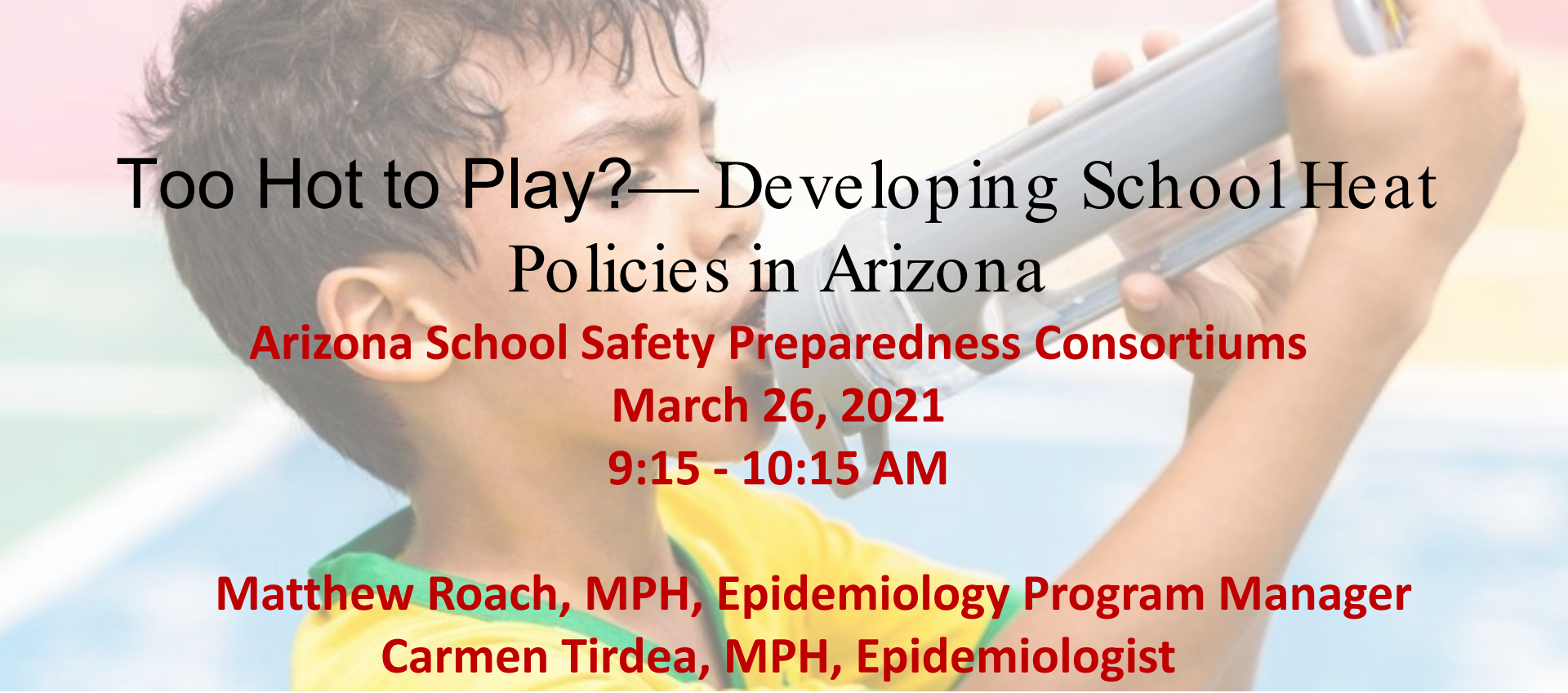


Too Hot to Play?— Developing School Heat Policies in Arizona

Arizona School Safety Preparedness Consortiums

March 26, 2021

9:15 - 10:15 AM

Matthew Roach, MPH, Epidemiology Program Manager

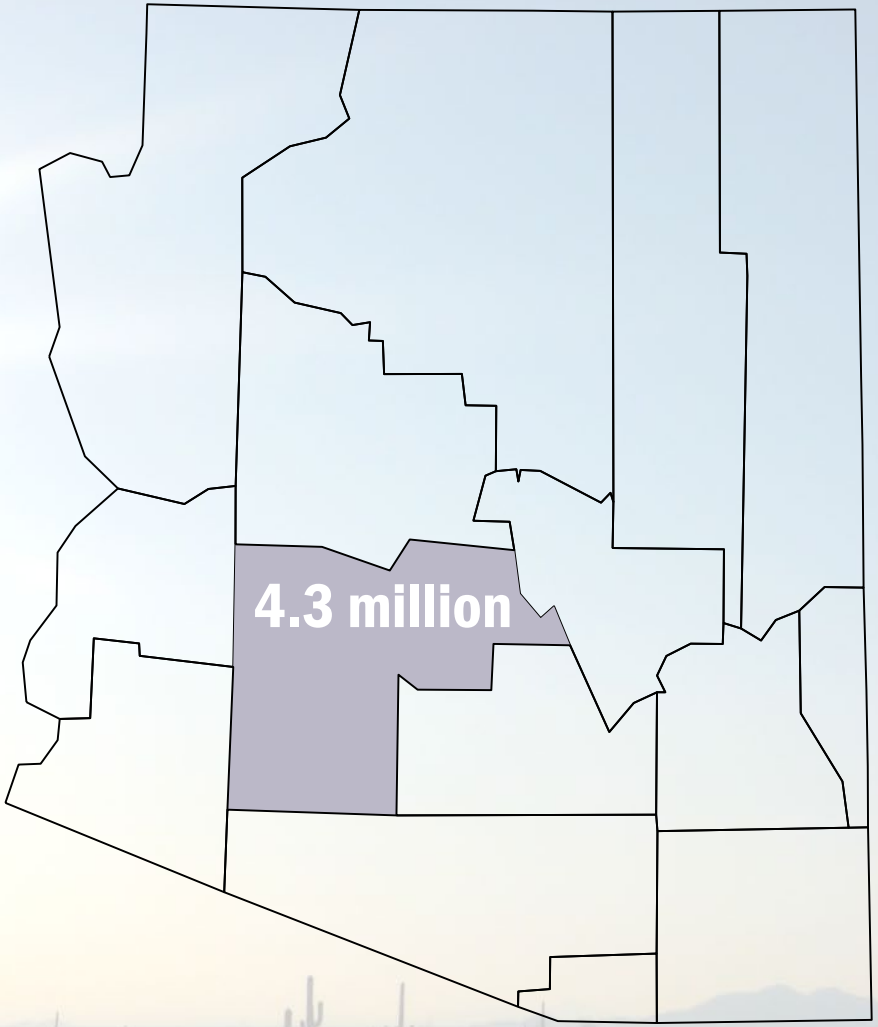
Carmen Tirdea, MPH, Epidemiologist

ARIZONA DEPARTMENT OF HEALTH SERVICES

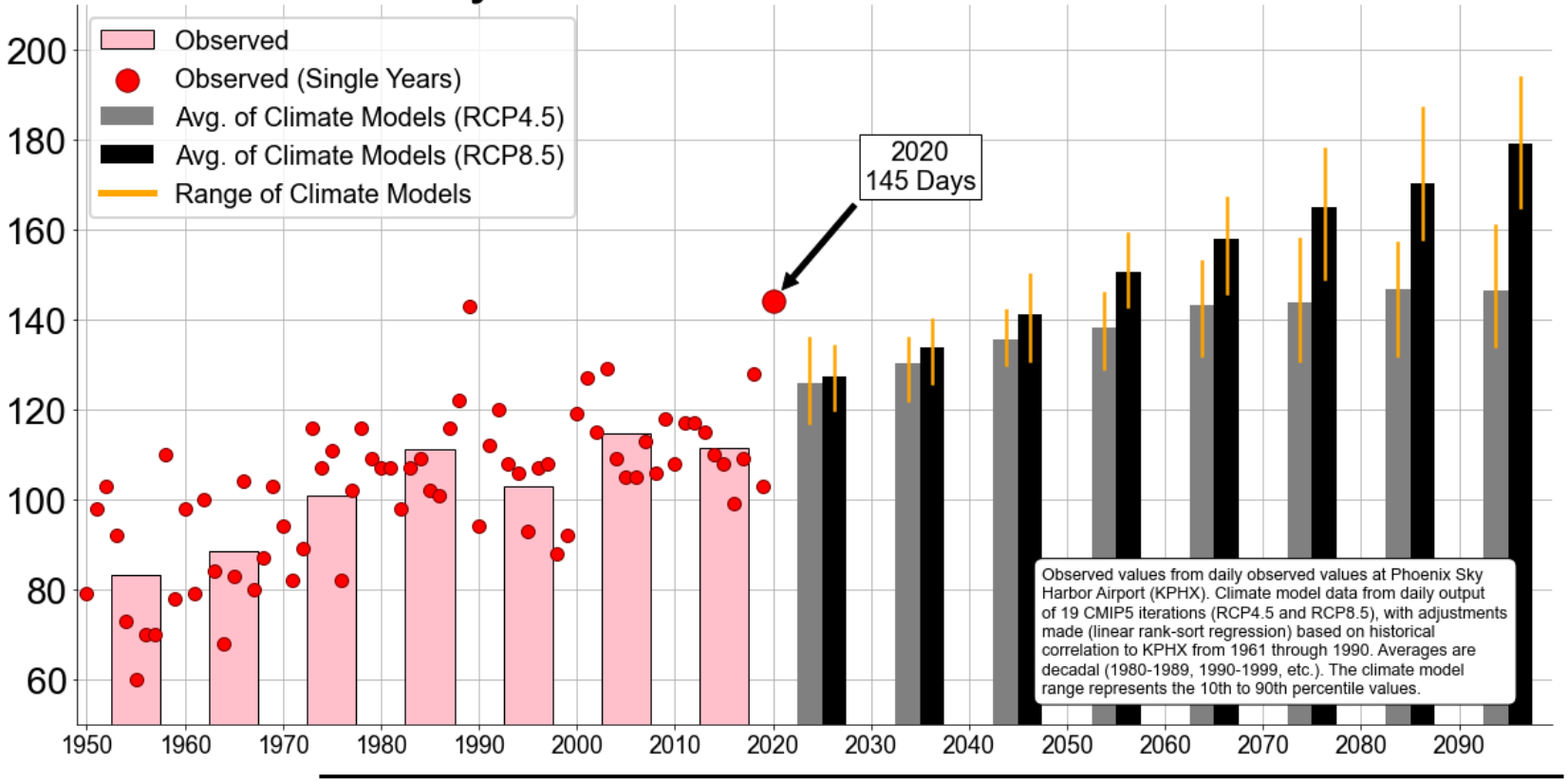
Health and Wellness for all Arizonans

Problem: Arizona is hot.

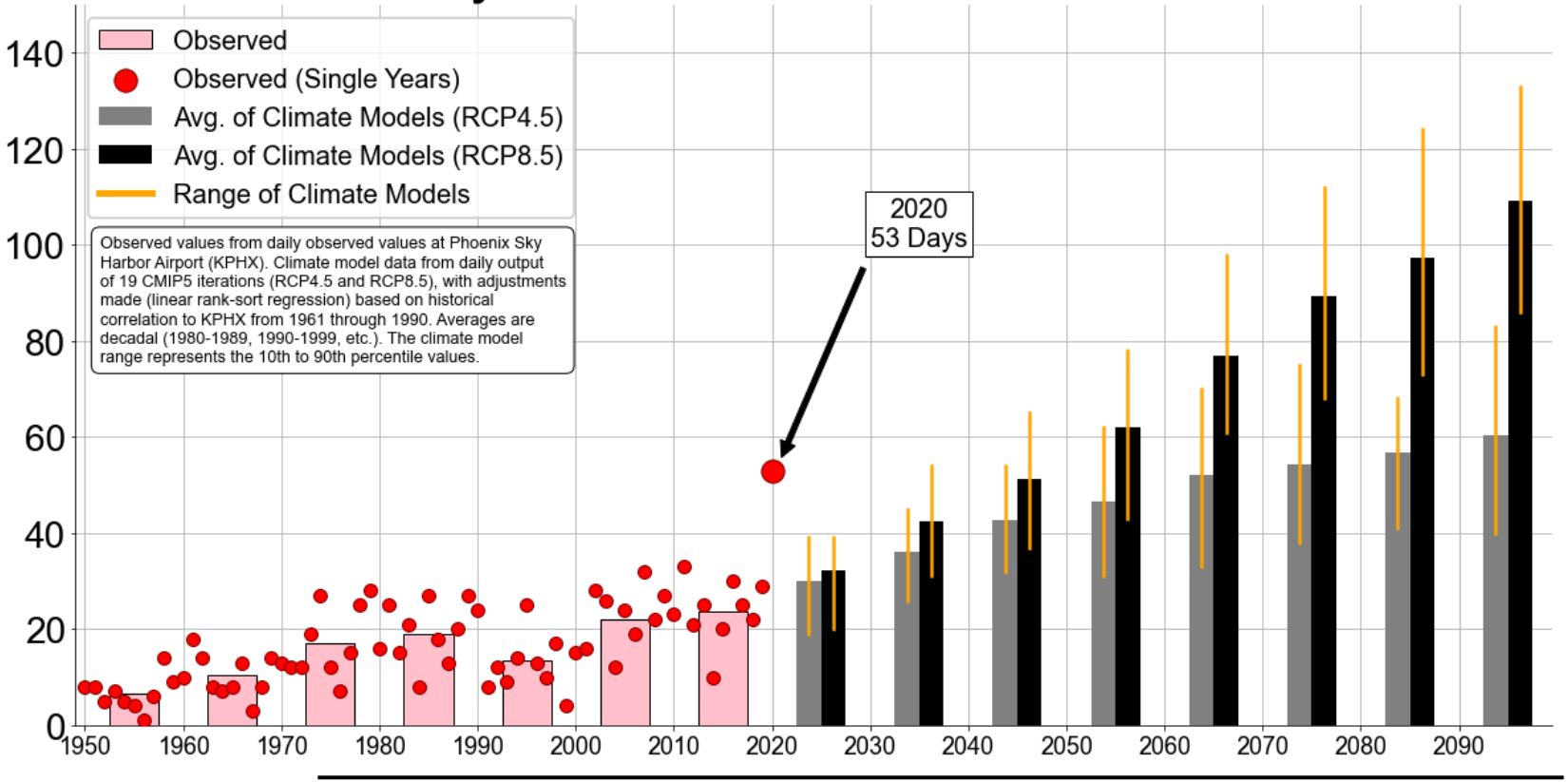
- During 2006–2016
  - Maricopa County
    - 140 days ≥ 90°F
    - 57 days ≥ 105°F



Number of Days 100+ °F in Phoenix, AZ



Number of Days 110+ °F in Phoenix, AZ



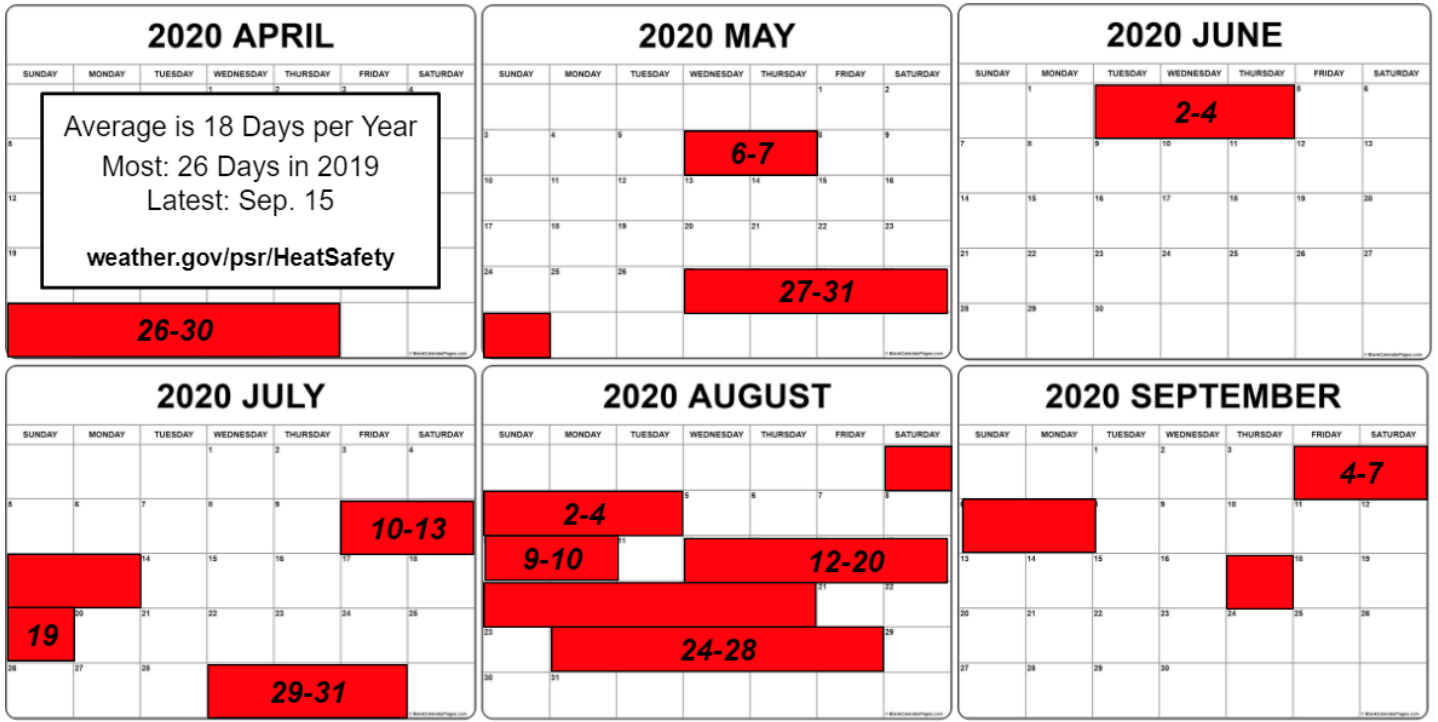
Phoenix Area Heat Warnings

48 Days

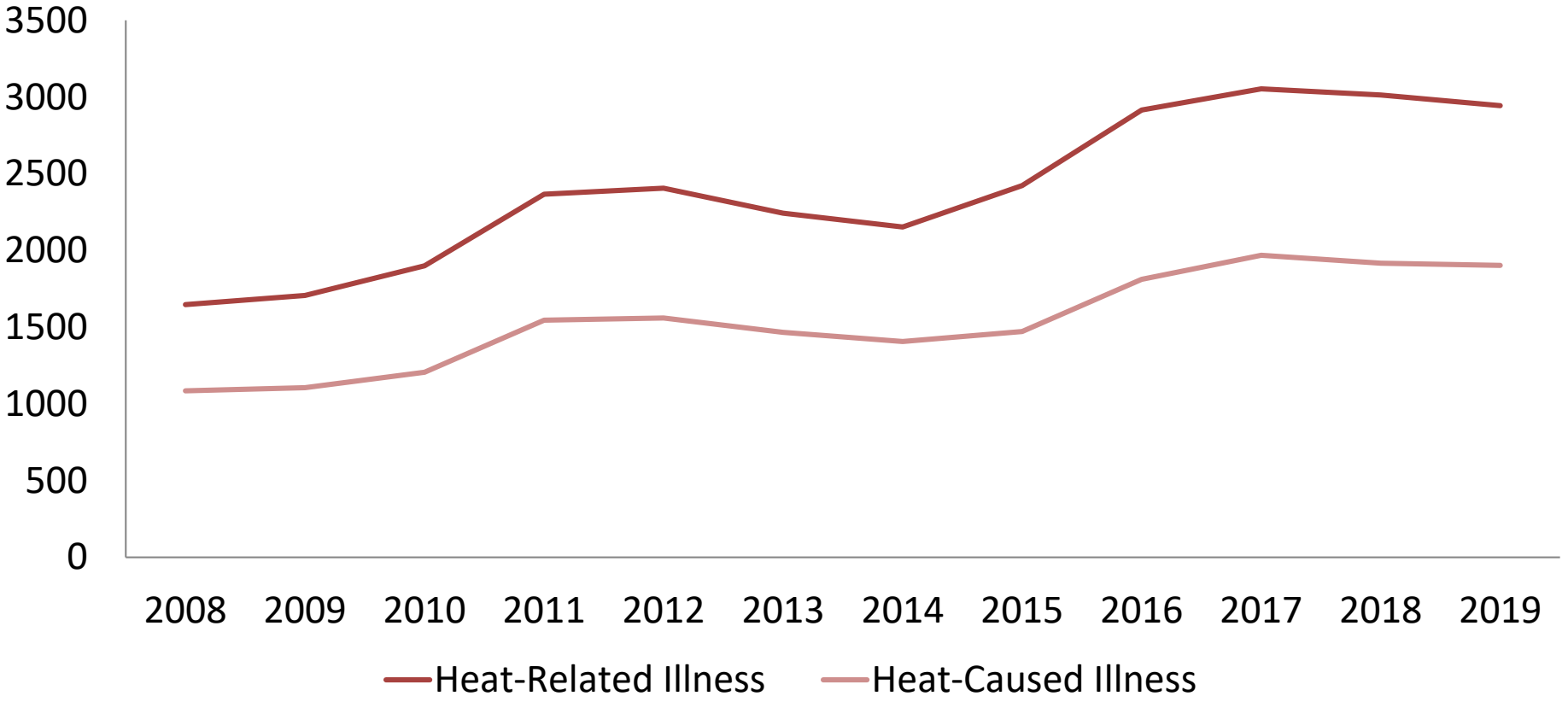
# of Heat Warning Days in 2020

4 Days

Heat Warning Average Lead Time



Heat-Related and Heat-Caused Illness Emergency Department Visits, 2008-2019



Heat-Related Illness Syndromic Surveillance Summary, May-September 2020

- **3,700+** ED visits
- **73%** Male
- **44%** Young Adults aged 18-44 yrs & **33%** Middle-Aged Adults aged 45-64 yrs
- **56%** White non-Hispanic & **23%** Hispanic and
- **94%** occurred in Maricopa, Mohave, Pima, Pinal, and Yuma counties

Preliminary Heat-Related Deaths Summary, 2020*

- **510 heat-related deaths reported* - record**
- Majority of deaths occurred in Maricopa, Pima, Mohave, Yuma, and Pinal counties

*Data presented for 2020 is preliminary.

ASU Study on Heat Ready Schools (2021)

What?

- HeatReady Schools project aimed to understand current environment of schools in South Phoenix and the perceptions of key stakeholders in schools

Who?

- School nurses, sports coaches, teachers, principals, epidemiologists, academic researchers, parents, administrative school staff

Why?

- Children are very vulnerable to extreme heat
- Phoenix's extreme summers are a concern
- Schools connect community networks together

Shortridge, A (2021)

ASU Study on Heat Ready Schools (2021)

Methods

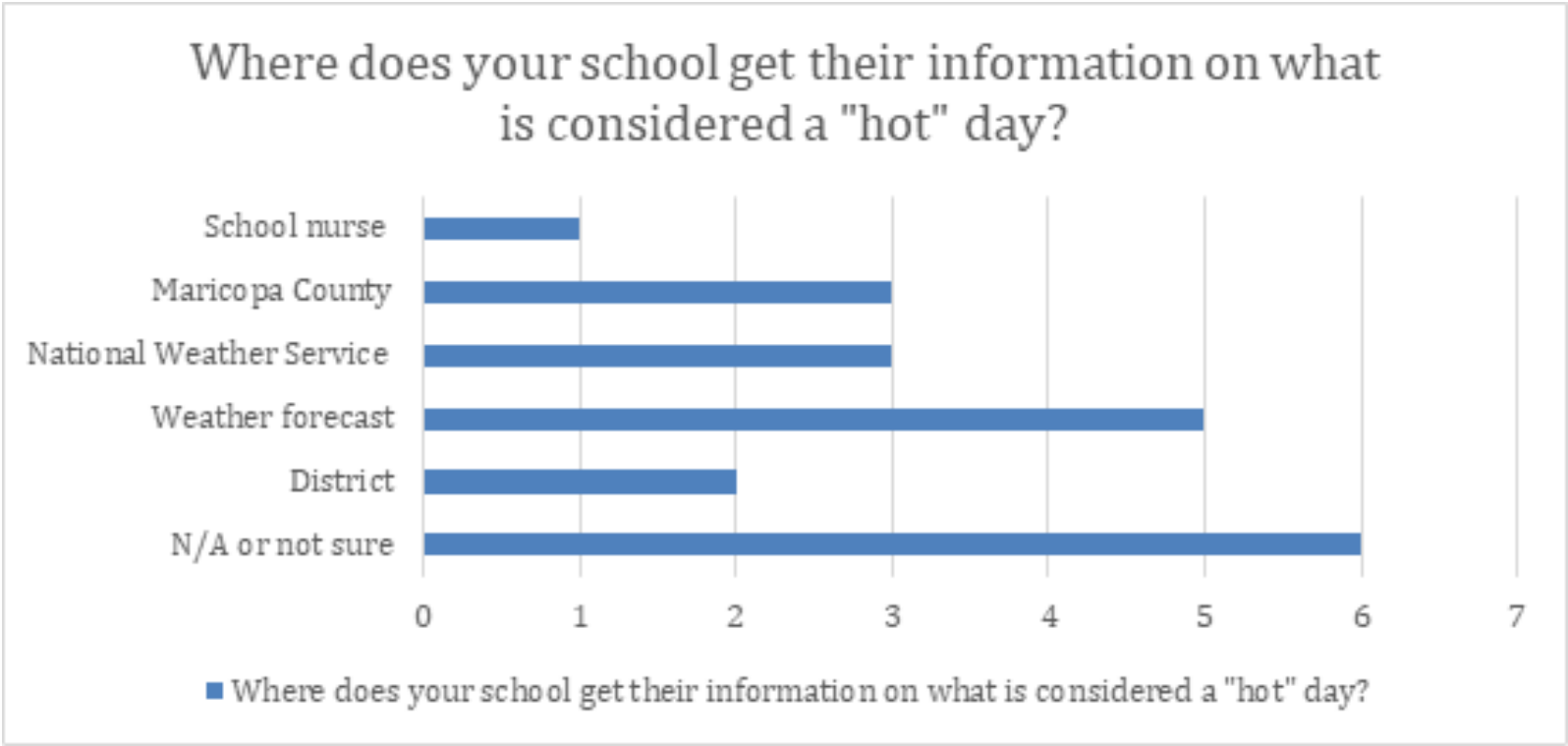
- Gathering interview and survey data from stakeholders

Results

- Current heat safety resources are available, but not utilized within school sites now
- Stories revealed that staff are overburdened with responsibilities
- Schools are underfunded
- The most helpful steps can begin with education

NEXT STEPS - Create and share HeatReady School rubric to support implementation of heat safety measures

Shortridge, A (2021)



Shortridge, A (2021)

Study Quotes

- We don't have a lot of that in place right now because we don't have the funds. [school nurse]
- We have no alternative indoor space to use. We also don't have the staff to monitor any alternatives. So, I mean, that is also a problem. [STEM teacher]
- We're making it to be a heat ready school, but we're educating these kids on how to make a heat ready school too. [school nurse]
- I think it [a mandatory heat training] should be, especially for new teachers into Arizona and they are not aware of how miserable it can be. [teacher]
- Not just heat education for the teachers...to get them on board with like a revised reschedule...I think the kids would actually benefit from heat education as well...especially like the hydration piece and like skincare piece. [teacher]
- Even as parents just making sure that their kids bring their water bottles, instead of bringing juice or soda. [sports coach]
- It's the norm for them to be walking around, full sun, hoodie on, 110-115 degrees. [teacher]

Shortridge, A (2021)

ADHS Heat Safety Website (azdhs.gov/heat)

Heat-Related Illness

Arizona is one of the hottest places on earth from May to September, learn tips to stay safe.

Heat Alerts

Stay informed! Sign up to receive heat alerts via email.

Older Adult Toolkit

The older adult population is more vulnerable to the effects of excessive heat.

Outdoor Worker Toolkit

Resources for outdoor workers & employers to prevent, recognize and treat heat illness.

School Toolkit

Info for students, school staff, athletic coaches and parents regarding heat-related illness and prevention.

Extreme Heat Related Maps

These maps visually represent the populations that may be most vulnerable to extreme heat events.

National Weather Service

National info about health dangers of heat and what to do in an excessive heat event.

Data, Statistics & News

Each year in AZ, 118 people die & nearly 2,000 people visit emergency rooms from heat related illnesses.

Heat Alerts

4,226 Subscribers

Heat Alerts for Schools

ARIZONA DEPARTMENT OF HEALTH SERVICES

azhealth.gov — Health and Wellness for All Arizonans

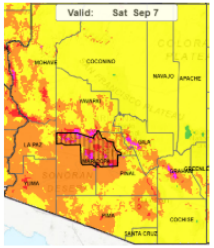
Excessive Heat Warning for Maricopa County

National Weather Service has issued an Excessive Heat Warning for:

Maricopa County on 9/7/19 from 10 AM to 8 PM

Daytime highs are expected to be in the **103 to 110** degrees Fahrenheit range. Residents are advised to stay cool, stay hydrated, and stay informed.

In areas with an excessive heat warning, it is recommended for schools to keep students indoors for physical activity and recess.



If students are going outdoors for recess, it is recommended that schools provide water (eight gulps every 15 minutes) and provide shade. Encourage students to wear hats, sunscreen, light colored clothing, and provide frequent breaks.

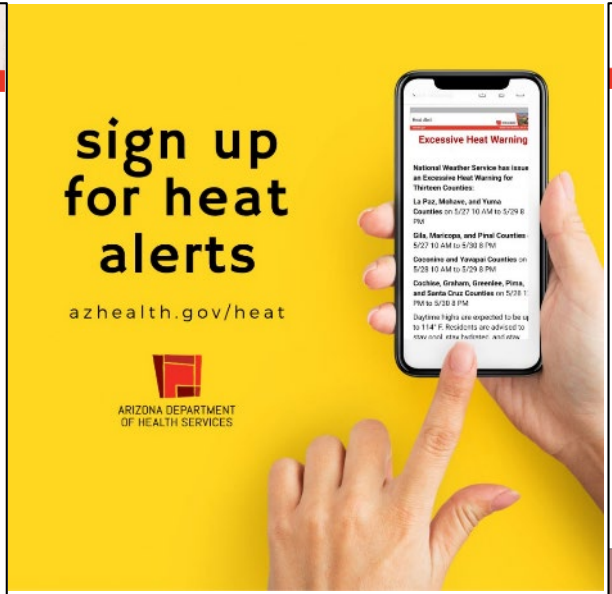
If students show signs and symptoms of heat illness or want to go inside, it is advised to get them to a cool environment immediately, such as inside an air-conditioned school building.

Additionally, it is very important that students be hydrated before, during and after being outside for physical activity and/or recess.

Check your local news for extreme heat warnings. Remember to also check the UV Index.

Click here to learn more about today's heat risk map.

For additional information, please visit our Heat Safety Site which details ways to stay cool, stay hydrated, and stay informed.



14,272 Subscribers

Heat Alert

ARIZONA DEPARTMENT OF HEALTH SERVICES

azhealth.gov — Health and Wellness for All Arizonans

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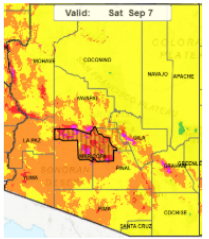
Daytime highs are expected to be in the **103-110** degrees Fahrenheit range. Residents are advised to stay cool, stay hydrated, and stay informed.

Precautions to prevent heat exhaustion or heat stroke:



Stay in air-conditioned buildings.

Limit outdoor activity during the hottest part of the day (mid-day).

Check on at-risk friends, family, and neighbors at least twice a day.

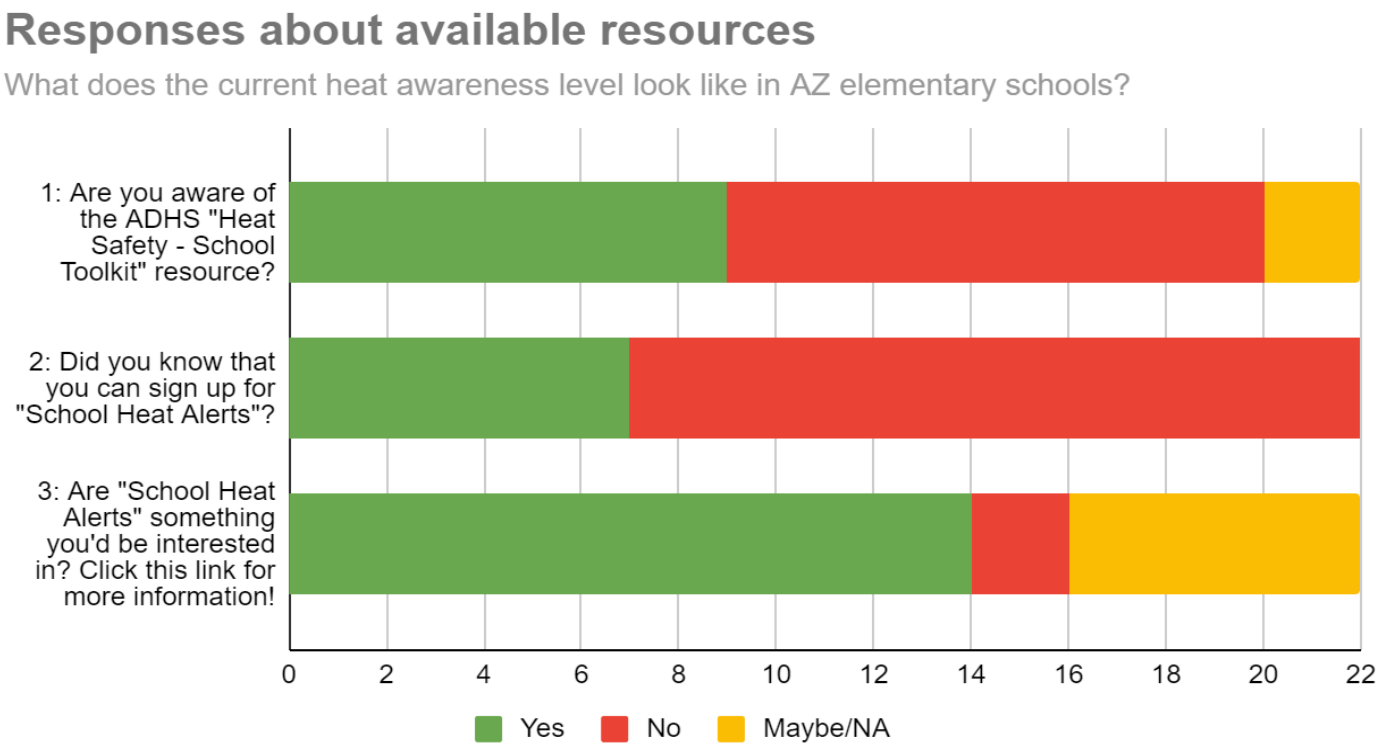
Drink water before, during, and after working or exercising outside.

Check the UV Index.

Click here to learn more about today's heat risk map.

For additional information, please visit our Heat Safety Site which details ways to stay cool, stay hydrated, and stay informed.

ASU Study on Heat Ready Schools (2021)



Shortridge, A (2021)

The school heat toolkit promotes use of a NWS heat index chart. Colors correspond to recommendations.

Extreme Danger | Danger | Extreme Caution | Caution | Most common in AZ

°F	RELATIVE HUMIDITY (%)																				
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
140	125																				
135	120	128																			
130	117	122	131																		
125	111	116	123	131	141																
120	107	111	116	123	130	139	148														
115	103	107	111	115	120	127	135	143	151												
110	99	102	105	108	112	117	123	130	137	143	150										
105	95	97	100	102	105	109	113	118	123	129	135	142	149								
100	91	93	95	97	99	101	104	107	110	115	120	125	132	138	144						
95	87	88	90	91	93	94	96	98	101	104	107	110	114	119	124	130	136				
90	83	84	85	86	87	88	90	91	93	95	96	98	100	102	106	109	113	117	122		
85	78	79	80	81	82	83	84	85	86	87	88	89	90	91	93	95	97	99	102	105	108
80	73	74	75	76	77	77	78	79	79	80	81	81	82	83	85	86	86	87	88	89	91
75	69	69	70	71	72	72	73	73	74	74	75	75	76	76	77	77	78	78	79	79	80
70	64	64	65	65	66	66	67	67	68	68	69	69	70	70	70	71	71	71	71	71	72

Recommendations are for the general population and are non-specific.

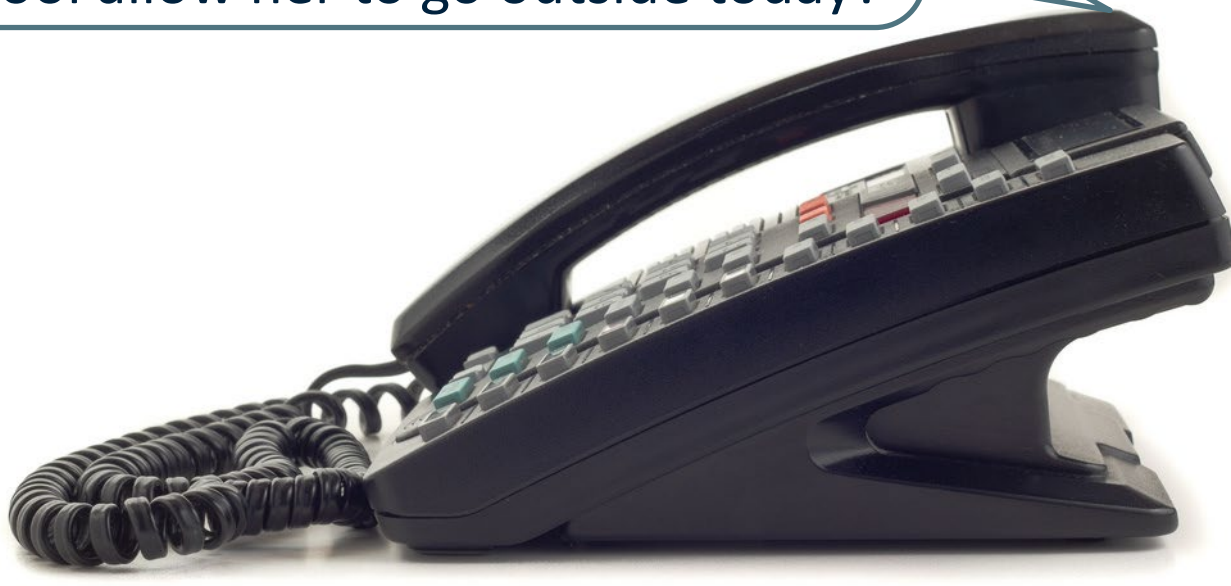
Heat Index ≥130 °F	**Health effects: Heatstroke/sunstroke is highly likely with continued exposure** **Recommendations: Avoid strenuous outdoor activity. Stay indoors in an air conditioned facility. Stay well hydrated. Drink 10 gulps every 20 minutes. Check on your family, friends, and neighbors.**
Heat Index 105–129°F	**Health effects: sunstroke, heat cramps, and heat exhaustion are likely. Heat stroke is possible with prolonged exposure and/or physical activity.** **Recommendations: Avoid strenuous outdoor activity. Stay indoors in an air conditioned facility. Stay well-hydrated. Drink 10 gulps every 20 minutes.**
Heat Index 90–104°F	**Health effects: Sunstroke, heat cramps, and heat exhaustion are possible with prolonged exposure or physical activity.** **Recommendations: Limit strenuous outdoor activity. Limit your time outdoors. Stay well-hydrated. Drink 10 gulps every 20 minutes.**
Heat Index 80–89°F	**Health Effects: Fatigue is possible with prolonged exposure and/or physical activity.** **Recommendations: Limit your time outdoors. Stay well hydrated. Drink gulps every 20 minutes.**

Schools and parents request more guidance.

"Should we keep the students indoors for recess today?

"Is it safe for the students to go outside to play?"

"Should my child's school allow her to go outside today?"



Is there any better guidance out there?

- Consult with CDC subject matter experts

Is there any better guidance out there?

- Consult with CDC subject matter experts
- Literature Review
  - Sports medicine and exertional heat illness
  - Heavy reliance on wet bulb globe temperatures (WBGT)
    - Heat stress in direct sunlight, accounting for temperature, humidity, wind speed, sun angle and cloud cover (solar radiation)

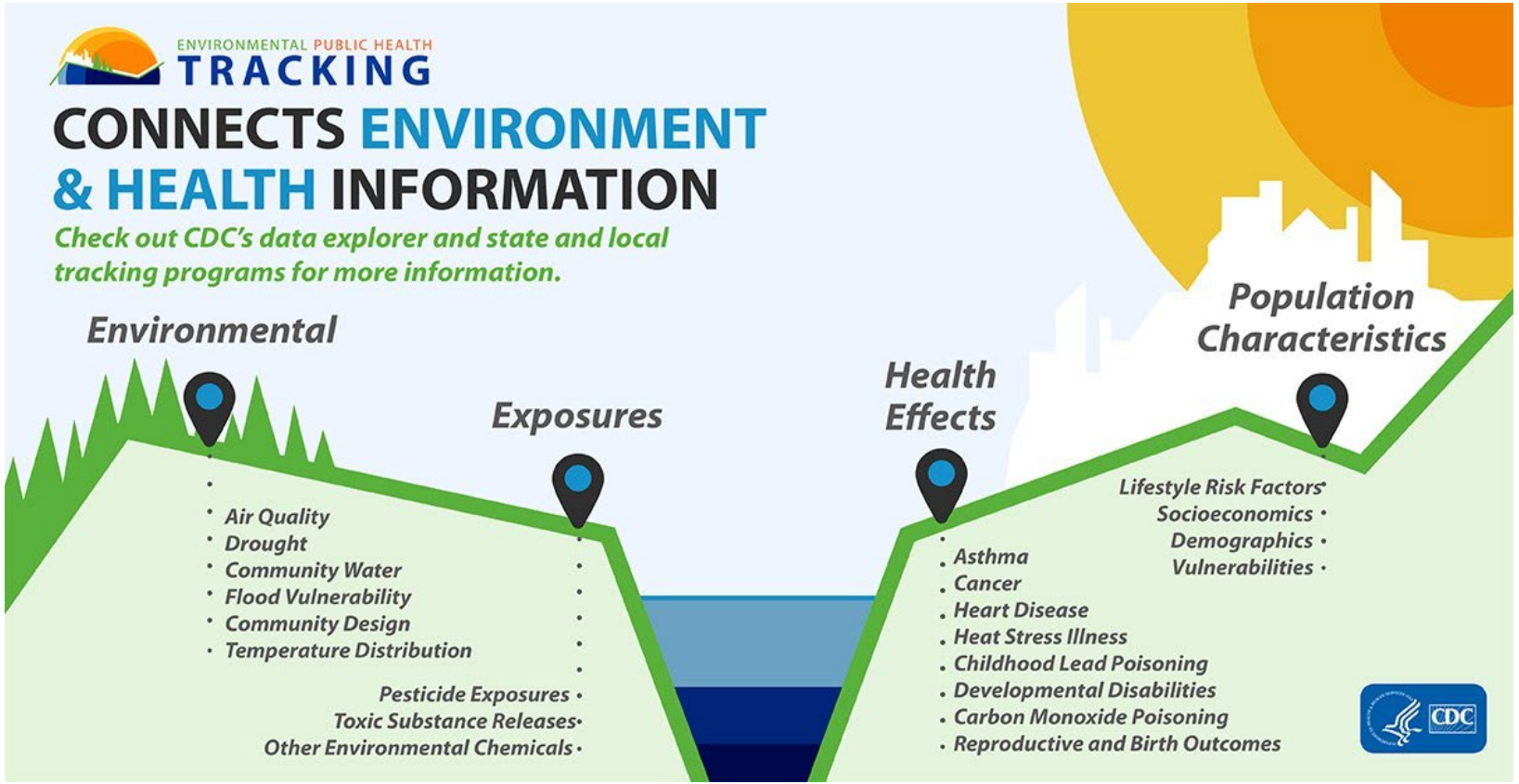
Is there any better guidance out there?

- Consult with CDC subject matter experts
- Literature Review
- Policies from schools in other states
  - Cancel all outdoor activities when heat index >96°F

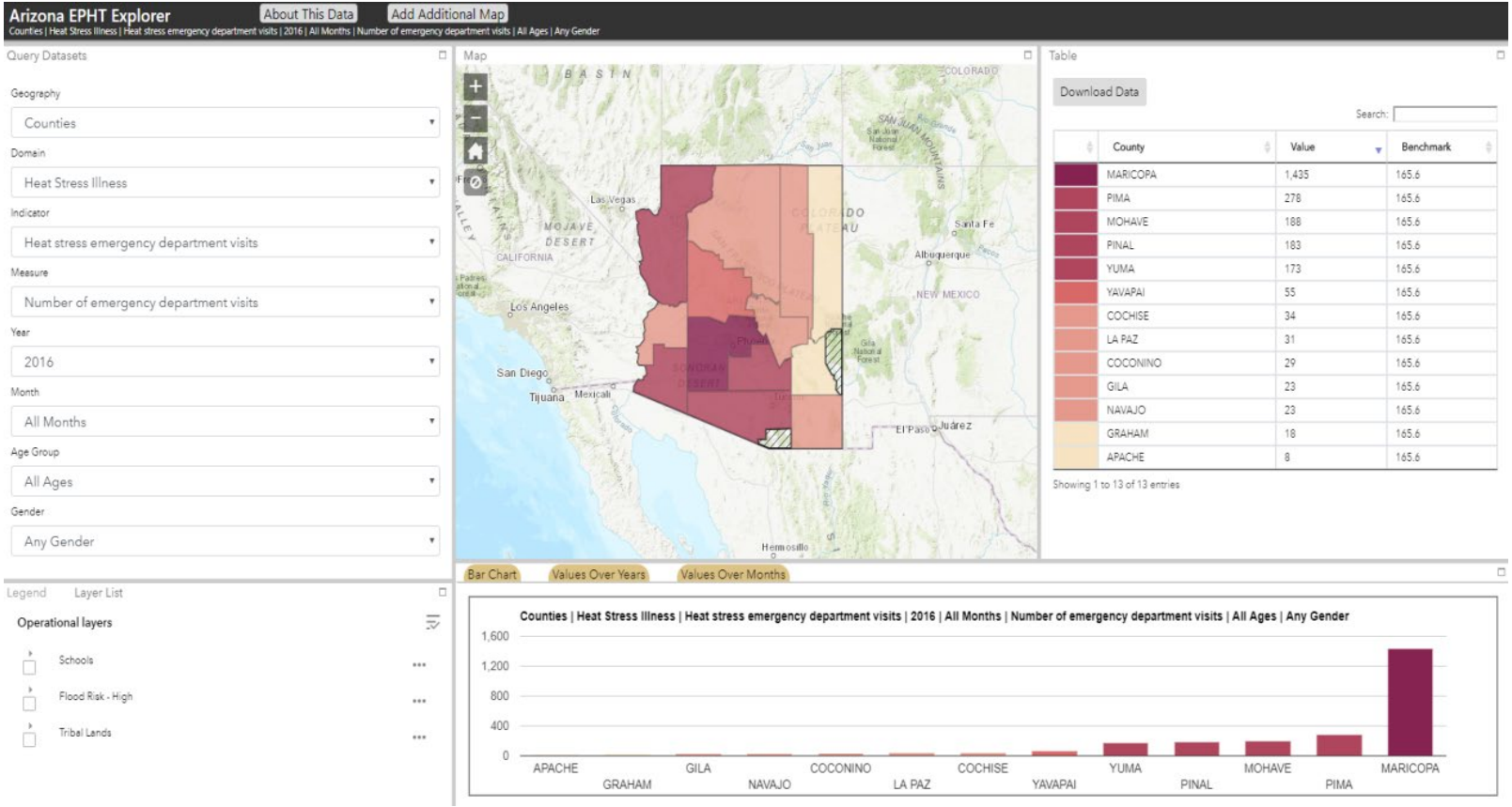
Is there any better guidance out there?

- Consult with CDC subject matter experts
- Literature Review
- Policies from schools in other states

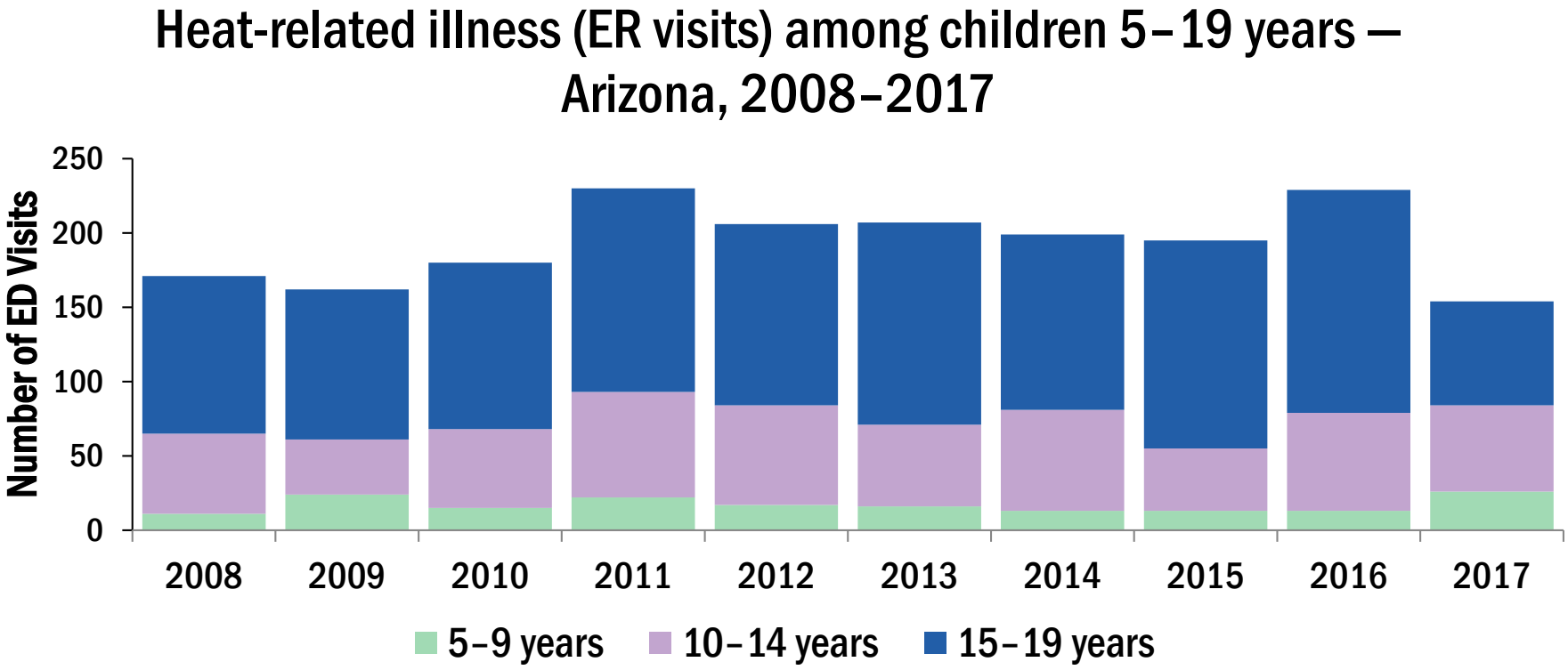
Environmental Public Health Tracking (azdhs.gov/epht)



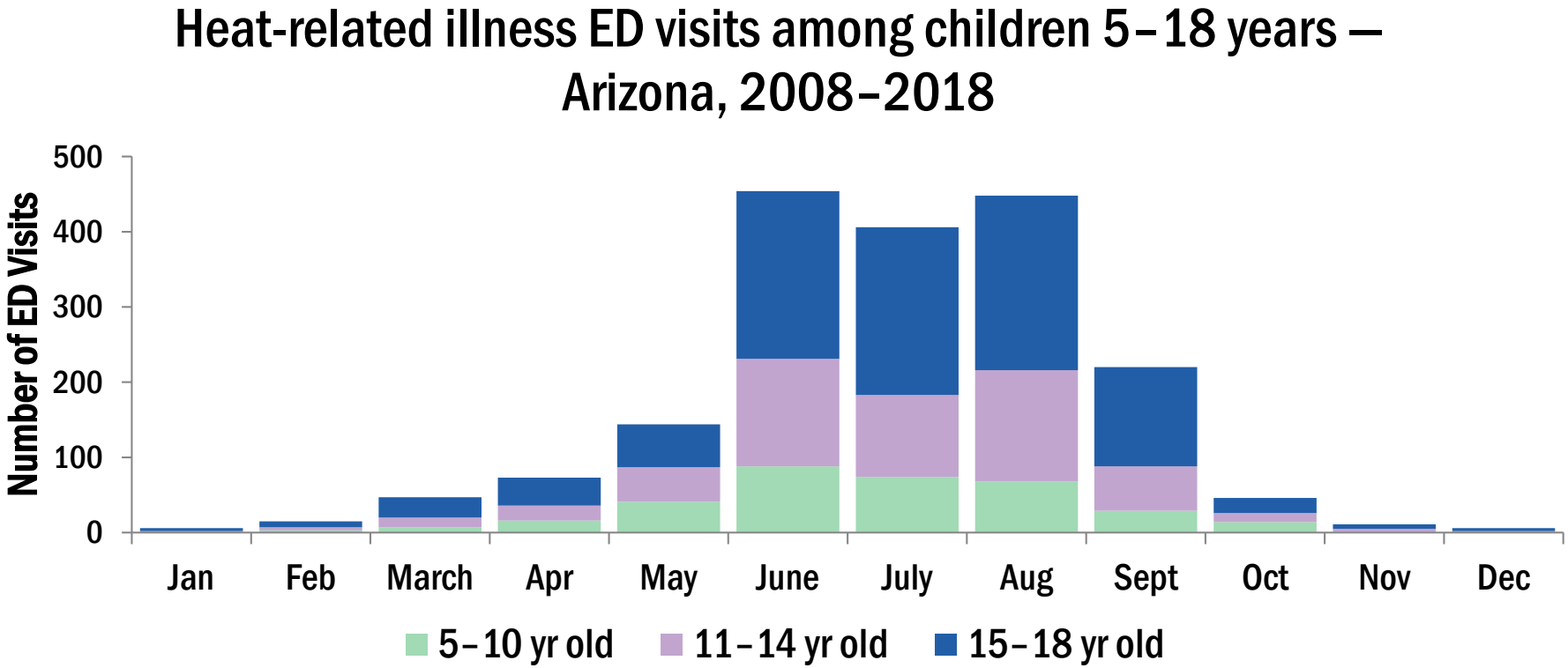
Heat data is available through the EPHT network.



What is the burden of heat-related illness among school-aged children?



What is the seasonal distribution of heat-related illness among school-aged children?

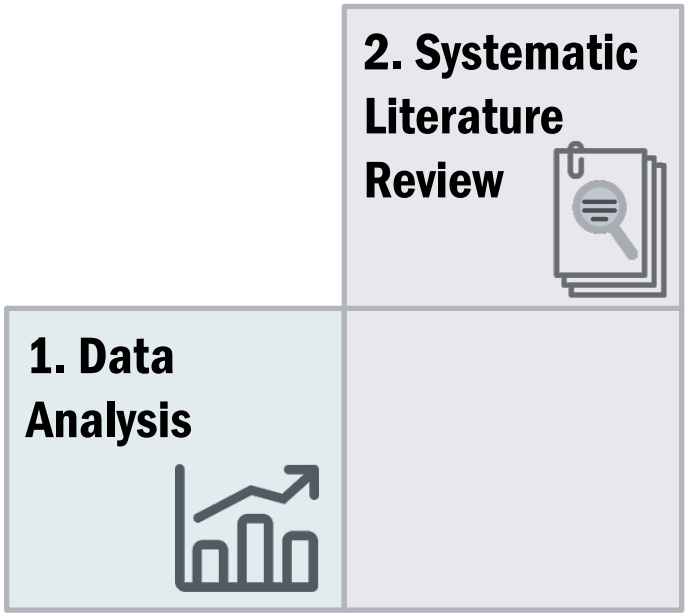


What is the association between weather and heat-related illness among school-aged children?

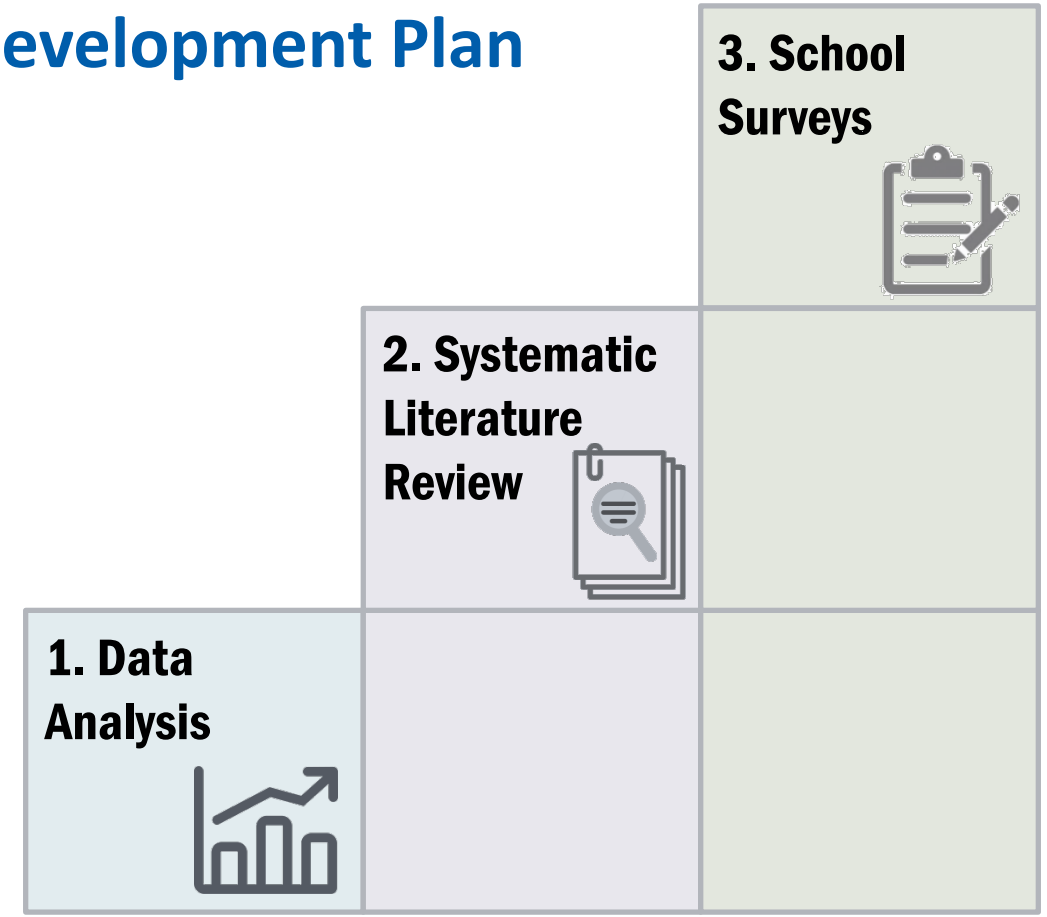
- Exposure: Meteorological Factors (Maximum Temperature) on Day of Illness
- Outcome: School Age Children Heat Illness Emergency Department Visits
- Result: Identify temperatures with higher risk

Policy Analysis and Development Plan

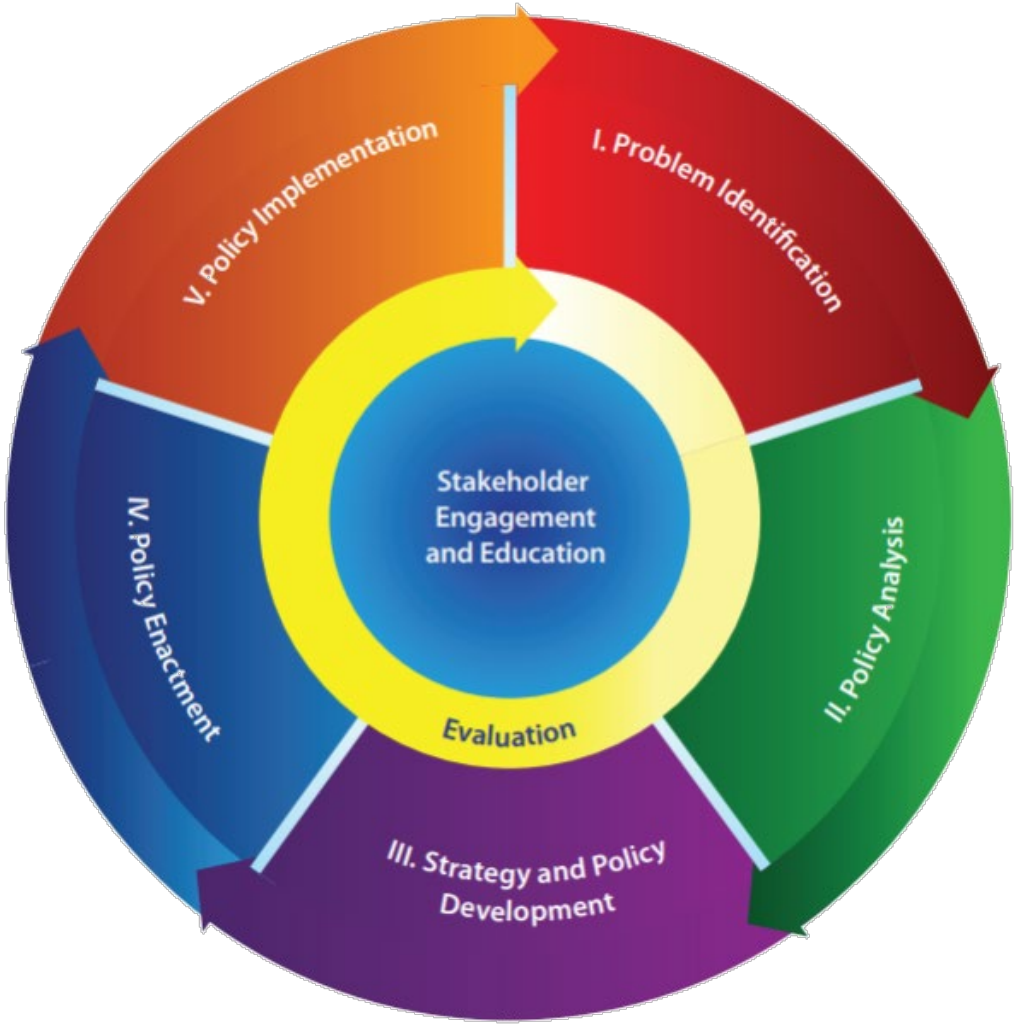
Policy Analysis and Development Plan



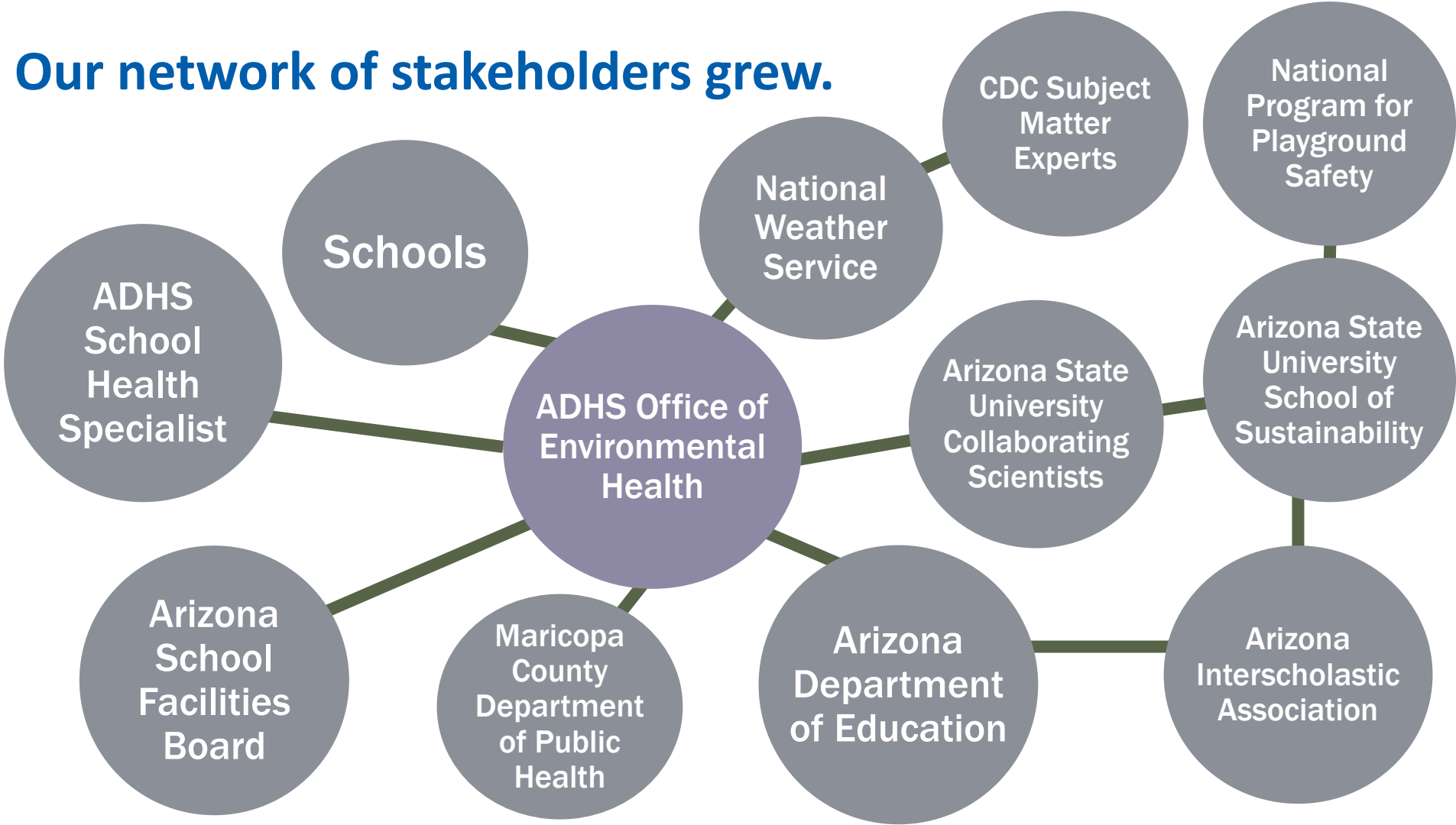
Policy Analysis and Development Plan



Time to Engage Stakeholders



Our network of stakeholders grew.



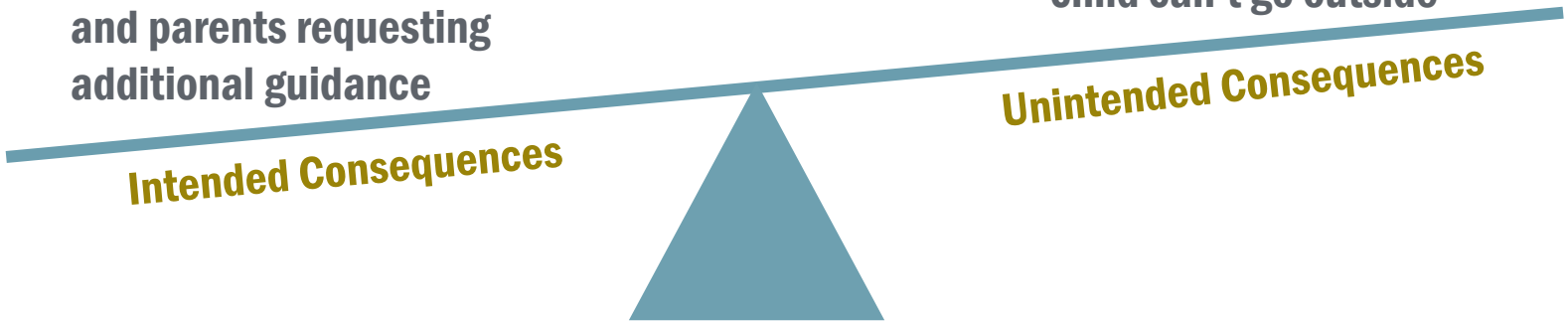
Balancing the Intended and Unintended Consequences

- Protect students from heat-related illness
- Encourage schools to develop heat policies
- Decrease calls from schools and parents requesting additional guidance

Intended Consequences

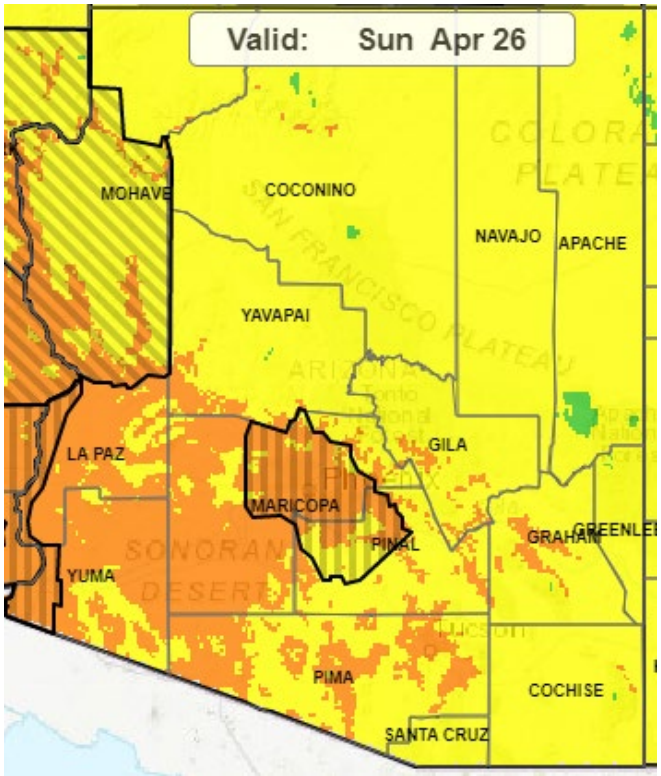
- Students spend too much time indoors → decreased physical activity
- Decreased attention to learning and impacts on health
- Phone calls from parents angry that child can't go outside

Unintended Consequences

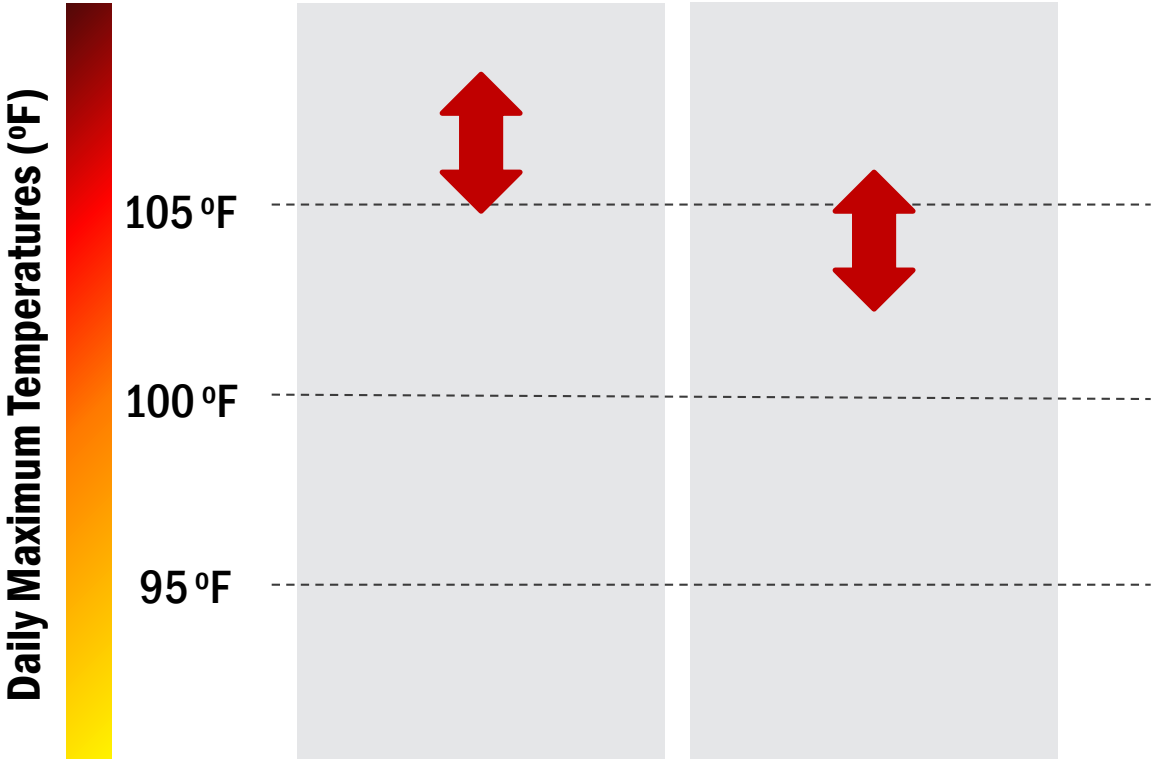


Data Analysis Methods

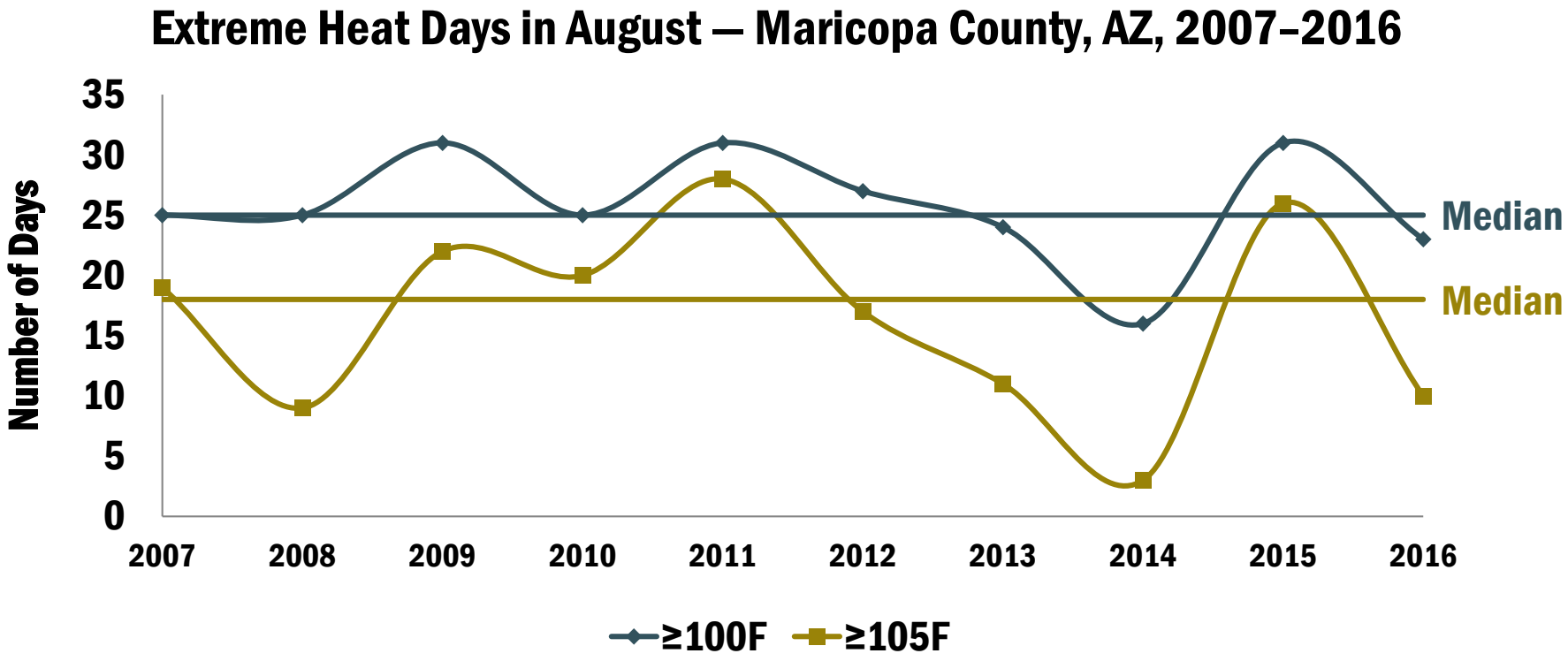
- Partnering with CDC subject matter experts to perform modeling
  - Ongoing work with National Weather Service to refine heat-risk mapping tool and warning levels
- CDC had access to National Weather Service Temperature Data in AZ
- Outcome Data Source (ADHS Hospital Discharge Data)
  - Daily counts of heat-related ED visits and all-cause ED visits for children aged 5–18 years during 2010–2018, aggregated to the 2010 census tract level by age group



Data Analysis: Expected Outcome



Local Weather Context



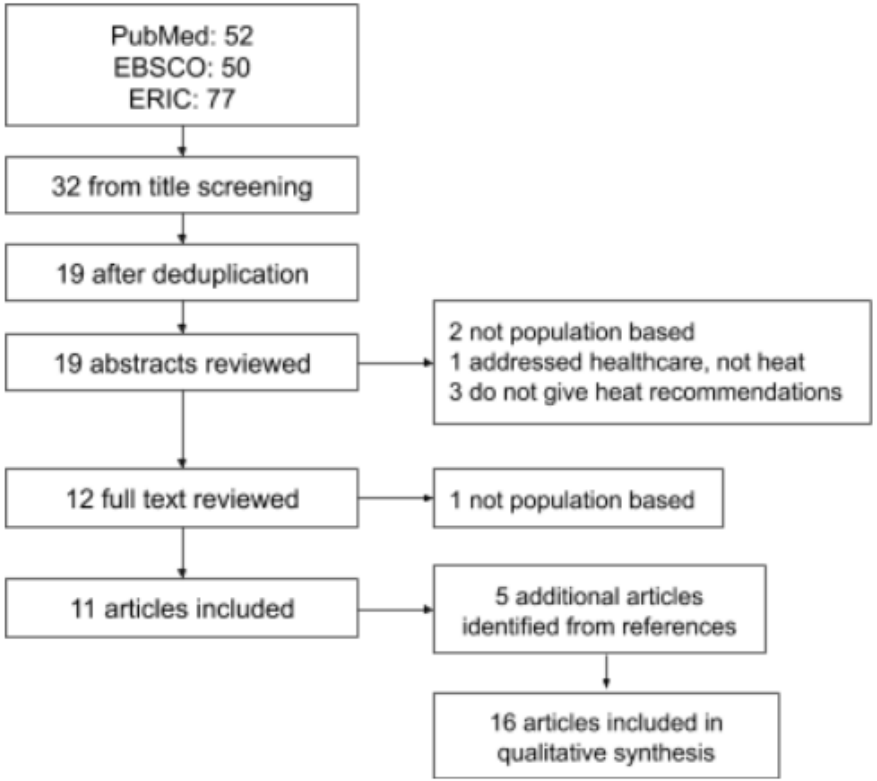
Literature Review Methods

- **Search Terms**
  - School OR high school OR elementary school

  AND
  - Heat OR hot weather OR extreme heat OR exertional heat illness OR heat illness

  AND
  - Policy OR guidelines OR recommendation OR procedure OR acclimatization
- **Databases:** PubMed and EBSCO and ERIC

Literature Review Results

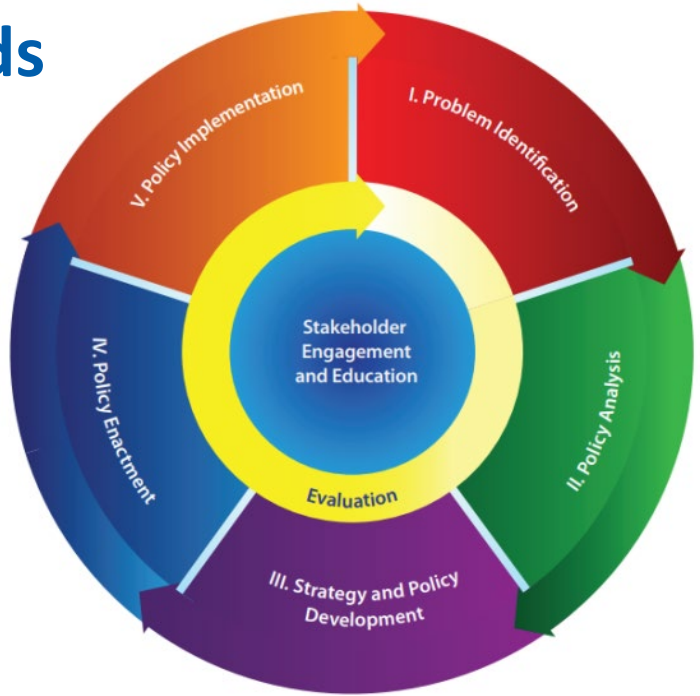


Literature Review Results

Recommendation	Rationale	References
Encourage students to drink more water	Hydration status an important factor in heat-related illness; children are not as good at hydrating	1, 2, 3
Install more drinking water fountains	Supports children in drinking more water	4
Install shade structures	Shade can reduce the perception of temperature by up to 15 degrees	1, 3, 4
Takefrequent rest breaks	Rest breaksallow students to drink water, rest in the shade, and recover from exertion	3, 4, 5

Statewide School Survey Methods

- Distributed to public school district administrators
  - Planning for future evaluation
    - Baseline of heat policies in the state
    - Feasibility of future data collection at the school level



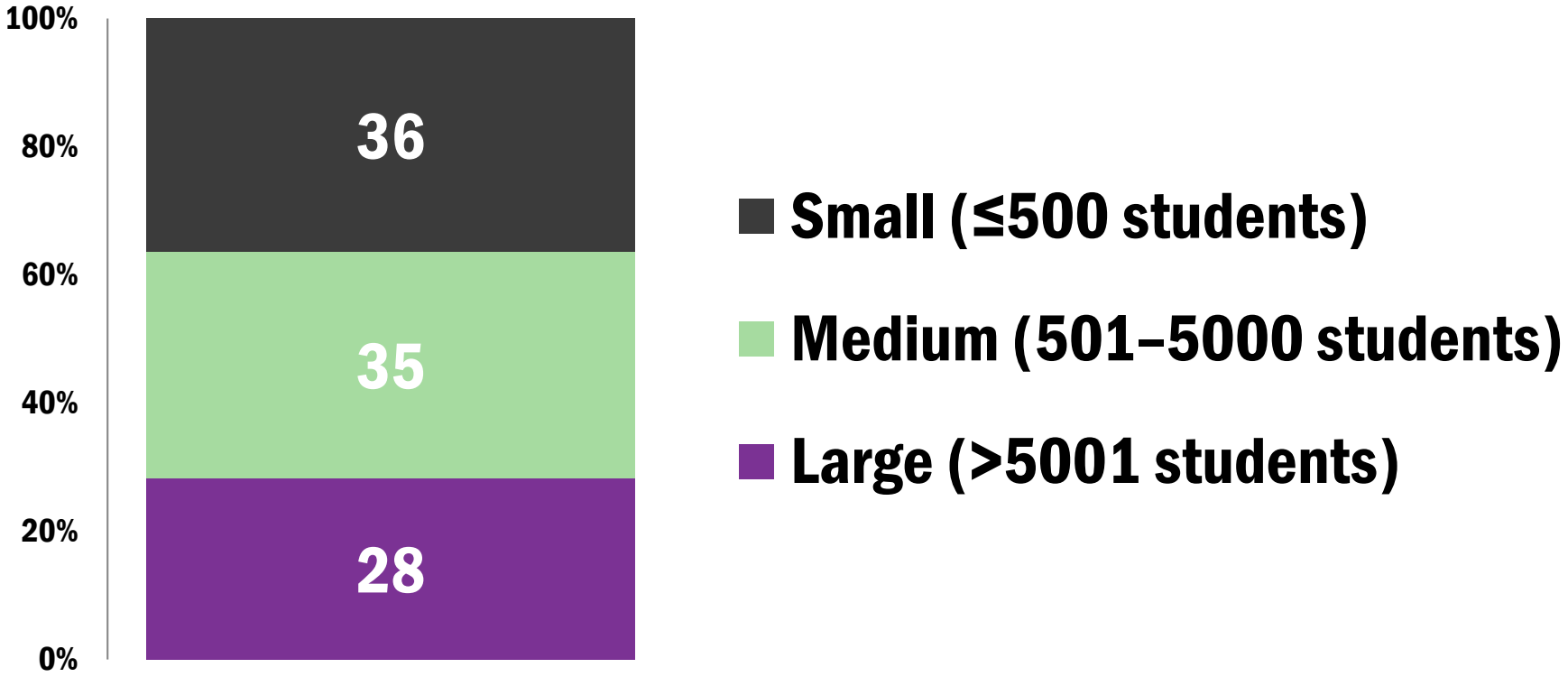
Statewide School Survey Methods (Sent to 216 school districts)

- Distributed to public school district administrators
  - Planning for future evaluation
    - Baseline of heat policies in the state
    - Feasibility of future data collection at the school level
  - Understand landscape of important factors
    - Physical activity policies
    - Availability of resources (e.g. shade structures, nurses)

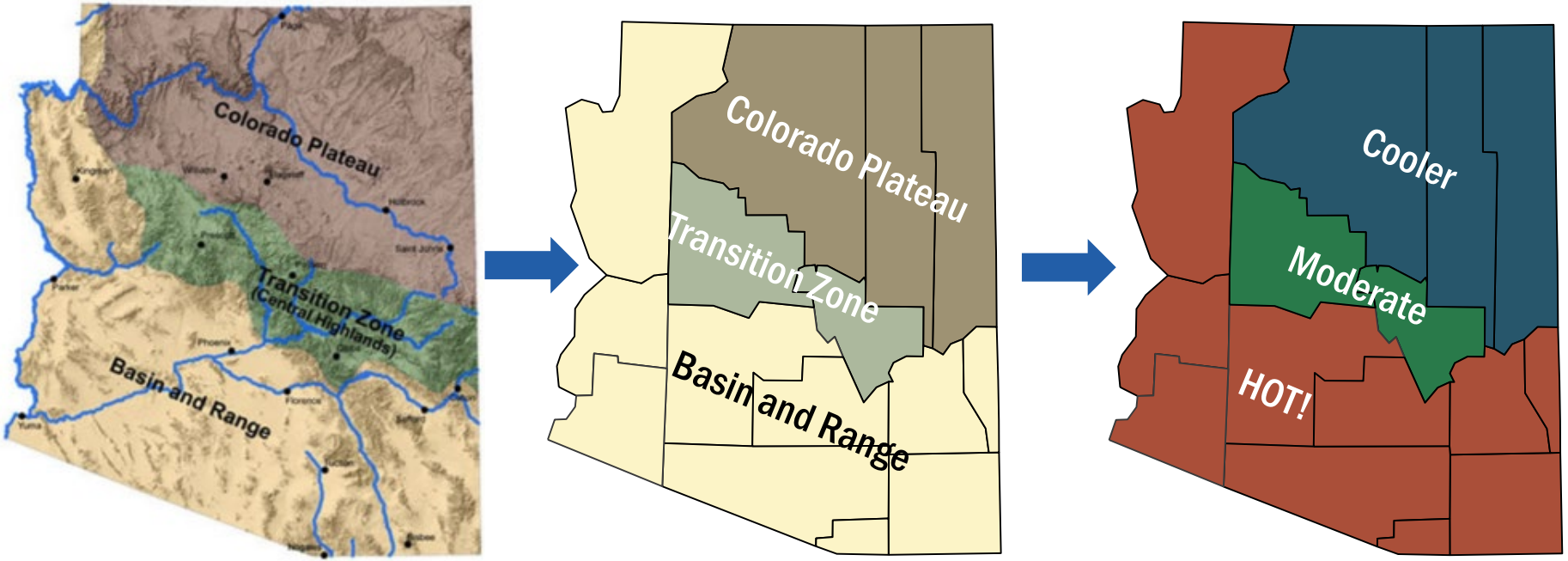
Key Informant Interview Methods

- Requested telephone interviews with 3 school districts in Maricopa County known to have independently developed heat policies
- Asked same questions as on statewide survey
- Also asked about experiences with policy
  - When and how developed?
  - How distributed?
  - Successes?
  - Challenges?

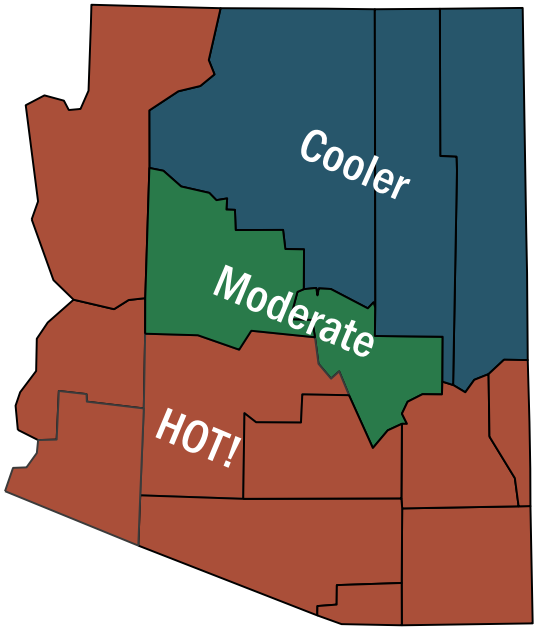
Districts (n = 99) were categorized as large, medium, or small based on student population.

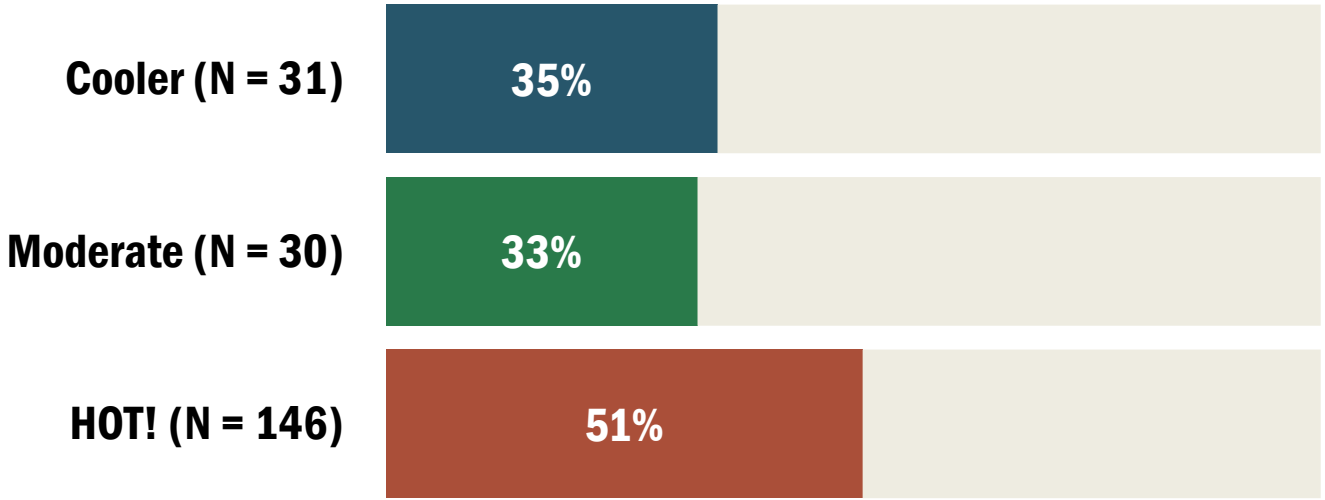


Districts were assigned to one of three climate zones found in Arizona by county.

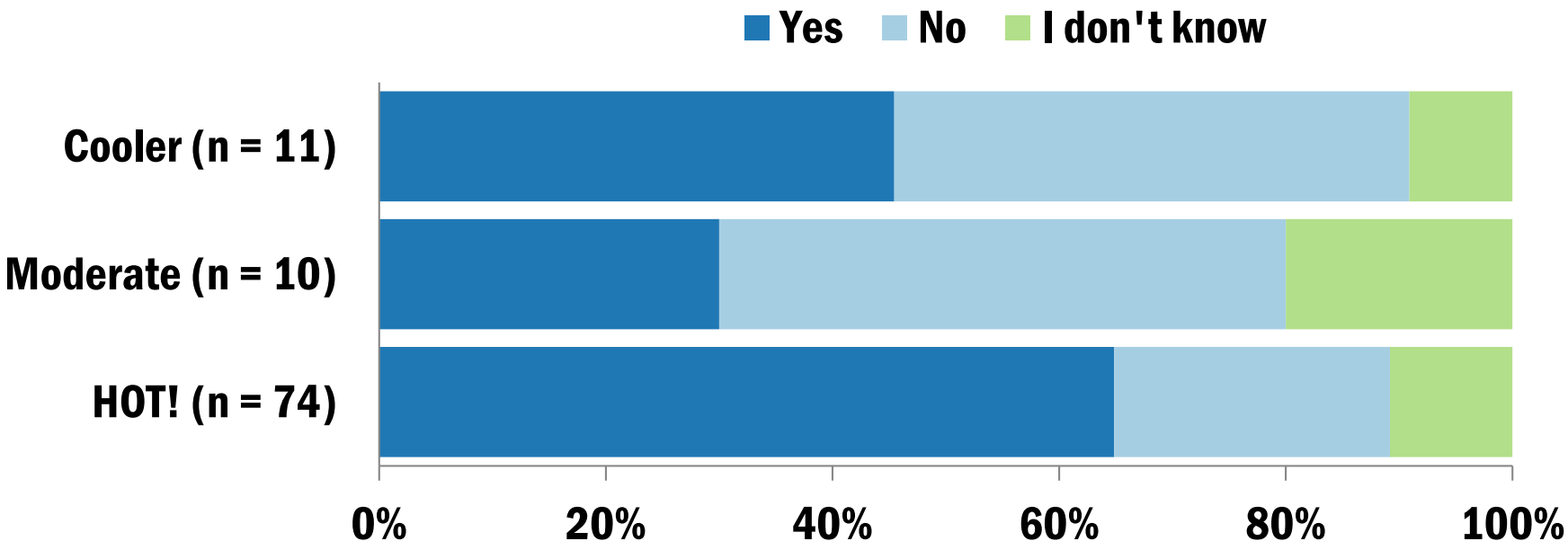


Overall response rate was 46% out of 216 districts. The response rate was highest among school districts located in the HOT! climate zone.

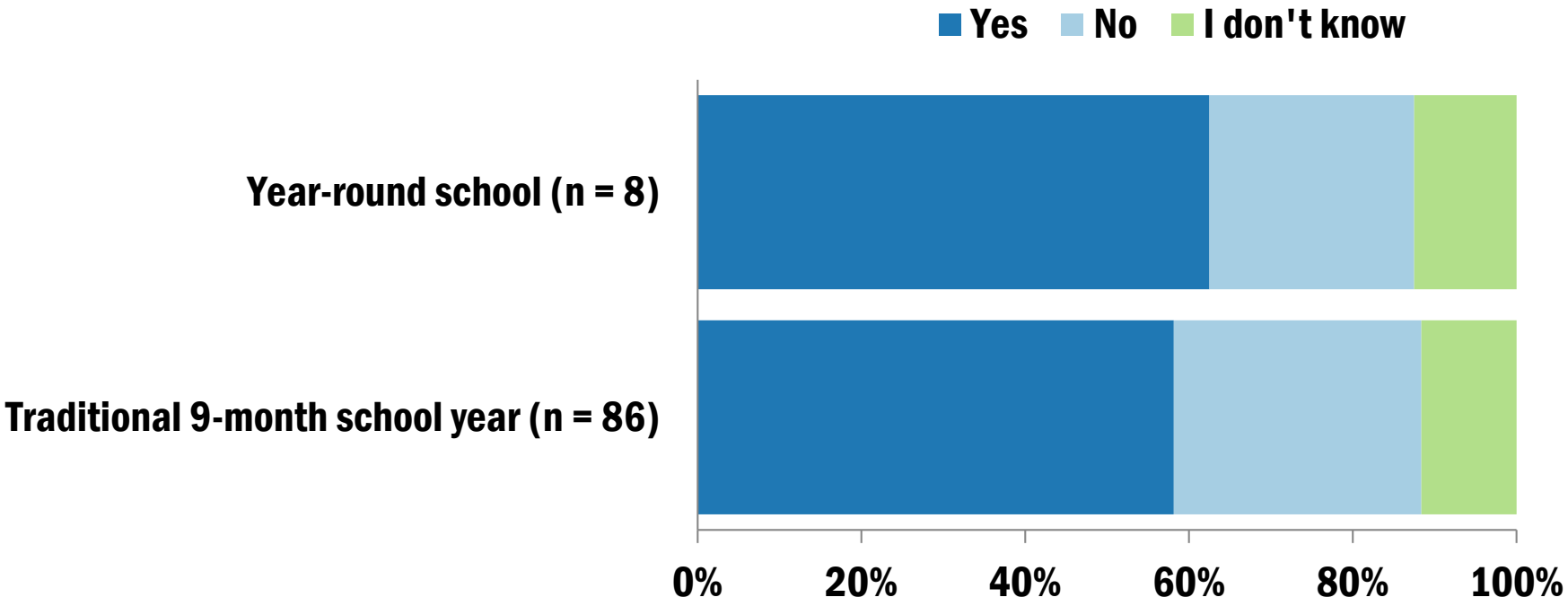




Respondents from school districts in Cooler and moderate climate zones were less likely to think heat was a problem in their district.



Respondents from districts with traditional and year-round schedules have similar beliefs about if heat is a problem in their district.



We asked if school districts had a **formal heat policy** or an **informal heat policy**.

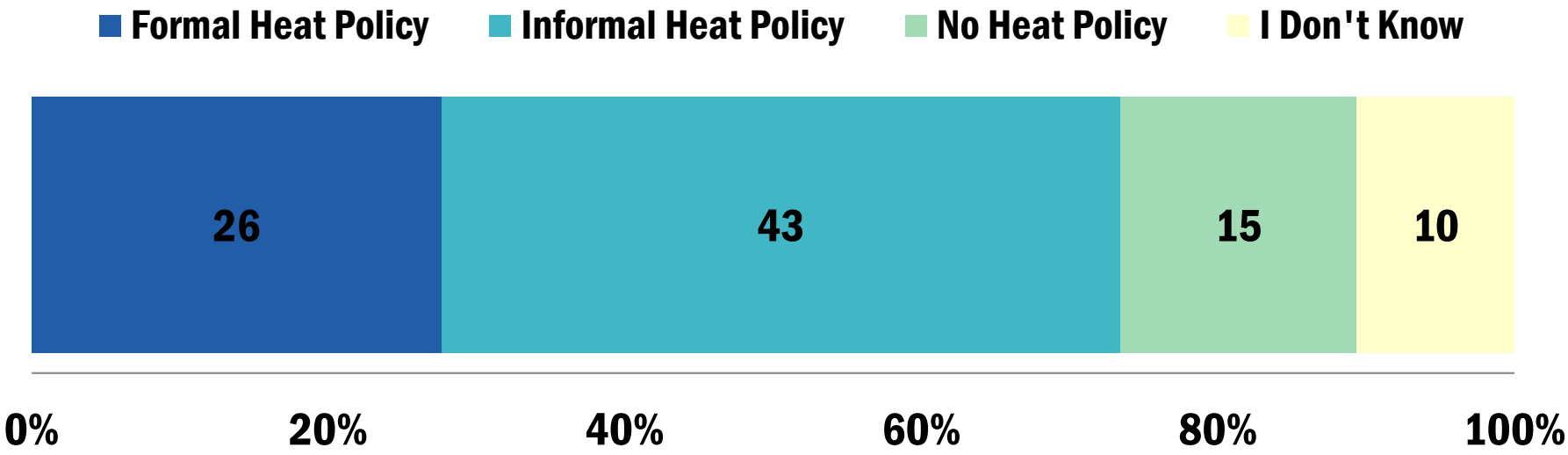
We defined a **formal heat policy** as...

Jamie is a school administrator at Venue Elementary School. She received an email from the district superintendent to implement their school policy for dangerously hot days. The district plan states that outdoor activity (recess, PE, sports, etc.) should be limited and certain precautions should be followed for those activities outside. The guidelines for outdoor activities request students to drink water before going outside, have access to water while outside, and have frequent water breaks. She forwards her school district's policy to all staff.

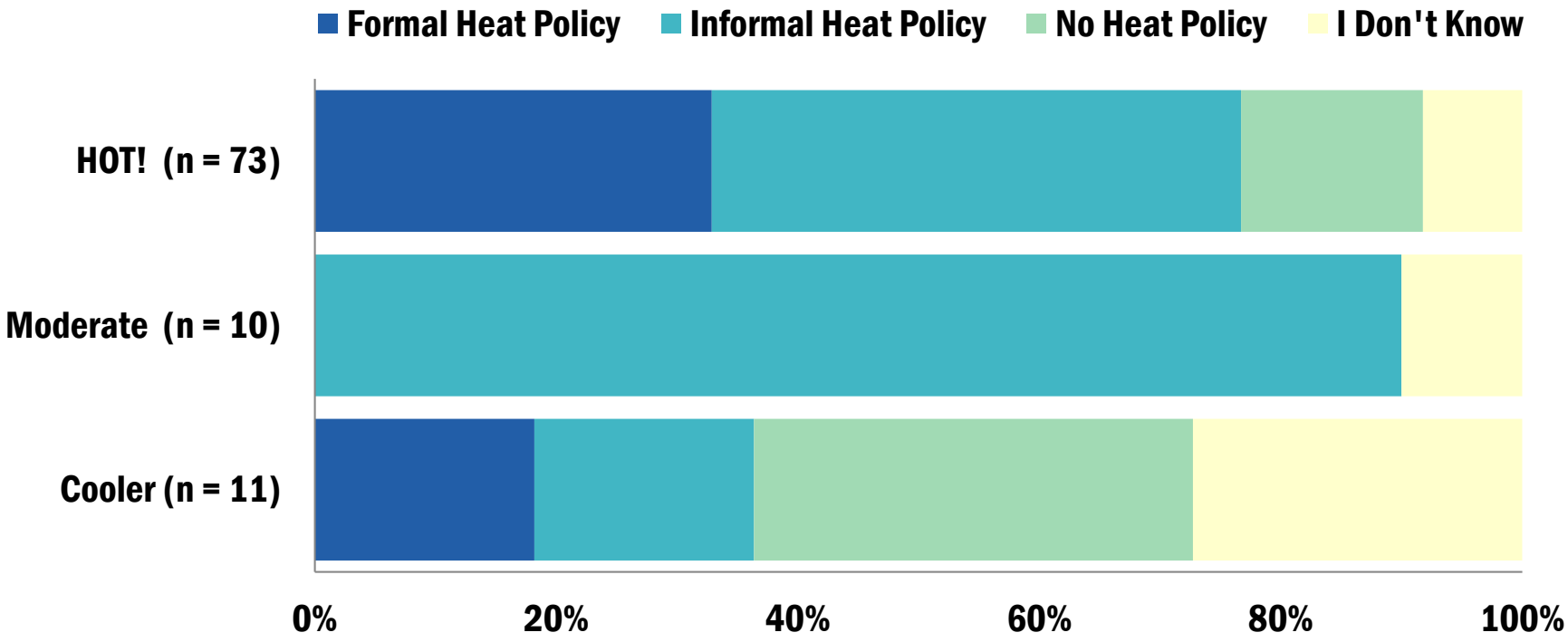
We defined an **informal heat policy** as…

Allison has been a school nurse at Parks Elementary School for 3 years. She frequently watches the news to check for upcoming weather forecasts. One evening she heard there is an excessive heat warning coming up near the school and decides to inform the principal (decision maker in her school) the next morning. The principal decided to limit time outdoors for the students and makes sure all students have access to water.

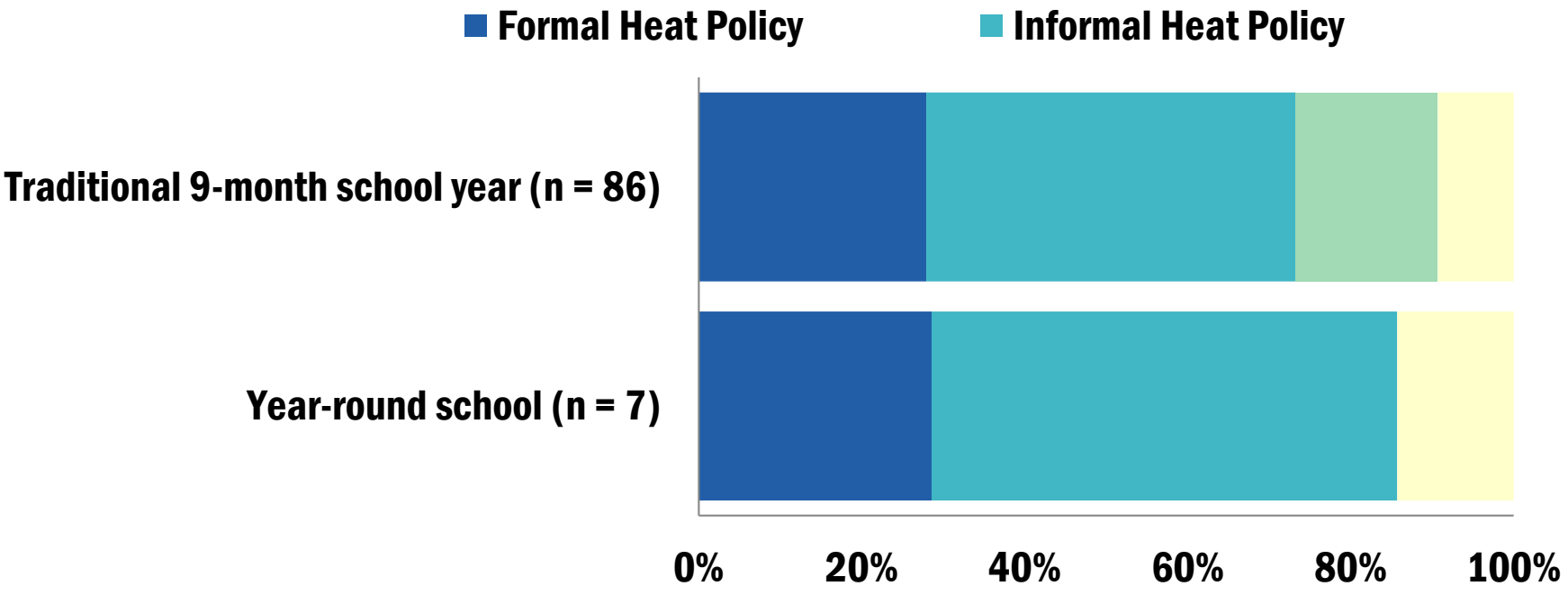
Overall, informal heat policies were most common (n = 94).



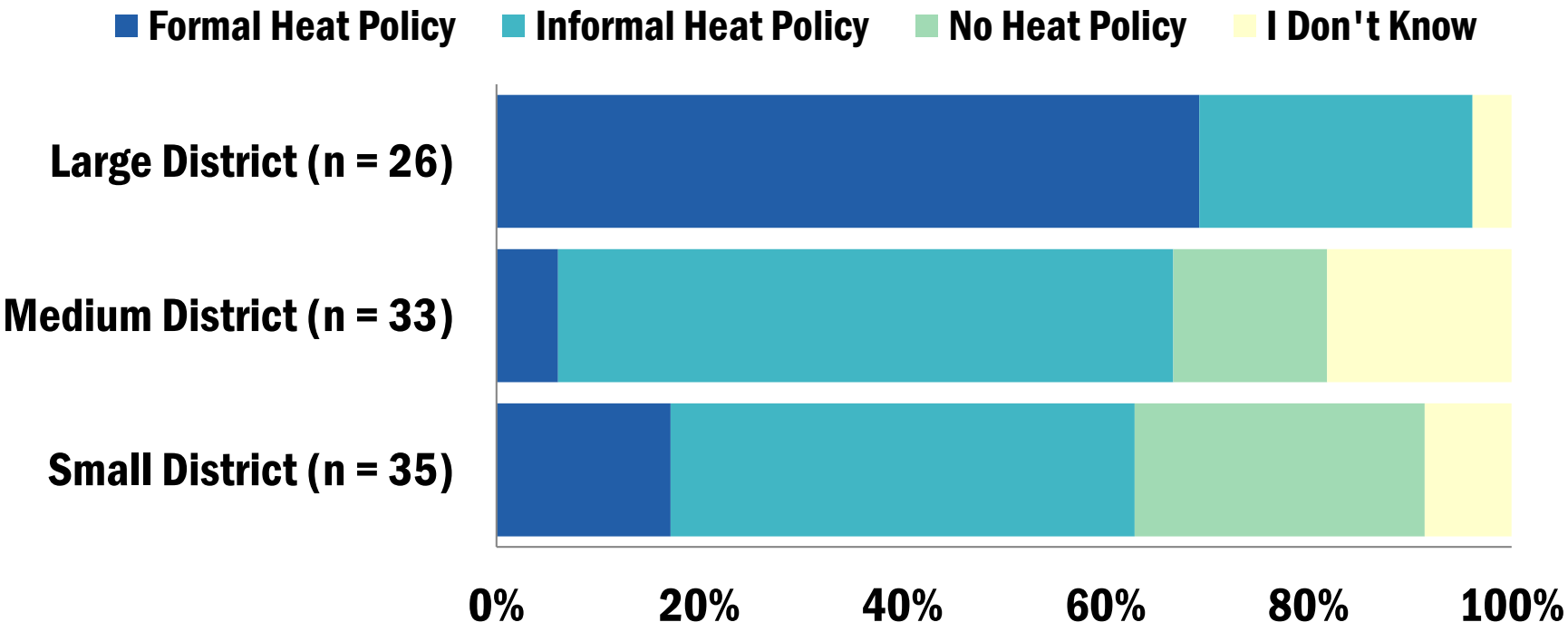
Heat policies vary by climate zones.



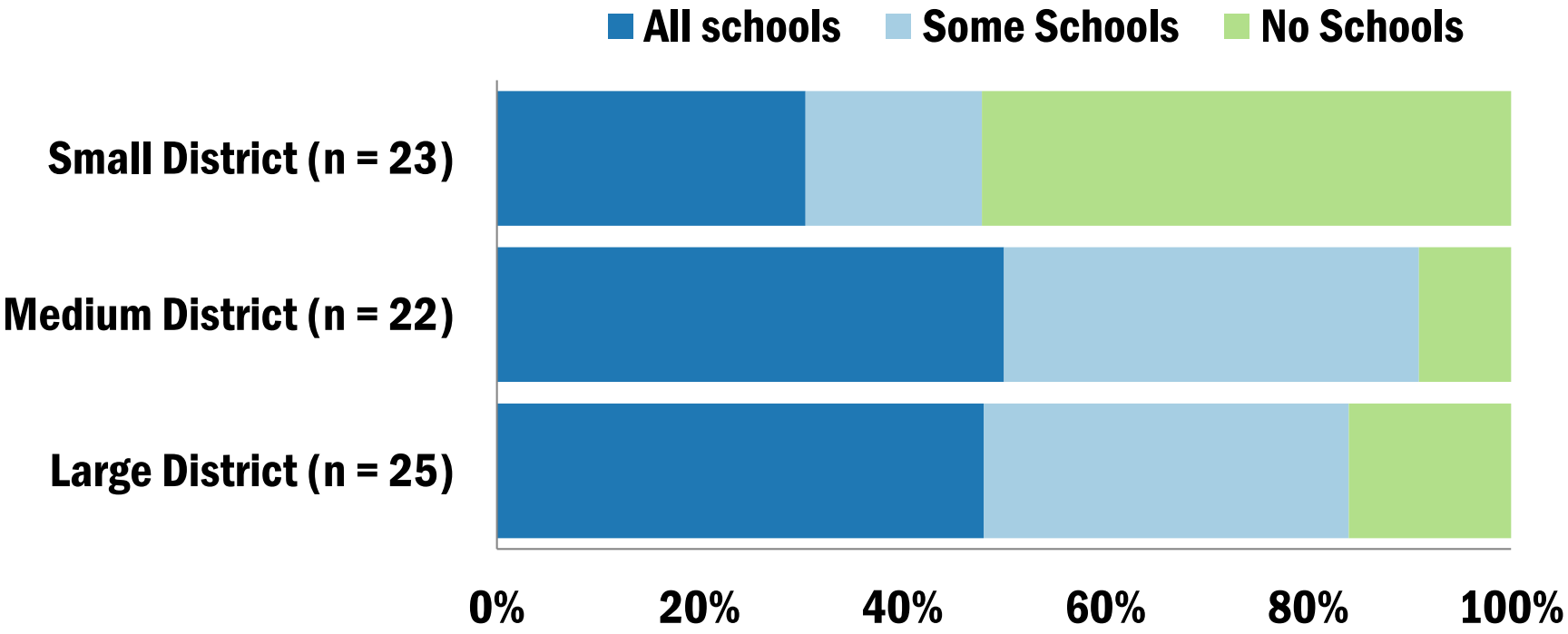
Traditional and year-round schools have similar types of heat policies.



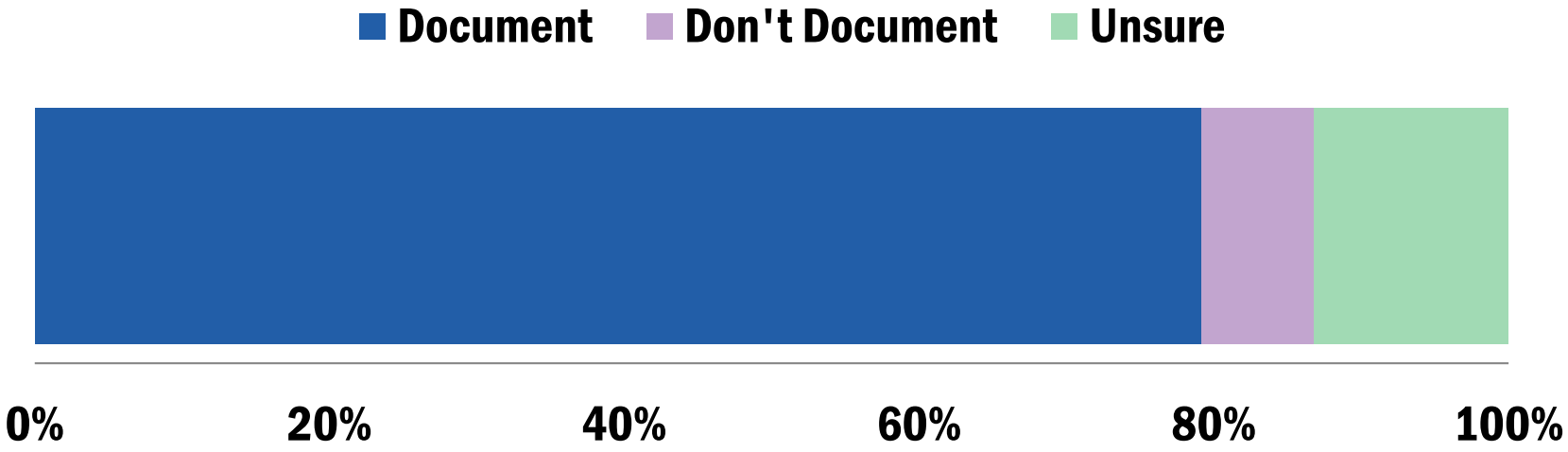
Formal heat policies were most common in large school districts.



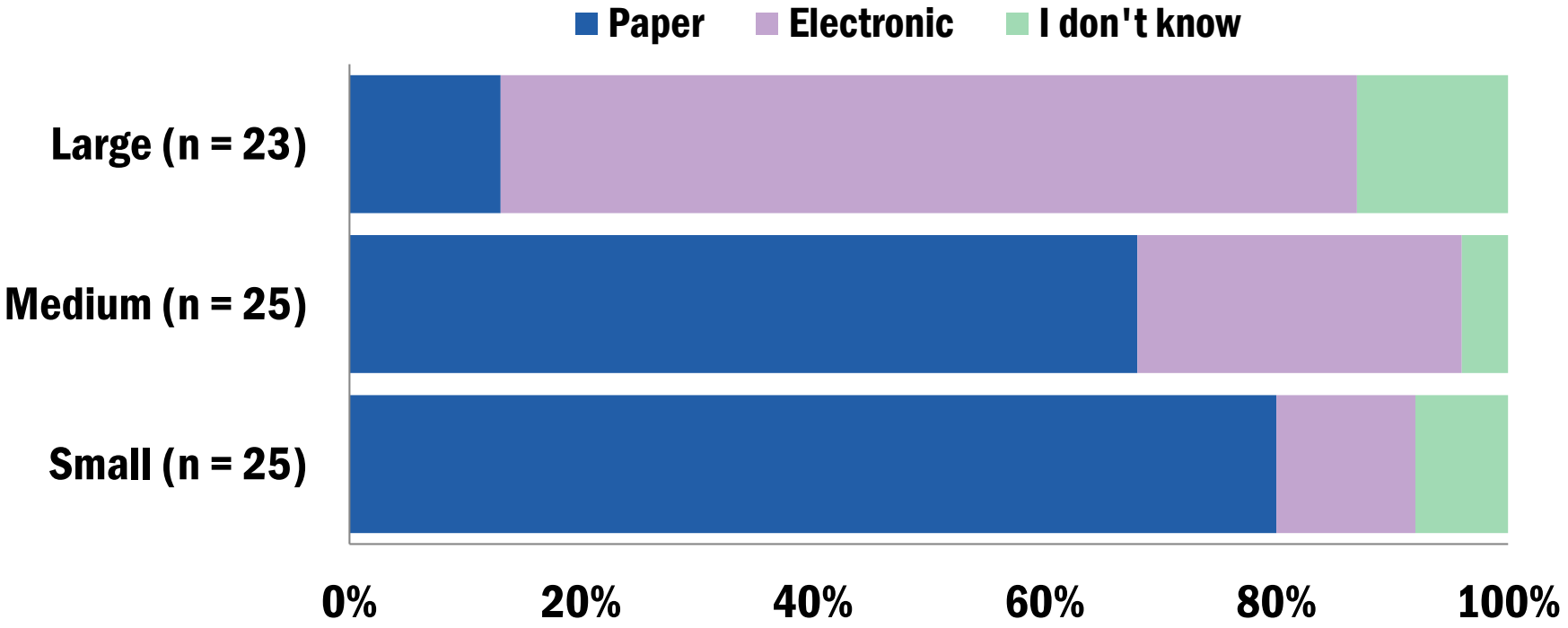
Smaller school districts were significantly less likely to have shaded play spaces in any schools.



The majority of districts document when students seek care for heat-related illness at school (n = 91).



However, large districts were significantly more likely to have electronic documentation systems (n = 72).



Key Informant Interview Results

- Need indoor space to keep students indoors
- Shade structures are expensive!
  - If data collection could help support funding for shade structures, that would be of tangible benefit to school districts
- There is somewhat of a disconnect between school day and after-school policies

Putting it all Together: Cook Book for School Heat Policies

- One summary document from ADHS that includes:
  1. Recommendation that schools develop formal heat policies
  2. Local meteorological trigger points at which risk to student increases
  3. Interventions across the hierarchy of controls that schools can incorporate into formal heat policies

- Stakeholder input!

Managing Extreme Heat Recommendations Guidance Document Walkthrough

ARIZONA DEPARTMENT OF HEALTH SERVICES

Contents

Suggested Policy Elements

- Response to extreme heat during school hours, including recess, physical education classes, and field trips.

Suggested Policy Elements

- Address after-school activities, such as club meetings, athletic practices, and competitions

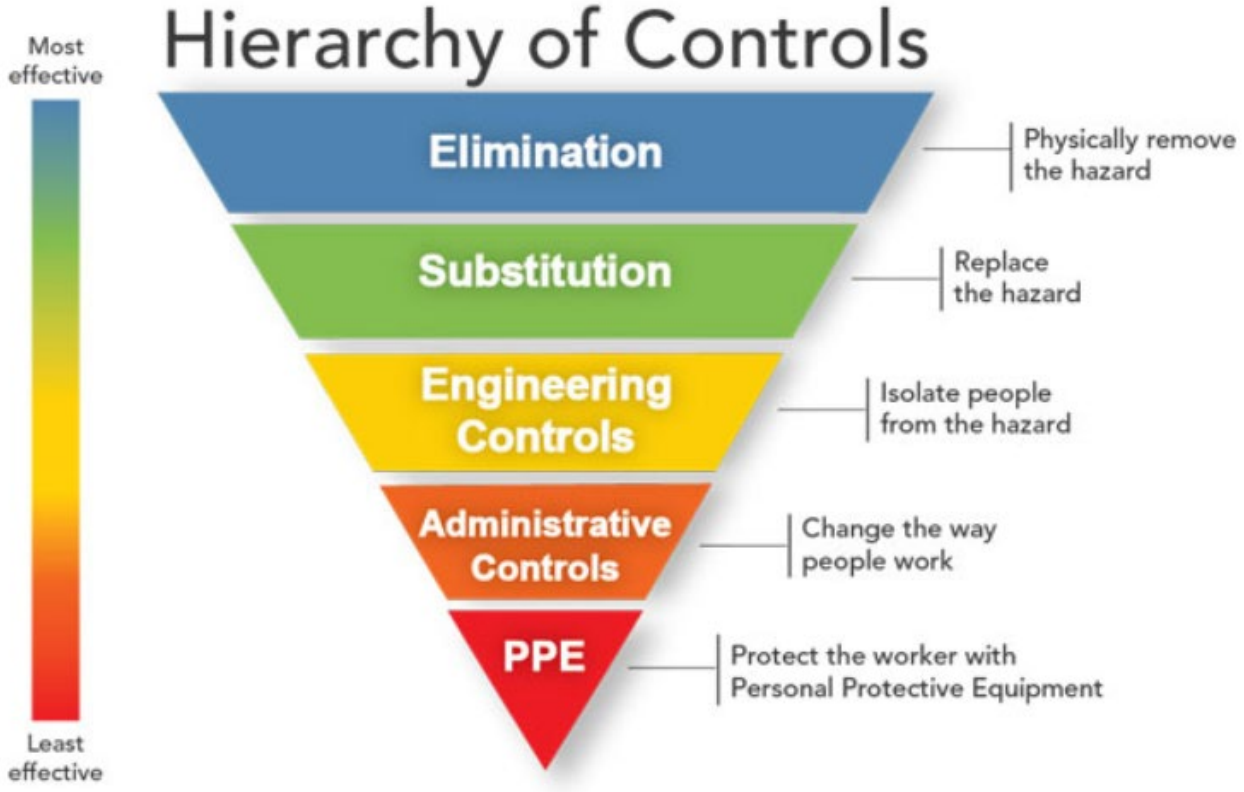
Suggested Policy Elements

- School districts that are members of the Arizona Interscholastic Association (AIA) are also subject to Bylaw 14.17 — *Heat Acclimatization and Exertional Heat Illness Management Policy*.
- Any district-level heat policy that includes actions related to interscholastic sports for grades 9–12 must not violate these standards.

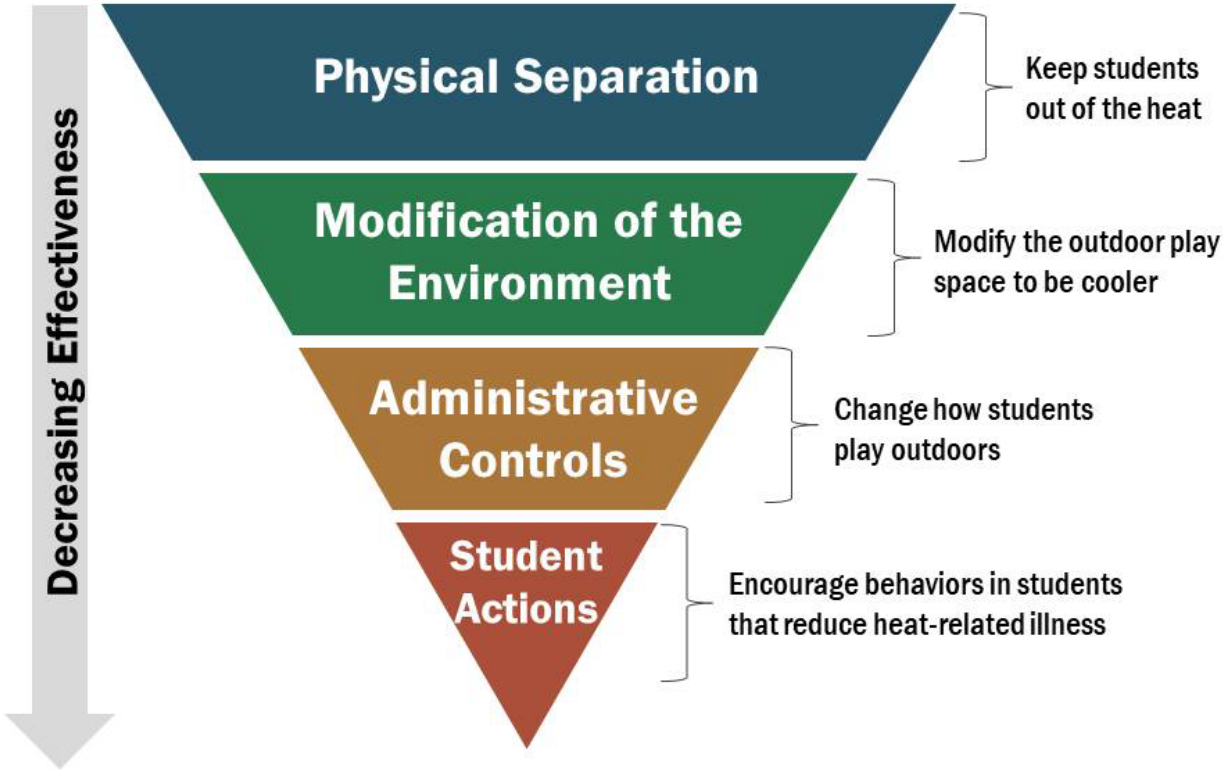
Suggested Policy Elements

- Roles and Responsibilities
- Plan for education students, parents, faculty, and athletic staff on heat-illness
- Define Trigger Points for implementing various administrative controls
- Plan for administrative controls

Recommendations Mirror an Occupation Health Framework



A Framework for Policy: Environmental Heat as a Hazard in Schools



AZ School Heat Policy - Thresholds by Climate Zone

Table 4: Trigger Points Actions and Time by Climate Zone

Percent of Heat-Attributable Emergency Department Visits by Daily Maximum Temperature Ranges (°F) (8 AM to 8 PM)									
Climate Zone		(76 to 80)	(81 to 85)	(86 to 90)	(91 to 95)	(96 to 100)	(101 to 105)	(106 to 110)	(>=111)
Basin and Range	Pre-heat Season	1%	4%	8%	15%	21%	27%	18%	5%
Transition Zone		11%	16%	29%	26%	9%	1%	0%	0%
Colorado Plateau		21%	30%	19%	5%	0%	0%	0%	0%

Table 5: Trigger Points Actions and Time for Maricopa and Pima Counties

Percent of Heat-Attributable Emergency Department Visits by Daily Maximum Temperature Ranges (°F) (8 AM to 8 PM)										
Age Group	County		(76 to 80)	(81 to 85)	(86 to 90)	(91 to 95)	(96 to 100)	(101 to 105)	(106 to 110)	(>=111)
5-10	Maricopa	Pre-heat Season	0%	4%	10%	16%	23%	29%	14%	3%
	Pima		3%	7%	15%	26%	29%	17%	4%	0%
11-18	Maricopa		0%	2%	5%	11%	19%	30%	24%	8%
	Pima		2%	5%	13%	25%	31%	20%	5%	0%

AZ School Heat Guidance
Tiered Response (Draft)

Time to Take Action/Season	Action to Take
Early on in anticipation of policy implementation Pre-heat season, spring	Environmental modification: • Plant trees • Install artificial shading • Install water fountains and water misters *Consider checking functionality of the water fountains, misters and artificial shading periodically and do upgrades, maintenance (misters cleaned, landscaping), or replacements as needed. These activities can occur anytime during the cooler season. Create a "water wise" environment and do not run the misters when children are not around to avoid wastage of water.
Lowest positive attributable risk by climate zone • Basin and Range – 81-85 °F • Colorado Plateau – 76-80 °F • Transition Zone– 76-80 °F Pre-heat season, spring	Education of supervisory staff, health professionals staff, parents and students on heat-related illness prevention, recognition, and treatment. Sign up for Heat Alerts or be aware of how to receive them.
One category below highest positive attributable risk for climate zone	Administrative control – Acclimation period, scheduled rest/hydration, recess before lunch, move activities during the cooler part of day. Student actions – use of sunscreen, lightweight clothing and frequent hydration.
Highest attributable risk for climate zone	Physical separation – Avoid outdoor play using indoor cooled space for all physical activity.

Table 1: Environmental Modifications for Consideration

Modification	Rationale	References
1. Plant trees to provide natural shading of outdoor play spaces	Trees reduce air temperature, glare, and UV radiation. Shade provided by mature trees could also reduce surface temperatures by as much as 60°F.	(Vanos et al., 2016)
2. Use artificial shading (canopies, tents, sails, umbrellas) to shade outdoor play spaces	Shade can decrease the perception of air temperature by 15°F. Without shade, a surface temperature can get up to 188 °F at noon, while a shade sail can bring the surface temperature down to 114 °F, closer to the air temperature.	(Vanos, Herdt, & Lochbaum, 2017)
3. Design play places to provide extra windflow in the summertime	Increased windflow will help increase thermal comfort. Wind roses or weather radials should be used to understand weather patterns such as prevailing summer wind directions during the hottest days and best understand expected weather factors that will consistently influence the thermal comfort.	(Kennedy et al., 2020)

4. Avoid materials and surfaces that radiate high amounts of thermal heat	Concrete, black asphalt or black rubberized synthetic surfaces can intensify hot conditions. Use natural surfaces as much as possible (where allowed) and if a surface has to be used for the safety of children, make sure it is shaded. The caveat is that selection of highly reflective surfaces or application of paints on existing surfaces can increase reflectivity and reduce ambient air temperatures.	(Hyndman, 2017)
5. Increase the number of water fountains, water coolers, or bottled water coolers	Increased access to drinking water can help encourage student behaviors to stay hydrated. Districts need to follow the Arizona Law which requires at least 2 drinking fountains per 100 students (grades K-8) and 1 drinking fountain per 100 students (grades 8-12).	(Hyndman, 2017)
6. Water misters	Reduce air temperature up to 30 degrees in dry environments.	(Bossenmeyer, 2014)
7. Position play spaces so that they are naturally shaded by existing buildings and structures during the warmest time of year and hottest part of the day	Building shade (human-made shade) can be beneficial and reduce surface temperature to near air temperature. In Arizona, this can be achieved by placing playgrounds on the North side of a building to block south sun, or on the east/west side of the building to block west (afternoon) or east (morning) sun depending on the school's recess schedule.	(Kennedy et al., 2020)

Table 2: Administrative Controls

Modification	Rationale	References
1. Acclimatization period	During the acclimatization period, changes occur as the body adapts to the stress of repeated exposure to heat. There is a strong evidence base that acclimatization can reduce heat-injuries among student athletes. Similarly, when students return to school in August, schools can consider implementing an acclimatization period for recess and physical education, where duration and intensity slowly increase over the course of a two week period.	(Casa et al., 2015; Council on Sports Medicine and Fitness and Council on School Health et al., 2011;National Center for Chronic Disease Prevention and Health Promotion, 1997; & Rodgers, Slota, & Gamboni, 2018; Tripp, Eberman, & Smith, 2015; Yard et al., 2010)
2. Scheduled rest/hydration breaks	Scheduling rest and hydration breaks in shade into outdoor play time can encourage students to modify their behavior. Proper hydration can help to reduce core body temperature. Dehydration of as little as 2% can negatively impact thermoregulation.	(Casa et al., 2015; Council on Sports Medicine and Fitness and Council on School Health et al., 2011; National Center for Chronic Disease Prevention and Health Promotion, 1997; Pryor et al., 2018; Rodgers, Slota, & Gamboni, 2018)

3. Schedule recess prior to lunch	Some districts have found that this strategy helps reduce the haste some students feel to eat lunch quickly to have time for recess. This schedule also gives students a chance to rest and rehydrate before returning to the classroom.	
4. Move outdoor activities to cooler times of day	Rescheduling activities during the mornings will reduce student exposure to extreme heat. Some studies have found that exertional heat illness is most likely to occur during mid-day activities, when the temperature is hottest.	(Casa et al., 2015; Council on Sports Medicine and Fitness and Council on School Health et al., 2011; Kerr et al., 2013; Rodgers, Slota, & Gamboni, 2018; Tripp, Ebarman, & Smith, 2015; Yeargin et al., 2016)
5. Move outdoor activities to an air-conditioned space	Air-conditioning is the number one protective factor against heat-related illness. Moving activities from outside to an air-conditioned space during extreme heat has been shown to prevent additional cases.	(CDC, 2016) (O'neil et al., 2009)

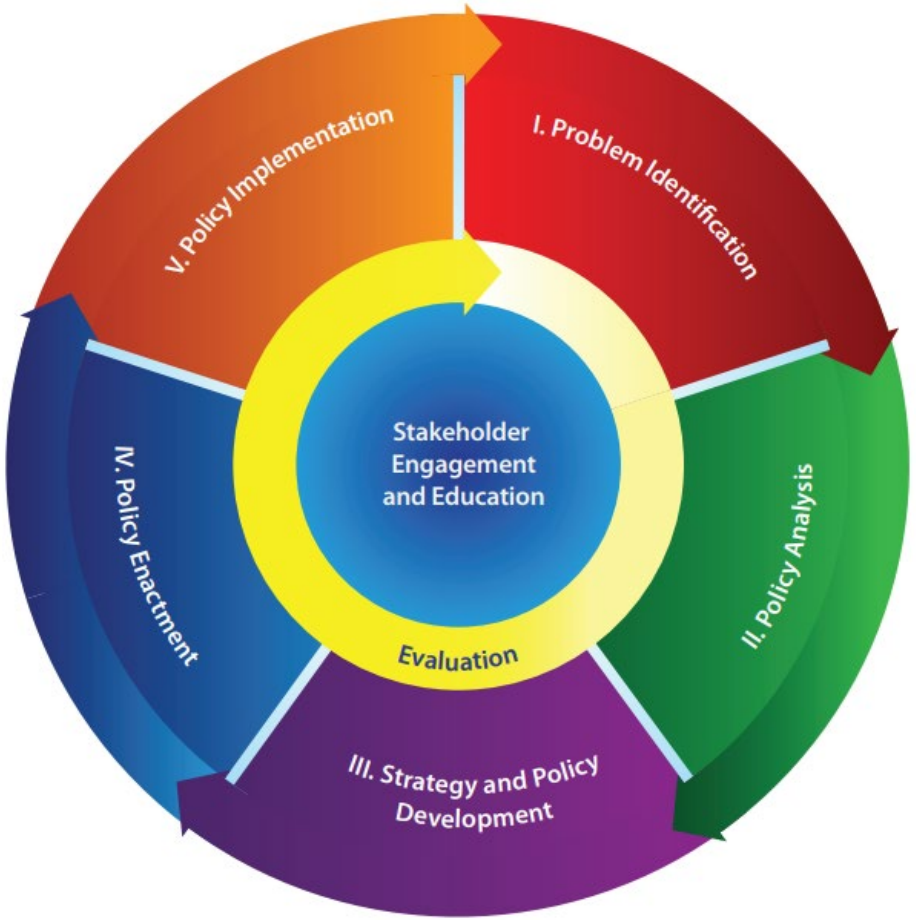
Student Actions

- Require students and their parents to comply consistently
- Require behavior change:
  - Protect skin with sunscreen, lip balm
  - Wear sunglasses, hats and light clothing
  - Stay in the shade and limit exposure during peak midday UV
  - Hydrate before, during, and after outdoor activities

- Need to happen 100% of the time to be effective

Next Steps

- Publishing
- Piloting
- Evaluation/Refinement



Would you be interested in helping us pilot this guidance document?

- Benefits of piloting
  - Help make the document more useable by schools
  - Increased ability to respond to dangerous heat


Discussion

Acknowledgments

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  - Jennifer Vanos
  - Adora Shortridge

Contact Us

- Carmen Tirdea, MPH (carmen.tirdea@azdhs.gov)
- Matthew, Roach, MPH (matthew.roach@azdhs.gov)