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# A Range of Pandemic Adjustments: Changes to Texas Heritage Site Business Operations during the COVID-19 Pandemic

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**Abstract:** During the first year of the COVID-19 pandemic, heritage sites, which protect natural and cultural resources, experienced the dauting task of sustaining business operations during the pandemic while serving the public by preserving and conserving resources. These businesses undertook risk reduction measures, conceptualized as adjustments, to mitigate the spread of disease while maintaining business operations. By engaging with Gilbert White's (1942) Adjustment Theory, this study examines the adjustments made by Texas heritage sites in response to emerging risks associated with the COVID-19 pandemic. Specifically, we analyze adjustments made to reduce risk to visitors, financial stability, and programmatic offerings; explore the extent to which these adjustments facilitated sustainability, business expansion, and innovation; and identify what factors contributed to or hindered their recovery. This mixed-methods study employed an online survey and a follow-up semi-structured phone interview with heritage site managers. Our findings indicate Texas heritage sites implemented a range of fiscal and health related adjustments in response to the pandemic. Specific to fiscal adjustments, we found changes in visitors led to adjustments in business operations which also facilitated revenue generation for these entities. We also observed how new opportunities arose from the health adjustments in the form of remote offerings and new markets. Our findings emphasize the importance of adjustments made by heritage sites to continue their operations during the pandemic while also offering strategies to mitigate future risks.

**Keywords:** business continuity; pandemic; conservation; cultural resources; museums; natural resources; parks; preservation



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## 1. Introduction

The impact of the COVID-19 pandemic on global sustainability varied over space, time, and across economic sectors [1]. While some environmental problems, such as air and water pollution, abated during the first year of the pandemic, they returned once stay-at-home orders were lifted and information about virus transmission improved [2]. Moreover, the pandemic disrupted the operations of businesses and public services responsible for protecting and preserving natural areas and cultural resources, such as museums, parks, and heritage sites (collectively termed heritage sites hence forth). Heritage sites span the public, private, and nonprofit sectors, seeking to either preserve or conserve a focal resource while maintaining business operations. Conservation sites protect natural resources, including publicly managed parks and nature centers, whereas preservation sites, like museums and historical locations, protect artifacts, landscapes, and buildings; heritage sites can also protect a mixture of both resources [3]. These sites—their natural and cultural resources, their missions, and their operations—are integral in advancing sustainability. Heritage sites can protect biodiversity, deliver important ecosystem services, enhance human well-being,

create community cohesion, support local and regional economies, and/or educate the public on practices that help conserve resources. Simultaneously, heritage sites also operate as businesses that seek to generate revenue to maintain their operations alongside missions of conservation and preservation [4]. Yet the COVID-19 pandemic forced heritage sites to alter their operations and business practices, as government entities implemented risk reduction measures to slow the spread of the disease. This research examines the experiences of Texas heritage sites as they adjusted their business operations in response to the emerging risks associated with the COVID-19 pandemic.

On 7 April 2020, Texas state officials announced the temporary shutdown of all publicly owned historic sites and state parks due to the rise of COVID-19 cases; closures lasted for approximately two weeks [5] (Figure 1). City and county governments across the state also implemented local ordinances, such as mask mandates, to reduce the spread of the disease. The timeline and types of risk reduction mandates varied by county. Texas's governor issued a mask requirement for the public on 2 July 2020, which ended on 10 March 2021, when the governor reopened businesses to full capacity and lifted most COVID-19-related restrictions [6]. Texas was one of the first states that reopened to 100 percent capacity for businesses. Moreover, due to the variations in local public health ordinances, state mandates, and federal directives alongside the evolving nature of the pandemic, many heritage sites in Texas were left to identify their own protective actions strategies with minimal guidance [6]. The conflicting local, state, and federal policies resulted in differing risk perceptions, attitudes, and behavior amongst heritage sites, yet many experienced numerous, compounding challenges related to operations, staffing, visitor management, and revenue generation [4]. These compounding events along with a rush to reopen businesses makes Texas a compelling case study. Understanding how heritage sites navigated these evolving dynamics during the first year of a pandemic with a new, emergent disease can inform future responses to a range of disasters, informing sustainable and resilient approaches to heritage site operations.

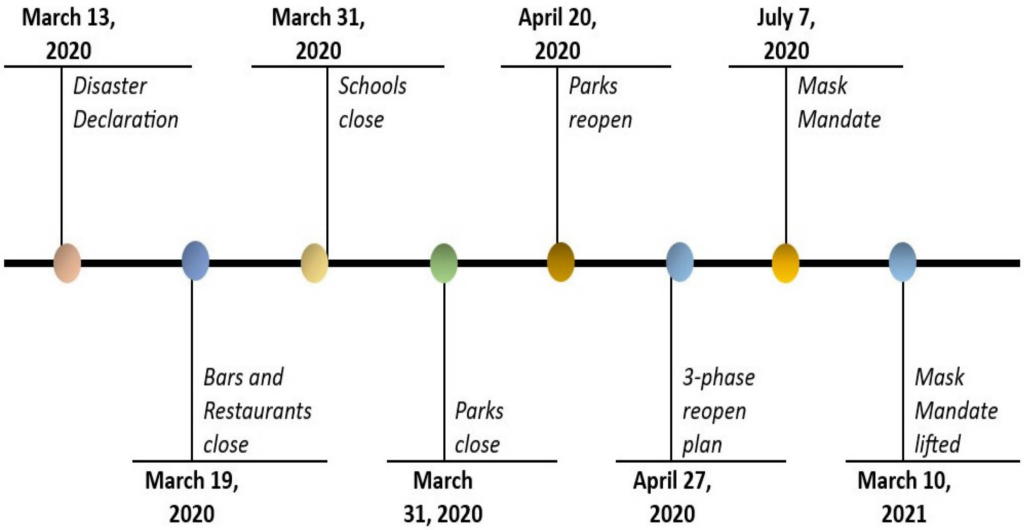


**Figure 1.** Timeline of COVID-19-related restrictions in Texas.

To identify how Texas heritage sites responded to the COVID-19 pandemic, this study extends the theory of human adjustment to floods by hazards geographer, Gilbert White [7]. White argued that there exists a range of adjustments that communities and individuals undertake when coping with extreme environmental events [8]. To adjust to hazards, communities implement risk reduction actions to mitigate loss and increase resilience. Community-level risk reduction activities work to enhance disaster preparedness, response, and recovery. Beyond community-level adjustments, White also identified factors that influence people's decisions on where to live relative to the potential hazards in their environment [7]. He divided these factors into two categories, disadvantages (also termed

as liabilities) and advantages (also termed as assets). Disadvantages, the more prominent of the two, include the factors that contribute to social losses and slow recovery efforts such as lack of flood protection and dense development in high-risk areas, while advantages bring about social benefits through mitigation efforts and aid recovery. White recognized that not every factor is present in all locations, and the factors are not permanently advantageous or disadvantageous.

In this study, we apply White's adjustment theory to understand how heritage sites adapted to the COVID-19 pandemic. During the pandemic, these entities undertook risk reduction measures to mitigate the spread of the disease while maintaining business operations; we conceptualize these measures as adjustments to COVID-19. Reflective of White's adjustment theory [7], we also categorize the factors driving heritage sites' adjustments to the pandemic as advantages and disadvantages. Therefore, the purpose of this research is to examine the range of adjustments undertaken by Texas heritage sites in response to the challenges posed by the evolving nature of the pandemic. This paper intends to: (1) document how these entities adjusted their business practices and operations to recover from the pandemic; (2) describe the extent to which these adjustments facilitated sustainability, business expansion, and innovation; and (3) identify what factors contributed to or hindered their recovery defined as return to pre-pandemic business operations.

## 2. Literature Review

During the first year after the governor's disaster declaration, Texas heritage sites experienced a range of challenges, and many adjusted their business operations to cope. At the same time, the COVID-19 pandemic afforded new business opportunities to these entities, such as new practices, streams of revenue, and markets. However, their recoveries were uneven, which is common after disasters due to business characteristics as well as the ability of regional and local economies to withstand the disruption brought by the disaster [9]. For instance, businesses that serve national or international markets are more resilient than small businesses that serve local markets [10]. After a disaster event, small businesses tend to encounter higher levels of losses and failure, and their recovery is often more difficult compared to larger businesses [11]. Yet to revive the local economy, business survival and return is essential for long-term community recovery [12,13]. In spite of these difficulties, disasters can also create windows of economic opportunity advantageous for businesses [10]. Some businesses owners become entrepreneurial during crises [14] and demonstrate opportunity-seeking behavior [15], but the benefits derived from these endeavors are frequently uneven across communities. Moreover, Pais and Elliott identified that, in a disaster context, those who possess social and cultural power and wealth tend to receive more benefits during disasters, whereas marginalized people continue to bear large amounts of losses [16]. Similarly, Klein found that some business entities, like construction companies who are needed in reconstruction efforts, benefit from disasters, while others suffer losses [17]. Therefore, experiences vary among business entities, including heritage sites, which are underrepresented in studies on the recovery of businesses following disasters.

To limit virus spread during the COVID-19 pandemic, government agencies around the world imposed varying levels of restrictions and social distancing regulations [18]. Many countries, including the United States, closed public spaces and parks during the first few months of the pandemic [19,20]. As people isolated themselves and maintained social distancing, the need for parks and other outdoor venues increased as the pandemic continued months after the first cases [19,21,22]. Due to the increased demand for these spaces, some U.S. cities decided to reopen parks at the end of April 2020 [23]. Initially after reopening, the number of visitors to national parks was much lower than pre-COVID levels; however, visitation soon increased at a rate that exceeded pre-pandemic levels, and reports on overcrowded parks became common [22,24,25]. Visitors to state and local parks also increased greatly [26]. Yet some entities continued to experience sharp declines in visitation [27]. For instance, attendance at indoor attractions, such as museums, enclosed

interpretive spaces, and visitor centers at parks, declined due to social distancing rules and knowledge of disease spread.

Changes in visitation affected not only heritage sites but also the communities that surround them. In tourism-dependent local economies, post-disaster decreases in visitation can indirectly impact surrounding businesses by decreasing the demand for many goods and services [28]. Parks and gateway communities, the localities that border national and state parks and public lands [29], are interconnected, and therefore, changes in visitors affect both entities [25]. The closure of parks and other public lands in the early phases of the pandemic negatively affected the economy of the surrounding areas. Yet when parks and public lands reopened after their initial closures, the number of local visitors increased in these sites, and many entities reported difficulty maintaining regular operations due to safety concerns, staff shortages and state and federal guidelines [30].

### *2.1. COVID-19 Adjustments*

Due to the COVID-19 pandemic, almost all organizations, including parks, museums, and galleries, restricted visitation and temporarily closed their sites for some period [31]. Many cultural heritage sites postponed or canceled events, exhibitions, and educational programs due to the crisis, which resulted in immediate negative impacts on their finances and employees. Some sites that were facing financial crisis due to the pandemic feared permanent closure [31]. The American Alliance of Museums (AAM) estimated that, because of the impact of COVID-19, U.S. museums were losing around $33 million USD per day [32]. To maintain business operations and reduce financial losses, the pandemic forced heritage sites to adjust their practices.

The literature identifies a range of adjustments made in response to the COVID-19 pandemic. Due to the closure and restrictions, many entities laid off staff [30] or shifted full-time staff to part-time services to balance budgets while also continuing to offer limited services [33]. Other heritage sites went online; however, lack of technology combined with varied levels of staff skill, resources, and other demands on their time influenced the success of this virtual transition [31,34]. Some entities shared their collections online with their audience through interactive online platforms, especially social media [35]. Virtual offerings allowed visitors to engage with heritage sites from any location, helping entities survive when they closed or operated with limited capacity. By promoting their collections and resources online, heritage sites maintained public attention while they waited to reopen [35].

Once sites reopened, for those visiting in person, managers implemented additional safety measures, such as social distancing, wearing masks to reduce virus spread, limiting the use of their facilities [36], and reducing operation hours [37]. Adjustments included installing plexiglass, increasing the frequency of cleaning, disinfecting of touch points, reducing menu options, increasing the use of grab-and-go food items that did not require waitstaff, offering flexible cancelation policies, and, where possible, moving indoor events to outdoor settings [25]. To communicate with visitors, entities used physical signage along with technology and social media. For instance, entities posted infographics on social distancing, updates on operations, and status of trails and campsites on their websites and on social media platforms, such as Facebook and Twitter [25].

### *2.2. Gilbert White's Adjustment Theory*

As a pioneer in hazards research at the Chicago School of Behavioral Sciences, Gilbert White emphasized the need to change human behavior that perpetuated risk rather than the New Deal policies of the 1930s that only addressed the consequences of that behavior [38]. With this perspective, White encouraged the use of incentives for hazard risk reduction to extreme events, especially related to flooding [7]. White argued that by incentivizing adjustments, or the building and development choices people and communities made, mitigating hazard risk was more effective and efficient [38].

Although recognized as both a versatile and influential theory [39], most research engaging with White's Adjustment Theory focuses on environmental hazards, especially flooding [38,40,41]. However, the theory has also extended to the management of water resources where adjustments can be utilized to address conflicting interests to meet sustainable development goals [40,42]. Regardless of hazard type, the large volume of scholarship engaging with White's Adjustment Theory has resulted in a long list of adjustments that scholars have categorized to better understand their effects [8,39]. For example, adjustments may be intended choices made by communities or an incidental consequence of an activity. Furthermore, adjustments may be the result of new prevention/mitigation activities while other adjustments may be the use of a traditional prevention/mitigation activity in a new way or location [8]. Building from this vast scholarship, this research addresses a gap in our current understanding of how businesses adjust to crisis events and extends White's adjustment theory to a pandemic setting.

## 3. Materials and Methods

We conducted a mixed-methods study to identify the range of adjustments undertaken by Texas heritage sites during the first year of the COVID-19 pandemic. We developed a survey and distributed it in March 2021 through Qualtrics, an online survey platform. Survey recipients included public, private, and non-profit entities who operated heritage sites in Texas. We identified eligible participants as any heritage site in Texas and collected their email addresses via governmental and tourism websites. The survey topics included questions related to the impact of the COVID-19 pandemic on daily operations, visitation, revenue, donations, funding, reopening, and programmatic offerings. Topic formation and questions were developed based on existing research on business recovery after disasters [10,11] as well as early research on the pandemic [30,31]. The survey consisted of closed response questions, along with a couple of open-ended response opportunities. The Association of Nature Center Administrators (ANCA) advertised the survey through their Texas members' email distribution. The Texas Parks and Wildlife Department (TPWD) distributed the survey to park superintendents. Reminders were sent via direct email and listservs in April and June 2021 before closing the survey, yielding a 13.3% response rate across the state (Figure 2). Among the 99 survey participants, 35.8% of responses came from the ANCA email link, 5.9% from TPWD, and the remaining came from direct email (see Section 4.1 for distribution among entity types). A total of 36.8% (n = 41) of respondents self-identified in the surveys as willing to participate in a follow-up phone interview.

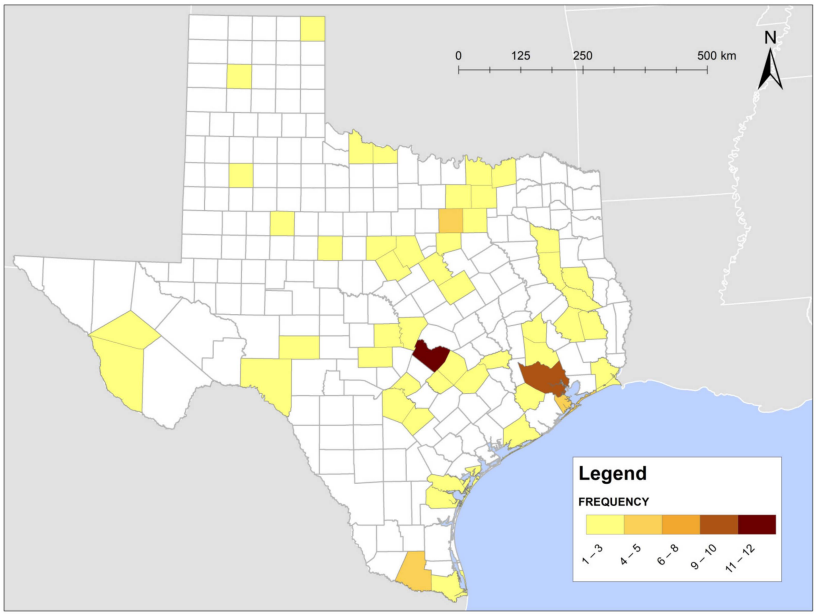


**Figure 2.** Survey participants' locations by county.

In June and July 2021, we conducted 20 semi-structured phone interviews with heritage site managers. Each conversation lasted between 30 and 60 min. At minimum, at least two members of the research team were present for each interview. We audio recorded the interviews and transcribed them verbatim [43]. One person declined to be audio recorded during their interview, so notes were taken instead. The interviews added depth to the survey responses and reflected topics such as challenges and successes related to COVID-19 policy implementation, visitation, staffing and programming. Specifically, we asked participants about their current operational status; whether they implemented any changes to business operations since the state governor lifted the mask mandate and fully reopened businesses; what types of changes they made; their experiences with changes in revenue and visitor numbers; any changes in program delivery methods; and their perceptions on long-term effects of the COVID-19 pandemic on these entities.

We analyzed the closed-response questions using descriptive statistics and the open-response questions using quantitative and qualitative content analyses to identify patterns and frequencies [44]. We used inductive coding in ATLAS.ti to identify themes in the interview data, specifically adjustment types, the factors influencing adjustments, and other emergent data relevant to business operations (e.g., opportunities and innovations) [45]. The first phase of coding focused on identifying adjustments taken in response to COVID-19. The second phase coded factors influencing these adjustments. After identifying the adjustments and factors, we categorized these codes into overarching themes such as technology or fiscal health. We then triangulated the results from both interview and survey sources to increase the reliability and validity of the findings. The survey provided content and background information for each entity, while the interview data provided more details and context about their experiences. Further increasing the reliability of the findings, our team consisted of three people conducting this research, which decreased potential for bias. Moreover, different team members tested the coding structure before applying it across the dataset to improve the validity of the data analyses and findings [46].

## 4. Findings

The COVID-19 pandemic impacted Texas heritage sites in a variety of ways that required heritage sites to make continual adjustments to changing risks during the first year of the pandemic. To understand these adjustments, we begin by describing the survey respondents and interview participants. Next, we present the impacts of the pandemic on sites' visitation, revenue, and donations. Then, using White's adjustment-to-floods theoretical concept [7], we identify the range of adjustments undertaken by these entities to maintain their business operations while meeting public health protocols to reduce disease spread. Finally, we then discuss the direct and indirect factors that affected these adjustments, how these factors helped/hindered recovery, and the opportunities that emerged while implementing them.

### *4.1. Survey Respondent Demographics*

After removing partially completed surveys (n = 3) and those declining to consent to the survey (n = 1), we analyzed a total of 99 surveys. Most respondents self-identified as either working at museums or natural heritage sites, yet some identified their sites as "other", including public gardens, an aquarium, and a wildlife rehabilitation center. Most of the respondents identified their sites as non-profit organizations while a handful identified their sites as partnerships between public, private, and/or non-profits. Approximately 46% of respondents self-identified as working at a museum (Table 1), and 56.5% of participants were employed at privately funded or nonprofit entities (Table 2). While survey and interview respondents were distributed across the state, the majority came from densely populated counties, such as Harris and Travis Counties, home to the cities of Houston and Austin, respectively (Figure 2). Of the 20 interview participants, approximately 45% self-identified as working at a nature center, wildlife refuge, park, or protected place (natural

heritage site; Table 3), and nearly 50% of interview participants' entities were privately funded or nonprofits (Table 4).

**Table 1.** Survey participant characteristics.

| Entity Type | Participants (n = 99) | Percentage (%) |
|---|---|---|
| Cultural Heritage Site | 3 | 3.0 |
| Museum | 46 | 46.5 |
| Natural heritage site | 38 | 38.4 |
| Other | 12 | 12.1 |

**Table 2.** Entity types in terms of majority funding sources for survey participants.

| Funding Type | Participants (n = 99) | Percentage (%) |
|---|---|---|
| Public | 38 | 38.4 |
| Private | 3 | 3.0 |
| Non-profit | 53 | 53.5 |
| Other | 5 | 5.1 |

**Table 3.** Interview participant characteristics.

| Entity Type | Participants (n = 20) | Percentage (%) |
|---|---|---|
| Cultural Heritage Site | 1 | 5.0 |
| Museum | 7 | 35.0 |
| Natural heritage site | 9 | 45.0 |
| Other | 3 | 15.0 |

**Table 4.** Entity type in terms of majority funding sources for interview participants.

| Funding Type | Participants (n = 20) | Percentage |
|---|---|---|
| Public | 9 | 45.0 |
| Non-profit | 10 | 50.0 |
| Other | 1 | 5.0 |

### *4.2. The Impact of COVID-19 on Heritage Sites and Associated Adjustments*

The COVID-19 pandemic impacted both visitor counts and annual revenues of heritage sites. Private and non-profit entities experienced a sharper decrease in their number of visitors (Table 5) compared to the number of visitors to public entities. The difference in visitation among the public versus private and non-profit entities during the first year of the pandemic was substantial; only 8% of private and non-profit entities compared to nearly 42% of public entities reported visitation increased or stayed the same. Consequently, private and non-profit entities experienced a higher loss in annual revenue than public entities during the first year of the pandemic compared to the previous pre-pandemic fiscal year. Approximately 26% of the survey respondents from public entities reported an increase in revenue. Despite these increases, most participating entities experienced a loss of revenue, with approximately 53% of public entities and almost 84% of private/non-profit entities reporting revenue losses. Approximately half of the survey participants from all entity types indicated a decrease in donations. On the other hand, 25% of the private and non-profit entities indicated that donations increased, and approximately 13% of public entities reported an increase in their donations (Table 5). The changes in funding, both from visitor revenue and donations, influenced the adjustments entities made in response to the COVID-19 pandemic and their timing.

**Table 5.** Impacts of COVID-19 on Texas heritage sites. Note: n equals the number of responses received.

| Impact Feature | Public Entities (%) | Private/Non-Profit Entities (%) |
|---|---|---|
| Number of Visitors | n = 33 | n = 50 |
| Increased | 36.36 | 8.0 |
| Stayed the same | 6.06 | 0 |
| Decreased | 57.58 | 92.0 |
| Revenue Impact | n = 38 | n = 56 |
| Increased | 26.32 | 8.93 |
| Stayed the same | 21.05 | 7.14 |
| Decreased | 52.63 | 83.93 |
| Donation Impact | n = 38 | n = 56 |
| Increased | 13.16 | 25.0 |
| Stayed the same | 26.32 | 17.86 |
| Decreased | 44.74 | 51.79 |
| Unsure | 15.79 | 5.36 |

We found that adjustments occurred at two critical time periods: first, after businesses reopened from the initial closure in April 2020, and second, after all restrictions were lifted in March 2021. Interestingly, study participants did not indicate the July 2020 mask mandate as resulting in significant adjustments. We also identified two primary factors that influenced adjustments: economic factors and human health factors. These factors led to what we term fiscal-related adjustments and health-related adjustments. Fiscal-related adjustments sought to maintain business operations and preserve financial stability of the heritage sites, while health-related adjustments focused on reducing risks to human health and mitigating the spread of COVID-19. Together, these adjustments helped entities keep their businesses running while protecting staff, volunteers, and visitors.

#### 4.2.1. Fiscal-Related Adjustments

All participating sites implemented various types of fiscal-related adjustments during the pandemic to maintain operations and stay in business. These were particularly critical given the loss of revenue, decline in visitors, and reduction in donations reported by most survey respondents. Adding to theses fiscal challenges, due to COVID-19, there were many restrictions recommended by local authorities, the State of Texas, and the U.S. Center for Disease Control (CDC), such as social distancing and mask mandates [47]. These restrictions brought additional financial burdens to the sites, either directly, such as the need to purchase disposable masks and hand sanitizer, or indirectly, such as limiting the number of visitors permitted on site, thus reducing revenue. Given these financial burdens, heritage sites relied on several fiscal-related adjustments to maintain business operations.

While implementing COVID-19 restrictions, 65% of the interview participants reported three adjustment measures to maintain fiscal wellbeing: (1) undertaking new fundraising approaches; (2) generating different funding streams; and (3) seeking new grant opportunities. Respondents often reported on attempts at new fundraising strategies and their outcomes. For example, one participant reported that, "[we] did a COVID funding drive late June. It was a campaign and it helped us a lot". Some entities tried to raise funds not only in person but also through virtual options. One participant explained, "we did a fundraiser last October. That was hybrid. We did it in person and online". Another participant from a historic home described their new event as "a charity tea party at our house with a charity auction donation". These quotations show that entities actively planned and implemented new fundraising methods during the pandemic to help address their fiscal concerns.

At the same time, many entities reported applying for different grants to meet their budgetary needs and to stay in operation. For instance, one participant explained, "[we] applied for some of the COVID grants, and we were able to receive those. . . they helped. . . to

pay my intern, and you know different things like that". By undertaking these fiscal-related adjustments, entities maintained economic stability and remained in operation.

#### 4.2.2. Health-Related Adjustments

Along with maintaining business operations to preserve financial wellbeing, participants identified human health concerns as important factors that resulted in numerous health-related adjustments when reopening their businesses. To mitigate the spread of COVID-19, all entities participating in this study enacted health safety measures by following COVID-19 safety protocols and guidance introduced by government organizations like the CDC. For example, many entities reported that they installed hand-sanitizing stations throughout their sites and added plexiglass shields at checkout areas to provide a barrier between staff and visitors. Participants also reported intensified cleaning, bleaching and sanitizing of facilities and touch points to adhere to COVID-19 protocols. One participant elaborated,

> We did of course change our cleaning protocols during COVID. We were much more thorough about wiping down all surfaces, including the light switches and doorknobs and all the things that you were supposed to be cleaning. Anything that somebody touched.

Many of these health-related adjustments reflect the modification of traditional prevention techniques into a new setting, or in this case to address an emergency disease. This expansion of traditional risk reduction adjustments to new locations or to meet new needs is well documented in the adjustment literature [8]. Heritage sites also sought to reduce touching common surfaces or shared items. For example, a museum in Texas organized their annual Smokey Bear birthday party to gift individually packaged bear shaped treats, unlike in previous years where a large cake was cut and shared. Other attempts to reduce contact included the use of online reservation systems to reduce the spread of COVID-19. One participant explained:

> For a while, we literally were not even taking cash, we were not taking checks, nothing that we had to touch. . . that the other person would have touched, and so for a while, literally the only way to get into the park was to go online and make a reservation in advance.

In addition to these reduced-contact procedures, heritages sites introduced signage to encourage mask wearing and abide by the health protocols, such as social distancing. Signs reminded visitors and staff alike to protect community health. Additionally, heritage sites introduced measures to reduce the number of people on site, including establishing timed entry, limiting the number of people per hour, closing overnight facilities, and setting a daily quota for the number of vehicles allowed entry. Furthermore, many sites also offered new reimbursement policies for people exposed to or symptomatic of COVID-19. These health-related adjustments, which sought to reduce the spread of the disease, often had adverse impacts to a site's fiscal wellbeing (i.e., decreased revenue due to fewer visitors), yet they were commonly observed amongst participants and reported in studies on national parks as well [25,48].

#### 4.2.3. Combined Fiscal- and Health-Related Adjustments

Many of the adjustments implemented by heritage sites sought to simultaneously maintain economic stability and protect human health. Programming emerged as an avenue where entities addressed both factors. Specifically, many participants reported changing their methods of programming, reducing the number of program offerings, limiting their capacity, or canceling them altogether. One participant described their site's reduced programming: "summer camp [was] not in full version this year. We usually have 11 camps, but we are going to have three". Offering fewer and smaller programs not only reduced potential exposure to COVID-19, but also lessened the workload on overburdened staff and volunteers. To prevent canceling an important annual community-wide event

and limit loss of revenue, one site created a drive-through program where visitors could still participate yet remain socially distanced. The participant said, "[we] have a circle parking lot people can circle in, pick up their stuff and circle right back out". These socially distanced program opportunities became the cornerstone of many heritage sites' offerings. As the pandemic wore on, many people relied on these heritage sites' programs for educational enrichment opportunities, socialization, and physical activity to improve mental health [22].

Participants also described adjustments to keep staff healthy while working. Many reported introducing work-from-home options for some of their team members. Those in management positions tried to keep themselves updated with the latest COVID-19 policies. For instance, one study participant said, "we recently updated our COVID policies. We've been updating them all along the way from the CDC guidelines". Others implemented more outdoor activities to limit staff exposure and maintain social distancing while proceeding with programming. Rather than offer guided tours, several entities introduced audiovisual tours "where we are able to let people come in and walk through at their own pace. They don't have to be in [our staff's] company". By introducing new technology, participants explained that they were able to reduce risk to staff and volunteers. The audiovisual tour is reflective of the creative thinking necessitated by the pandemic. For many heritage sites, technology enabled them to maintain business operations and protect human health while adjusting to evolving conditions and policies.

The most frequently reported adjustment that addressed both economic stability and human health concerns was the increased use of technology. A range of technological approaches to adjustments is well documented in the literature, especially related to water resources [40]. During the first year of the pandemic, when sites were closed or operating under reduced in-person programs, many study sites introduced virtual programming options. Before COVID-19, almost all interview participants reported having little to no experience creating and distributing virtual programs. This lack of experience explained why many interview participants initially were concerned whether virtual programs would be successful. One participant explained how their concerns about moving to virtual platforms turned into relief:

> We have a three-week series [of classes]. I wasn't quite sure if it would work, 'cause it's six hours for three Saturdays in a row. And I was like are people gonna be able to sit in Zoom for six hours for 2 to 3-h classes? And they did.

The increased use of virtual programs was an adjustment that maintained business operations and reduced the risk of disease spread. One participant powerfully described, "When the whole thing first went down, I told the staff that we had to do something to be in front of people or they would forget about us, and we die. And so, we became very active with our social media". To stay in business, heritage sites had to adapt and evolve while maintaining public safety. Another described virtual programs as the solution since "the city as a whole was taking a pretty restrictive stance because they wanted to... try to keep as many people safe as possible and move forward". Unlike in previous studies that reported only cultural sites or museums deploying virtual options in response to COVID-19 [31], nearly every participant in our study (e.g., museums, parks, and nature centers) offered some range of virtual options.

To meet the demand for virtual programs, heritage sites reported using a variety of platforms such as social media, YouTube, Zoom, websites, and cable channels. Social media, particularly Facebook Live, emerged as the most popular platform given its ability to reach a greater number of people, including new audiences, for free. One participant indicated, "we definitely had a large uptick in our social media interactions". Another explained, "[Facebook Live] proved very popular. So, we take [videos down] after they're [on] Facebook... and we convert them and upload on YouTube". Not only were more people visiting heritage sites' social media pages, but the heritage sites were creating more content to post to these pages. Several participants mentioned that they bought recording equipment, such as microphones and high-quality cameras, to make new video content to

make their social media presence stronger than before. A study participant from a state park explained:

> We did increase our social media presence and put things like cameras out and videoed different parts of the park and put [that] video footage from the cameras up on our social media page. I have several staff members that just like to take pictures of stuff 'cause they're very passionate about their park so we would take their pictures that they found and put them up on social media.

These findings are consistent with research studies, confirming that social media was a popular tool for museums around the world during the COVID-19 pandemic [35] to keep people healthy while generating revenue.

#### 4.2.4. The Evolution of Fiscal- and Health-Related Adjustments through Increased Virtual Programming

While virtual options span a range of intended audiences and topics, the expansion of virtual options helped increase access to heritage sites while continuing to protect public health and generate revenue. Virtual camps aimed at youth audiences were popular among respondents. One study participant described, "there has been a significant increase [in the number of people] in social media, like the virtual field trips we offered". Another spotlighted their virtual camp as in demand since its "where the kids got to meet animals virtually. . . and talk about life". Additionally, virtual programs offered an opportunity for people to visit these sites who may not have the resources to visit in person, such as school districts that cannot afford to bus large groups of kids to these sites. Therefore, the pandemic-induced virtual programming increased access to heritage sites and the knowledge they contain.

Virtual programing also increased access by removing geographic barriers. Since many people were seeking activities while adhering to stay-at-home restrictions, new audiences were attending virtual programs, such as live garden tours and virtual walks in nature centers. A participant from a nature center explained that before COVID-19 they used to have an in-person morning walk every Wednesday where less than 50 people joined the walk each week. The participant described, "we then went to the virtual Wednesday walk and all of a sudden we were having hundreds of people attend that at no charge". Many interview participants indicated that the audiences were increasing in the virtual platforms compared to in-person experiences. Some programs received new international audiences too. A participant explained they were reaching international audiences in the following way:

> We had started doing remote classroom visits by. . . staff members. . . and [for] the first few of [visits] we expected we were going to go to rural school districts in Texas. Instead, [staff members] were going [virtually] to places like school systems very close to the Arctic Circle in Canada. Next one was a request from New Zealand. And before we knew it, we realized we really had a worldwide audience instead of just [a] Texas audience.

A participant from a nature center indicated that in some cases people were more comfortable doing activities online than doing them in person. They said, "people actually like [online cooking classes] better because they could be in their own kitchen and do their own cooking with natural resources like beautyberry". In this instance, the virtual programming was preferable to the in-person on-site classes, and the site suggested that they may continue these classes virtually since the response was so positive.

Heritage sites were creative in offering unique types of virtual options to attract audiences. For instance, art shows, socials and online birthday parties hosted by heritage sites enabled people to join virtually and, in some instances, sites generated revenue from these events. One study participant said that before the pandemic they had in-person fundraisers, but during the pandemic they started conducting their fundraisers online and in person so that people could participate at their convenience and named it a "hybrid

fundraiser". Another study participant described the popularity of a digital book signing program where audience members could virtually chat with a book author. One of the interview participants illustrated,

> We have a local author, and he released a book about the town and [the heritage site used] an in-person book . . . But I wanted to offer a digital option for people. You know, people may not have been entirely comfortable coming out to the book signing. And so, we offered virtual author chat.

According to [35], as the heritage sector moved in-person programs to virtual options, it enabled them to apply creativity and diversity to promote their heritage in a way that would capture public attention. The creativity and diversity in online programs garnered public attention and, in some instances, increased visitors. One participant described,

> how [new visitors] found us I think a lot of that is because during COVID, like everybody else, we went highly virtual. And I think a lot of people stumbled across [us] through our Facebook live presentations and things like that and. . . they're just chomping at the bit to get a chance to come out and actually see the place, so we have seen our organizational memberships go up, as well as visitation. And I truly believe that is just people finally discovering us. You know, we may have to change our whole marketing plan. Also, that what we've done for 20 years of being the hidden jewel and we got found.

#### 4.2.5. The Legacy of Fiscal- and Health-Related Adjustments

Although many participants reported that the adjustments made, including virtual programs, were well received by their audiences, there were mixed responses from participants about continuing these offerings post-pandemic. Many participants were enthusiastic about keeping virtual options post-pandemic because they could reach more people. For example, a participant from a park confirmed they would continue offering virtual options and explained, "part of our goal is outreach, and we are avid and very sincere about trying to reach people that aren't already coming to parks. . . so it's not just the COVID thing, it's part of our outreach". Another spotlighting the success of virtual programs said, "The one thing that we started to do that became very popular, and we're continuing to do now, is doing Facebook live sessions". Yet for some entities, virtual programs stressed the existing skills and resources of the heritage site. A participant from a wildlife center illustrated,

> no, I will not continue to do [program offerings] virtually. It does not come across as effectively as of course, seeing things in person. And I'm just not techno savvy [laughs] enough to be very good at it. And I'd rather not put something out there that's not quality [content]. You know, I'm 64 years old and so it's [laughs] a little trickier for me.

Therefore, for some heritage sites, adjustment measures were only temporary and would cease once more normal business practices could resume. This finding is consistent with other scholarly research on adjustments made to extreme environmental hazards, where some adjustments are short-lived while others embed in society [8].

These new and expanded virtual programs are examples of adjustments made during the pandemic to address both human health concerns and business operations. Given their reception, many adjustments are likely to persist long after pandemic conditions end for those heritage sites with the technological skills and resources to allocate to virtual programs. By continuing to offer virtual programs, heritage sites may reach new audiences and reduce barriers that prevented people from visiting sites. Furthermore, new audiences may increase revenue support for these sites beyond the pandemic.

### *4.3. Factors Affecting Adjustments*

As described above, economic wellbeing and public-health-related concerns were the two primary direct factors that influenced heritage sites to implement fiscal-related adjustments and health-related adjustments. However, a host of indirect factors also

influenced the observed adjustments. Following White, we divided indirect factors into two categories: (1) disadvantages, the factors that impeded recovery; and (2) advantages, the factors that contributed to recovery [7]. Disadvantages manifested as challenges to business operations that arose from the COVID-19 pandemic, such as staff and volunteer shortages, limited technology, and decreased funding and reduced budgets. Although lack of funding was a prominent disadvantage and more common among participants, some sites experienced increases in funding and donations, which served as an advantage.

Staffing emerged as one of the most important indirect factors that influenced adjustments. Participants reported laying off staff members, leaving vacant positions unfilled, and reducing volunteer hours. Regardless of method, many participants reported that their sites operated without a full staff during the first year of the pandemic. One participant from a nature center detailed, "I laid off two people COVID wise. I had a director of education who was 45 years here. She retired. I didn't replace her. My conservation director moved back to. . . [another city] in August [2020], I didn't replace her until February this year [2021]". Another nature center manager commented that three part-time employees left because they found full time jobs in other organizations, while others reported hiring freezes kept vacant positions from before COVID-19 unfilled.

Volunteer unavailability negatively affected many sites' operations causing entities to adjust their business practices. Most survey participants reported decreases in volunteers during the pandemic. Participants reported volunteers were instrumental in operations like tours, customer service, and ground beautification. A participant from a nature center detailed, "we have one program that relies pretty much solely on volunteers. . . we tried to engage volunteers in doing it virtually. But overall, that just wasn't the experience they were looking for, so we did see a significant decrease." Another study participant from a museum who remained closed a year after the onset of COVID-19 reported that "we are continuing to look for opportunities to open. It's based more on availability of volunteers than anything. . . we are seeing plenty of visitor interest. . . but. . . waiting until our volunteers come back where a lot of our volunteers are senior staff". For this heritage site, 98% of their operations depend on volunteer labor, with only one paid employee. Without volunteers returning to full capacity, many heritage sites could not continue regular operations.

Therefore, staff and volunteer attrition indirectly influenced adjustments made during the pandemic. Labor shortages even created challenges for virtual formats. One participant illustrated, "online in a way is easier, but in a way, it takes more staffing. It takes more educated staffing to run, but onsite takes more facility staffing to run 'cause they have to set the room up. So, it's give and take on both sides. So, we're trying to figure that out". Another participant explained, "When COVID first hit, we only had one staff person [physically] going in to work. . . and it was too large of a task for one person to do because normally there would be six people doing it". All staff members could not go to the site due to health concerns, causing difficulty running operations. Reduced staffing was observed in the literature as a vital factor that influenced adjustments in other entities too [30]. With a lack of staff and frequently reported volunteer shortages, participants reported the need to adjust business operations to keep revenue incoming.

Similarly, as we have shown, almost all participants reported transitioning operations to virtual platforms, but this created challenges. Inadequate equipment, insufficient technology, and lack of technological skill negatively affected operations, thus requiring adjustments. For example, one participant reported, "[we were] ill prepared on the technological side. . . to jump full board into doing those kind of programs [virtually]". Despite lacking technological skills and adequate equipment, the entities tried to adjust. For instance, another participant said, "we don't have the equipment, but we're trying to make do [for virtual programming] with what we have". To meet these challenges, participants indicated that they tried to adjust with available resources or acquired new equipment or skills when possible. Sometimes this meant expanding the responsibilities of existing staff. One participant described that their intern was more experienced using social media than

the manager, so the intern's job responsibilities evolved to include posting material on the site's social media pages:

> we had an intern at the time, and she did a few extra things. She tried to get the Instagram going and did some livestreams and things like that. . . [the interns] were usually really great about picking up and enhancing whatever they could with the social media, working on things like twitter.

By capitalizing on existing skills and modifying responsibilities to reflect staff strengths, heritage sites attempted to address limited technological resources.

Beyond limited staffing and technology, lack of funding and reduced budgets generated adjustments to operations. Many entities struggled to maintain business operations due to reduced budgets caused by the pandemic. While talking about budget reductions, one participant reported that constraints increased as the pandemic wore on: "for 2020 we were fully funded. . . ironically, on this next fiscal year our budget is reduced". With reduced budgets, some participants tried to adjust by seeking funding from new sources. For example, a participant mentioned that "our leadership is looking at trying to find funding. . . for extending [a certain] program". Therefore, decreased funding and budget reductions served as indirect factors that produced disadvantages for entities' adjustments to the COVID-19 pandemic.

Despite disadvantages being more pronounced, which is consistent with the findings of White, some advantages emerged [7]. Participants identified changes in funding and donations as positive catalysts for adjustments. In the survey, respondents identified their primary sources of funding before COVID-19 and during the first fiscal year of the pandemic (Table 6). Before March 2020, for public entities, the top three primary sources of funding were visitor revenue, donations, and state funding. Whereas in March 2021, donations emerged as the top funding source for public entities. Despite this change, their top funding sources remained consistent, and the increase in donations often generated a surplus. Private and non-profit entities, however, reported their primary sources of funding before March 2020 came from donations, visitor revenue, programming, and foundation funding. In March 2021, their primary sources of funding were from donations, foundation funding, and federal sources. As their visitor revenue decreased, private and non-profit sites relied on federal funding, specifically temporary COVID-related relief grants as a top funding source.

**Table 6.** Primary sources of funding before March 2020 and between March 2020–March 2021.

| | **Before March 2020** | | **March 2020–March 2021** | |
|---|---|---|---|---|
| **Funding Source** | **Public (%) n = 38** | **Private/ Non-Profit (%) n = 56** | **Public (%) n = 38** | **Private/ Non-Profit (%) n = 56** |
| Federal funding | 10.5 | 7.1 | 7.9 | 28.6 |
| State funding | 39.5 | 5.4 | 7.9 | 0 |
| Municipal funding | 31.6 | 14.3 | 13.2 | 5.4 |
| Programming revenue | 18.4 | 42.9 | 2.6 | 5.4 |
| Visitor revenue | 50.0 | 44.6 | 21.1 | 17.9 |
| Foundation funding | 26.3 | 37.5 | 5.3 | 32.1 |
| Corporate partner | 2.6 | 10.7 | 2.6 | 7.1 |
| Donations | 44.7 | 75.0 | 23.7 | 46.4 |
| Private events | 15.8 | 28.6 | 0 | 5.4 |
| Other | 15.8 | 23.2 | 7.9 | 8.9 |

For public, private and non-profit entities, donations played an important role, allowing them to stay in operation, and influenced their adjustments. One participant said that they received donations from not only their long-term supporters but new people, too. "There are people out there who have been supporters of us. . . [and] in some cases, we got

donations from people we've never gotten donations from before". Another participant illustrated how the donations assisted:

> then we did live garden tours. It was rough at the beginning. . . we had an iPad and just quickly got a hotspot. . . worked in the garden and you just never know who's in your class. . . I said in the class. . . we are quickly adjusting and trying to learn this online format as quick as possible and trying to gather up these online materials and equipment as quick as possible, but we don't have this equipment, but we're trying to make do with what we have. And there was a woman in the class, afterwards she emailed me and said, "do you have a budget?" and I said yes, and she said, "send it to me". And I sent it to her, and she cut us a check for five thousand [dollars]. . . So you never know who's listening or who's watching and that saved us. So, with that we were able to buy microphones, and a nice DSLR camera [with] which we've done a lot of our videos.

This donation allowed the site to offer better quality online material to attract virtual visitors. Other entities reported receiving similar gifts to help expand their virtual programming. Moreover, temporary funding from a range of sources, such as private COVID-19 relief grants, FEMA's Small Business Administration loans, and Congressional funding through the CARES Act, positively influenced the entities' ability to run operations and implement adjustments. For example, one participant from a museum illustrated that they used temporary relief funds to expand their operations: "the support of the board to go ahead and use the SBA funds. . . to expand the museum and expand the collection". Another participant explained, "so financially this last year, even though a lot of it was gifting [donations] and SBA support and things like that, we did extremely well". Despite the temporary nature of the funding from disaster relief sources, some entities were able to make permanent enhancements to their sites and operations. Therefore, while not the experience of most participants, for some, donations and relief funding helped heritage sites adjust to the COVID-19 pandemic conditions.

### *4.4. New Opportunities from COVID-19 Adjustments*

Though all the sites identified challenges related to the COVID-19 pandemic, new opportunities arose. These opportunities often arise after disaster events [49]. We identified several prominent opportunities among participants, and those most likely to last beyond the pandemic, including networking, site maintenance, and virtual programming. Almost all participants reported some reliance on formal and informal networking with established and new partners. They collaborated with other entities to collect and share information on best practices to maintain operations and reduce risk. One participant elaborated: "Every other Friday since the pandemic, we get on a call in Houston, all the great leaders, and we compare notes". Another participant described building new relationships through "very, very extensive communication with the other local area museum directors". For some entities, existing networks got stronger during the pandemic:

> we have always networked with other rehab centers and nature centers and that kind of intensified during the past year. Because we wanted to make sure that we were following some of the same protocols as per COVID safety as some of the other organizations and also to see how they were handling their staff and. . . their volunteers. Also, what types of programs that they were offering.

Therefore, networking became a significant source of sharing and learning about the successful measures and enabled the execution of new plans in response to the pandemic. Sharing information and resources enabled entities to overcome some of the COVID-19-induced challenges such as staff and volunteer shortages and limited access to technology. By engaging with practices proven successful by other entities, heritage sites could focus their limited resources on these best practices, maximizing chances for success and profit. These collaborative environments should help entities execute successful plans and mitigate the effects of extreme events in the future.

In addition to networking, many sites used the temporary closures as opportunities for on-site maintenance. These projects proved difficult to implement while open to the public, but the pandemic closures provided an opportunity to repair and renovate their grounds. One participant explained, "So we were closed, and my intern and I were like this is a good time to work on exhibits that we just haven't had time to do". Another described that "[we] painted some of our infrastructure, . . . our buildings on the outside that would have been hard to take care of when we were open". Projects included indoor and outdoor updates, practical facility maintenance, as well as site beautification and landscaping. Participants spotlighted specific projects that were previously deferred due to frequent visitors, such as improving parking lots, installing restrooms, and performing building maintenance. Moreover, these maintenance projects will benefit the sites and their visitors, far beyond the COVID-19 pandemic.

Finally, the introduction and expansion of virtual options created new opportunities to reach audiences remotely [33]. Most of the interviewed participants agreed that they were able to reach a larger and expanded audience virtually. Virtual platforms especially offered an opportunity to connect with people beyond their local area or with those with financial or mobility limitations. A participant from a nature center explained,

> we recognize that this has allowed people who maybe are in different parts of the city who couldn't come to an in-person program because of transportation, or physical limitations that they had. They could come and participate virtually. So, our goal would be to offer some programs virtually in the future [post-COVID].

The pandemic provided an opportunity for sites to expand their virtual programming, reach a more diverse audience, and monetize those programs to earn additional revenue from this adjustment. Therefore, almost all interview participants agreed that they would keep up their virtual options post-pandemic.

### *4.5. Lessons Learned and Recommendations*

From this novel research, several lessons and recommendations can be identified for heritage sites to maintain operations during future extreme events. First, social connections and networks played a vital role for all participating entities during the pandemic. Previously established professional networks relied on each other to share information while new groups emerged to meet the evolving risk posed by the pandemic. We encourage heritage sites to maintain and extend these networks as a means of sharing their resources post-COVID-19. By sharing resources, entities can learn best practices both during extreme events or periods of normalcy that can improve business practices.

Second, virtual programs became a key component of pandemic business practices; however, many participating entities reported that they initially lacked the skills and/or technology to shift programs to virtual formats. Those with staff familiar with social media were able to move content online more efficiently and effectively than those without existing skillsets. As many entities wanted to keep the virtual options post-COVID-19, we recommend training staff and volunteers to master online technology and help maintain that skillset prior to the next extreme event. Moreover, many participating entities reported that they had to acquire new technology to meet virtual programming demands whereas others did not have the funding to acquire those technologies. Therefore, thirdly, we recommend budgeting for virtual options to buy equipment and other resources.

Finally, as revenues shifted during the pandemic, especially related to visitors, many entities found themselves depending on grants to maintain their budgets. Therefore, we encourage governments and non-profits to expand grants and low-interest loans options and make them easily accessible during extreme events for heritage sites. While many state and federal heritage sites were eligible for federal grants during the COVID-19 pandemic, many private and non-profit sites reported ineligibility from relief funding. Therefore, by increasing eligibility and access to government support, heritage sites can better adjust to changes brought by extreme events in the future.

## 5. Conclusions

Heritage sites play a critical role in preserving and conserving natural and cultural resources, so their continual operation is important to advancing sustainability goals. The COVID-19 pandemic forced heritage sites to adjust their operations in order to minimize risks to both public health and risks of financial loss. Extending the theoretical concept of human adjustment to hazards established by White [7], we identified adjustments made by Texas heritage sites to reduce risks associated with the COVID-19 pandemic and the factors that influenced those responses. As observed in the literature [8], some adjustments remained short-term interventions while other heritage sites embedded these adjustments into their on-going operations. As society faces new, emergent hazard agents alongside risks altered by a warmer atmosphere, it is critical to understand how households, businesses, and institutions adjust their behaviors, or not, to extreme events such as the COVID-19 pandemic. Adjustments made by Texas heritage sites provide useful lessons for business continuity professionals and emergency managers as they respond to future events.

Specifically, we observed that during the first year of the pandemic, although varied, many participants reported revenue loss. The decrease in revenue, however, was more widespread among private and non-profit heritage sites compared with public entities, some of which indicated increased revenue. These differences were linked to changes in pandemic policies that altered visitation and therefore funding sources. For private and non-profit entities, the number of visitors decreased greatly, while public sites reported increased visitor counts. Changes in the number of visitors required adjustments to maintain operations.

Texas heritage sites implemented a range of adjustments motivated by the need to maintain fiscal stability while also protecting public health; frequently adjustments met both priorities. To maintain financial well-being, sites adjusted by undertaking new fundraising methods, pursuing new revenue and funding streams, and seeking new grants to maintain operations. To reduce the spread of COVID-19, heritage sites installed hand-sanitizing stations, added plexiglass shields at customer service counters, and intensified cleaning of the facilities. Almost all participating entities initiated or expanded virtual programs, such as kid camps, art shows, adult workshops, and live tours of the facilities. To make these adjustments, many sites had to acquire new skills, technology, and equipment. For sites that lacked access, the means to acquire these skills or technology had difficulty sustaining operations. Yet participants that overcame these challenges reached larger audiences than previously captured during in-person programs, often beyond their local area. Virtual programs also increased access to these heritage sites, driving new visitors to the online programs and attracting those new patrons to visit sites in person. Most participants planned to continue virtual offerings given the opportunity to reach new audiences.

Several indirect factors influenced adjustments and we categorized these as either disadvantages or advantages following White [7]. Observed disadvantages included staff and volunteer shortages, lack of technology and technological skills, along with reduced budgets, which negatively affected the sites' business operations. Whereas advantages, including funding from a variety of sources and donations from new donors, positively affected sites' operations and influenced their adjustments.

Despite the challenges brought by the COVID-19 pandemic and the associated adjustments to maintain business operations, some participating entities reported new opportunities emerging from the pandemic. Almost all interview participants implemented maintenance work while their facilities were closed or reduced in operation. Networking, specifically the sharing of business practices related to the pandemic, emerged as another opportunity. Many expanded their formal and informal networks during the pandemic with existing and new partners. Relationships were strengthened and ideas shared that will outlast the pandemic and aid resilience. In addition, moving to virtual options brought new audiences, and continuing these offerings should provide additional support for these sites well into the future.

This research contributes to the small but growing body of knowledge at the intersection of post-disaster business recovery and heritage tourism [50]. Previous research focuses primarily on impacts from environmental hazards (e.g., flooding, hurricanes, earthquakes) rather than biological hazards. Research on the preparedness or recovery activities of individual businesses is usually survey-based and lacks the qualitative depth to answer the "why" questions guiding observed changes in operations [10]. On the other hand, research that uses a case study approach is usually geographically concentrated and limited in sample size [34,51,52]. The current study is novel in its mixed method design, its focus on impacts from a biological hazard agent, and, given the size of Texas, its geographically diverse sample of heritage sites.

Our findings provide important insights into how heritage sites can increase the resilience of their operations during future extreme events and become more sustainable in the long term. Our findings from the COVID-19 pandemic suggest that widening the geographic and demographic diversity of donors and the scope of grants could help heritage sites better cope with economic shocks induced by public health emergencies, hazard impacts, or market fluctuations. These adjustments can be accomplished directly, through creativity in pursuit of such donors and grants, or indirectly, by generating interest through virtual programming, which may generate interest from a broader pool of potential donors. These managerial strategies could be most useful to private and non-profit sites that lack dedicated public funding and must rely on a robust donor base and grant funding to operate. However, even public sites may employ such strategies to operate during austere fiscal climates, which occur sporadically in state budgets. Our findings highlight the benefits heritage sites gain by building networks and sharing resources with one another. By sharing resources, entities can learn from each other to adjust their policies, realign staff duties, and improve business practices in ways that maximize efficiency and flexibility. Improved networking could also lead to new collaborative programming (e.g., combination tours or heritage trails) that link the missions and stories of multiple sites, thereby amplifying their educational potential. Additionally, our findings point to benefits in maintaining virtual programming offerings along with the requisite staff, equipment, and skillsets. Not only would these investments increase resilience in operations, but they could also induce bottom-up adjustments in heritage site missions with sustainability in mind. For example, as heritage sites appeal to new audiences through virtual programming, this could encourage staff to rethink their onsite interpretation and to relate to a wider set of ages and demographics. Such new interpretations focusing on previously overlooked people–place connections may bring about a wholesale re-envisioning of a heritage site's mission in ways that are more inclusive and equitable, and thus sustainable.

As this research addresses critical gaps related to how heritage sites adjusted to the first year of the COVID-19 pandemic, several limitations remain. First, this research focuses on Texas heritage sites and research is needed beyond Texas to understand the overall impacts of the pandemic across the U.S. and worldwide. Another limitation of the work is to understand how experience with previous disaster events, or events that occurred during the COVID-19 pandemic, influenced adjustments during the first year of the pandemic. Furthermore, a limitation of this study is that it focuses on the first year, suggesting a need for future work to expand the timeline to understand how adjustments changed over time. Longitudinal research would help ascertain which fiscal-related adjustments and health-related adjustments made in the first year of the pandemic proved successful as new COVID-19 variants emerged, further interrupting business practices. Moreover, longitudinal work should examine how many of these businesses stayed in operation or closed three and five years beyond the pandemic's spread and what factors influenced their outcomes. The information gained by expanding the geographic and temporal scales of analyses will provide insights into to how heritage sites can mitigate against future events while protecting vital resources.

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