Morrison Institute for Public Policy
Arizona State University

Are State and Local Policies Addressing Community Concerns about Extreme Heat?

A Case Study of American Indian and Latino Communities in Phoenix, Arizona

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Acronym List

ACC: Arizona Corporation Commission

ADOH: Arizona Department of Housing

APS: Arizona Public Service

BCCPH: Bridging Climate Change and Public Health

CDC: Centers for Disease Control

COVID-19: SARS-CoV-2

EPA: Environmental Protection Agency

MCDEM: Maricopa County Department of Emergency Management

MCDPH: Maricopa County Department of Public Health

MAG: Maricopa Association of Governments

SRP: Salt River Project

T2050: Phoenix Transportation 2050 Plan

Introduction

Extreme heat can be deadly. Today, many cities are experiencing higher temperatures due to climate change and the urban heat island effect (Dahl et al., 2019). Heat disproportionately affects neighborhoods where most community members are low income and/or people of color (Benz & Burney, 2021; Dialesandro et al., 2021; Chow, Chuang, et al., 2012; Harlan et al., 2006). While effective heat management strategies exist (e.g., indoor air conditioning, increased vegetation and trees; Environmental Protection Agency [EPA], 2021), they are not equally available across racial groups, income levels, and neighborhoods due to a variety of historical and contemporary factors (Bolin et al., 2005; Bolin et al., 2013; Hoffman et al., 2020; Locke et al., 2021). These challenges have led government agencies at multiple levels to take action to manage and mitigate the effects of extreme heat (Bolitho & Miller, 2017; Chow, Brennan, et al., 2012; Guyer et al., 2019).

The COVID-19 pandemic can exacerbate vulnerabilities to extreme heat and has disproportionately affected people of color (Vinopal, 2020). Acting as a system shock, the pandemic tested the policy infrastructure intended to mitigate the impacts of extreme heat for individuals and households. COVID-19 thus presents a unique opportunity to examine how existing policies address communities' needs and concerns around extreme heat, and to identify additional opportunities to support community members.

The Morrison Institute for Public Policy and the Guinn Center for Policy Priorities collaborated to design parallel studies in the City of Phoenix, Arizona, and Las Vegas/Clark County, Nevada, respectively. This report focuses on the case study of Phoenix. It examines community concerns and challenges related to extreme heat during a typical year and during the COVID-19 pandemic, which policies have helped address these concerns and challenges, and potential opportunities to further support community members with the challenge of extreme heat. We focus specifically on American Indian and Latino/a community members, given their disproportionate risk of experiencing detrimental impacts of extreme heat (Benz & Burney, 2021; Dahl et al., 2019; Harlan et al., 2006; Vaidyanathan et al., 2020) and overlapping risk factors for negative outcomes of COVID-19 (U.S. Bureau of Labor Statistics, 2020; U.S. Census Bureau, 2019a; U.S. Department of Labor, n.d.; Office of Minority Health, 2021). The case study for Las Vegas/Clark County is presented in a separate report.

Background

The Growing Challenge of Extreme Heat in Cities

With increasing temperatures due to climate change, metropolitan areas such as Phoenix are experiencing higher temperatures and a more intense urban heat island effect (Dahl et al., 2019). The urban heat island is a phenomenon in which cities experience higher temperatures than nearby rural areas because the built environment absorbs and radiates heat. In the U.S., the heat island effect causes urban daytime temperatures to be 1-7° F higher than surrounding rural areas, and nighttime temperatures to be 2-5° F higher (EPA, 2021). Without intervention, this problem is likely to get worse, with particularly detrimental impacts for vulnerable groups (Dahl et al., 2019).

Vulnerability to Extreme Heat

Exposure to extreme heat can cause a variety of health complications, including headaches, anxiety, confusion, and dizziness, as well as more severe medical conditions such as heart attacks, heat strokes, kidney failure, seizures, and death (Dahl et al., 2019). In fact, heat exposure has remained one of the leading causes of weather-related deaths for the past 30 years (National Weather Service, 2020).

Although everyone experiences heat, some people are more vulnerable to its impacts than others. A person's vulnerability to an environmental stressor (in this case, extreme heat) can be understood as the combination of exposure, sensitivity, and adaptive capacity to that stressor (Marinucci et al., 2014). Children, the elderly, outdoor workers, people with pre-existing conditions (e.g., respiratory disease and cardiovascular disease), and people with low incomes are among those most impacted by rising temperatures. Energy costs lead many low-income households to use air conditioning less or not at all (Dahl et al., 2019).

People of color are also considered vulnerable to extreme heat due to higher exposure and other risk factors (Benz & Burney, 2021; Bolin et al., 2005; Dahl et al., 2019; Harlan et al., 2006). A study of 20 cities in the American Southwest found significant inequities in heat exposure based on income and ethnicity: 10% of neighborhoods with the highest concentration of Latino residents were 4° F hotter on average than the 10% of neighborhoods with the lowest concentration of Latino residents (Dialesandro et al., 2021). The authors noted that racial and ethnic inequities overlapped with income inequities. Greater exposure to extreme heat in minority communities is at least partially

explained by historic patterns of housing discrimination, which have limited the quality and location of housing available to people of color (Hoffman et al., 2020; Locke et al., 2021). Vegetation, green spaces and urban canopy — which have significant cooling effects — are strongly predicted by historic redlining maps in U.S. cities (Locke et al., 2021). Historically redlined neighborhoods experience higher surface temperatures relative to other neighborhoods in the same city (Hoffman et al., 2020).

In addition to greater exposure to extreme heat, American Indian and Latino people have a number of risk factors that increase sensitivity to extreme heat. Nationally, an estimated 23% of American Indian people and 17.2% of Hispanic or Latino people live below the poverty line, compared to 10.3% of white people (U.S. Census Bureau, 2019a). American Indian adults are 50% more likely to be diagnosed with coronary heart disease and 10% more likely to have high blood pressure than white adults (Office of Minority Health, 2021). Another risk factor for extreme heat is working outdoors, and Latino people, particularly men, disproportionately work in occupations with a high risk of extreme heat exposure, such as in construction and agriculture (U.S. Bureau of Labor Statistics, 2020).

The vulnerability of communities of color to extreme heat is also evident in the disproportionate number of heat-related deaths among American Indians and Black people. A recent study found that from 2004 to 2018, American Indians had the highest rates of heat-related deaths in the United States at 0.6 per 100,000, followed by 0.3 for Black people, and 0.2 for white people and Hispanic people. The authors noted that these differences in heat-related mortality can “be associated with social vulnerability, which often tracks with factors leading to heat exposure (e.g., less green space and more heat-absorbing surfaces), health disparities manifested by lower income, and absence of structural adaptations such as air conditioning” (Vaidyanathan et al., 2020, p. 731).

Vulnerability to COVID-19

Many of the risk factors that increase vulnerability to extreme heat also increase vulnerability to COVID-19, further compounding health risks for American Indian and Latino communities, among other groups. Health conditions such as heart disease and chronic pulmonary disease have been linked to higher risk of a severe COVID-19 infection (Centers for Disease Control [CDC], 2021a). Lower socioeconomic status and in-person work increase risk of exposure (CDC, 2021b; U.S. Department of Labor, n.d.). Latinos comprise 25% of service workers nationally and are overrepresented in fields such as health care support, food preparation, and food processing (U.S. Bureau of Labor Statistics, 2020). The Urban Institute found that 53% of Latino workers and 51%

of American Indian workers have jobs that require them to work in-person and close to others, compared with 41% of white workers, placing them at greater risk of exposure to COVID-19 (Dubay et al., 2020). As with extreme heat, the presence of these risk factors in American Indian and Latino communities have led to disproportionate outcomes during the COVID-19 pandemic. Nationally, American Indian people are 3.4 times more likely than white people to experience hospitalization due to COVID-19 and 2.4 times more likely to die as a result of the disease; Latino people have been hospitalized at a rate 2.8 times that of white people and are 2.3 times more likely to die from COVID-19 (CDC, 2021c).

Case Study: Phoenix, Arizona

This study focuses on Phoenix, a city witness to worsening extreme heat as well as disproportionate health impacts of COVID-19 among American Indian and Latino communities.

The City of Phoenix is located in Maricopa County, Arizona, which experiences some of the most extreme heat in the United States. The county has an average of 110 days over 100° F, and 26 days over 110° F each year, typically from May through October (Maricopa County Department of Public Health [MCDPH], n.d.a).

Phoenix is home to nearly 1.7 million people (U.S. Census Bureau, 2019c). While some community members accept extreme heat as a characteristic of the region, others consider it to be a concerning problem that is getting worse (Culp et al., 2014; Guardaro et al., 2020). Climate data supports these concerns. The years 2012, 2014, 2015, 2016, 2017, and 2018 are among the ten hottest years recorded in Phoenix since data collection began in 1896 (National Weather Service, 2018; National Weather Service, n.d.). Heat-related hospital visits and deaths in Maricopa County have steadily increased over time. In 2001, there were 21 heat-associated deaths in Maricopa County. By 2020, the number had increased by 15 times, to 323 heat-associated deaths (MCDPH, 2020).

In 2020, a year in which there were 12 excessive heat warnings over 48 days, 85% of heat-associated deaths in Maricopa County occurred outside. Among individuals who died indoors from a heat-related cause, 82% had an air conditioner, but 69% had a non-functioning unit and 31% had a functioning unit that was not in use. The highest rates of heat-associated death occur among males, African Americans, American Indians, and individuals who are 75 years or older. The City of Phoenix had the highest number of deaths in the county at 191; a rate of 12 people per 100,000 (MCDPH, 2020).

As is the case nationally, heat is experienced and mitigated differently across demographic groups in Arizona. Populations with greater vulnerability to the effects of extreme heat include people with low-incomes, minorities, the elderly, outdoor workers, people engaged in outdoor recreation, and people without access to air conditioning (Chuang et al., 2015). In Phoenix, there are also observable differences in heat vulnerability by neighborhood. Heat vulnerability and heat-related deaths are lower in Phoenix neighborhoods with higher income and education levels, younger white residents, greener landscapes, air conditioning, and cooler microclimates (Harlan et al., 2013). Conversely, Phoenix neighborhoods with greater heat stress lack vegetation and are more likely to be inhabited by people of color and/or those who have low socioeconomic status (Harlan et al., 2006). Compared with predominantly affluent white neighborhoods, neighborhoods populated mostly by Latinos with low-incomes have higher temperatures and heat-related risk exposure and were found to lack adequate resources to deal with heat (Harlan et al., 2007).

Several research efforts in Phoenix have documented individual and household experiences of heat, as well as strategies to mitigate heat impacts and address community needs. A 2015 survey of Maricopa County residents found that extreme heat and power outages are among the top emergencies likely to affect households. The same study found that 25% of the sample reported the cost of electricity as a barrier to keeping their homes cool. Many were unaware of utility assistance programs. The majority of respondents were also unaware of Heat Refuge Stations (MCDPH, 2015). A 2017 evaluation of cooling centers in Phoenix concluded that cooling centers provide a valuable public health service, especially for those who lack air conditioning in their home or cannot use their air conditioner to the extent needed to keep cool due to the associated costs, and that more can be done to increase awareness and use of these sites (Berisha et al., 2017). Another study spoke with Phoenix residents to identify neighborhood barriers to heat adaptation. Participants discussed the need for water features such as splash pads, sprinklers, and fountains in public spaces. Other recommendations included training around public health and heat, as well as advocacy training to help people access resources in the existing system. Participants also requested more heat relief at bus stops, increased shade and trees on walking paths, and a community tree fund to maintain trees on residential property (Guardaro et al., 2020).

Arizona is a leader in policy action around extreme heat at the state and local level. In 2006, Arizona became one of the first states to develop a Climate Action Plan, which inspired Arizona counties and cities to develop climate plans and other policies of their own. Early versions of municipal plans were similar to the 2006 state plan, acknowledging extreme heat as one of many effects of climate change. More recent

policy efforts cross a variety of policy domains — including public health, disaster management, transportation, and more — and have put extreme heat at the foreground of concern (see Appendix B). Many acknowledge the unequal impacts of heat across social groups. The 2020 Phoenix Climate Action Plan Framework states:

> [H]eat does not affect all residents equally — outdoor workers, those experiencing homelessness and other vulnerable populations, such as low-income residents living in poorly insulated homes, are more impacted by heat. Successful heat programs and policies must address this disparity and focus on those most vulnerable.
>
> (City of Phoenix, 2020a, p. 25)

Several heat-related policies were developed through public engagement, and document Phoenix residents' preferences for parks, trees and shade, public transportation, walkability, water access, information, and more (e.g., City of Phoenix & PlanPHX Leadership Committee, 2015; City of Phoenix, n.d.g.; Rothballer et al., 2019).

However, little is known about how these policies collectively address the heat-related concerns and needs of individuals and households. Such policy efforts within the City of Phoenix are the focus of this study.

Moreover, as noted above, many of the risk factors associated with heat-related illness and death overlap with those of COVID-19, resulting in disproportionate negative impacts for some groups. Arizona is no exception. Of the 73% of cases that reported race/ethnicity, 41% were among Hispanic individuals (32% of population) and 6% were among American Indians or Alaska Natives (5% of population; Kaiser Family Foundation, 2021; U.S. Census Bureau, 2019b). Among COVID-19 positive heat-related deaths in 2020, American Indians were also overrepresented (MCDHP, 2020). Thus, the COVID-19 pandemic provides a unique opportunity to examine whether existing policies for extreme heat address the challenges and concerns of members of high-risk groups both during a typical year and during a public health crisis.

This study aims to identify opportunities to address the heat-related challenges and concerns of American Indian and Latino/a community members in the City of Phoenix. It does so by identifying state, county, and municipal policies that address extreme heat, examining whether these policies address the heat-related challenges and concerns of American Indian and Latino/a community members in a typical year and during the COVID-19 pandemic, and exploring potential opportunities to further support community members with the challenge of extreme heat.

What We Did

To answer our research questions, we conducted a **landscape analysis of existing policies** that address individual and household experiences of extreme heat, focusing on state, county, and municipal plans, programs, statutes and codes from the years 2010-2021. We then conducted a **community needs assessment** to identify needs and concerns around extreme heat among American Indian and Latino/a community members, particularly under pandemic conditions. This involved an online survey and semi-structured interviews with community leaders and community members. Finally, we conducted a **gap analysis** to identify existing policies that address community concerns and needs around extreme heat, and where there are opportunities to address gaps. Detailed Methods can be found in Appendix A.

The research team consulted with an advisory board of 19 leaders in government, the nonprofit sector, and academia with specific expertise in extreme heat, climate, and/or public health. The advisory board reviewed and provided feedback on the selection of policies to be included in the landscape analysis; provided insights on how to make the study more useful, valid, and informative to decision-makers and communities; and connected the research team with other experts, community leaders, and community members.

Who We Spoke With

We completed 72 interviews. Fifteen interviews were conducted with community leaders representing a range of health and social service organizations and positions as well as representatives from Maricopa County. Fifty-seven interviews were completed with community members. Fifteen interviews were conducted in Spanish. Background information on community members was gathered via a survey prior to the interview. Participants identified as Latino/a (n = 29, 51%), American Indian (n = 24, 42%), or both American Indian and Latino/a (n = 4, 7%). The majority were women (88%) and most (60%) were between the ages of 25 and 44 years.

Community members were mostly employed full- (42%) or part-time (23%). Of the participants who reported employment, 41% were essential workers and 70% were in positions requiring them to regularly interact with others within 6 feet. Most community members (78%) worked indoors the majority of the time, with all but one interviewee indicating access to air conditioning while working indoors. Three quarters of community members interviewed (75%) reported an annual household income of $50,000 per year or less. The most commonly reported annual income bracket was $25,001-$50,000

(42%), followed by another 33% who reported an annual income of less than $25,000 (Table 1).

Table 1. Community Member Employment and Income

Income and Employment	Frequency	Percent
Employment [can select more than one]		
Full-time	24	42.1%
Part-time	13	22.8%
Unemployed (looking for work)	2	3.5%
Unemployed (Not looking for work)	1	1.8%
Student	18	31.5%
Homemaker	11	19.2%
Disabled	2	3.5%
Retired	1	1.8%
Other	2	3.5%
Essential worker		
Yes	15	40.5%
No	16	43.2%
Not sure	6	16.2%
Regular interaction with others within 6 ft.?		
Yes	26	70.3%
No	11	29.7%
Work the majority of time indoors or outdoors?		
Indoors	29	78.4%
Outdoors	2	16.2%
Equally indoors and outdoors	6	5.4%
Annual household income		
Less than $25,000	19	33.3%
$25,001 - $50,000	24	42.1%
$50,001 - $75,000	8	14.0%
$75,001 - $100,000	3	5.3%
Prefer not to answer	3	5.3%

Nearly half of community members reported living in a single-family home, and nearly 40% reported living in an apartment or condominium. A majority were renters. Most participants spent the majority of the summer in 2020 at home and almost all reported access to the internet at home (Table 2). Interviewees were not asked about the type or efficiency of internet access; therefore, it is unclear if people accessed the internet primarily through a cell phone versus other means or whether their service was reliable.

Table 2. Community Member Housing and Internet Access

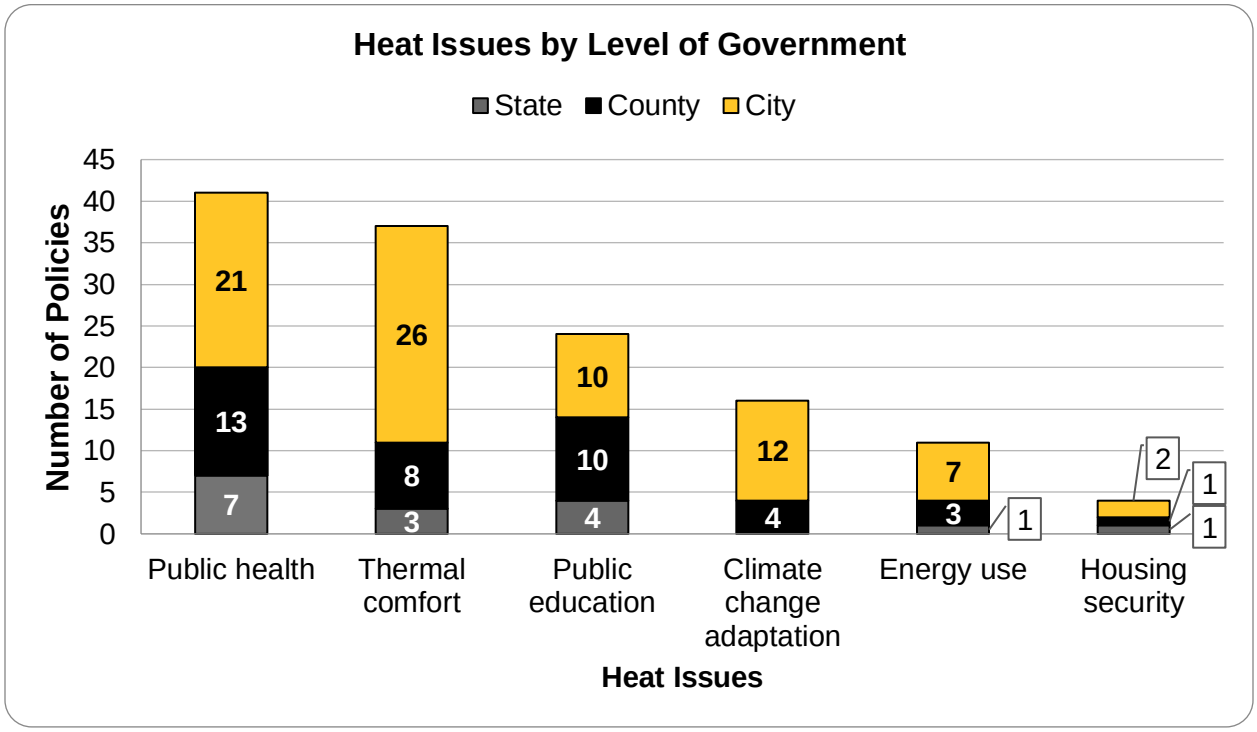
Living Situation	Frequency	Percent
Primary living situation		
Apartment	19	33.3%
Condominium	3	5.3%
Townhouse	2	3.5%
Single family home	28	49.1%
Mobile home or trailer	1	1.8%
Other	4	7.0%
Rent or own		
Rent	36	63.2%
Own	16	28.1%
Neither rent nor own	4	7.0%
No response	1	1.8%
Majority of summer 2020 spent at home?		
Yes	47	82.5%
No	9	15.8%
No response	1	1.8%
Internet access at home?		
Yes	55	96.5%
No	2	3.5%

What We Found

Landscape Analysis

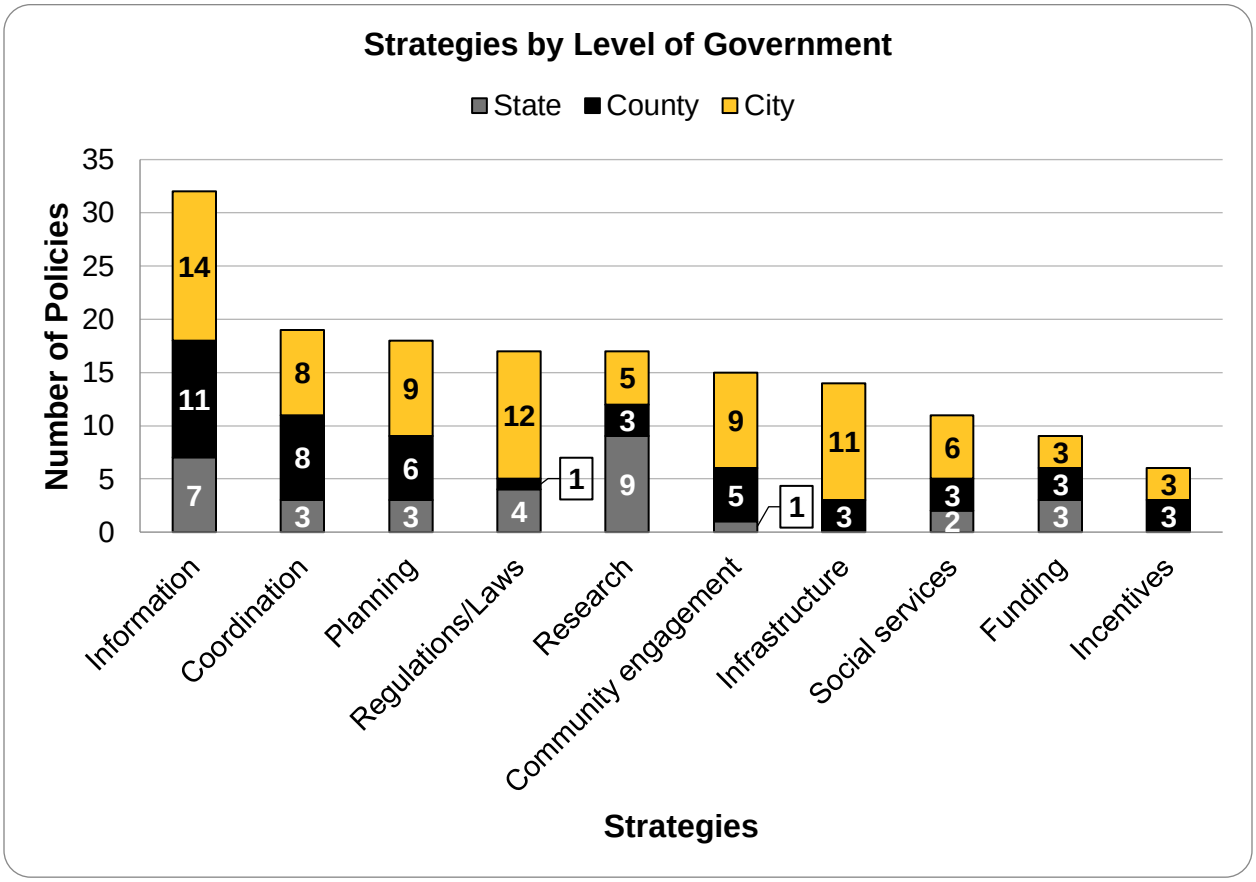
In total, we identified 51 policies that address heat within the City of Phoenix: 15 plans, 26 programs and initiatives, and 10 statutes and codes. The majority of these policies were from the City of Phoenix (30 policies), followed by policies from Maricopa County (including the Maricopa Association of Governments, MAG) (13 policies) and the State of Arizona (8 policies). Policies were associated with 24 government agencies (11 city, 6 county, 7 state). See Appendices B and C. The heat issue most addressed in these policies was public health (41 policies). The issue least addressed by this collection of policies was housing security (4 policies); however, the sample did not include all housing-related policies (Figure 1).

Figure 1. Number of Policies Addressing Heat Issues



The most prominent strategy among heat-related policies was information (32 policies), and the least-utilized strategy was incentives (6 policies; Figure 2). The policies most addressed public space (e.g., public parks, government buildings; 34 policies), but private space (e.g., homes, yards) was also a focus (29 policies). The least commonly addressed space was the workplace (7 policies; see Appendix C). Outdoor spaces were a dominant focus (44 policies) and appeared twice as often as indoor spaces (22 policies; see Appendix C). Finally, 30 policies provided information in Spanish, either online or via informational or community engagement sessions (see Appendix B).

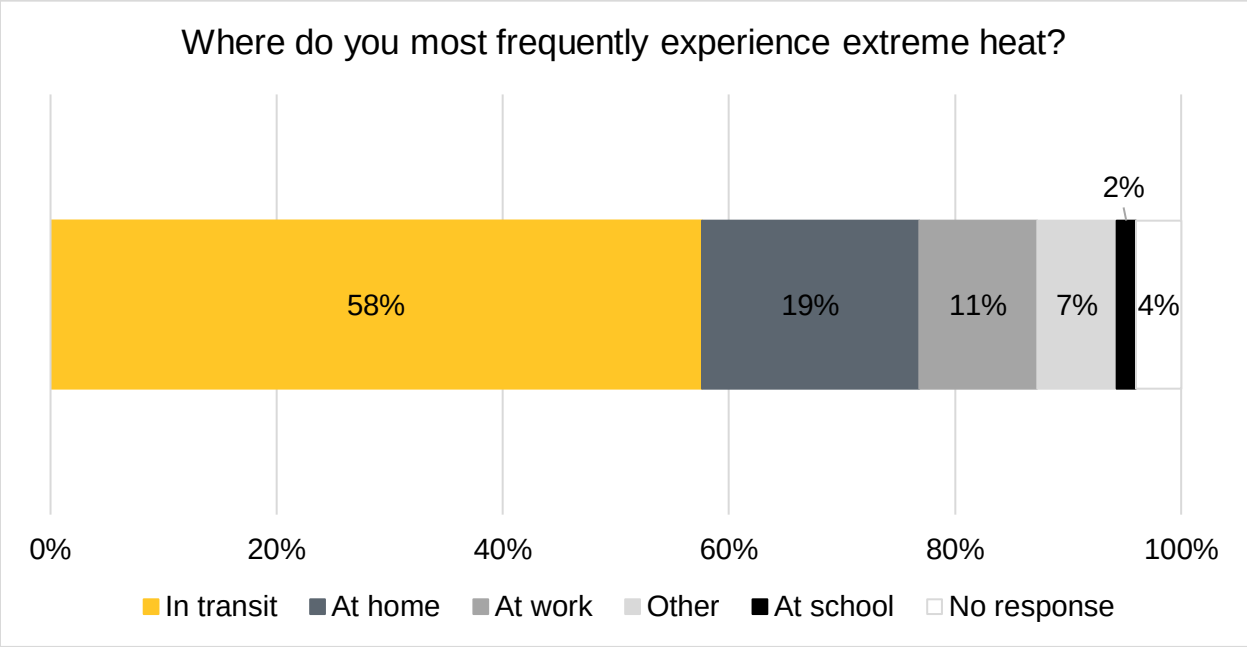
Figure 2. Strategies Used to Address Heat Issues



Needs Assessment and Gap Analysis

In survey responses, nearly 60% of community members said they experience extreme heat most often in transit. Notably, 90% reported their primary mode of transportation to be a personal vehicle or vehicle of a friend, family member, or co-worker. The remaining interviewees used public transportation, carpooled, walked, biked, or used taxis, Uber, or Lyft. The second most common response for where people most frequently experience heat was at home (19%). When asked how often they or their household members felt too hot inside their home the past summer, over half said, “sometimes but rarely” and nearly a quarter said, “most of the time but not always” (Figure 3).

Figure 3. Places Community Members Experience Extreme Heat Most Frequently



Heat Management Strategies

In addition to identifying heat-related challenges and concerns experienced by American Indian and Latino/a community members, the interviews highlighted the many ways in which participants manage and adapt to heat. Heat management strategies identified by community leaders mirrored those of community members; however, leaders tended to discuss broader, systems-level strategies (i.e., social services), while community members focused on individual and/or household strategies.

Many community leaders and community members discussed helpful supports and strategies that extend beyond government policies and resources. For example, social support was identified as one of the primary supports for dealing with heat. In fact, social support was the third most mentioned heat management strategy during a typical year and elevated to the second most mentioned strategy during the COVID-19 pandemic. Community members rely on family and friends for access to resources like air conditioning, pools, and refuge in cooler parts of the state and country. While social support was reduced for some during the COVID-19 pandemic, it remained an important resource for people during a time when support was limited.

In a typical year, community leaders and community members mostly talked about utilizing cool public indoor spaces to escape the heat. In other words, community members, when not restricted by a pandemic, leave their home to take advantage of

accessible indoor spaces with air conditioning. These spaces include cooling centers, libraries, malls, churches, gyms, and restaurants.

Many participants also discussed staying home, using home air conditioning, and staying hydrated as ways to manage heat during a typical year. Other strategies for keeping cool at home included fans, do-it-yourself insulation, and eating cool foods like salads and popsicles.

During the COVID-19 pandemic, the public spaces that community members most commonly cited as helpful for managing heat were no longer safe or reliable due to pandemic restrictions and precautions. This limited community members' adaptive capacity and resulted in people having to stay home to keep cool. Use of home air conditioning was still a top cooling strategy. One community member commented (emphasis added):

> **I couldn't go out to the pool. I couldn't go to the gym. I couldn't go to public spaces that had naturally cool AC.** I mean, walking into Home Depot, that place is crisp. It's like walking into a refrigerator, but of course, we couldn't do that anymore.

Moreover, personal cooling solutions like keeping windows and doors closed, taking cold showers, and buying cool clothing became top heat management strategies during the pandemic, in addition to reducing energy consumption to help compensate for the additional time at home. Community leaders discussed co-location as a common strategy for families where multiple generations co-habitat to split costs and share resources.

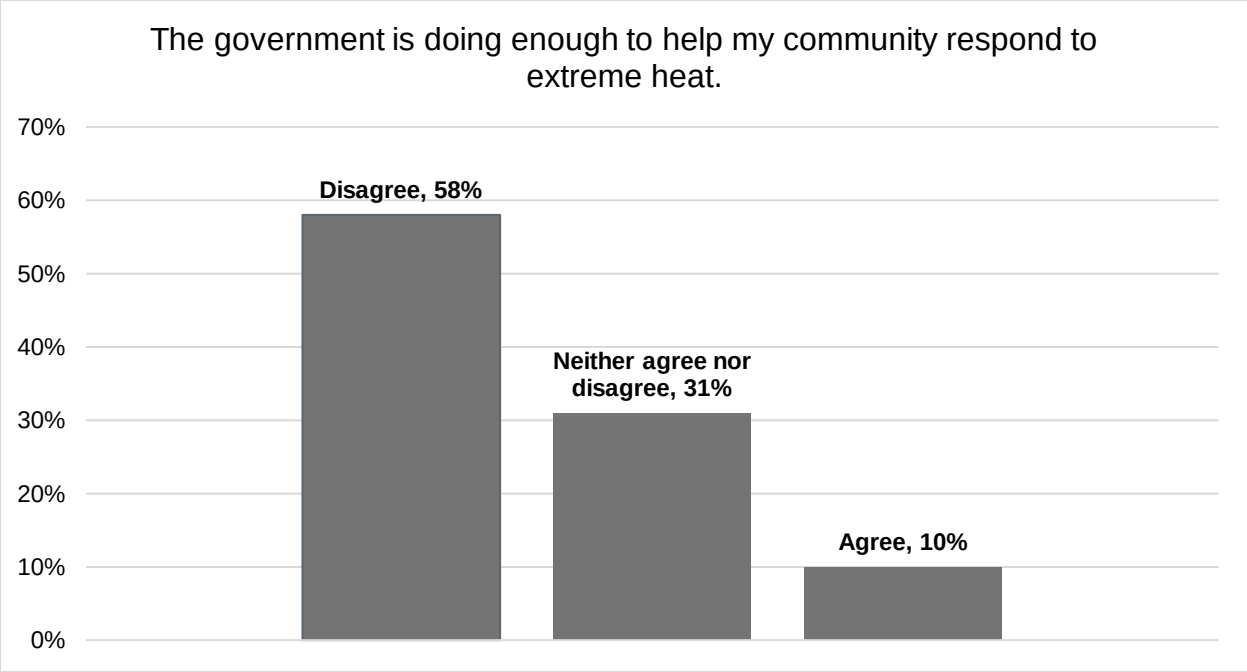
Participants also discussed how cooling options are greatly limited during travel. Community members mostly rely on air conditioning in their personal vehicles and/or minimize exposure by planning their day around the heat. For example, many participants talked about scheduling appointments and running errands early in the morning or later in the evening when the heat is less intense. For example, one community member explained how they try to schedule doctor's appointments "early in the morning and try not to be out in the afternoon."

Together, these findings emphasize the importance of thermally comfortable private spaces, such as homes and vehicles, and the financial resources needed to maintain them.

Community Concern about Extreme Heat

A large majority of the community members we spoke with (81%) reported being somewhat or very concerned about the risks posed by extreme heat. When asked if the government is doing enough to combat heat in communities, 58% disagreed and 31% neither agreed nor disagreed (Figure 4).

Figure 4. Community Member Perceptions of Gov't Response to Heat (n = 48)



Below, we detail what we heard from American Indian and Latino/a community members about their individual and household experiences with heat challenges, both during a typical year and during the COVID-19 pandemic. The heat challenges that participants discussed most in interviews related to thermal discomfort, energy use, and health. Thermal discomfort is another way to say a person feels uncomfortably warm or hot. In the following sections, we elaborate on these themes, focusing on the spaces in which participants discussed them: thermal discomfort and energy use at home, thermal discomfort in public outdoor spaces, thermal discomfort during transit, and the impacts of heat on health and body.

Each section summarizes the challenges and concerns that interviewees raised about the given issue and space, the supports and programs community members identified as helpful, additional relevant policies we identified in the landscape analysis, recommendations from community members and leaders, and potential gaps between

community members' concerns and existing policies. We illustrate our findings with quotes from interview participants, emphasizing key points in bolded text.

We highlight the most salient results; however, additional findings can be found in Appendices B, C, and D. Specifically, we discuss the top three themes that participants identified for heat challenges. Subthemes and helpful policies related to heat challenges are discussed when at least 10% of participants mention them. Results across American Indian and Latino/a participants were very similar overall and are thus presented in aggregate; however, differences between samples are noted where they emerged. Similarly, we highlight differences between community member and community leader responses where they were present.

Thermal Discomfort and Energy Use at Home

Most interview participants experienced thermal discomfort in their homes, which many associated with poor insulation, inefficient air conditioning, and in some cases, not having air conditioning. Broken or insufficient air conditioning was cited more among Latino/a participants than American Indian participants. For example, one Latina community member explained:

> In the house that we rent ... **the air conditioning does not come in all the rooms**, but we tell the owners that there is this problem. But well, they ignore us … they come and [say] no, that everything is fine, there is no problem.

Participants widely associated thermal discomfort at home with energy use, and the financial impact of higher utility bills during the summer. Many practiced the strategy of keeping their thermostat at a higher temperature than their comfort level in effort to lower their energy bills. Some participants were on a "peak hours" utility plan, in which energy costs are more expensive per kilowatt-hour during high-usage hours, usually 3 p.m. to 8 p.m. (hours vary based on provider and time of year). Several participants described these plans as their most affordable option, but also described them as more difficult for managing thermal comfort at home because peak hours coincide with the hottest times of day. Participants frequently discussed negative financial impacts because of high utility bills and, to a lesser extent, air conditioner maintenance. The following quotes from community members exemplify some of the challenges that they face:

> It is kind of hard **during the peak hours. You sit there and suffer it out** for a few hours but then, I mean, it does make a little difference on your light

> bill, probably like $30, $40 difference, but that helps out because in summertime your light bill is over $200 easily one month, as opposed to your wintertime when it's like $64.
>
> I think **a lot of the expenses** that relate to heat and trying to stay cool in the summer also **includes the upkeep of air conditioning**. We do replace the filter every month and they're filters that are supposed to last three months, but they're not lasting three months ... I would say [we spend] at least about $150 a year.

Many interviewees told us their energy usage and expenses increased during the pandemic because they were spending more time at home. Some faced the challenge of working or attending school from home during the pandemic, which was more challenging and uncomfortable, since other cool spaces like libraries and malls were not open to the public to provide relief from the heat.

> My work started a telecommute program ... so I had to adjust the temperature at home to make it comfortable during the day, and that increased my electric bill almost 50 to 60%. Once I realized that was happening, I had to adjust the temperature in the house, because **I could just not keep up with that expense. And it was very uncomfortable to work from home.** I tried to look for other places that were safe, but I was not successful. **So, I ended up with a huge electric bill that I'm still on a payment plan to cover … from last summer.**
>
> Well, I guess it's like my husband and I, **we'll just work through [the heat]** ... and I can work without turning on the little air conditioner, right? I'll just work through it and not complain, but **when the kids are here, it's like, "Okay, well, they can't focus without it."** So, I think **we just had to deal with it at times**, just **because we knew we just weren't going to be able to pay the electricity if it went up too high**.

Helpful Policies Identified by Interviewees. Interviewees identified several policies as helpful for addressing thermal discomfort and energy use at home. These included the moratorium on electricity disconnections during summer months, which is part of Arizona Administrative Code, Title 14, Chapter 2 (see text box titled "How Utilities are Regulated"). Both community members and leaders described this policy as helpful during a typical year and during the COVID-19 pandemic.

Most of the helpful supports and programs that participants identified around this issue were beyond the state and local scope of our study's policy analysis. These included utility assistance programs and financial assistance programs that are privately or federally funded, such as housing or rental assistance and COVID-19 stimulus checks. Financial assistance programs were noted as helpful primarily during the COVID-19 pandemic.

Additional Policies. In addition to the supports and programs that interviewees identified as helpful, participants' concerns around thermal comfort and energy use at home are addressed by home weatherization programs and regulatory protections for renters.

Home weatherization programs provide households with financial assistance to improve home energy efficiency, reduce energy expenses, and enhance health and safety. The City of Phoenix administers the Weatherization Assistance Program to Phoenix residents as a partner of the Arizona Department of Housing (ADOH) Weatherization Assistance Program (see text box titled "Home Weatherization Assistance").

There are also several policies specifically for renters that provide protections and services related to thermal comfort at home. They include Arizona Revised Statute 33-1364, which requires that landlords supply all utilities (including cooling) outlined in the rental agreement (A.R.S. § 33-1364, 1973/1995), and Phoenix's "Cooling Ordinance" (City of Phoenix, 2021a), which requires landlords to provide air conditioning capable of cooling to 82° F or below, or evaporative cooling capable of cooling to 86° F or below. Phoenix also offers the Landlord and Tenant Program, which provides education to landlords and tenants on their rights under the Arizona Residential Landlord and Tenant Act (City of Phoenix, n.d.b).

How Utilities are Regulated in Arizona

There are two major energy providers in Phoenix: Arizona Public Service (APS) and Salt River Project (SRP). Like most private and investor-owned utilities in Arizona, APS is regulated by the Arizona Corporation Commission (ACC) under Arizona Administrative Code Title 14 Chapter 2 (1982/2020). The ACC is an elected body of five commissioners, whose responsibilities include regulating utility rates and service disconnections. The ACC sets rates to balance the needs of ratepayers with a fair rate of return for the utility company. Utility companies can propose price changes by submitting an application to the ACC requesting a “rate case” (ACC, n.d.). The ACC then audits the costs associated with providing the service, a process typically requiring months of testimony and audits to ensure the proposed rate is fair and legal. Finally, the ACC votes on the proposed rate in an open meeting.

The ACC also regulates the termination of service for utilities, more commonly referred to as “disconnections” or “shut offs” (Ariz. Admin. Code § R14-2-211, 1982/2020). Rule CC R14-2-211 of the Arizona Administrative Code prohibits the disconnection of electrical services for residential customers between June 1 and October 15. Disconnections are also prohibited during periods of extreme heat or other extreme weather conditions. To prevent disconnection, residents must pay at least half of their outstanding balance or have a balance of $75 or less. Additionally, utility services can only be shut off on days in which the public has access to the utility office as well as the day after disconnection.

The Salt River Project is a utility provider that has served Phoenix and other Arizona cities over the past century (SRP, n.d.a). It provides electricity via the Salt River Project Agricultural Improvement and Power District (SRP, n.d.e), which is governed by a board and council elected by eligible SRP landowners (SRP, n.d.b). The district’s board of directors sets electricity prices with public and third-party input (SRP, 2018). The process for setting prices follows SRP’s Pricing Principles, which consider both company and consumer concerns (SRP, n.d.c).

SRP implements a disconnection after a late fee and warning notification has been dispensed, approximately a month after initial billing (SRP, n.d.d). Full payments with additional charges are required to reactivate a discontinued account (SRP, n.d.d.). These types of disconnections are halted when the National Weather Service broadcasts an excessive weather warning. During this time, bills and late fees are still applied to accounts, as outlined in company policy (SRP, n.d.d).

Home Weatherization Assistance

Home weatherization programs provide homeowners and renters with financial assistance to improve home energy efficiency and reduce energy expenses, while improving health and safety. They cover improvements such as adding insulation, replacing a cooling system, reducing air and duct leakage, and shading sun-exposed windows.

The City of Phoenix Weatherization Assistance Program partners with the Arizona Department of Housing Weatherization Program and local utilities to serve Phoenix residents (T. Ekenberg, personal communication, August 5, 2021). Between 2015 and 2020, the program provided assistance to over 500 residential units, with an average of $12,200 per home (City of Phoenix, 2020a). Individuals whose primary residence is located within Phoenix city limits and whose income is within 200% of the poverty level are eligible to participate in this program (City of Phoenix, n.d.i; ADOH, 2020).

Gaps and Recommendations. The large number of participants who reported feeling uncomfortably hot in their own home at least part of the time and experiencing health and financial impacts as a result, both during a typical year and during the COVID-19 pandemic, emphasizes the importance of improving thermal comfort in private spaces (see section below titled “Health and Body”). Interview participants and this study’s gap analysis highlighted additional opportunities to address interviewees’ concerns around thermal comfort and energy use at home. While interviewees identified assistance programs (e.g., utility assistance) as helpful, many also felt they have a limited reach, and recommended they be made more accessible to more people. Some participants suggested reducing the cost of utilities and/or broadening assistance-program qualification criteria, such as raising the maximum income level. Latino/a community members and community leaders also recommended removing immigration status and social security numbers from assistance program applications. One Latina community member provided this perspective:

> There are people who say, “I go where they help me pay the [electric] bill,” but we cannot go, because of our status. They ask you for proof of everything and we do not have any of that. You just have your birth certificate from [redacted], and they say no, it's for those from here. **There is always help for everyone, but not for [Latinos].**

In addition, some participants suggested simplifying applications by reducing the documentation and time needed for completion. Community leaders further observed

the need for long-term strategies to help households manage, pay off, and prevent utility debt. Many participants were not aware of existing heat relief programs and expressed a desire for more information about these kinds of supports.

The gap analysis revealed other opportunities to address participants' concerns. While existing home weatherization programs address many participants' concerns around thermal comfort and energy costs, few participants expressed awareness of these programs. Relatively few community members — 10, about 18% — mentioned implementing some form of home weatherization as a heat management strategy. This suggests there may be an opportunity to provide more information about weatherization programs and strategies, such as practical tips for improving home energy efficiency for renters and homeowners with various budgets. Future research could explore public awareness of and interest in home weatherization as a heat management strategy, and the extent of the need for this type of support.

Thermal Discomfort in Public Outdoor Spaces

Community members discussed feeling uncomfortable outdoors during the summer. Many felt it was too hot to go outside in the middle of the day to run errands, recreate, or even take a walk in their neighborhoods. They often tied this discomfort to a lack of shade, trees, and green space. Some participants adjusted their schedules to go out early in the morning or late at night, though some discussed feeling too hot at night as well. Many interviewees talked about having to stay home or indoors more than they wanted due to limited options for safe outdoor recreation during the summer. During the COVID-19 pandemic, outdoor recreation became even more challenging with the closure of public parks and pools.

Some community members described how the COVID-19 pandemic actually improved their thermal discomfort challenges, as they were able to avoid the heat more easily. For example, participants talked about not "going out" as much and transitioning to indoor activities at home because of physical distancing and the closure of recreational and leisure facilities.

Helpful Policies Identified by Interviewees. Interview participants widely cited rural and urban parks as helpful for managing heat during a typical year. Community members talked about cooling off by visiting public parks in and outside of Phoenix that provide contact with nature and/or water. Examples included public pools and splash pads, municipal parks and, to a lesser extent, state parks like Red Rock (Sedona) to beat the Phoenix heat. In total, the City of Phoenix manages 185 parks, 29 pools, and over 200 miles of hiking trails (City of Phoenix, n.d.c). At the time of drafting this report

(summer 2021), there were 12 pools and 11 splash pads open for public use in Phoenix (City of Phoenix, n.d.e).

Although Arizona is home to 34 state parks and 22 national parks, none are physically located in Phoenix (Arizona State Parks and Trails, 2021).

Participants also noted community resources as helpful for managing heat during a typical year and during the COVID-19 pandemic. This primarily included access to support and resources from local nonprofits and community centers. These resources were out of scope for the study's policy analysis because they are federally or privately funded.

Additional Policies. Several other policies address interviewees' concerns related to heat in public outdoor spaces, particularly city-level plans and associated programs. Expanding the tree canopy is part of the City of Phoenix's sustainability strategy, as articulated in the 2015 General Plan: "By thinking about trees and shade as focus areas for infrastructure investment Phoenix can address environmental issues like the urban heat island and ensure better use of stormwater" (City of Phoenix & PlanPHX Leadership Committee, 2015, p.155). In 2010, the city released its Tree and Shade Master Plan to expand and maintain the urban forest and increase shade (see text box titled "The Phoenix Tree and Shade Master Plan"). Phoenix has also used zoning ordinances to promote shade in specific neighborhoods, particularly for pedestrians and vehicle parking (City of Phoenix, 2016, e.g., chapters 6, 12, 13).

Maricopa County's Department of Public Health aimed to address concerns around heat in public outdoor spaces in its Heat Action Planning Guide for Neighborhoods of Greater Phoenix (Rothballer et al., 2019). This partnership with Vitalyst Health Foundation, The Nature Conservancy, Arizona State University, and others involved residents in planning to address shade, trees, and other heat-related issues.

Several government agencies provide information on tree selection and care, which is helpful to public and private landholders seeking to increase the tree canopy on their property (see text box titled "Information on Tree Selection and Care"). Finally, there are multiple government sources with information about the health impacts of heat (see section below titled "Health and Body").

Gaps and Recommendations. Interview participants and this study's gap analysis highlighted additional opportunities to address interviewees' concerns around thermal comfort in public outdoor spaces. Many participants expressed a desire for more outdoor recreational spaces with shade or water features. They recommended adding

more trees and shade at parks and on sidewalks, as well as more public pools and splash pads at Phoenix parks. These recommendations were more prevalent among Latino/a participants than American Indian participants. One American Indian community member explained:

> We used to live in Tempe. Tempe was wonderful because most of their parks had splash pads. They had the water there; so, we didn't have to figure out the City of Phoenix pool schedule or anything like that. We could just go to a park, push a button and there's a splash pad that's activated. Which was different when we came to Phoenix. **I'm struggling to think of any parks that we've been to that actually have a splash pad** that our daughter would have been happy to take advantage of [at] the park or play in.

Participants talked about having limited access to pools and swimming activities during a typical year due to distance or transportation challenges, as well as costs. During the COVID-19 pandemic, access was completely restricted due to the closure of all public pools in Arizona (Exec. Order No. 2020-43, 2020). There appears to be an opportunity to increase access to pools and water features at parks as public spaces re-open. This might include adding water recreation at existing parks or offering more low-to-no cost swimming activities for families. At the time this report was drafted (summer 2021), the City of Phoenix was offering free swim lessons for youth ages 3 to 12 and “open swim hours for all ages and abilities.” Future research might explore the extent to which current access to pools and splash pads provide heat relief to community members, particularly those who are vulnerable to extreme heat.

While the Tree and Shade Master Plan (see text box titled “Phoenix Tree and Shade Master Plan”) aims to increase the city’s tree canopy to 25% by 2030, many participants did not seem aware of this policy, nor does this policy provide short-term relief to community members. Decision-makers and researchers might explore more short- or medium-term strategies and resources to help community members better manage extreme heat in public outdoor spaces.

The Phoenix Tree and Shade Master Plan

The Phoenix Tree and Shade Master Plan aims to expand and maintain the urban forest on public and private land to address increasing temperatures and the lack of adequate shade in Phoenix. The goal is to increase the city's tree canopy from an estimated 11-13% vegetative cover in 2010 to 25% coverage by 2030 (City of Phoenix, 2010). The city planted 4,500 trees in 2019 (City of Phoenix, 2021b) and has an estimated total of 93,419 trees (City of Phoenix, n.d.h). Still, reaching 25% coverage is complicated by the fact that dead trees are being removed at a faster rate than they can be replaced. Programs stemming from the Tree and Shade Master Plan that promote tree planting and education include the Citizen Forester Program (City of Phoenix, n.d.a) and Tree Donation Program (City of Phoenix, n.d.d).

In 2019, Phoenix's Urban Heat Island/Tree and Shade Subcommittee (2019) provided recommendations for implementing the Tree and Shade Master Plan, which included prioritizing high-use transit stops and walkways, and areas with populations vulnerable to extreme heat. In 2021, the City of Phoenix trial budget included funds to hire a Tree and Shade Administrator to help implement the plan (Myers, 2021).

Information on Tree Selection and Care

- Arizona Department of Forestry: Tree Selection and Care (https://dffm.az.gov/tree-selection-care)
- Maricopa County Air Quality Department: Clean Air Make More Initiative (https://cleanairmakemore.com/trees/)
- City of Phoenix: Citizen Forester Program (https://www.phoenix.gov/volunteer/citizenforester)

Thermal Discomfort During Transit

Interviewees discussed thermal discomfort in a variety of transit modes: private vehicles, public transit, and walking. In private vehicles, participants talked about the discomfort of getting into a hot vehicle, especially one that has been parked in the sun, and/or the discomfort of not having sufficient air conditioning in their vehicle. They also discussed the financial impacts of maintaining the air conditioner in their vehicle, and the extra gas expenses from running the air conditioner during the summer months, especially in traffic. As some community members explained:

> For me, just **the commute to work is absolutely grueling.** ... Like getting in the car ... you feel hotter than it is on the outside because it's just keeping, trapping all the heat in. And so even getting into places that you think would be a lot cooler, they're still just as hot, if not hotter. So, **until I'm actually at the workplace, it's just dealing with extreme heat**.
>
> Driving in our car, unless we're in a garage or find some shade, **the car is really hot**. Also, our air conditioner ... I mean, we have an air conditioner, but I would say **people that are in the backseat have a hard time staying cool** just because of the overwhelming heat that is Phoenix.
>
> And also, because we **experience the most heat through transit**, that affects how much gasoline we're using in our car. **If you're using the A.C., you're using more gas.** So, I tend to see we experience a fluctuation of those costs during the hottest months.

With public transportation, interviewees talked about the discomfort of walking to transit stops and waiting for the bus in the heat. Participants discussed the lack of refuge at bus stops with hot metal benches and little or no shade:

> And **the bus stops, you know? They're hot, they're made out of metal.** So, when you sit, you know, **after you walk a mile to get to a bus stop ... that should be a little break** to refresh ourselves before we get in the bus or we keep on walking.

At least two participants shared that they have missed school, work, and other appointments because of heat-related challenges with public transportation. One community member explained, “Before I had access to a car I wouldn't go to my doctor's appointments as often because of the heat. It would make it more difficult to even use public transportation.” Another community member commented:

> **If I wanted to take any sort of public transportation or ride my bike, it was really hot**. So **sometimes I would call off of work** if I didn't have a ride there, just because I can't handle the summer heat for that long, especially if I'm riding a bike.

Many also described the discomfort and hardship of walking in the heat in general, such as to transit stops, the grocery store, walking pets, or taking their kids to the park, especially where there is little-to-no shade:

> So, we have a car, but we also take public transportation. **The city is not very walkable** so if we have to take our daughter to school on the light rail, **it's about a five-to-seven-minute walk** from the light rail station to her school and **that can be really hard to do sometimes**.

The COVID-19 pandemic improved thermal comfort during transit for a few participants. They discussed not having to drive to work or school and having greater flexibility in the day to plan activities around the heat.

Helpful Policies Identified by Interviewees. Community leaders and community members did not identify programs and supports that are specifically helpful for managing heat during transit. During the COVID-19 pandemic, four community members — less than 10% of participants — indicated grocery and other delivery services as helpful, which are beyond the scope of this study.

Additional Policies. Several policies address interviewees' concerns related to thermal discomfort during transit, particularly concerns related to public transit and walking. These policies are largely municipal and county plans passed since 2015. For example, Phoenix's voter-approved Transportation 2050 (T2050) plan (2020c) includes adding shade structures at bus stops (see text box titled "Phoenix Transportation 2050"). Phoenix's Complete Streets Design Guidelines (2018) promote urban designs that reduce heat and increase shade for pedestrians, cyclists and transit users throughout the city. Reinvent PHX is an example of collaborative planning for transit-oriented development (City of Phoenix, n.d.g). Through community engagement, it established a community-based vision for development that promotes walkability, shade, safety, and more in five Phoenix neighborhoods along the light rail system (City of Phoenix, n.d.g). The city established in Chapter 13 of the Phoenix Zoning Ordinance, known as the Walkable Urban Code, that 75% of the sidewalk in those neighborhoods should be shaded (Ordinance G-6047, City of Phoenix, 2016).

The Maricopa Association of Governments (MAG) is addressing community members' concerns around thermal comfort in transit with its Active Transportation Plan (2020), which aims to increase the number of people who take transit, bike and walk by expanding the regional active transportation network. MAG prioritizes funding for projects within the complete corridors and regional conduits identified in the plan. It also provides local decision makers with examples, advice and criteria for high quality, comfortable transportation infrastructure with its Active Transportation Toolbox (MAG, n.d.a).

Gaps and Recommendations. Existing policies already address most participants' concerns and needs related to public transit and walking in extreme heat. However, as with many infrastructure interventions, these policies have a long timeline. It may be helpful to consider additional short- and medium-term interventions that can provide relief to community members in the interim.

We did not identify supports or policies that address participants' top concerns related to heat in private vehicles. Given that many people in Phoenix rely on private vehicles for their transportation needs (Arizona Town Hall, 2015), there appears to be an opportunity to provide support in this domain, such as information and other types of support for seasonal vehicle maintenance (e.g., air conditioner repair) to help community members ensure their personal vehicle is ready for summer.

Phoenix Transportation 2050

The Phoenix Transportation 2050 (T2050) plan aims to install shade structures at bus stops citywide to address the lack of shade (City of Phoenix, 2020c). As of July 2020, the city (2020c) had successfully installed 257 bus shelter shade structures with the goal of installing an additional 400 by the end of fiscal year 2025. The Public Transit Department spent a total of $722,273 in T2050 revenues on bus passenger facilities in fiscal year 2020 (City of Phoenix, 2020c). Within city boundaries, 2,552 out of 4,059 bus stops currently have passenger shelters, each costing between $6,700 and $16,000 depending on location (City of Phoenix, n.d.f).

As part of T2050, Phoenix launched the Cool Pavement Pilot Program in June 2020 (City of Phoenix, 2020c). The program is currently testing a water-based asphalt treatment designed to absorb and reflect less heat to help reduce the heat island effect, potentially creating cooler conditions for commuters and pedestrians. The completion of 11 mobility studies also generated several recommendations for more accessible transit, including installing shade trees (City of Phoenix, 2020c).

Health and Body

Most interviewees discussed how thermal discomfort affects their physical and mental health. Health challenges were most associated with being outdoors, but some participants also experienced health issues indoors. American Indian and Latino/a participants both expressed concerns about heat and health. However, two Latino/a community members discussed heat-related health concerns because of outdoor employment, and three Latino/a participants reported financial impacts of health challenges; these issues were not mentioned by American Indian interviewees.

A majority mentioned experiencing physical health effects, such as exhaustion, sunburn, sweating, or dehydration. For some, heat affected their ability to move, exercise and/or sleep. Some participants specifically noted physical impacts of heat during transit, including exhaustion and dehydration. For others, heat exacerbated pre-existing conditions like diabetes or high blood pressure. To avoid heat, some reported getting less exercise and physical activity, avoiding errands such as picking up medications, or procuring food from closer sources, often fast food. These challenges were particularly relevant among participants without a private vehicle.

Many participants mentioned that thermal discomfort affected their mental health. When discussing the mental and emotional effects of heat, participants used words like “agitated,” “grumpy,” and “frustrated.” Some also experienced stress and worry around maintaining thermal comfort and discussed how heat can negatively affect their social relationships and activities. Some participants also described worrying about heat-related health issues for themselves or their loved ones:

> Being from Northern Arizona, when you go outside, you don't really think about taking water if you're just going to be out for a bit, but here you have to be conscious about it. **You [have] to worry about sunburn, heat exhaustion.**

> I think it's just the **pressure of making sure that the finances are all kept on track** in order to be able to meet the demands of the utility rates. And also, I think **it’s more psychological stress,** and then my dad [works in construction]. ... He's pretty used to it by now, but **it is getting hotter every single year**. So, I think it's just more of a stress and anxiety where we're at right now.

Many interviewees noted that heat challenges related to health were made worse by the COVID-19 pandemic, or that new problems arose. For example, some discussed how food insecurity was exacerbated. Others noted reduced access to cool spaces such as libraries and shopping malls that normally allow them to cool off outside of the house, be active, and mitigate bad moods. This further reiterated the importance of private refuges for heat relief (see section above titled “Thermal Discomfort at Home”). Interviewees also identified a variety of new health-related heat challenges, including reduced access to bottled water or refill stations, difficulty breathing while wearing a mask in the heat, and fear of using air conditioning due to initially not knowing how the virus spread.

A small number of community members who did not report heat-related health challenges during a typical year reported emergent health challenges as a result of the pandemic, such as weight gain and reduced water consumption:

> So, I think when it comes to heat for me, **my ability to go out and exercise and go out to walk is my biggest challenge**. Especially during COVID when gyms closed … and I personally did not feel comfortable working out at the gym [when they opened], which **personally for me it did affect my health in a negative way: I gained weight**.

Although no participants experienced homelessness at the time of this study, several expressed concern about the health risks of those who are unsheltered and the need for additional support and resources for them.

Helpful Policies Identified by Interviewees. Libraries were widely cited by participants as helpful for managing heat during a typical year. The Phoenix Public Library System includes Burton Barr Central Library and 16 branch libraries (City of Phoenix, 2021c). Phoenix libraries are a part of the Heat Relief Network, which provides free access to water and air conditioning at locations across Maricopa County (see text box Heat Relief Network). During the COVID-19 pandemic, public libraries were closed, meaning this key heat support was not available to community members. At the time of drafting this report (summer 2021), all but one of the library locations were open to the public.

Participants also mentioned cooling centers, hydration stations, and refuge locations as helpful for dealing with heat in a typical year. These types of locations are part of the Heat Relief Network as well. Like public libraries, many sites reduced access or closed during the COVID-19 pandemic (City of Phoenix, 2020b). Community members did not mention cooling centers or hydration stations as helpful during the pandemic.

Additionally, participants indicated that water distribution and/or food and nutrition support were helpful for mitigating heat-related health issues during a typical year and during the COVID-19 pandemic. Interviewees specifically mentioned access to water, food donations, and free meals. These services were beyond the scope of this study.

Additional Policies. Several other heat-related policies address interviewees' concerns around heat, health and body. We identified multiple online sources of information addressing heat safety, such as heat safety practices, signs of heat-related illness, and ways to help someone experiencing heat-related illness (see text box titled "Heat and Safety Information Sources"). People can also sign up for heat alerts with the Arizona

Department of Health Services, which notifies subscribers of extreme heat events via text and email (ADHS, n.d.).

The City of Phoenix offers outdoor spaces where community members can get some physical activity and exercise, such as parks, trails, pools and splash pads (see Thermal Discomfort in Public Outdoor Spaces, above).

The City of Phoenix is starting to take actions to address food insecurity. The 2015 Phoenix General Plan named a healthy food system as a priority (City of Phoenix & PlanPHX Leadership Committee, 2015), and the city approved its first Food Action Plan in 2020. This plan outlines recommendations for policies, actions, and more to support community members most impacted by hunger and food insecurity. For example, it includes the goal “Incorporate healthy food access into existing and future land use plans with initial focus on designated food desert areas” (Albright, 2020, p. 13; the Food Action Plan acknowledges extreme heat but is technically out of scope for this study because the plan does not directly address heat).

Other state and county policies address the intersection of health and extreme heat and/or climate change on the planning front, promoting awareness, coordination, and strategic direction among government agencies and other partners. Such policies include the Maricopa County Regional Multi-Hazard Mitigation Plan (Maricopa County Department of Emergency Management [MCDEM] & JE Fuller Hydrology & Geomorphology, Inc., 2015), the Arizona Climate Health Adaptation Plan (Roach et al., 2017), and the Climate and Health Strategic Plan for Maricopa County (Bridging Climate Change and Public Health [BCCPH] Planning Workgroup, 2018). Additionally, the Maricopa County Department of Public Health generates weekly heat surveillance reports from May through October, as well as annual reports on heat-associated deaths (MCDPH, n.d.b).

Gaps and Recommendations. Interview participants and this study’s gap analysis highlighted additional opportunities to address interviewees’ concerns around heat and health. A prominent finding is that while there are many sources of information on heat safety and helpful programs (we identified 21 distinct policies that provide information), roughly 40% of community members were not aware of them and recommended that more information be made available. Community leaders also suggested that information should be more available. This suggests the issue is not a lack of information, but rather that there is an opportunity to increase awareness about existing resources. Some interviewees recommended that information be centralized to make it more accessible. Latino/a interviewees also recommended that more information be provided in Spanish.

Participants recommended providing more cooling centers and heat refuge areas. Although many cooling centers were closed or limited during the COVID-19 pandemic, there were more than 40 sites operating in Phoenix in summer 2021 (see text box titled “Heat Relief Network”). As with information about heat safety, there appears to be an opportunity to increase public awareness about existing cooling centers and other heat relief spaces. Participants recommended public campaigns to help spread information about heat safety, heat management strategies, and helpful supports through social media, radio, television, newspapers, public transit, and partnerships with nonprofit organizations and community groups.

To further address the relationship among extreme heat and food insecurity, decision makers might incorporate into forthcoming policies concrete strategies to mitigate the impacts of heat on access to healthy food.

Heat Relief Network

The Heat Relief Network is a collaboration of the Maricopa Association of Governments (MAG) and local partners formed in 2005, which aims to reduce heat-related illness and death in Maricopa County by coordinating heat relief locations. It includes partners such as libraries, community centers, and faith communities that serve as hydration stations, cooling centers, emergency heat relief stations, and/or collection sites (MAG, n.d.c; MAG, 2021b). They serve anyone seeking heat relief, especially individuals who are particularly vulnerable to high temperatures (MAG, n.d.c). MAG maintains an online map of locations, hours, and other details for partners and users. Due to the pandemic, 2020 saw a significant reduction in the number of locations available across the region (MAG, 2021a). In summer 2021, there were over 40 locations in Phoenix, and many more across the county (MAG, n.d.b).

Heat Safety Information Sources

- Arizona Department of Health Services: Heat Safety (https://www.azdhs.gov/preparedness/epidemiology-disease-control/extreme-weather/heat-safety/index.php#heat-home)
- Maricopa County Public Health Department: Extreme Heat (https://www.maricopa.gov/1871/Extreme-Heat)
- Maricopa County Emergency Management: Extreme Heat (https://www.maricopa.gov/5143/Most-Common-Natural-Hazards)
- City of Phoenix: Summer Heat Safety (https://www.phoenix.gov/pio/summer/heat)
- City of Phoenix Parks & Recreation Department and Fire Department: Take a Hike. Do it Right. (https://www.phoenix.gov/parks/trails)

Limitations

This study has several limitations, particularly around sampling and scope, which we outline here.

The sample of policies for the landscape analysis was defined as state-, county-, and city-level policies that directly addressed extreme heat for individuals and households within the geographic boundaries of the City of Phoenix. A limitation of defining the sample this way is that there are many notable heat relief efforts led by nonprofits, community groups, other Arizona cities, and the federal government. Future research might undertake a comprehensive review of these other important heat relief efforts.

A limitation of the landscape analysis and gap analysis is that they are exploratory and descriptive. This study did not evaluate how effective heat-related policies are at addressing their stated goals, and/or the concerns identified by community members and leaders in the needs assessment. Future research could evaluate the implementation and efficacy of the heat-related policies identified in this study.

The needs assessment focused on the experiences and concerns of American Indian and Latino/a community members. The sample of interviewees from each of these populations was not large enough to be representative. Therefore, the results of this study should be considered a starting point for understanding the heat concerns and

experiences of American Indian and Latino/a community members in Phoenix. Furthermore, the study sample was composed of individuals with housing and access to a phone and/or the internet. The voices of individuals experiencing housing insecurity and/or homelessness are not represented. Similar research could be conducted with these and other populations who are vulnerable to extreme heat.

The challenges community members experience with extreme heat, and the relative impacts of heat-related policies, are affected by other systemic factors such as access to housing, water, electricity, and a livable wage. While interviewees discussed these topics, the landscape analysis was limited to policies with an explicit connection to heat. Future research could examine how other systemic factors and related policies intersect with and affect community members' experiences of extreme heat.

Key Takeaways

Many Phoenix community members struggle to maintain thermal comfort in their homes during the summer, suggesting an opportunity to help individuals better prepare their homes for the heat. For example, community members may benefit from more access to weatherization strategies and programs (See section above titled "Thermal Discomfort and Energy Use at Home"). For many, thermal discomfort at home was worse during the COVID-19 pandemic, when community members had limited or no access to cool public spaces, emphasizing the importance of private spaces for managing extreme heat.

Community members would like increased access to shade and water features in public outdoor recreation areas. This might include adding trees, splash pads, and pools at existing parks or offering more low- or no-cost cool outdoor activities. Future research might explore short- or medium-term strategies and resources to help community members recreate and better manage extreme heat in public outdoor spaces (See section above titled "Thermal Discomfort in Public Outdoor Spaces").

More short- and medium-term strategies for managing heat in transit could help. While Phoenix's Transportation 2050 plan and other policies address participants' recommendations to increase shade at public transit stops and on sidewalks, the implementation span several decades. Current policies do not address the heat challenges of private vehicles. This suggests there may be opportunities to help people manage heat in the short and medium term (see section above titled "Thermal Discomfort During Transit").

Many community members are not aware of existing resources. Participants recommended public campaigns to help spread information about heat safety, assistance programs, and heat management strategies through social media, radio, television, newspapers, public transit, and partnerships with nonprofit organizations and community groups (see section above titled “Health and Body”).

Some findings from this study reiterate those of previous studies. For example, Guardaro and colleagues (2020) also found that Phoenix residents indicated limited access to water, shade, and trees as heat-related challenges, and that they want more water features at parks to help mitigate heat challenges. Previous efforts also highlighted opportunities to increase awareness of heat resources, such as cooling centers and utility assistance programs (Berisha et al., 2017; MCDPH, 2015). Recent public engagement processes have also documented community members’ interest in parks, trees and shade, public transportation, walkability, water access, and information (e.g., City of Phoenix & PlanPHX Leadership Committee, 2015; City of Phoenix, n.d.g.; Rothballer et al., 2019).

The present study adds to the body of research on extreme heat in the City of Phoenix by focusing on the experiences and concerns of American Indian and Latino/a community members and examining how existing policies address their concerns during a typical year and during the public health disruption of COVID-19. The findings suggest that, despite the diverse and creative strategies that community members employ to manage heat, and the existence of dozens of relevant policies, there are still opportunities to help individuals and households manage extreme heat and other intersecting challenges or disruptions like the COVID-19 pandemic.

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Appendix A: Study Methods

Landscape Analysis. The objective of the landscape analysis was to identify existing policies for extreme heat within the geographic area of the City of Phoenix and understand how they address individual and household vulnerability to heat. We identified 51 heat-related plans, programs, initiatives, statutes, and codes from 2010-2021 led or co-led by agencies or departments of the State of Arizona, Maricopa County, and City of Phoenix governments (see Appendix B). To keep the scope of the study manageable, federal policies and COVID-specific policies were excluded (e.g., Low-Income Home Energy Assistance Program (LIHEAP); Coronavirus Aid, Relief, and Economic Security (CARES) Act; American Rescue Plan).

Relevant policies were identified by first looking at plans for public health, disaster management, climate change adaptation, transportation, and city planning. Next, we looked for heat-relevant policies that these plans and their related websites, reports, and documents mentioned or cited. We also asked local heat experts (including the project advisory board members, researchers, and others) to recommend policies related to heat. A policy was included in the analysis if it directly addressed heat, and there was a publicly available government source (such as a policy, report, or website authored or published by a state, county, or city agency or department) with enough information to analyze using the project codebook (more below).

To understand how these policies address individual and household vulnerability to extreme heat, we conducted a deductive qualitative analysis. We developed an original codebook comprised of themes that articulate the “what, how, and where” of heat-related policy. Specifically, the codebook identified and defined themes for what issues the policies address about heat (heat issues), how they address heat (strategies), and where they address heat (spaces). The themes in the codebook were identified from the policies themselves using a grounded approach. All themes were inclusive, meaning they could be coded with any other code. The themes were as follows:

Heat Issues	Strategies	Spaces
Climate adaptation Thermal comfort Energy use Housing security Public education Public health	Community engagement Coordination Funding Incentives Information Infrastructure Planning Regulations & laws Research Social services	Body Private Public Transit Workplace Indoor Outdoor

A team of four coders (one Morrison Institute analyst who was the senior coder and three graduate research assistants) used these codes to complete the deductive analysis. Because of the diversity of policies and data sources, we used a consensus coding approach (Ratajczyk et al., 2016). After some preliminary testing to establish a shared understanding of the codebook among the team (Hruschka et al., 2004), each policy was independently analyzed by at least two coders, noting presence or absence of each theme, based on evidence from publicly available government sources. Each week, the team met to share their coding results. Any disparity in coding was reviewed and discussed until the team came to consensus. During the first round of coding, the team revised the codebook as needed to clarify or refine themes. After the first round, the team reviewed and revised the analysis to ensure the final results reflected the final version of the codebook.

Needs Assessment. The objective of the needs assessment was to identify concerns and experiences related to heat among American Indian and Latino/a community members, particularly during the COVID-19 pandemic. Capturing these experiences and concerns allowed us to examine how policies in Phoenix address their needs and concerns related to extreme heat. We did this by conducting confidential semi-structured interviews with community members who identified as American Indian and/or Latino/a who reside in Phoenix, and community leaders who work with these populations on heat-related issues. This study received ethical approval and cultural review under IRB ID STUDY00013131 at Arizona State University.

Community leaders were identified on the websites of organizations and agencies that work on heat and related issues, and by recommendation from advisory board members and other participants. They were invited to participate in the study via email.

Community members were recruited to participate in the study in several ways. Advisory board members and other community leaders helped the study team connect with Phoenix-based organizations and community leaders who work on heat-related issues, and/or work with American Indian and Latino/a community members. This included nonprofit organizations focused on health, social justice, environment, climate, and education. Some of these organizations distributed a flyer containing information about the study to their networks. We also used targeted Facebook advertising. Participating community members received a $50 gift card for their time participating in the study.

To enroll in the study, community members filled out an online scheduling form. To be eligible to participate, they had to self-identify as American Indian and/or Latino/a/x and self-identify as living in the City of Phoenix. Prior to the interview, participants were asked to complete a brief questionnaire to provide contextual and demographic information. The questionnaire was offered in English and Spanish and included structured questions about heat exposure, level of concern about extreme heat, and demographic information (for instance, age and education).

Interviews were completed by two Morrison Institute analysts during March and April 2021. They were conducted one-on-one by phone or Zoom and lasted between 13-60 minutes. Fifty-two interviews were conducted in English, and 15 were conducted in Spanish, following participants' language preferences. Participants were asked about their household's experiences of heat during a typical year and during the COVID-19 pandemic in summer 2020; strategies they use to manage heat; helpful supports and policies; barriers to participating in or benefiting from policies; and recommendations for ways to help community members better manage heat. With participants' permission, the interviews were audio recorded and transcribed. Interviews conducted in Spanish were transcribed in Spanish, then translated to English.

The interview transcripts were analyzed by the same two Morrison Institute analysts. They developed an interview codebook that aligned with the codebook used in the landscape analysis. The interview codebook included categories such as heat challenges, spaces, helpful policies, and recommendations, which were analyzed deductively. For example, the themes for the category "heat issues" from the landscape analysis were adapted as themes that interviewees mentioned as heat challenges. If a theme was identified in an interview transcript at least once, it was coded as present for that participant in the corresponding category. All themes were inclusive, meaning they could be coded with any other code. Once this coding was complete, we totaled the deductive results to quantify the salience of each theme by the number of participants who mentioned it. The three most salient themes for heat challenges were then

examined more closely to identify subthemes, using keyword searches in the qualitative analysis software NVivo (QSR, 2020). For example, for the theme energy use, we used keywords such as “utility,” “air conditioner,” and “bill,” to locate text segments relevant to the theme, then inductively coded those segments for subthemes. Recommendations were analyzed inductively if indicated by at least 20% of participants in the deductive coding. This approach allowed us to identify concerns and experiences that were most salient among interview participants and compare those with current policies and programs to identify alignment and gaps.

Responses to interview questions that did not align with the landscape analysis codebook were analyzed using a free listing approach, in which the themes emerged from the interview data (Bernard, 2011). This approach was used to characterize strategies for heat management, barriers to participating in or benefiting from existing policies, and unaddressed challenges. For example, if a participant mentioned drinking water to stay hydrated as a heat management strategy, the analyst listed it under the category “heat management.” Once all the interviews were coded, the full list of responses for each category was analyzed to identify recurring themes. Salience of each theme was measured by the number of participants who mentioned it. We considered a minimum of 10%, or 7 participants, to be salient. These results were used in conjunction with the deductive interview analysis to further understand common concerns and experiences among interview participants, as well as alignment and gaps with current policies and programs.

The two analysts first developed a shared understanding of the codebook by separately coding, then discussing and coming to consensus on 28 of the 72 interview transcripts. They then divided the analysis by analytical tasks, with one analyst completing the deductive coding for the remaining transcripts, and the other completing the free listing components of the analysis for the remaining transcripts. This allowed the analysts to focus on a smaller portion of analysis and helped ensure the coding would be consistent across transcripts. Results were examined in aggregate, as well as between groups (i.e., leaders, American Indian community members, and Latino/a community members) to identify potential differences. The sample of interviewees is not representative, and comparisons were not tested for statistical significance. We also compared the salience of themes during a typical year and during the COVID-19 pandemic. Comparisons between points in time were not tested for statistical significance.

Gap Analysis. The objective of the gap analysis was to identify existing policies that address community concerns around extreme heat, and where there are opportunities to address gaps. We did this by comparing the most salient concerns and recommendations from the needs assessment with the results of the landscape

analysis. First, we inductively coded participants' top three concerns and top six recommendations for subthemes. Next, we aligned participants’ heat concerns with the policies they identified as helpful, and their recommendations for policy change. We then used the landscape analysis to highlight policies addressing specific concerns or experiences with which participants and the public may be less familiar. In some cases, we found that policies did not address, or only partially addressed, participants’ concerns and experiences. We identified these and participants' recommendations as potential opportunities for action by governmental and/or nongovernmental organizations.

Appendix B: List of Policies in Landscape Analysis

*Information available in Spanish.

City of Phoenix
Plans
Citizens Transportation Commission (CTC)
City of Phoenix Transportation 2050*
Environmental Programs, Office of (OEP)
Phoenix Climate Action Plan*
Human Services Department (HSD)
Phoenix City Council Policy Session Agenda Oct 27, 2020 (Strategies to Address Homelessness)*
Parks and Recreation Department
Phoenix Tree and Shade Master Plan
Planning and Development Department (PDD)
Phoenix 19 North Transit Oriented Development*
Phoenix General Plan*
ReInvent PHX Transit Oriented Development (5 district plans)*
Street Transportation Department
City of Phoenix Complete Streets*
Programs/Initiatives
Communications Office
Summer Heat Safety*
Summer Safety*
Environmental Programs, Office of (OEP)
Green Stormwater Infrastructure*
Urban Heat Island/Tree and Shade Subcommittee*
Homeland Defense Bureau
Urban Area Security Initiative (UASI-PHX): Preparing for Hazardous Heat
Human Services Department (HSD)
Landlord and Tenant Program*
Summer Respite*
Neighborhood Services Department (NSD)
Weatherization Assistance Program*
Parks and Recreation Department
Citizen Forester Program*
Pools and Splash Pads*
Tree Donation Program*

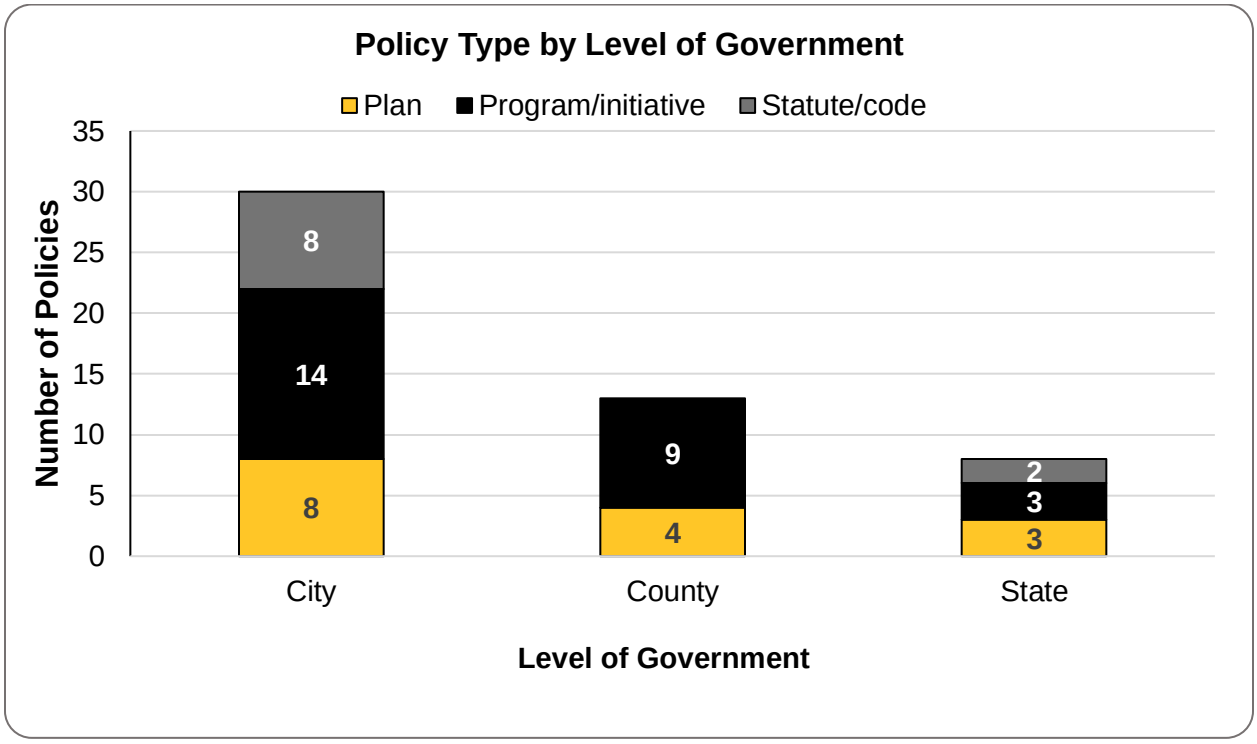
Take a Hike, Do it Right*
Public Transit Department
Personal Cool*
Street Transportation Department
Cool Pavement Pilot Program*
Statutes/Codes
City of Phoenix
Green Construction Code (2011)*
International Residential Code (2018)
Phoenix City Code, Sec. 39-5: Electrical, plumbing, and mechanical systems; health and safety conditions*
Planning & Development Department (PDD)
Zoning Ordinance, Ch. 5, Sec. 507: Development Review Approval
Zoning Ordinance, Ch. 6: Zoning Districts
Zoning Ordinance, Ch. 7, Sec. 703: Landscaping, Fences and Walls
Zoning Ordinance, Ch. 12: Downtown Code
Zoning Ordinance, Ch. 13: Walkable Urban Code

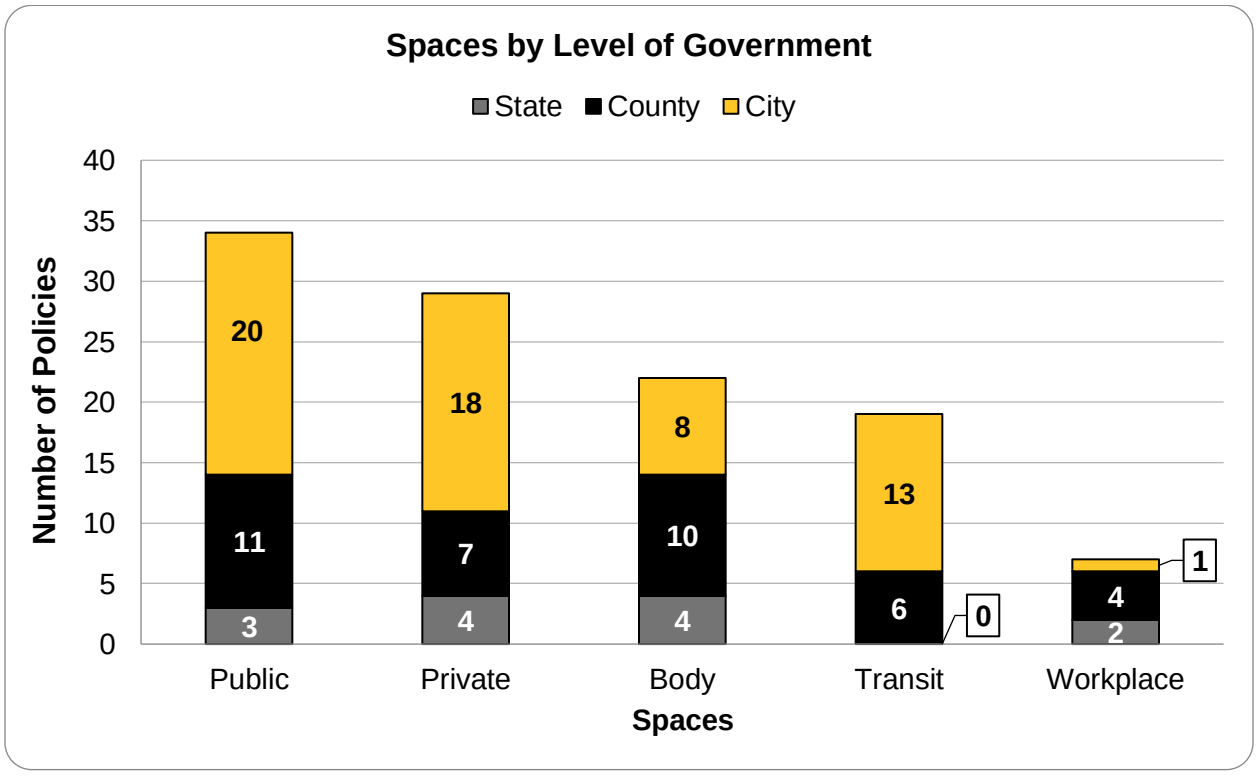
Maricopa County
Plans
MAG Active Transportation Committee
MAG Active Transportation Plan
Emergency Management, Department of (MCDEM)
Maricopa County Regional Multi-Hazard Mitigation Plan*
Maricopa County Emergency Operations Plan
Public Health, Department of (MCDPH)
Maricopa County Climate and Health Strategic Plan
Programs/Initiatives
MAG Active Transportation Committee
Active Transportation Toolbox: Pedestrian Infrastructure: Shade and Thermal Comfort
Air Quality Department (MCAQD)
Clean Air Make More Initiative*
Emergency Management, Department of (MCDEM)
Maricopa County Most Common Natural Hazards: Extreme Heat*
Industrial Development Authority (MCIDA)
Heathy Urban Environments Initiative
Public Health, Department of (MCDPH)
Bridging Climate Change and Public Health Workgroup*

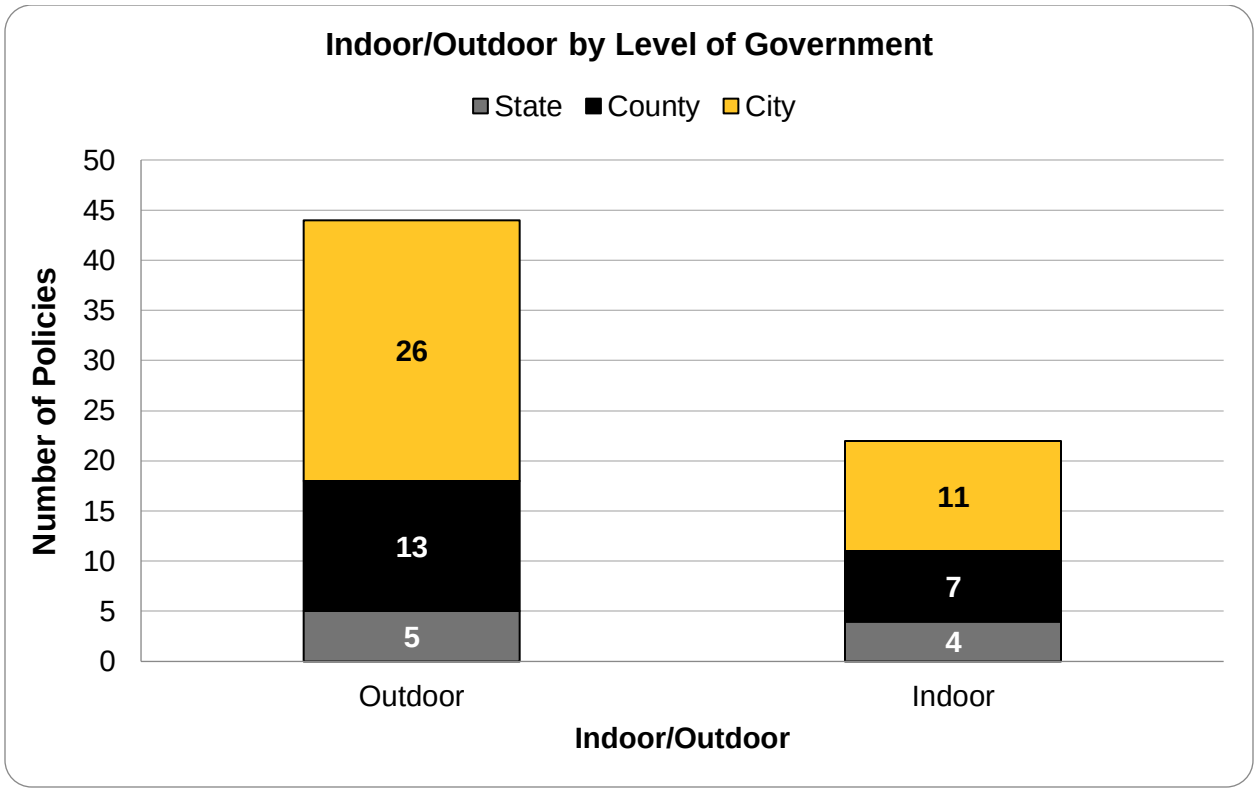
Heat Action Planning Guide for Neighborhoods of Greater Phoenix*
Maricopa County: Extreme Heat*
Maricopa County Heat Surveillance: Heat Reports
Maricopa Regional Continuum of Care
Heat Relief Network

State of Arizona
Plans
Emergency and Military Affairs, Department of (DEMA)
AZ Hazard Mitigation Plan
AZ State Emergency Response and Recovery Plan
Health Services, Department of (ADHS)
AZ Climate Health Adaptation Plan
Programs/Initiatives
Forestry and Fire Management, Department of (DFFM)
Arizona Department of Forestry: Tree Care
Health Services, Department of (ADHS)
Extreme Weather & Public Health – Heat Safety*
Industrial Commission of Arizona (ICA)
Arizona Division of Occupational Safety and Health (ADOSH): Heat Stress Awareness
Statutes/Codes
Arizona State Legislature
Arizona Revised Statutes § 33-1364. Wrongful failure to supply heat, air conditioning, cooling, water, hot water or essential services*
Arizona Corporation Commission (ACC)
Arizona Administrative Code § 14-2-211. Termination of Service

Appendix C: Landscape Analysis Results






Indoor/Outdoor by Level of Government
State
County
City
Number of Policies
50
45
40
35
30
25
20
15
10
5
0
26
13
5
11
7
4
Outdoor
Indoor
Indoor/Outdoor

Appendix D: Needs Assessment Results

Heat Challenges

Heat challenge	Community leaders	Community members	Total	Percent
Thermal discomfort	12	51	63	87.50%
Energy	14	34	48	66.67%
Health	13	25	38	52.78%
Housing insecurity	8	0	8	11.11%
Education, knowledge, and information	3	2	5	6.94%
Don’t know	0	2	2	2.78%
Other	0	2	2	2.78%
Climate change adaptation	0	0	0	0.00%
Coordination	0	0	0	0.00%
Research	0	0	0	0.00%
Community engagement	0	0	0	0.00%

Thermal Discomfort as a Heat Challenge

Thermal comfort	Community leaders	Community members	Total	Percent
Relevant space				
Body	10	42	52	72.22%
Private space	7	41	48	66.67%
Indoor	7	39	46	63.89%
Outdoor	8	37	45	62.50%
Transit	10	24	34	47.22%
Public space	4	18	22	30.56%
Workplace	1	7	8	11.11%
Impacts				
Physical	9	34	43	59.72%
Mental/emotional	3	27	30	41.67%
Financial	0	16	16	22.22%
Social	2	6	8	11.11%
Change with COVID-19				
Exacerbated challenges	8	39	47	65.28%
New challenges	2	16	18	25.00%
No change	0	8	8	11.11%
Got better or improved	0	7	7	9.72%
Not mentioned	2	4	6	8.33%
Don’t know	2	0	2	2.78%

Energy Use as a Heat Challenge

Energy use	Community leaders	Community members	Total	Percent
Relevant space				
Indoor	14	34	48	66.67%
Private space	14	34	48	66.67%
Body	1	0	1	1.39%
Transit	1	0	1	1.39%
Other	0	0	0	0.00%
Public space	0	0	0	0.00%
Workplace	0	0	0	0.00%
Impacts				
Financial	13	32	45	62.50%
Mental/emotional	6	8	14	19.44%
Physical	5	4	9	12.50%
Social	1	0	1	1.39%
Change with COVID-19				
Exacerbated challenges	10	23	33	45.83%
Not mentioned	3	7	10	13.89%
No change	0	4	4	5.56%
New challenges	1	1	2	2.78%
Don’t know	1	0	1	1.39%
Got better or improved	0	0	0	0.00%

Health as a Heat Challenge

Health	Community leaders	Community members	Total	Percent
Relevant space				
Body	13	25	38	52.78%
Outdoor	4	11	15	20.83%
Indoor	2	5	7	9.72%
Private space	1	5	6	8.33%
Transit	3	3	6	8.33%
Public space	0	3	3	4.17%
Workplace	0	2	2	2.78%
Impacts				
Physical	10	25	35	48.61%
Mental/emotional	1	11	12	16.67%
Financial	2	3	5	6.94%
Social	0	0	0	0.00%
Change with COVID-19				
Exacerbated challenges	9	8	17	23.61%
Not mentioned	3	9	12	16.67%
New challenges	1	10	11	15.28%
Got better or improved	0	4	4	5.56%
Don’t know	1	0	1	1.39%
No change	0	1	1	1.39%

Helpful Programs and Supports (Typical Year)

Helpful programs (typical year)	Community leaders	Community members	Total	Percent
Other	11	31	42	58.33%
Rural/urban parks	2	19	21	29.17%
Social support	4	13	17	23.61%
Don’t know	0	15	15	20.83%
Utility assistance and/or moratorium on shutoffs	7	7	14	19.44%
Information sources	7	6	13	18.06%
Health-related community programs	5	6	11	15.28%
Cooling centers, hydration stations, refuge locations	5	4	9	12.50%
Housing/rental assistance	5	0	5	6.94%
Statute for failure to provide AC	0	3	3	4.17%
Infrastructure-related	0	0	0	0.00%
Owner occupied housing rehabilitation program	0	0	0	0.00%
State or city weatherization assistance program	0	0	0	0.00%
Statute for noncompliance by landlord	0	0	0	0.00%
Workgroups	0	0	0	0.00%

Helpful Programs and Supports (During COVID-19 Pandemic)

Helpful programs (during COVID-19)	Community leaders	Community members	Total	Percent
Don’t know	1	24	25	34.72%
Other	10	15	25	34.72%
Utility assistance and/or moratorium on shutoffs	7	7	14	19.44%
Social support	2	9	11	15.28%
Health-related community programs	4	5	9	12.50%
Information sources	3	6	9	12.50%
Housing/rental assistance	6	0	6	8.33%
Rural/urban parks	1	4	5	6.94%
Cooling centers, hydration stations, refuge locations	2	0	2	2.78%
Statute for failure to provide AC	0	2	2	2.78%
Workgroups	1	0	1	1.39%
Infrastructure-related	0	0	0	0.00%
Owner occupied housing rehabilitation program	0	0	0	0.00%
State or city weatherization assistance program	0	0	0	0.00%
Statute for noncompliance by landlord	0	0	0	0.00%

Recommendations

Recommendations	Community leaders	Community members	Total	Percent
Thermal comfort (cooler spaces)	5	32	37	51.39%
Education, knowledge, and information	8	24	32	44.44%
Infrastructure	5	27	32	44.44%
Social services	8	23	31	43.06%
Energy use	7	16	23	31.94%
Health	6	8	14	19.44%
Other	7	4	11	15.28%
Funding	4	6	10	13.89%
Housing security	5	5	10	13.89%
Regulations/laws	4	4	8	11.11%
Community engagement	4	3	7	9.72%
Coordination	4	0	4	5.56%
Planning	2	1	3	4.17%
Research	2	0	2	2.78%
Climate change adaptation	1	0	1	1.39%
Incentives	0	0	0	0.00%

Heat Management Strategies

	Typical Year				COVID-19			
Heat Management Strategies	**Community leaders**	**Community members**	**Total**	**Percent**	**Community leaders**	**Community members**	**Total**	**Percent**
Stay home	0	30	30	41.67%	4	45	49	68.06%
Home air conditioning	1	28	29	40.28%	2	23	25	34.72%
Personal cooling solutions*	1	18	19	26.39%	0	19	19	26.39%
Monitoring/reducing energy consumption	2	12	14	19.44%	2	13	15	20.83%
Cool public outdoor spaces*	3	9	12	16.67%	1	12	13	18.06%
Fans	1	10	11	15.28%	0	12	12	16.67%
Cool public indoor spaces*	7	41	48	66.67%	0	11	11	15.28%
Water intake/hydration	3	25	28	38.89%	1	10	11	15.28%
Plan day around hottest part of day	2	19	21	29.17%	0	9	9	12.50%
Trees/shade	3	15	18	25.00%	0	8	8	11.11%
Leave/travel to cooler areas	0	14	14	19.44%	0	5	5	6.94%
Public pool/waterpark/lake	2	18	20	27.78%	0	5	5	6.94%
Vehicle air conditioning	0	8	8	11.11%	0	5	5	6.94%
Cool private spaces*	0	12	12	16.67%	0	8	8	11.11%
Wear cool clothing	0	7	7	9.72%	0	4	4	5.56%
Home weatherization	0	10	10	13.89%	0	3	3	4.17%
Minimizing heat producing activities	0	6	6	8.33%	0	3	3	4.17%
Assistance programs	1	0	1	1.39%	2	0	2	2.78%
Better diet	1	3	4	5.56%	0	2	2	2.78%
Co-location	0	0	0	0.00%	2	0	2	2.78%
Minimizing exposure	1	3	4	5.56%	0	2	2	2.78%
Other	1	0	1	1.39%	1	0	1	1.39%