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## Research article

## Flexibility and partnerships perceived as supportive of dual hazard response: COVID-19 and heat related illness, Summer 2020

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## ABSTRACT

**Objectives:** To understand how health departments implemented the response to the dual hazards of Heat Related Illness (HRI) and COVID-19 in Summer 2020.

**Methods:** We interviewed five health jurisdictions with a Building Resilience Against Climate Effects (BRACE) Framework HRI project to understand impacts to organizational roles and preparedness activities, capacity to respond to the heat season, challenges experienced with resources and personnel, and how partners influenced their capacity to respond to dual hazards.

**Results:** Health jurisdictions working in both heat preparedness and on the COVID-19 response highlighted three components as integral to maintaining public health capacity throughout the pandemic: 1) adapting to changing roles and responsibilities, 2) building and strengthening inter-organizational partnerships, and 3) maintaining flexibility through cross-training as themes to maintain the public health capacity throughout the pandemic.

**Conclusions:** With impacts of the changing climate, including resultant extreme events with subsequent public health impacts, simultaneous responses are likely to arise again in the future. Developing cross-training programs, fostering flexibility and adaptability within the workforce, and building and sustaining external partnerships can support health departments anticipating the need to respond to simultaneous public health hazards in the future.

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## Abbreviations

ADHS	Arizona Department of Health Services
ASU	Arizona State University
BRACE	Building Resilience Against Climate Effects
EPHT	Environmental Public Health Tracking
HRI	Heat Related Illness
PHEP	Public health emergency preparedness
UA	University of Arizona
US	United States

## 1. Introduction

Rising temperatures due to climate change and extreme heat is a major concern for human health in the United States (US) Southwest and particularly in Arizona [1–4]. Four health departments (Pima County Health District, Yuma County Public Health Services District,

Maricopa County Department of Public Health, and Pinal County Public Health Services District) along with the Arizona Department of Health Services (ADHS) participate with the Centers for Disease Control and Prevention's Climate-Ready States and Cities Initiative which implements the Building Resilience Against Climate Effects (BRACE) Framework as part of the program to plan for heat (among other climate hazards) and subsequent heat-related illness (HRI) within their jurisdiction [5–7]. Currently these health departments conduct active surveillance to monitor and track HRI in their jurisdiction. Collecting HRI data is a labor-intensive activity that takes considerable public health staff time, including data extraction, reviewing medical records, and syndromic surveillance [3,8,9]. As such, there can be a delay of 3–4 months between preliminary counts and final values, and summaries of HRI morbidity and mortality can take up to a year for final approvals in local health departments. Once finalized, these data are summarized as surveillance reports and posted on local health department websites, including the Arizona Environmental Public Health Tracking (EPHT) website [4,10].

In addition to monitoring the trends and conducting surveillance for HRI, most health departments also engage in information dissemination typically in conjunction with National Weather Service heat warnings [11]. Public health education communication often includes

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their local health department website, social media networks, radio, or communications to their external partners. These efforts take considerable expertise and staff time to orchestrate. To help alleviate future health impacts, agencies also develop and coordinate emergency response plans and long-term planning for extreme heat in their jurisdiction.

Health department staff in Arizona started responding to the SARS-CoV-2 pandemic in late January 2020. This time of the year often coincides with the beginning of heat preparedness and prevention efforts in local jurisdictions. Due to their expertise in planning and communications for other hazards, like extreme heat, many of the staff who respond to HRI were shifted to respond to the COVID-19 health response. Summer 2020 was also the hottest, driest summer on record for Phoenix, Arizona since tracking began in 1986 [4]. Other jurisdictions across the state also saw record temperatures and record heat-related hospitalizations and deaths as compared to previous years [4]. June 2020 also coincided with the first large increase in cases of COVID-19 illness in Arizona [12]. Responding to these two public health hazards simultaneously created a large strain on health department staff and each jurisdiction responded slightly different to these dual hazards.

The goal of this project is to understand how Arizona health departments responded to this unprecedented situation given their prior experience and resources, and what resources they need in the future in order to respond to multiple health hazards. Using key informant interviews with health department staff, we summarize how health departments prepared for multiple simultaneous health hazards, and discuss implications for the future given the predicted human health impacts of climate change.

## 2. Methods

A qualitative study was conducted with five Arizona health jurisdictions regarding their preparedness and response to the dual public health response of the COVID-19 pandemic and extreme heat during summer 2020. The University of Arizona Institutional Review Board reviewed this study and deemed it exempt in December 2020.

### 2.1. Study population

Five health jurisdictions in Arizona developed four HRI projects fitting within the BRACE framework. These projects varied in scope from supplementing ongoing work to developing the infrastructure to begin monitoring HRI. Among these projects, one maintained their BRACE project (ongoing for >3 years), one returned the funds to ADHS who forwarded them to university collaborators at Arizona State University (ASU) and University of Arizona (UA) who had been working with the BRACE project since 2014 (ASU) and 2015 (UA) (1 year old), and one withdrew completely (<1 year old). One jurisdiction was unable to start a new HRI project due to COVID-19; they were interviewed to capture this experience.

### 2.2. Participant recruitment

Two personnel from each health jurisdiction (five total) familiar with their unit's heat preparedness and response work for the BRACE program in Arizona were recruited via personal email invitation. No financial incentives were provided. One jurisdiction was unable to participate, yielding a total of four health jurisdictions participating.

### 2.3. Procedures

Each interview was conducted over Zoom, a web-based conferencing platform. The facilitator explained the project and that participation was voluntary and anonymous. The interview consisted of questions regarding: 1) organizational roles, 2) how the COVID-19

pandemic impacted capacity, 3) challenges experienced, 4) how partners influenced response capacity, and 5) adapting to roles during the pandemic. Interviews were recorded and automatically transcribed by the Zoom platform. Interviewers verified the transcriptions after the recording. The guiding questions for the interviews are provided as supplemental materials.

After all interviews were completed, we used inductive coding whereby each investigator independently reviewed the recordings of the interviews to identify themes prior to meeting for an analysis session in March 2021. Together the investigators grouped responses and themes to identify broad categories or patterns in the participant responses.

## 3. Results

Seven interview sessions with eight participants representing four Arizona health jurisdictions were completed from January 13–28th, 2021. Participants included five women and three men ranging from 1 to 15 years in their current position. Interviews averaged 45 min.

### 3.1. Impact to health departments

Health department staff mentioned little or no bandwidth to work on the HRI projects, "because all hands were on deck for the COVID-19 response." They also mentioned struggling to analyze results from the previous summer in order to inform health messaging for 2020, and feeling overwhelmed about passing information on to the partners who needed it. "I blew off almost every email that wasn't related to COVID over the last 8 months. We had no time for anything. At this point, I still do not."

Participants reported the shift due to COVID-19 opened up new opportunities around dual-purpose messaging for heat and COVID-19 such as, providing extreme heat and climate hazard brochures at COVID-19 testing sites. One participant identified that increased attention to the public health department, recalling "our perception is that people are reading things from the county health department . . . that's one good thing we can build upon."

Perhaps the largest effect of COVID-19 in preparing for heat was the shift of personnel to the COVID-19 response. One stark example of how the health department staff were overwhelmed was the cancellation of the state heat meeting [2] which usually brings together partners from organizations and offices around the state to help coordinate the heat response throughout Arizona. "The 8 hour days went away March of last year. We just didn't have any capacity at all to handle any of that."

### 3.2. Preparedness

Public health emergency preparedness (PHEP) in practice includes a "full range of prevention, mitigation, and recovery activities," [13] operational capabilities to expand capacity, and providing continuous improvement in response plans. We identified three preparedness themes which aided in the ability to respond to the dual hazards: flexibility in expectations, adaptability in the face of uncertainty, and tenure in position.

#### 3.2.1. Flexibility

Individual flexibility facilitated rapid response to the constantly changing pandemic landscape. Granting agency flexibility with respect to use of funds and loosening of deadlines emerged as supportive of bolstering response capacity. Partner and colleague flexibility was also repeatedly highlighted. "Everyone was really flexible during the time so I don't think relationships were really hurt or impacted or anything. Everyone understood the situation." Health department staff noted that being strategic with their response and learning to be flexible helped when looking forward: "What we did

learn is how to respond and how to be flexible.” In contrast, health departments with more siloed departments, meaning those with less interaction between departments before the pandemic, felt their response was less flexible and less robust. Participants highlighted how they aim to support flexibility in the future: “I’m going to be emphasizing that whatever realm I have control over making sure that people can cross communicate, cross-talking and actually know what’s happening.”

### 3.2.2. Adaptability

Another attribute that emerged as aiding response capacity was adaptability. Partners and colleagues quickly adapted to “alternative ways” of getting tasks done. This included quickly adopting online platforms for meetings. Among other challenges was “uncertainty around COVID and what proper protocols [needed] to be in place.” Relying on previously developed pandemic plans were not as useful as health department staff hoped. “When we got into the pandemic we pulled out the pandemic flu response, we looked at it, we said ‘this is useless’. We threw it away, and we started all over again.” While this interviewee did explain that it might have been naive to assume a tabletop exercise could completely transfer, they did feel such training was helpful in building familiarity with a situation and identifying pieces that could be adapted.

### 3.2.3. Tenure in position

The length of time individuals were in their position and the length of time the BRACE project had been established facilitated an agency’s capacity to sustain the COVID-19 and heat hazard response simultaneously. At its most basic implementation, knowing what HRI related products needed to be generated or having established templates and data dashboards helped most. Knowing which partners could support collecting and disseminating HRI or COVID information was also beneficial: “. . .having many years in this role, I have the connections to know who to talk to, to get answers.”

Tenure meant established HRI work could continue with limited additional effort: “we already have the process in place and so things, they seem to be going, no matter what happens,” or that, additional human support could easily be trained into an established process. Those who had been in the position longer were better able to ease the transition for new hires or when handing projects over to partners. Rather than hiring new COVID-19 expertise, it seemed better to move existing team members to the COVID response and backfill the work of the team member with new hires. “I was able to use the knowledge that I gained from heat to help the new person I hired as well as the couple people that are on my team for COVID. So, I was able to do both.”

### 3.3. Cross-Training

Health departments ascertained that their response was tied to retention and turnover, meaning that some staff at the health department have a lot of institutional knowledge and then retire before sharing that knowledge. The demand for sharing institutional knowledge, deepened the need for flexible individuals who were able to adapt to ever-changing roles and needs during the pandemic response. One solution identified was a cross-training curriculum so that anyone could rotate into an emergency response position. Another option was developing cross-cutting positions (meaning individuals hired across multiple departments). One interviewee posited the utility of having “training curriculum that’s documented somewhere, so that we have a workforce knowledgeable enough to pick up some of these pieces.” Cross training would ensure units were: “kind of working off the same sheet of music and putting multidisciplinary team meetings together.” Another proposed model was shadowing in current roles, offering smaller tasks to their shadow throughout the year, and providing previous examples of work to

help in the training. This cross training and rotations would be beneficial for standard working as well as emergency response. “There’s epidemiology data analysts work, there’s messaging and communications, you know there’s different things that make up this complex picture of making, creating a resilient community.”

### 3.4. Partnerships

Health departments relied heavily on stakeholder networks and external partnerships to respond to the dual threat. Most already had robust partner networks and, though there was less interaction than previous years, participants did not feel the relationship was hurt.

Large networks, including academic partners is a critical component of the BRACE strategy [14]. “[Universities] have really like stepped up throughout the summer and, like, saw the need, [to identify and disseminate locations/times for] cooling centers and all that. So it really helped.” Universities were seen as having greater resources. “I think using [the university] just has tons of resources, we have a very finite amount of resources, a small amount of time and a lot of things we have to do.” The positive interactions of the pandemic reinforced the need for partnerships. “Integrating you all more into our workflows would be really helpful.” Through these good working pre-pandemic relationships mutually benefited health departments and their partners.

## 4. Discussion

In 2020, Arizona faced record heat deaths (520 deaths, compared to an average of 229 deaths/year), emergency visits (3700+ visits, compared to an average of 2870/year) [4,15], and some of the highest COVID-19 case counts in the world (June-July) [12]. Agencies were pushed to the edge by the COVID-19 response and many had to scale back other programs. The COVID-19 summer peak coincided with record heat registered across Arizona with 145 days over 100°F when 115 days is the average [4]. Through key informant interviews, public health departments engaged in heat preparedness and the COVID-19 response highlighted three themes that supported response capacity: flexibility, adaptation, and tenure in position, which were, in turn, further supported by cross-training and partnerships.

Interviewees indicated that preparedness should shift to focus on flexibility and adaptability to building PHEP capacity. Savoia et al. [16] describes the importance of flexible emergency plans that can be tailored to an emergency as needed, and considering potential delays in organizational, financial, and legal infrastructures within a health department. This could look like health departments developing broad emergency plans and protocols rather than disease- or event-specific plans. PHEP is still fairly new [17], and continues to develop as it is tested within the public health system. Dual hazards will drive that evolution. Specifically, climate change will drive increases in outbreaks in the future, and health departments should consider PHEP response that is adaptable to multiple (and dual) responses.

The health jurisdictions that were able to maintain their dual response were those large enough to split and maintain a smaller team to maintain HRI related activities. Such shifts in roles were further facilitated when the individuals had longer tenure in their position. Even when these individuals moved to COVID-19 related work, those with a longer tenure working on HRI were better able to delegate tasks to new hires and thus maintain the dual response to heat and COVID. Health departments should engage in workforce retention strategies, as well as cross-training efforts, to build workforce capacity in multiple areas such that smaller teams can sustain climate change critical work during dual hazard responses. The high-turnover [18] of health departments, however, may hinder the efficacy of cross-training as people quickly move out of their position to new organizations. Importantly, temporary /new COVID hires were more efficient when they supported an established position, freeing the

established individual who knew the system could guide them and themselves focus on the new threat.

Maintaining flexibility through cross-training and building and strengthening inter-organizational partnerships were identified as modifiable solutions to support maintaining public health capacity throughout the pandemic. In their review of PHEP, Savoia et al. [16] highlight: cross-sector partners, timely communications, and social capital across organizations to develop sustainable systems and help maintain flexibility. The collective trauma of the COVID-19 pandemic, meaning the impact to personal and professional work lives, may have contributed to the need for increased flexibility of capacity and resources by all involved in these partnerships. Health departments with strong stakeholder relationships utilized these partnerships to sustain their climate change work. Stakeholder relationship building is therefore essential for health departments who may have to shift climate change work to a lower priority given a higher priority hazard that occurs in their jurisdiction.

Cross-training creates a shared mental model so that team members are better able to anticipate needs in high-intensity situations [19]. While all individuals we spoke with highlighted the importance of cross-training, there was no consensus on what that cross-training would look like. Suggestions included: shadowing or task sharing, rotations with other departments (e.g., epidemiology with communication), and multidisciplinary team meetings. A positive association between intra-organizational ties has been shown to improve productivity under 'normal' situations [20]. While cross-training by rotating team roles creates increased demand during training: it improves communication [21] and performance [22] when workplace demand increases. The lack of consensus of what cross-training looks like probably reflects that any cross-training programs needs to be developed by the jurisdiction to meet their local needs.

Partnering with academic institutions was written into the BRACE grant as a priority action [23] and we specifically asked about these partnerships based on our observations and interaction with health departments. However, the concept came up organically as a means to allow projects to move forward, indicating that the BRACE goal of building partnerships had a positive and lasting impact [24]. Similarly, Academic Health Departments [25] are mutually beneficial partnerships where health departments ensure research is applicable to public health practice and research centers increase the scientific rigor of processes and programs [26]. As reported here, partnerships can help to fill gaps within the health department which are often too small or under-resourced to respond to the roles expected of them [26,27].

It was encouraging that some of our participants noted the benefits of creating workflows and just-in-time team trainings. The Centers for Disease Control and Prevention have provided an assessment of PHEP which defines workflows in terms of information sharing between systems, and training requirements and standards for preparedness [28]. Cathcart et al. [29] provides an overview of just-in-time trainings and rapid deployment of these customized trainings during public health emergencies which can be helpful for public health departments to model during emergencies. We encourage the use of locally developed trainings or tailoring of existing products for the local situation to develop local PHEP capacity.

Our focus on the experiences of health departments who specifically work on heat preparedness through the BRACE program resulted in a small sample size, which may limit the generalizability of these results. However, we did speak with two members at each participating organization, and the themes that emerged were universal. Our sample included health departments we partner with which may have encouraged social desirability bias. Finally, we did not quantitatively validate the health departments' response capacity. Even with a small sample, these qualitative results contribute to developing understanding of health department efforts during this time, which can be used to assess

the impact of dual public health department emergency responses in the future.

## 5. Conclusions

With the impending impacts of the changing climate and the resultant extreme events with subsequent health impacts, dual hazard response needs are likely to arise again in the future. Health departments will be forced to triage work in order to sustain critical areas, such as the health impacts of extreme weather events. Responding to public health emergencies will interrupt infrastructure, workflows, and workforce. Cross-training, fostering flexibility and adaptability within the workforce, and building and sustaining partnerships will aid health departments responding to simultaneous public health hazards. We encourage health departments to not create another plan, but to consider how building and strengthening stakeholder relationships, developing flexible and modifiable trainings and plans, and focusing on workforce retention might contribute significantly to dual hazard responses in the future.

## Author statement

Both authors contributed equally to the conceptualization, methodology, validation, formal analysis, investigation, data curation, and writing for this project. Additionally, Heidi Brown provided resources, supervision, project administration, and funding acquisition for this project.

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## Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.joclim.2021.100068](https://doi.org/10.1016/j.joclim.2021.100068).

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