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Abstract

Hurricane Laura made landfall in August of 2020 as a Category 4 storm, heavily affecting the coastlines of Texas and Louisiana. At the same time, both areas were coping with a surge in COVID-19 cases absent a vaccine. For this study, we explored how emergency management stakeholders navigated evacuation, sheltering, and re-entry planning and decision-making during a dual hazard threat where hurricane risk reduction measures contradicted COVID-19 risk reduction measures. We conducted 35 semi-structured interviews with emergency management stakeholders in Texas and Louisiana in the spring of 2021. Participants were recruited using a purposive sampling strategy designed to identify agency representatives and other officials involved with planning for hurricane season and with the Hurricane Laura response effort. We used thematic analysis to code and analyze the data. Findings suggest that while the process for planning for hurricanes had to shift to an online approach, the plan for addressing hurricane season was largely unchanged from the perspective of most participants until days before impact, when the decision was made to move to noncongregate sheltering. This led to adaptive and creative improvisation on the part of participants managing the evacuation and sheltering operations. Likewise, we found that caring for and communicating with evacuees in a noncongregate setting presented unanticipated challenges that required improvisation to address. Given the continued threat posed by COVID-19 and other respiratory illnesses, this study provides insights that emergency management stakeholders could apply to current and future planning and response efforts for hazards that require evacuation and sheltering.

Keywords: Hurricane Laura, COVID-19, Noncongregate sheltering, Improvisation

1. Introduction

On August 25, 2020, Hurricane Laura entered the Gulf of Mexico as a Category 1 hurricane. Following a period of rapid intensification, the hurricane made landfall the morning of August 27, 2020, as a Category 4 hurricane along the Texas Louisiana border near Cameron, Louisiana (Pasch et al., 2021). The rapid intensification of the storm reduced the time available for officials to issue evacuation orders, leading officials to warn of “unsurvivable storm surge” in both states in the days before landfall (Newburger, 2020). Hurricane Laura was the most powerful hurricane to affect this part of western Louisiana in recorded history (NOAA, 2021), causing considerable damage across the state. In total, the storm resulted in \$17.5 billion in damages in Louisiana and \$975 million in damages in Texas. The storm caused seven direct deaths and 34 indirect deaths in the U.S. (Pasch et al., 2021).

At the same time, both Texas and Louisiana were responding to the COVID-19 pandemic. The average COVID-19 cases during Hurricane Laura in both states was approximately 150 per 100,000, higher than the U.S. average which was around 100 cases per 100,000 in August of 2020 (CDC, 2020). At the time of the hurricane, COVID-19 response had been consuming public health and emergency management resources (staff, funds, etc.) nationally since the federal emergency declaration on January 31, 2020 – nearly 7 months before Hurricane Laura – as all US communities coped with a novel threat to the American public, including instituting lockdowns that reduced community functioning to only essential operations (US Department of Health and Human Services, 2023). When Hurricane Laura made landfall, Louisiana had been reopened with phase two of their reopening going into effect that June (Louisiana Office of the Governor, 2020) whereas Texas had reopened much earlier in March (Office of the Texas

Governor, 2021). Reopening coincided with rising COVID-19 rates and strain on the public health and emergency management systems (*Texas Coronavirus Map and Case Count*, 2023).

This confluence of the COVID-19 pandemic with the landfall of a Category 4 hurricane left Louisiana and Texas in an unprecedented situation. When considering protective actions for COVID-19, authorities generally have recommended social distancing to the degree possible to limit exposure. In a hurricane of sufficient strength, however, protective actions include evacuating, either to stay with friends or family that are out of the path of the hurricane or in a public shelter. In both Texas and Louisiana, the states issued evacuation orders for counties, but they reduced the number of riders on public buses used for evacuation and made a late shift to a noncongregate sheltering approach in an attempt to address COVID-19 exposure.

These conflicting protective actions, along with the rapid intensification of Hurricane Laura, provide the motivation for this study. Here, we explore how emergency management stakeholders in Louisiana and Texas responded to Hurricane Laura in the context of the COVID-19 pandemic. We focus on how emergency management stakeholders planned for hurricane season and managed evacuation and sheltering operations and made re-entry decisions during the ongoing pandemic. Addressing these questions will improve our understanding of how emergency management stakeholders address dual threat events, improvise in novel situations, and provide insights regarding noncongregate sheltering for future hazards.

The rest of the paper is organized as follows. First, we review relevant literature addressing disaster preparedness and improvisation. Second, we outline our approach to the interviews and data analysis. Next, we discuss our results, organized temporally through the evacuation process. Fourth, we discuss our findings and the practical implications of our work. We conclude by discussing our study limitations and directions for future work.

2. Literature Review

Disaster preparedness is a multidimensional concept that encompasses individual and household preparedness, community preparedness, and organizational preparedness (Gillespie & Streeter, 1987; Kirschenbaum, 2002). Across numerous definitions, an overarching theme is that preparedness is "...nominally defined as intent by individual, community, or disaster agency to minimize death, injury, and economic loss" (Kirschenbaum, 2002, pp. 10–11). While different scholars have conceptualized the dimensions of preparedness in varying ways, they generally include stockpiling provisions, developing skills or proficiencies, planning, and undertaking protective actions before a hazard event (Gillespie & Streeter, 1987; Kirschenbaum, 2002).

Most studies measure preparedness by including a list of potential activities to measure the broader concept (Greer et al., 2020; Kirschenbaum, 2002; Lindell et al., 2009; Lindell & Prater, 2000; Mulilis & Lippa, 1990; Russell et al., 1995). At the household level, this usually includes a list of activities specific to the hazard being studied. Historically, preparedness at the organizational or community level tends to take an all-hazards approach to consider similar response capacities needed for different types of hazards (Dynes, 1983). Emergency management agencies and other government offices tasked with disaster preparedness usually go through a process that involves hazard and risk assessment (Cutter, 2002; Deyle et al., 1998; Ferrier & Haque, 2003), vulnerability assessment (Cutter et al., 2003; McEntire, 2005), capacity assessments, forming collaborative partnerships (Drabek, 2007; McEntire, 2002), conducting exercises (Perry, 2004; Peterson & Perry, 1999), and developing written plans.

It is perhaps this last activity, developing written plans, that receives the most attention, both before and after a hazard event. Written plans focus on the state of and plans for future hazard mitigation (Berke et al., 2012; Horney et al., 2017; Olonilua & Ibitayo, 2011), disaster response operations that are often all hazards but can include hazard-specific annexes (Caruson & MacManus, 2011; Peleg et al., 2021), plans and procedures for short- and long-term disaster recovery (P. R. Berke & Campanella, 2006; Nigg, 1995), and strategies for building community resilience (Chang et al., 2019; Handmer & Dovers, 1996). Best practices suggest ongoing review and updating of plans (Dynes, 1983) to account for changing conditions or learning from prior disaster events (Moynihan, 2008). Likewise, exercises, which may consist of tabletop or full exercises of potential disaster situations, are an important tool for understanding current preparedness levels, ensuring key stakeholders are aware of their roles and responsibilities, and preparing individual responders and response organizations for potentially unseen scenarios (Perry, 2004; Peterson & Perry, 1999). These exercises should also happen as part of a regular update of disaster plans.

In areas where a specific hazard is common, such as hurricanes along the East Coast and Gulf Coast of the United States, some have argued that a disaster culture or subcultures centered around common hazards may increase preparedness (Moore, 1956; Wenger & Weller, 1973). On this point, though, there is considerable discussion regarding whether this manifests at the household or community level and what the necessary conditions are for the formation of a disaster subculture. For example, even with their hurricane exposure, Kapucu (2008) found that residents of Florida are not necessarily more prepared than populations in other states. Likewise, a number of studies have found that experience is not consistently linked to preparedness levels for households (Botzen et al., 2009; Lindell & Hwang, 2008; Russell et al., 1995). Others have found that experience with a disaster often improves preparedness at the organizational level (Britton, 2007; Gillespie et al., 1974; Sadiq & Graham, 2016); though this is not consistent across studies. A 1993 survey found that businesses in earthquake prone Los Angeles had undertaken very little preparedness activity (Webb et al., 2000). Across organizational types, public and nonprofit organizations are more likely to adopt preparedness activities than private organizations (Chikoto et al., 2013). However, even in San Francisco, at a high risk of earthquakes, most community-based organizations are not prepared to resume and maintain operations post-disaster (Ritchie et al., 2010).

Planning for evacuation and short- and long-term sheltering is paramount to hurricane preparedness for communities (Lindell, 2013; Quarantelli, 1995; Wu et al., 2019; Zhang & Peacock, 2009). Based on these plans, communities also need to develop specific, actionable warning and other risk communication plans for the community (Dynes, 1983; Matsuda & Okada, 2006). The post-Katrina disaster preparedness landscape has changed (Gerber, 2007), and there is evidence that institutional preparedness has improved. For example, the Emergency Preparedness Rule from the Centers for Medicare and Medicaid requires healthcare organizations accepting those insurance plans to comply with emergency preparedness regulations such as having an emergency plan and bi-annual training in emergency preparedness (Centers for Medicare & Medicaid Services, 2016). Improvements have also been observed within private sectors. Hutchins and colleagues (2008) collected data from private organizations before and after Hurricane Katrina, finding that their crisis management plans had significantly improved after the event.

The literature has demonstrated a connection between planning and the mitigation, preparedness, response, and recovery phases within the emergency management life cycle (Perry

& Lindell, 2007; Quarantelli, 1998). This connection is particularly evident in pre-disaster plans such as preparedness and response plans. Local emergency managers devise strategies and procedures that encompass both recurring and potential disaster events within their jurisdictions (McEntire et al., 2014). This involves aspects such as planning for warning dissemination, evacuations, sheltering, and other disaster response operations (Wu et al., 2019). Once a plan is developed, continuous planning for hurricanes, as with other hazards, is important. To put this another way, it is critical that plans not be viewed as a task to complete, but rather as a living document, representing a continually evolving understanding of how prepared we are for hazards and what we will do in the case of a hazard event in a given context (Perry & Lindell, 2003). That context, however, is often unknown, and when it comes to plan implementation, responding agencies must improvise from their planned response when encountering novel hazard conditions to address emergent concerns (Kendra & Wachtendorf, 2007).

Kendra & Wachtendorf (2006) argue that planning focuses on what ought to be done, and improvisation during an event addresses what needs to be done during the event. Written plans detail what to do, but plans are often based on known, familiar events, and the next disaster may be different from the last disaster. Since no two disasters are alike, even in communities where specific hazards are more common, organizations must be open to improvisation. As noted by Kendra and Wachtendorf (2006), while creative improvisation may be necessary where emergency managers must create new systems or capacities not identified in existing plans to meet response needs, often what occurs is adaptive improvisation, where emergency managers leverage existing capacities identified in an existing plan in a new way. Likewise, Webb and colleagues (2004; 1999) note that improvisation may occur where responders improvise their roles or materials used in response. This does not nullify the importance of the plan, but rather emphasizes the importance of the planning process. Understanding vulnerabilities, threats, capacities, capabilities, roles, and responsibilities is essential to being able to adaptively respond to novel hazards. Therefore, emergency managers need plans that are both flexible and broad and undergo continuous planning efforts (Staupe-Delgado & Kruke, 2018).

Here, we consider hurricane planning, evacuation behavior, sheltering operations, and re-entry decisions in the context of a novel hurricane season for Louisiana and Texas. In particular, we were interested in how the COVID-19 pandemic affected how emergency managers planned for the 2020 hurricane season and how the pandemic affected their response to Hurricane Laura. We expect that, in this context, emergency managers encountered novel situations that required them to adapt prior plans to new situations. The following research questions (RQs) are used to investigate this unique scenario.

RQ1: How did COVID-19 affect the planning effort for the 2020 hurricane season?

RQ2: How did COVID-19 affect the evacuation effort associated with Hurricane Laura?

RQ3: How did COVID-19 affect sheltering operations in response to Hurricane Laura?

RQ4: How did COVID-19 affect re-entry decisions after Hurricane Laura?

3. Methods

We utilized an exploratory qualitative cross-sectional study design. To better understand the preparation for hurricane season and response to Hurricane Laura, we conducted semi-structured interviews (n=35) between January and July of 2021 with emergency managers, public health professionals, and local officials activated during Hurricane Laura in both Texas (n=19) and

Louisiana (n=16). We selected this location given that both states were affected by the hurricane and Texas received evacuees from Louisiana. We purposefully selected participants working in emergency management offices, local and state governments, and departments of public health. Using a snowball sampling approach, we recruited additional interviewees from recommendations from participants. We continued interviewing until we reached saturation (Patton, 2014, p. 310).

A pair of researchers from the research team interviewed participants virtually over Zoom. Study participants were emailed a copy of the informed consent form when an interview was scheduled and gave verbal consent before the interview began. We designed the interview guide to collect information regarding study participants' roles and responsibilities at their organization, experiences during Hurricane Laura that related to organizing evacuation, sheltering, and re-entry, communications during the events, and their perspectives regarding the challenges and positive aspects of the entire operation. Interviews lasted from 23 to 69 minutes, with the average interview lasting 50 minutes.

Interviews were transcribed verbatim using *Rev Transcription Service*, a professional transcription company, and corrected by the research team. We analyzed interview transcripts using *NVIVO*, a commonly used qualitative analysis software. Since this work is exploratory, we used grounded theory methodology to analyze the data (Corbin & Strauss, 2008). Two of the researchers independently coded the transcripts using open coding, then discussed and reconciled differences (Saldaña, 2015, p. 37). The lead author then recoded the data using the developed codebook and used a second cycle focused coding approach to develop subthemes and themes from the data.

4. Results

While both Louisiana and Texas have extensive experience with hurricanes, COVID-19 presented novel challenges in both states regarding planning for and responding to Hurricane Laura. In this manuscript, we move through the evacuation process temporally to discuss the emergent themes relevant to each period of the evacuation effort. We focus on how COVID-19 affected relevant planning and response processes, highlighting how key stakeholders improvised to address challenges.

Time 1: Preparing as usual, interrupted

As outlined through the interviews, emergency management stakeholders in both Louisiana and Texas have general rhythms as to how they prepare for hurricane season. Broadly, participants from both states said they were beginning to plan for hurricane season early in the year as COVID-19 became a cause for concern across the country. As they stretched further into the planning effort, COVID-19 began to spread in their regions. Most participants described, to one degree or another, shifting to a remote planning approach, relying on Microsoft Teams, Zoom, or other web platforms to substitute for what would traditionally be face-to-face planning efforts.

Most participants noted that this digital shift presented several significant challenges when planning for hurricane season. First, many participants noted that their leadership struggled to coordinate and organize their teams around virtual platforms. They described how virtual EOCs were new to them and their staff, and that technological failures and a lack of in-person access to personnel and information hampered their ability to plan. Second, important planning and preparedness functions that would typically happen, such as community education programs, did not this year due to struggles with engagement and institutional capacity. Third, a shift to virtual

meetings was a learning curve for staff and volunteers involved in the planning and response efforts. As noted in the quote below, many employees and volunteers working with these organizations were described as older and had issues adapting to the technology.

We did a lot of training for our volunteers to be comfortable with working in a virtual environment, so there was varied success of volunteers from outside of our division...The average age of our volunteers are around 60 to 85, so we have a lot of people that just have technology issues. I think that was probably our biggest challenge, is trying to teach people how to use Teams in the middle of making operational decisions that needed to happen quickly...**T12**

Additionally, participants noted that the lack of in-person events presented a challenge for garnering participation in messaging, training, and exercises and affected the quality of their programming. Many participants suggested that they and their constituents were “zoomed out” and questioned the quality of online interactions in place of what they had traditionally done.

Yes, for sure. The Zooming team, and I think, let me tell you. I think the only hands-on training that we have done and we reduced the amount of people that attend that is the onsite training. And a lot of exercises in 2020 were canceled. We did only a few minimal exercises. We did more drills through Zoom or whatever it may be, trying to create that scenario through Zoom. But for the most part, yeah, it definitely affected our training. **L3**

Before COVID what we would do, we would have the public meetings and we would let people know what was expected, and we would also go by some of the housing projects and talk to them personally and let them know, and especially talk with their management groups over the areas. But with COVID, when COVID was going on, we weren't able to do that. So what we did is we left a lot of that up to the management companies, and we went and passed out brochures to them and told them what to expect. And then I think as a result of that, some of those management companies didn't actually follow through with giving the paperwork to the customers or to our residents. **T19**

When considering the process of developing the plan for the 2020 hurricane season, participants outlined three main hurdles: planning for the unknown, the perception of shifting guidance, and COVID-19 distancing. First, much of the planning effort initially attempted to address rectifying a plan for responding to a hurricane with a plan for addressing an infectious disease. In that context, many of the initial adjustments to plans that participants described focused on how COVID-19 would affect evacuation efforts. Several participants noted that they lacked guidance documents or experience to reference when developing a plan. A few participants relied on experience with managing the response to Ebola in Texas, while others said they looked to efforts from the 2000s, such as the National Strategy for Pandemic Influenza. Generally, though, participants suggested that there were no obvious guidelines or experiences to draw from to assist in this planning effort.

I had to have two plans, a pandemic response plan, and a hurricane plan. And well I'll say three, an evacuation plan as well that included pandemic response in all three, which was the PPE, making sure that people had the hand sanitizers, everything else. So the dynamics changed obviously where we had to include the actual response that was going to take into account the pandemic and the Corona virus. **T18**

Second, when discussing information sources, many participants stated that the guidance they received regarding COVID-19 precautions from outside organizations shifted over time, leading to confusion as to how to appropriately plan for evacuation and sheltering operations. While most participants noted that they were getting their information directly from the CDC, many suggested that this information seemed to shift rapidly, leading them to reconsider the efficacy of their plans. Several participants explained that they were working with their state and local public health agencies, often to interpret and operationalize guidance from the CDC. We heard a lot of frustration about what would be required of them by state and federal agencies regarding COVID-19 precautions and consternation as how to adhere to guidance and their capacity to meet those demands.

I think the information that would come to us would be not necessarily interpreted, not interpreted differently, but utilized differently inside each of those agencies. Red Cross would have, this is the CDC guidance. This is what it means for us with single family house fires, hurricane, dah, dah, dah, deployment in person, things like that. FEMA had a different one, probably a lot more strict. Not that ours wasn't strict, but we didn't have the ability to do a lot of our work virtually right off the bat. We had to work our way into it. **L16**

As a result, we felt like we had some good knowledge to work from in trying to manage pandemic, but it kept changing. As we all know, we think one thing is right and then turns out that science says something else. And so, yeah, balancing the information is a little tough. I don't know if we always did a great job of it. **L14**

Third, participants described how planning for an evacuation in the context of COVID-19 led to shifts in their transportation plans. While participants varied on when in their planning efforts they made this shift, almost all noted that they were planning to space evacuees on buses to reduce the chance of spreading COVID-19. Many noted that this doubled, or even tripled, the number of buses required to facilitate the evacuation effort.

Well, yes, it had to do with the number of people. Okay. First of all, a normal bus, you'll transport around 50, 53 people on, okay? So we wound up transporting on those buses was somewhere between 20 and 25, 26 people, something like that on the bus. We did everything we could. Matter of fact, we made sure we kept all family units together, so we didn't put grandma on the next bus if they were traveling with their kids and grandkids. So we'd keep all those people together on the bus. If we had somebody that identified as COVID positive, they got transported on a bus that just had COVID positive people on it.

T1

While many participants noted that they thought COVID-19 may affect sheltering efforts, they were planning for congregate sheltering efforts consistent with their past experiences or expecting to rely more on partners outside their organization for alternative sheltering arrangements. Some participants, however, anticipated the shift to noncongregate, to some extent, and had begun to reach out to partners developed in past response efforts, such as local hotels, to discuss capacity in the event of a shift in sheltering operations. The prevailing idea, however, was that sheltering would be some modified form of congregate sheltering, with additional spacing required between evacuees.

There had been some discussion about non-congregate sheltering, but no real planning was done that I know of. We asked about it a few times as early as April but no one really

had a good answer for it. I think it was one of those things where if I had to say it was probably people thought that it might be a problem, but nobody could think of an answer for it. They wasn't on the front burner, let's put it that way. **L2**

So that was the expectation. They were going to go into the congregate shelter locations. And we were going to have to figure out something with social distancing. And we never really got any clear guidelines. I mean, we talked about it all summer and it was a constantly shifting target. It was very much akin to what we were dealing with at the same time, with the COVID response. One was driving to the other. So there would be some new revelation in the healthcare world and that would relay in some type of new revelation over here in the evacuation itself in our world. And, really, we knew that whoever got hit by the first storm, they were going to be the guinea pigs, and there we were. **T1**

Time 2: Evacuating at a distance

When it came time to manage the evacuation efforts, participants noted that COVID-19 had a considerable, disruptive effect on their ability to manage the response. While participants indicated that they would typically manage the evacuation effort from a central Emergency Operations Center, most of them suggested that they had staff spread across multiple sites, causing challenges in coordinating an evacuation effort. While they were much more familiar with and comfortable working remotely owing to their experience during the planning effort, participants noted that the change in format caused some anxiety and, from their perspective, led to a more challenging evacuation effort. While not as common, other participants instituted a hybrid model where key players were in the room while others were virtual. This model was challenged by COVID-19 as well, where positive cases led participants to go fully remote for a few days.

And the issue was typically for hurricanes, you would gather all of your forces, gather all of your staff in a confined area, a safe space, but because of COVID, we were very concerned about gathering our public safety altogether in one room or one area. So we ended up having to spread people out a little bit more... I would just say anytime you don't follow a traditional plan, it always creates a little bit of consternation or uncertainty. And so we had to stray from our traditional plan because of COVID and it did cause some challenges. **L6**

We're talking about 1,200 people supporting 26,000 people in hotels, 52 separate hotels across Louisiana. Not even just all in New Orleans, across Louisiana. We were building that airplane while we were flying it. They would have one interpretation, GOHSEP would have another, and it was all really focused on safety first. But also, how are we going to meet the needs of people? We still have to be in the same room. We still have to be in the same room. And you would have someone test positive and they'd shut down the EOC and clear it for two or three days, sanitize, whatever. And then everyone could test and then come back. So it was just interpreted differently, but always with safety in mind. **L16**

While, as documented above, there had been planning efforts in place for hurricane season, Hurricane Laura formed relatively quickly and forced a rapid actualization of those planning efforts. At the same time, COVID-19 left emergency management stakeholders in, what they described as, uncharted waters. In many ways, the confluence of these threats was anticipated, but there was also hope among participants that it would be avoided. We heard several participants

say that “COVID was declining” or “going away” in their areas, so there was an anticipation that the evacuation might be business as usual, apart from transportation. That said, when the time came to shelter evacuees, both states pursued a noncongregate sheltering strategy, primarily using hotels as shelters instead of their traditional convention centers and schools.

Among our participants across both states, there was not consensus on when the decision was made to pursue a noncongregate sheltering approach. In some cases, we were told participants learned of the shift on the day of the mandatory evacuation order. In other cases, we heard that, early in the hurricane season planning efforts, noncongregate sheltering was the likely approach. That said, most participants indicated that they learned of the shift in strategy in the days before the storm and, in some cases, after they had issued evacuation orders.

There was a major shift in policy, So we evacuated our folks to [redacted]... So I'm not exactly sure, but I think what happened was the state conferred with FEMA and in view of the healthcare concern, they got non congregate sheltering approved...all those people got pushed out of the congregate shelters that they were in, into non-con shelters. ...Which was different. right in the middle of everything. I mean, that was something we've never experienced before. **T1**

That was actually pretty close to her making landfall. We had definitely already started to evacuate individuals. And so it was like a quick change... So we were 48 hours from her tropical storm enforcement hitting the coast when they made this call...[We] think, "Oh, that was soon." But it's really 48 hours before. That's two whole days. And it's hard enough anywhere to evacuate when it's blue skies. So we're taking what we know from the locals and taking their cues and then we are setting the goals and objectives for that instance...Taking all of those perspectives, we changed really quickly and went to non-congregate. **L9**

When asked about how participants were addressing COVID-19 concerns during the evacuation effort for evacuees, we heard mixed responses. While all participants indicated that they had planned precautionary measures to limit the spread of COVID-19 during the evacuation, their ability to institute those plans varied. Almost all participants noted that they were able to limit bus capacity to at least 50% so participants could maintain some personal space. Likewise, many participants were providing masks for evacuees boarding the busses. In some cases, participants noted that they were checking temperatures before evacuation but had dropped other measures they had planned to institute, such as asking evacuees about their travel history before boarding buses. In other cases, we were told that there was no screening involved before boarding buses.

At that point, the travel history wasn't a question that you asked anymore. I mean, it was out there, it was already community spread. There was the assumption that anybody and everybody could have it. Now, early in the season that would've been something that we would've done, but at this point in the season, we were strictly concerned with signs and symptoms and the borne exposure patient.

Interviewer: And how do you guys monitor the signs of symptoms?

Well, other than putting the old mark one eyeball on them and seeing what they looked like, we had folks from the health department there that were helping screen. And primarily

what they were doing was they were asking the screening questions and they were taking temperatures. T1

There was no screening. The only ones we handled differently was self-identified COVID positives. We did handle those folks different and got them on a separate transit to a hotel. But as far as our work with LDH, a state health officer said that getting them out of harm's way was more important than getting COVID at that time. L3

Time 3: Oversight, but at a distance

Absent COVID-19, in an evacuation scenario, participants described how they would set up evacuation reception centers where they could keep a running count of evacuees, assess evacuee needs, and "...generally just put eyes on people." With a mandate to space people in a noncongregate sheltering operation, however, this intake process was not possible. Instead, both states pivoted, and in different, yet converging, ways. In Louisiana, participants detailed how they managed to place evacuees primarily via communication between emergency managers, bus drivers, hotel staff, limited physical reception centers, and a 211 system.

Participants in Louisiana described speaking to bus drivers and local emergency managers about how many evacuees they had, then calling hotels, generally that they had pre-existing relationships with due to prior response efforts, and matching need to capacity. While they later developed a more formal tracking mechanism, they initially tracked evacuees via a spreadsheet for each hotel participating. Given that not all evacuees took busses, participants described how there was a continuous communication between the receiving hotels and emergency managers attempting to track evacuees, capacity, and demand.

They were open and they answered the phone. Somebody answered the phone. That was pretty much it. ... We started that operation without an internal system really to track. This will make you cry. We had... separate spreadsheets, one for each hotel. That's what we did, because we didn't have an internal system big enough to track that many people... Which we ultimately were able to build and port the data and do the stuff. But again, we're talking probably end of September mid-October before we had that online where it was useful. But then also remember, we're not the only dog in the hunt, so to speak. FEMA in the meantime is building their own system and our systems can't talk to each other... So we're basically bootlegging spreadsheets together that one entity ended up holding, just so we could keep the case notes straight. L16

Yeah, called them and like, "Hey, I need a block of a hundred rooms as a hundred or more rooms. And then we started getting like the hotel owners in [redacted]... And so when you start talking to the head of Hilton and you can block 2,500 rooms at a time, then, you know, and at first when the hurricane first moved in, you know... it's like supply and demand. L9

When considering the rapid shift to noncongregate sheltering, many participants noted that the serendipity in capacity was essential for their ability to make this shift. Participants in Texas noted that evacuees were mostly transported north, beyond Houston, for sheltering, due to concerns about flooding in Houston. In Louisiana, evacuees were either transported to Texas or taken east outside of the hurricane track. Given the state's population centers, most evacuees ended up sheltering in the greater New Orleans area. Like most areas, COVID-19 deflated tourism and, notably, had a significant negative effect on the hotel industry. While staff numbers were down

due to COVID-19, many hotels in the region had excess capacity that was atypical for August, allowing them to accept evacuees. Many interviewees suggested that, had the hurricane turned further east and threatened New Orleans, they would have struggled to find hotels for evacuees within the state. A few interviewees note that they were reticent, based on experiences with outmigration following Hurricane Katrina, to send evacuees out of state for sheltering.

Participant 1: Absent of a pandemic we would not have the hotel space...And we are in discussions now, if we have to evacuate New Orleans, that's a whole other issue. Because there's no other place in Louisiana that has that amount of hotels that has that population density... Even with congregate, we have a plan, even without COVID for host states, if New Orleans... If that area is impacted and they have to do a mandatory evacuation. So that's what worries us. So if you don't have a pandemic situation, you don't have New Orleans hotels that are sitting there empty.

Participant 2: And if you have a hurricane coming towards New Orleans, you still don't have hotels in New Orleans. **L9**

The problem with Louisiana is general population and the normal process, everybody fills up the limited hotels we have in Louisiana. We're not like Texas, we don't giant cities with a lot of hotels. Unfortunately, our giant cities are on the coast, which means New Orleans. Shreveport, Alexandria, Lafayette, all those sites, the hotels were pretty much full when we started to look into hotels. The only place that was not full was the Baton Rouge and New Orleans hotels. We started working with GOHSEP who started finding hotels in that area. And that's very unusual for us because our entire planning cycle is planning to evacuate New Orleans. Here we are moving into New Orleans.

...To be honest with you, the numbers coming out of Lake Charles was Lake Charles. If we would've been a bigger city, we would've had serious issues. That's one of the things that we got to look at hard in the future for the season coming is identifying hotels that are going to be upfront, ready to go. **L3**

In Texas, the state outsourced finding hotels to a virtual reception center hosted by a third party that matched evacuees that called in with hotels. Interviewees in Texas expressed quite a bit of concern regarding the capabilities of the third-party company and the ability of the system to process and accommodate the evacuees. As described below, emergency management stakeholders we interviewed described the system as a last-minute pivot that suffered from major issues, such as long wait times and frequent disconnects.

I think the State made a bad move making a contract with something similar to like a hotels.com to kind of help them with the registration process. I think that was a terrible move...They're being just overwhelmed. It was on a holiday weekend, too, now mind you. And so they didn't have the staff. I was talking with several of the hotels there at the time and I remember when we were telling them who was handling the registrations, and they were like, "Oh, my God. That is a small company. Oh, well you know, we don't know these people, we just have to take their word for it." But, you know, that kind of seems true, because it was a holiday weekend, some of these people were not able to get through. Now the state will tell you that, you know we addressed this to the State and just provide them with the information we were hearing. One or two people, okay. But when we get a dozen people with the same story, you start realizing it's an issue pushing that bigger thing.

I think if we had to do it again, have something a little bit more vetted that can handle that kind of call volume. I think they underestimated when they gave that number out what they were going to get, because they knew if they didn't get through, that they would not possibly get a room. So if you had a party of five, you can bet not just one person from that party of five was calling. All five people are calling, and sometimes the waits were as long as 18 hours. And the State will come back and tell you it wasn't that terrible. But we called ourselves in some jurisdictions just out of curiosity to see what it is, to see what the wait time is going to be. I know I personally called, and I had wait time given of 16 hours on there, so I'm like, "Oh, my gosh." So, I think that registration, utilizing that, I think was a major lesson learned. I don't believe that they'll do that that again. **T5**

Beyond capacity and technical issues, we also often heard concerns from emergency management stakeholders about their lack of control over the intake process. Even though they were not in a large convention center setting, emergency management stakeholders assumed a sense of responsibility for safety and meeting the needs of the evacuees sheltering in their regions. While hotels were ideal in some respects here, particularly in providing meals, individual spaces and locked doors presented challenges when tracking evacuee status. Like Louisiana, interviewees told us they created their own systems to track individuals and needs, and were relying on cleaning staff at the hotels and door-to-door assessments of needs to track evacuees. Interviewees also expressed concern that the physical distance created room for fraud, such as evacuees without needs occupying hotel rooms or allowing others to use their rooms.

Y'all, look, I remember one morning vividly. I woke up at 6:00 AM that morning to a phone call that there were 3-400, I can't remember exactly how many rooms, but there were hundreds of rooms where evacuees had landed in a hotel overnight and I had no visibility on it. And so that 6:00 AM phone call was from a local jurisdiction asking me, "What the hell is going on?" Our dispatch is being called and being told that we've got hundreds of people in one of our hotels, and I knew nothing about it. "What's going on?" And I have to tell them, "I have no clue."

And what happened was it was a new partnership with some of these, Hotel Engine and other private sector partners. They had just placed people in a room and they did it without our awareness. We had no ability to catch them, in process them, figure out what was going on, give awareness to the jurisdiction that this is happening. And so surprises like that. And they weren't just people showing up self-evacuating, which that happens too and we had a lot of that. And there was some confusion as to folks showing up. And are they part of the hotel congregate shelter program or not? **T2**

We had to create a whole new process for documenting our overnight shelter population. We have trained for years our volunteers how to count people at a shelter, how to enter the information. We have the timeframes that they need to. We had no way of tracking, no way of putting information into a system that was for a non-congregate shelter. We had to create, we created a Power BI app, taught everybody how to use it, and rolled that out. But it was hard to get the counts because you couldn't always verify the occupancy. You'd talk to the hotel manager and they'd say, "Yes, we've got 70 people in 70 rooms, that's how many." Then our team would go because we knew that we saw people leaving with suitcases, and we'd knock on all the doors and maybe our count would be 40. Then housekeeping would come back and they're like, "Actually, we just went through all of the

rooms and there's only 28 people here." It's like you're constantly trying to figure out how many people are there.

At a shelter, at a congregate shelter, you're walking through the area, you can see if someone has not gotten up from their cot, you can see if they have a mental health, if they're not dealing with the stress or anxiety of the disaster. You're able to walk by, ask them how they're doing. Other people are asking people how they're doing. You can't do that in a non-congregate shelter at a hotel because everybody's in their own rooms, the doors are closed, and it may not even feel like a shelter because you don't see anybody...

Our numbers fluctuated a lot from day-to-day. I think once we figured out work with the cleaning staff and our Red Cross person was walking in the room and verifying, we got way better counts than we did at the beginning. Because the hotel, we were relying on them, "This person has checked in with their family of four," or whatever the number was, and so every day they reported that number even though that person had left or maybe it was only one person. **T12**

Interviewees from both states suggested that communicating with evacuees was more challenging in a noncongregate setting. With hotels serving as shelters, interviewees had participants behind locked doors at multiple sites. This led participants to use some traditional approaches, such as flyers in lobbies, and other innovative communication channels, such as relying on hotel staff to share messages or broadcasting messages on local media.

So these folks had now gone from [redacted] to [redacted], and because they weren't all in the same hotel, they were several different locations that fragmentation makes things even harder to track. So now you've got people who are not in a common area that you can make an announcement. You've got people that are holding up in their rooms or they even may leave the hotel, passing a note under the door or making a call through the room line, that may or may not be an effective way of contacting people. **T1**

I had basically a flyer each day, like a newsletter. So we had our communications team, had a newsletter that we printed out everyday with background information, this county's letting you come back tomorrow, breakfast is served at this times, activities of the information about the unmet needs store, phone numbers, frequently asked questions.

It would be put out every day and it would either deliver it with the breakfast or lunch, and it would be in their bag that was left at their door for the room. We also had our mass notification system as we got people's numbers coming in. We did that for, not necessarily life safety, but more critical messaging. We also had like big dry erase boards out in the lobby, where we put different information on, or we have a huge poster printer. We'd print things out, tape it on the wall, both hotels for information. But a lot of it was word of mouth, they would come, and post so you can get diapers down there, so the family would talk because people would go out and smoke a cigarette. You're still trying to tell them to maintain the social distancing, but family groups, and they would still talk while doing things, so it helped, word of mouth. But I think that the newsletter and having to bullet the boards out greatly helped pushing information out to the resident properties. **T6**

Time 4: Reluctance to Evacuate and Reluctance to Return Home

On many occasions, interviewees suggested to us that they saw evacuees choosing to evacuate later than they have in past hurricane events. Participants had two main explanations they posited for this change in behavior. First, participants suggested that survivors evacuated late because they rode out the storm at home and later realized they could not stay in their homes with the state of the infrastructure.

So you have a few people that want to leave. And so we were looking for a set amount of rooms when the hurricane comes in and it is devastating and have people who have been in their homes with no power for two days. And then there's no hope, there's no light at the end of the tunnel. Okay, we got to get out. So then at post storm, we started moving and that's when we needed big blocks of hotels, post storm. But literally it took us calling the first hotels that we thought were near closer to Lake Charles. And then as we saw the numbers increase, we had to move all the way to New Orleans. **L9**

Second, some participants suggested that individuals decided to evacuate when they learned that they were sheltering in hotels, and that they might not have evacuated if it were a congregate sheltering operation. Likewise, there was a pervasive sentiment that noncongregate also delayed re-entry decisions. We heard, on several occasions, that evacuees would refuse to return home until their hotel keys were deactivated or decided to leave when emergency management personnel consolidated hotels.

I'll tell you anecdotally, we heard and saw folks from just the brief interaction we would have with them at the reception center or the shelter that led me to believe they would not have evacuated had it been a gym, but only because it was a hotel they evacuated. I certainly know we had folks that didn't really need to evacuate, but they did because it was a hotel. We had people that would come up for the weekends and go back home, and then come back up for the weekends and go back home. We knew and in the process of doing the consolidation, like I mentioned, whenever we did the consolidation, there was a number of folks that just said, "Okay," my words, not theirs, "My vacation's over. I'm going back home to get started with my recovery." **T2**

There was a pervasive sentiment that this also delayed re-entry decisions. We heard, on several occasions, that evacuees would refuse to return home until their hotel keys were deactivated or they decided to leave when emergency management personnel consolidated hotels. Lastly, many interviewees suggested that residents were weighing the risks of COVID-19 against the risks of the hurricane, which led some to choose to not evacuate, and delayed evacuation for others.

I think it [COVID-19] did deter some people from evacuating. I don't know what the statistic is on how many residents stayed. But I think it did determine for some people that they may not want to evacuate to what they thought at the time might be a congregate shelter. But I think it did have some effect on whether or not some people chose to evacuate...There were residents that stayed. Had homes destroyed or they were just without power. There's no food available. They did go to Red Cross and say, "I need to be placed." Yes, there were some that stayed and decided later to go elsewhere. **L12**

We had a reduction. And we had guests that would happen early on. I mean, I'm made the statement more than once back in May or early June, that we were not going to get evacuation compliance... One reason is that, at that point in time, people had been pretty much shut up in their homes for months. They were already sick and tired of the

government telling them what to do and not to do. And then there was a sizeable portion of folks out there too, especially some of the elderly, that are just extremely fearful of contracting the virus, and rightfully so. So I felt like going into that part, part of the season that people just wasn't going to go, because if they had the ability to say no to us, they were going to say no and then other folks were just going to be scared of getting around that many more people. T1

5. Discussion and Practical Implications

This exploratory qualitative study aimed to address how COVID-19 affected the planning effort for the 2020 hurricane season along with the evacuation efforts, sheltering operations, and re-entry decisions in response to Hurricane Laura. While emergency management stakeholders tended toward the status quo, at each time discussed above, they encountered situations where business as usual was not adequate. Here, the literature on improvisation offers some insights. While Kreps (1991) and others (Kendra & Wachtendorf, 2006) have suggested that planning happens in the preparedness stage and improvisation happens in the response phase, this confluence of hazards blurs that line. We saw evidence here, as outlined above, of improvisation in the planning phase for hurricane season, where normal planning functions were interrupted by an ongoing response to the COVID-19 pandemic.

Regarding planning for hurricane season (Time 1), emergency management stakeholders had to shift to plan digitally in an environment where they lacked experience with a complex hazard. This led to important preparedness activities receiving short shrift and challenges with engagement of outside stakeholders. Likewise, guidance, largely from the CDC and the respective states, shifted as the science evolved. As noted by Weick (1998), a lack of clear guidance documents and inadequate experience is a recipe for improvisation. In this case, however, emergency management stakeholders had extensive experience with hurricanes, but not with pandemics, so their planning efforts adhered to their traditional approach to hurricanes for as long as tenable. The major concession from business as usual was the plan for spacing on busses, but the sheltering plan was still for congregate approaches.

When considering the evacuation effort (Time 2), emergency management stakeholders were forced to manage the evacuation effort remotely, departing from their traditional response structures to reduce their COVID-19 exposure. Here, we saw evidence of both adaptive and creative improvisation (Kendra and Wachtendorf 2006). For example, emergency managers relied on busses to evacuate residents, the same mode of transportation as they normally would, but had to adapt this effort by spacing residents. In a form of creative improvisation, they relied on hotels instead of congregate approaches, shifting their sheltering strategy in the days and hours before the hurricane made landfall. This shift, imposed from outside authorities, led states, counties, and parishes to rely on existing relationships with hotels and to outsource to extending organizations to manage arranging for sheltering for evacuees (R. Dynes, 1970).

The challenges of a decentralized sheltering effort (Time 3), and the material improvisations (Mendonça et al., 2014; Webb, 1998, 2004) needed to manage it, were numerous. In Louisiana, there was serendipity in hotel capacity, with New Orleans having excess hotel capacity due to deflated tourism resulting from COVID-19 concerns. Here, we see improvisation where emergency managers relied on prior experience with hotels (Weick 1998) and the state scrambled to find match need with capacity in a complicated, ongoing dialogue with local

emergency managers. Absent a system to track where evacuees sheltered, the emergency managers and NGOs built their own in real time. Texas, outsourcing to a third-party company, encountered a myriad of issues with wait times, dropped calls, and a lack of oversight with the sheltering effort. Participants from both states discussed the difficulties of meeting the needs of and communicating with a dispersed population. Many adaptations were made, from relying on hotel staff to help meet needs and communicate to using flyers and messaging via local media in receiving cities.

In both states, participants noted that they thought that residents were more reluctant to evacuate than they were in their prior hurricane experience (Time 4). While they largely attributed their hesitation to evacuate to fear of COVID-19 exposure either on busses or at a congregate site, they suggested that many eventually did evacuate later due to realizations of how much damage the hurricane had done in their areas or learning that they would be accommodated in a hotel instead of a congregate sheltering site. Likewise, participants noted that many evacuees delayed re-entry compared to prior hurricanes, which many attributed to the noncongregate sheltering approach.

There are a few practical implications of this work. For example, states might benefit from work with local emergency managers and nonprofit partners to plan for noncongregate sheltering options in the future. This is likely not the only multi-hazard scenario that will require noncongregate sheltering, and learning from this experience and considering alternative approaches for managing decentralized evacuation and sheltering effort in the future could support a more efficient, less burdensome response. As noted above, preparing for noncongregate sheltering where major cities are affected would be critical to this planning effort. Likewise, this planning effort should include systems for matching populations with special medical needs with appropriate shelters, whether those be managed by the states or a negotiated contract with a third-party company with clear expectations for performance, and early partnership with public health officials to ensure planning for reducing public health effects of hazard exposure and management. We also suggest that efforts should be made to make decisions regarding congregate or noncongregate sheltering before hurricane season, where possible. This would allow emergency managers and nonprofit partners to put systems into place ahead of time.

Additionally, advances in technology will continue to evolve how Emergency Operations Centers operate during complex events. This technology will likely expand local capacity to collaborate with agencies in other communities or regions. New technologies may also make it easier to track evacuees across multiple jurisdictions. However, a major issue in the Hurricane Laura preparedness and response phases was how individuals struggled with the move to virtual planning meetings due to unfamiliarity with the technology. Emergency management agencies, as well as other responding agencies, must have systems in place to keep up with new technological innovations that may impact their operations in the future. In particular, the rapid availability and increase in use of artificial intelligence and machine learning could both have benefits and create complications for emergency preparedness in the future.

6. Conclusions

The confluence of Hurricane Laura and COVID-19 presented a novel challenge for emergency management stakeholders. This exploratory study represents an early attempt to understand how COVID-19 affected emergency management operations in response to a familiar hazard. In

general, we found evidence of improvisation in both states and at each time described above. Participants described a system that operated on inertia, adhering to normal hurricane planning and response operations until outside forces necessitated a change. Improvisation in the planning process was in response to COVID-19 precautions, and improvisation in the hurricane response was tied to attempts to address a last-minute shift to noncongregate sheltering imposed by their respective states. This improvisation led to varying approaches across the states in regard to the evacuation effort, and each state encountered a number of challenges in managing the distributed evacuation effort remotely. Given the continued threat posed by COVID-19 and other respiratory illnesses, this study provides insights that emergency management stakeholders could apply to current and future planning and response efforts for hazards that require evacuation and sheltering.

There are few limitations of this study that provide avenues for future research. First, this is an exploratory, cross-sectional qualitative study of a novel situation, so while results are transferrable, they are not necessarily generalizable. Future research should explore how transferrable our findings are to other contexts. While our case was novel at the time, there have been subsequent disasters, notably hurricanes and wildfires, that have necessitated evacuation and sheltering operations during the COVID-19 pandemic. Second, we used purposive and snowball sampling to recruit study participants, which can bias our sample in a few ways. For example, participants that were frustrated with the response effort or proud of the job they performed may have been more likely to agree to participate in the study. Likewise, participants tend to recommend people like them as potential participants, which can lead to researchers missing valuable, divergent experiences. Future research efforts can use a database of local businesses relevant for the study aims to identify potential participants from a complete pool of organizations, for example faith-based or public administration organizations. Additionally, longitudinal studies using the same methods, across multiple hazards and jurisdictions should lead to a better understanding of diverse experiences and activities. Lastly, many of our insights regarding evacuees are from the perspective of emergency management stakeholders, not evacuees. Future studies should qualitatively explore how the shift to noncongregate affected evacuation decisions among evacuees. Participants speculated regarding why households made decisions, but it would be valuable to collect perspectives on those issues from the evacuees.

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