Schools, Climate, and Health

RESPONDING TO EXTREME HEAT

NETWORK FOR RESILIENT PK-12 SCHOOLS IN EXTREME CLIMATES AND APA'S DIVISION 34: SOCIETY FOR ENVIRONMENTAL, POPULATION AND CONSERVATION PSYCHOLOGY



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Introduction

Extreme heat is a growing, daily threat to the health of children and adolescents, adversely impacting their health, development, and ability to learn. Defined as excessive heat and humidity relative to local norms (U.S. Environmental Protection Agency, 2016), extreme heat is increasing in frequency, duration, and intensity across the United States. Children and adolescents are uniquely vulnerable: their bodies regulate heat differently, their brains are still developing, and they depend on adults and institutions to shape the conditions in which they live and learn. As temperatures rise, students of all ages experience real and measurable effects on physical health, mental health, cognition, behavior, learning, socialization, and educational engagement; effects that compound existing inequities and disproportionately burden children from families with the fewest resources.

Schools are a central context in this crisis. Children spend a substantial portion of their waking hours in school buildings, often during the hottest parts of the day and year. Extreme heat is not a seasonal inconvenience, but a persistent instructional and health challenge. When school environments are unable to protect students and educators from extreme heat, the result is not only lost instructional time, but preventable harm to both children and educators' well-being.

This report synthesizes the evidence on how extreme heat affects children, adolescents, and the adults who instruct and care for them — and situates those impacts within a systems framework that recognizes variation by age, geography, community context, and historical inequities. Drawing on an ecological perspective (Bronfenbrenner, 1979), it examines how schools, families, communities, and policy systems interact to shape exposure, vulnerability, and capacity to respond. Based on the available evidence, the report offers recommendations for comprehensive heat planning in schools, addressing physical health, mental health, and learning to ensure that educational environments support children's safety, development, and ability to thrive in a warming world.

It should be noted that the recommendations in this report are directly applicable to K-12 contexts and pre-kindergarten programs housed in traditional school buildings; pre-K programs operating in other types of facilities (such as places of worship or community centers) may face distinct conditions that warrant adapted implementation or dedicated guidance. Finally, the report uses the terms "educators" and "staff" to refer to all those working in schools.

BACKGROUND

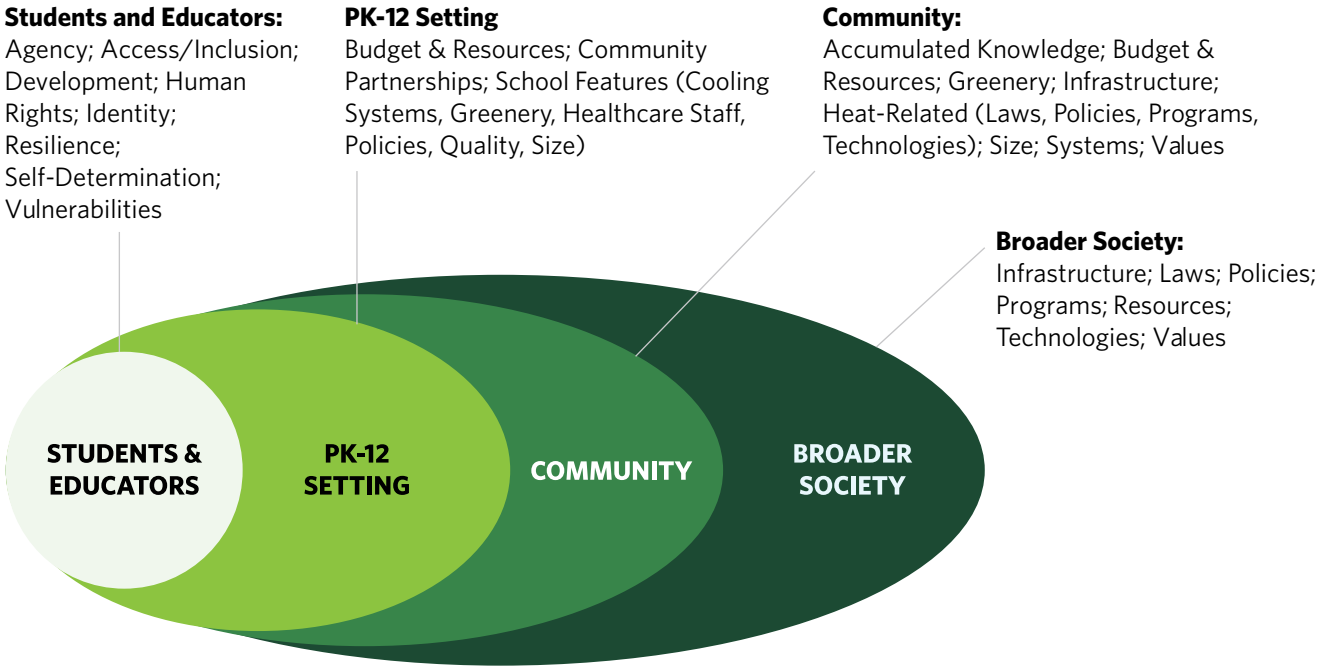
A Systems Perspective

Students and educators are embedded in school settings that differ in budgets, resources, partnerships, and features such as ventilation and cooling systems, building infrastructure (e.g., roof and wall materials), school grounds (e.g., shade structures, percent of impervious surfaces like asphalt, availability of indoor refuge spaces), transportation to and from school, healthcare staffing, policies, and school size, all of which influence exposure and mitigation capacity. Schools also reside within communities that vary in infrastructure, such as local cooling resources, energy grid stability, greenery, heat-related laws, programs, technologies, fiscal resources, and values. These communities, in turn, are shaped by broader societal systems (e.g., legal frameworks, public infrastructure, and funding streams) that can either assist or constrain school responses. Because these nested systems interact dynamically, heat impacts reflect the interplay of local hazards, community assets, and individual characteristics. The broad range of heat's impacts on students, educators, and school volunteers – from physical and mental health risks to cognitive and behavioral disruptions – must be understood in the context of the systems that surround them.

Physical Health Risks

Extreme heat can cause acute symptoms such as dehydration, heat cramps, dizziness, nausea, and skin conditions (e.g., eczema). Physiologically, heat may elevate stress hormones and trigger cascades that disrupt sleep (Kalmbach et al., 2018), increase inflammation (Liu et al., 2017), and impair cardiovascular and immune functioning (Juster et al., 2010). Prolonged exposure to heat also accelerates biological aging (Choi & Ailshire, 2025) and can greatly reduce opportunities for physical activity.

The severity of physical health risks depends on hazard level, exposure, and individual vulnerability (Smith et al., 2022; Turner & Zhou, 2023). Urban schools face higher risks due to heat islands (i.e., tendency for cities to experience higher temperatures than rural areas; Oke, 1982; Imran et al., 2021) and historically cooler regions are becoming increasingly vulnerable without adaptation systems. Built environments also appear to matter: schools lacking adequate ventilation, cooling, and shade tend to have increased absenteeism and poorer student learning outcomes (Grassie et al., 2025; Simons et al., 2010). Under-resourced communities face disproportionately higher risks when cooling infrastructure is insufficient (Romitti et al., 2022). Even in relatively protected environments, heat exposure can escalate quickly, especially between 10 a.m.



and 4 p.m. and during physically demanding activities such as physical education and sports. Importantly, these risks extend more broadly to all school operations, including facilities maintenance, food service, and student transit or crossing zones. Some of these risks, like regional climate, are beyond schools' control. However, other risks can be mitigated with resources and policy (e.g., building infrastructure, activity adjustments, etc.), which we seek to address in the Recommendations section of this report.

Individual vulnerabilities also matter. Younger children are particularly at risk because their physiological response to heat is less effective than that of adults and, therefore, their bodies acclimate to heat more slowly and are less efficient at managing thermal stress (Smith, 2019), and this may be made worse by their limited ability to recognize the need to rehydrate or reduce exertion (Azan et al., 2025). Students and educators with chronic illnesses may be disproportionately affected as heat can exacerbate underlying conditions, like asthma, diabetes, heart disease, and autoimmune or neurological conditions (e.g., postural orthostatic tachycardia syndrome [POTS], multiple sclerosis). Those with increased vulnerability also include pregnant educators and staff. Biological sensitivity to context might explain why some individuals show pronounced reactivity to environmental stressors such as heat (Boyce & Ellis, 2005; Ellis et al., 2017). Without adaptation, rising temperatures will continue to amplify health risks in PK–12 settings (Schapiro et al., 2024). Individual action alone is not enough to mitigate these risks, regardless of individual vulnerabilities. Even the most hydrated and healthy individuals are at risk under extreme heat, both physically and psychologically.

Brain and Psychological Impacts

Children's developing brains demand significant energy for emotion regulation and self-control, making them especially sensitive to thermal stress. Studies with humans and animal models indicate that excessive heat strains cognitive and physiological resources, upregulates cortisol, and shifts brain–body feedback loops that govern arousal and calm (Adalat et al., 2024; Jasnic et al., 2013). These changes can increase negative emotions and reduce the capacity to manage them, while also affecting brain regions involved in self-control, decision making, and attention (Sun et al., 2013; Yu et al., 2025). Specifically, extreme heat exposure disrupts functional connectivity (synchronized brain activity) across brain regions associated with self-awareness, attention, emotion regulation, and memory (Granés et al., 2025).

Critical developmental periods amplify these risks. Early childhood and adolescence are characterized by multiple and rapid neurodevelopmental changes (Guyer et al., 2018; Gogtay et al., 2004) and heat-related illness and stress can interfere with processes such as synaptic pruning, myelination, and the maturation of executive functions, partly through heat-induced elevations in cortisol that disrupt HPA axis regulation during sensitive neurodevelopmental windows (Lupien et al., 2009). Disruptions during these sensitive periods may have lasting consequences for emotion regulation, impulse control, and cognitive flexibility, increasing vulnerability to behavioral dysregulation and mental health challenges later in life (Cuartas et al., 2024).

Further, while limited, there is emerging evidence that the *frequency*, *intensity* and *duration* (FID) of extreme heat exposure are important factors with regard to understanding the adverse impacts of extreme heat exposure on children's brains. A 2025 study in six developing countries found that 3-4 year-old children exposed to average maximum monthly temperatures above 89.6 F degrees were more likely to experience impacts on their numeracy and literacy skills compared to same-age children exposed to cooler averages (Cuartas et al., 2025). Another 2025 study using data from the U.S.-based Adolescent Brain Cognitive Development (ABCD) longitudinal study of children who were enrolled at 9-10 years old found significant negative impacts on cognitive functioning on those youth exposed to heat waves, as measured by a cognitive battery including assessments on reading, vocabulary, and pattern recognition skills (Assari & Zare, 2025). Both of these studies also found that extreme heat exposure exerted a disproportionate cognitive impact on children from economically disadvantaged families (Assari & Zare, 2025; Cuartas et al., 2025), and the U.S. study found a disproportionate impact among families from under-represented groups (Assari & Zare, 2025).

Economic resources play a critical role in moderating these outcomes. Families and caregivers with limited financial means often lack access to air conditioning, safe cooling spaces, or flexible schedules that allow children to avoid peak heat exposure at home. These constraints increase the likelihood of prolonged heat stress and heat-related illness, which can disrupt learning and school attendance (Hernández & Siegel, 2019; Uejio et al., 2011).

Mental health effects of excessive heat are evident across age groups. Among adults, extreme heat is associated with increased emergency department (ED) visits for mental health concerns (Nori-Sarma et al., 2022). Parallel patterns emerge for children and adolescents: extreme heat is linked linked to increases in ED visits for mood disorders, self-harm, and suicidality (C. Dey et al., 2025; Sewell et al., 2024), as well as anxiety and exacerbations of bipolar and psychotic disorders (Niu et al., 2023). These impacts are not evenly distributed. Young children, low-income families, and communities of color face greater burdens due to structural inequities, including the legacy of redlining and systemic racism, that heighten exposure and limit access to mitigation resources (Clark et al., 2024; Hoffman et al., 2020).

Cognitive, Socio-Emotional, and Behavioral Effects

Beyond physical and mental health risks, extreme heat threatens students' ability to learn. Evidence from laboratory and

field studies shows that optimal classroom temperatures fall between 68 – 73.4 °F (20–23 °C), and deviations above this range reduce both speed and accuracy in cognitive tasks (Wargocki et al., 2019). Field studies confirm these patterns: in a study of 3,109 fifth graders across 140 classrooms, each 1 °C decrease (within ~20–25 °C) predicted higher math, reading, and science scores, with better ventilation independently boosting performance (Haverinen-Shaughnessy et al., 2011; Haverinen-Shaughnessy & Shaughnessy, 2015). Large-scale analyses of standardized testing reinforce these findings. U.S. data from repeated PSAT administrations revealed significant score reductions on hotter days, with air conditioning mitigating these losses (Park et al., 2020). Yet inequities persist: schools serving low-income and marginalized students often lack effective cooling infrastructure (Vasilakopoulou & Santamouris, 2025).

Schools are also primary contexts for developing communication and interpersonal skills, yet extreme heat disrupts these processes (Ahdoot et al., 2024). Research examining the impact of extreme heat has identified significant effects on children's development, attributed to restricted access to beneficial behaviors like outdoor play and socialization (Azan et al., 2025). When high temperatures limit outdoor play, children lose vital opportunities for social bonding, conflict resolution, and prosocial skill-building (Koepp et al., 2023; Beaulieu et al., 2024). This effect is likely more pronounced for students who live in crowded housing or have neighborhood safety concerns, further restricting opportunities for outdoor play and social engagement.

In addition to the cognitive and developmental impacts of extreme heat, it is also crucial to examine how extreme heat influences behavioral functioning. Rising average temperatures have been associated with aggressive behavior in adolescents (Younan et al., 2018) and absenteeism (Conte Keivabu, 2024). Beyond immediate conduct, children also report elevated distress regarding climate events (e.g., worry, helplessness, despair) that can reduce motivation and erode resilience (Léger-Goodes et al., 2022). Taken together, the impacts of extreme heat on behavior, cognition, and socio-emotional development represent a critical risk for students' ability to gain necessary skills for the future.

IMPACTS ON EDUCATORS

The impact of extreme heat extends beyond students. The adults charged with instructing, guiding, and shaping students' development are also affected, compromising their ability to provide high-quality education. Educators' well-being and effectiveness decline under heat stress. Symptoms include fatigue, headaches, dizziness, and exhaustion (Malmquist et al., 2021). Physiologically, prolonged – both during a single day and recurring daily – exposure that continues for an extended duration, especially longer than the body is accustomed or adapted to tolerate, increases cardiovascular strain and dehydration (Ebi et al., 2021). Heat stress also affects emotion regulation, increasing irritability and anxiety (Meidenbauer et al., 2024). Over time, uncomfortable conditions could contribute to emotional exhaustion, reduced efficacy, and burnout, potentially leading to attrition. Because educators are key connectors with families, heat-related reductions in well-being can also dampen home–school collaboration, affecting yet another critical system in children's lives.

IMPACTS ON PARENTS AND CAREGIVERS

For parents and caregivers, hot days disrupt routines, strain relationships, and pose mental and physical health risks, with disproportionate burdens where social and economic inequalities restrict access to cooling. Higher temperatures are associated with increased interpersonal conflict (A. Dey et al., 2025), which can spill over into parenting. Sleep disruption is another pathway: hot nights impair restorative sleep for both caregivers and children, fueling mood problems and emotion regulation difficulties (Lechat et al., 2025; Tomaso et al., 2021; Palmer et al., 2024). Families experiencing energy insecurity or crowded housing may have even fewer options for cooling (Jessel et al., 2019), potentially increasing caregiver stress.



Recommendations

Based on the preceding review of the literature, the following recommendations are intended to provide general, evidence-based guidance grounded in scientific evidence. The Network for Resilient PK-12 Schools in Extreme Climates recognizes that each school community is unique, shaped by its students, staff, families, available resources, geographic location, and broader social, cultural, and policy contexts. Access to implementation support and services (e.g., builders, developers, mental health providers) may also vary widely across regions and communities.

Implementing these strategies requires upfront investment in cooling infrastructure, green schoolyards, health monitoring systems (e.g., indoor air quality (IAQ) monitors, mechanisms to track heat-stress), family and caregiver engagement, and more. However, research demonstrates measurable returns through reduced energy costs, protected attendance-based funding, fewer emergency expenditures, and improved student outcomes (Ranđelović et al., 2024; Elkhapery et al., 2021; Le et al., 2021). We recognize that resource availability varies widely across communities and encourage school leaders to adapt these recommendations to their specific context and capacity.

These recommendations are not intended as a one-size-fits-all approach, but as a flexible set of evidence-based options that can be tailored to build on community strengths, address local needs, and advance equitable outcomes for students and school communities.

DESIGNATE DISTRICT-LEVEL HEAT LEADERSHIP AND ACCOUNTABILITY STRUCTURES

Without clear leadership and accountability structures, heat mitigation relies on informal authority, which may delay critical protections for student and staff health and well-being. As an example, the Arizona Department of Health Services (2021) recommended that, at a minimum, districts should identify:

- Who makes and communicates decisions about modifications to in-school student activities, curricula, etc.
- Who makes and communicates decisions regarding before- and after-school activities, including athletics, transportation, and all other extracurricular activities
- Who coordinates heat education initiatives for families, educators, athletic staff, etc.
- Who is responsible for overseeing first-aid in the event of a heat-related illness
- Alternate decision-makers in each area to ensure continuity of protections, particularly outside of school hours

Decision-making responsibilities can be incorporated into existing roles rather than hiring new staff.

DEVELOP AND IMPLEMENT HEAT THRESHOLDS AND MONITORING PROCEDURES, INTEGRATED INTO EMERGENCY AND SAFETY PLANNING

Clear, objective heat thresholds remove ambiguity and prevent dangerous exposure before symptoms escalate. Many states and districts lack formal standards, leaving school districts responsible for ensuring safe working conditions without guidance. Building heat thresholds and monitoring procedures into emergency planning is crucial for enabling timely responses and modifications.

Maryland and Oregon's recent state Occupational Safety and Health (OSHA) standards, requiring action at 80°F indoors, illustrate how thresholds can be operationalized (Maryland Department of Labor, 2024; Oregon Occupational Safety and Health Division, 2023). Districts and states can pair National Weather Service HeatRisk forecasts (National Weather Service, n.d.) with on-site Wet Bulb Globe Temperature (WBGT) monitoring to assess actual heat stress, particularly indoors where humidity and limited airflow may amplify risk. WBGT is particularly critical for assessing heat stress, as it incorporates temperature, humidity, sunlight, and air movement (Occupational Safety and Health Administration, n.d.-a). When combined with clear communication and identified backup learning or cooling spaces, threshold-based policies protect health while minimizing disruption and inequitable decision-making.

PRIORITIZE MITIGATION IN THE MOST IMPACTED AREAS

The negative effects of extreme heat on health are well-documented, both for children and the adults who care for them (Schapiro et al., 2024; Ebi et al., 2021). While many districts recognize individual heat mitigation strategies, extreme heat increasingly requires intentional sequencing of investments and modifications across the school system. When resources are limited, district actions should prioritize meaningful risk reduction in the locations where heat causes the greatest harm.

To move beyond obvious interventions, districts should identify where, when, and for whom heat exposure is most dangerous and prioritize those conditions for early action. Priority areas include classrooms with afternoon sun exposure, schoolyards used for athletics or summer programming, arrival and dismissal zones, buses, and spaces serving students with disabilities. Temperature mapping, school health office data, and staff input can guide low-cost, high-impact decisions. There is a wealth of design choices available to mitigate



extreme heat, for both indoor and outdoor spaces. Outdoor modifications can include schoolyard greening/forests, misting stations, and heat-resilient play structures, while indoor modifications can include indoor green spaces, passive solar design with interior and exterior shading and overhangs, thermal mass, and mechanical ventilation. Importantly, such modifications can serve not just as heat mitigators, but as educational opportunities. For example, school green programs have been linked to improved academic outcomes (Vakalis et al., 2021). Design initiatives can be facilitated through community partnerships (e.g., city and county parks departments, local landscaping companies) to reduce heat exposure more quickly, build public trust, and strengthen the case for future funding (Chiesa & Danks, 2023).

REDUCE STUDENT AND EDUCATOR HEAT EXPOSURE ACROSS CLASSROOMS, TRANSPORTATION, AND SCHOOL ACTIVITIES USING SYSTEM-LEVEL PROTECTIONS

Schools should organize heat mitigation using the National Institute for Occupational Safety and Health (NIOSH) Hierarchy of Controls, which prioritizes system-level changes over individual coping (Centers for Disease Control and Prevention, 2024) and has been adapted for school heat planning (Arizona Department of Health Services, 2021). Engineering controls (e.g., redesigning school grounds to replace asphalt with green schoolyards, air conditioning, ventilation, fans, heat exhaust fans, separate areas for workers to cool down) isolate the hazard. Administrative controls (e.g., relocating activities to cooled environments, acclimatization, emergency response and planning, rest breaks, heat monitoring) change the way work is done. Depending on the working conditions, more corrective actions may be required if specific control measures are not already in place. The goal is to use a combination of all types of controls to mitigate the hazard. For example, a combination of schoolyard greening and heat monitoring would allow districts to preserve the developmental and health benefits of outdoor learning and recess (Hodges et al., 2022) whenever conditions remain safe.

On the most high-heat days, risk can be reduced through environmental modification and administrative controls rather than cancellation. Increasing shade and airflow (e.g., temporary structures in the most exposed walkways), expanding access to potable water, misting stations, scheduling activities in naturally cooler spaces or times of day, and enabling acclimatization periods all reduce heat absorption and exposure duration. Modifications should be carefully designed to ensure physical accessibility and sensory inclusiveness, so that all students and staff can benefit (e.g., temporary structures that do not block pathways for those using mobility devices or aids, avoiding overcrowding and high noise levels in cooling areas). Individual actions, such as wearing light clothing or sunscreen, should be supported but clearly identified as the last layer of protection. This hierarchy-based approach prevents undue reliance on individual vigilance and more effectively reduces heat-related illness and fatigue among both students and educators.



ENSURE AUTOMATIC PROTECTION FOR STUDENTS AND STAFF WHO ARE MORE VULNERABLE TO EXTREME HEAT

Extreme heat poses disproportionate risk to individuals with disabilities, chronic medical conditions, or medications that impair thermoregulation or contribute to dehydration (National Integrated Heat Health Information System, n.d.). Many serious heat-related incidents occur not because protective measures are unavailable, but because individuals must self-identify, self-advocate, or wait for discretionary decisions while already experiencing physiological stress. To reduce preventable harm, districts should plan to preauthorize automatic heat protections for vulnerable individuals that activate when temperature thresholds are reached. For example, students with asthma may need morning reminders to keep their inhaler handy. Using an access-and-functional-needs approach, which has been implemented in existing disaster planning guidance (e.g., Federal Emergency Management Agency, 2010; Ringel et al., 2011), schools can document heat-related accommodations (e.g., priority access to cooled spaces, modified schedules or duties, remote options) in IEPs, 504 plans, and staff health forms without requiring diagnostic disclosure. Asking heat-related (but not diagnosis-related) questions on emergency information or health forms (e.g., does the student have difficulty sensing when they are overheated, does the student use an inhaler) can help schools gather information on vulnerabilities while protecting privacy.

Once heat thresholds are met, the identified protections should activate system-wide, eliminating delays and reducing inequities created by inconsistent implementation. This approach treats heat vulnerability as a systems-level safety issue, rather than an individual burden.

IMPLEMENT DEVELOPMENTALLY AND PHYSIOLOGICALLY INFORMED PROTOCOLS FOR MONITORING SYMPTOMS AND MANAGING HEAT-RELATED HEALTH RISKS

Extreme heat has uneven physiological effects that require proactive monitoring rather than relying on students and educators to self-report symptoms. Younger children have immature thermoregulation and limited capacity to recognize or communicate early symptoms, pregnant staff and older adults face heightened risk, and individuals with conditions such as asthma, multiple sclerosis, or who take medications affecting hydration may deteriorate rapidly (Azan et al., 2025; Tsuzuki, 2023; Baharav et al., 2023; Xu et al., 2025; World Health Organization, 2024; National Integrated Heat Health Information System, n.d.). Schools should therefore treat heat as a health stressor, embedding adult-led, developmentally calibrated symptom monitoring into daily routines during elevated heat.

Monitoring should focus on observable indicators such as unusual fatigue, dizziness, flushed skin, behavioral changes, or altered attention, with clear criteria for removing students or staff from exposure to a cooler location, and initiating active cooling first-aid principles (e.g. applying cold towels, using fans to circulate air, removing outer layers of clothing, etc.; Occupational Safety and Health Administration, n.d.-b). For individuals with known vulnerabilities, heat considerations should be explicitly operationalized within existing health and education plans, including guaranteed access to medication and clear response pathways. To maintain instructional continuity, schools should also anticipate staffing shortages for vulnerable individuals, including school personnel as well as external personnel and volunteers responsible for extra-curricular programming. Proactive monitoring reduces preventable emergencies while supporting stable learning environments.

REDUCE EDUCATOR HEAT EXPOSURE THROUGH ADDITIONAL PROTECTIONS

Educators experience heat exposure as an occupational health risk shaped by supervision demands, fixed schedules, and limited autonomy. Heat safety guidance emphasizes water, rest, and access to cooled recovery spaces, yet many educators report avoiding hydration because of unreliable bathroom or lunch access. Survey data indicate that these practices contribute to dehydration and bladder-related medical issues, increasing vulnerability during extreme heat (Flannery, 2024). Schools should therefore treat guaranteed bathroom access, duty-free lunch periods, and scheduled rest breaks in air-conditioned spaces as core heat-protection measures rather than discretionary benefits. These protections are critical for educators, including those whose work involves recess, physical education, arrival and dismissal, transportation, and campus supervision, and they should work collaboratively with their educators' unions to ensure they are in place. Whether through collective bargaining or other labor-management engagement, school districts must ensure that needed support for educators is in place. Ensuring

recoverability for educators reduces medical risk, protects instructional quality, and enhances overall school safety during heat events.

IMPLEMENT HEAT-SPECIFIC POLICIES FOR ATHLETICS, EXTRACURRICULARS, AFTER-SCHOOL PROGRAMS, AND TRANSPORTATION

The effects of extreme heat certainly do not begin and end with the school day. Students can be affected by heat on their bus ride home, at sports practices, or during after-school care. Heat threshold policies should extend to before- and after-school programs, with a designated decision-maker available during these hours.

Per the National Athletic Trainers' Association (Casa et al., 2015), key protections for student athletes include:

- 7-14 day acclimatization periods to practicing in the heat
- Access to fluids during and outside of breaks
- Preventing students with viral infections, fevers, and skin rashes from participating until they are recovered
- Onsite equipment for heat-illness treatment (e.g., ice towels, ice baths)
- Training on heat-illness symptoms for coaches, trainers, etc.

Importantly, the protections outlined for student athletes are applicable to any outdoor extracurricular activity, like green clubs or scouting clubs, and apply to the adults who oversee them. All adults responsible for overseeing these activities should, at a minimum, be trained in recognizing heat illness symptoms and providing first aid.

Finally, extreme heat poses critical risks for both students and bus drivers. While some mitigation strategies like shortening bus routes, shaded parking, or tinting windows can provide immediate relief, sustained advocacy efforts are needed to revamp the school bus fleet. Districts can support these efforts by implementing data collection efforts to quantify and aggregate internal school bus temperatures in their advocacy for improvements.

ENSURE CONTINUITY OF LEARNING AND INDOOR ENVIRONMENTAL QUALITY DURING EXTREME HEAT

When outdoor heat limits normal routines, developmental and cognitive disruptions can be significant, particularly for younger students who rely on movement, play, and social interaction for regulation and learning. At the same time, remaining indoors does not guarantee safety if indoor air quality deteriorates due to heat, humidity, or HVAC system strain. Schools should maintain building-specific Indoor Air Quality (IAQ) management programs, using established frameworks like the U.S. Environmental Protection Agency's Framework for Effective School IAQ Management (U.S. Environmental Protection Agency, 2025) to guide monitoring and response. Continuous IAQ tracking allows facilities teams to adjust systems in real time or relocate occupants to safer spaces when conditions degrade. In parallel, districts should plan for developmentally appropriate continuity of physical and creative activities through indoor movement, creative group work, rescheduling outdoor time during cooler hours, and adapted lessons. This integrated approach preserves learning and well-being while avoiding compounding health risks.

TREAT HEAT LIKE A "SNOW DAY FOR COGNITION"

High temperatures measurably impair cognitive functioning, including memory, attention, and decision-making capabilities (Wargocki et al., 2019; Mazloumi et al., 2014), undermining both teaching and learning. Continuing typical instructional expectations during extreme heat places unrealistic expectations on students and educators, potentially exacerbating heat-related frustration, behavioral incidents, and inequitable academic outcomes. Districts should therefore formalize heat-responsive instruction plans, similar to snow-day protocols or high-stakes testing calendars. This does not necessarily require closure or virtual learning, but rather a planned reduction in cognitive demands when heat thresholds are reached, with assessments postponed and instructional load adjusted. These plans specify in advance when assessments are postponed, instructional load is reduced, and cognitively demanding tasks shift to cooler hours or lower-demand formats once heat thresholds are reached.

Policymakers should also factor into their planning the impact of excessive heat on testing, given that the results of these assessments are used for federal compliance and to make high-stakes policy and funding decisions about students, educators, and schools. State education agencies should incorporate heat-related assessment procedures (such as adjusting testing hours, providing for rescheduling and/or relocation of assessments, etc.) into assessment manuals for districts to limit inaccurate results from conducting high-stakes assessments in extreme heat environments. Operationalizing processes for treating extreme heat as a predictable constraint on the ability of policymakers and the public to rely on assessment results can minimize harm, reduce ad-hoc decision-making, ensure consistency across schools, and align academic expectations with student and staff capacity, protecting learning quality while minimizing avoidable harm.

ADOPT HEAT-RESPONSIVE EMOTION-REGULATION AND TRAINING

High temperatures are associated with poor student behavior, potentially increasing frustration and conflict among students and staff. Without intentional safeguards, heat can

erode classroom climate and increase reliance on punitive discipline at precisely the moment when patience and judgment are most taxed, especially for younger students and those with existing regulation challenges.

For districts, building a shared understanding of heat's cognitive and behavioral effects among educators will support more appropriate instructional, disciplinary, and health responses, protecting both student and educator well-being. Professional development opportunities should integrate:

- Introductory content on heat science, and its effects on student development, cognition, and behavior.
- Guidance on heat-aware decision making, including symptom monitoring, curriculum modifications, and heat-aware disciplinary policies that prioritize de-escalation and restorative approaches.
- Emotion-regulation training for educators themselves, emphasizing brief, evidence-informed practices such as mindfulness, breathing, and cognitive reappraisal that can be embedded into daily routines (Doyle et al., 2024).
- Emotion-focused curricula for students, helping learners identify and process emotions using age-appropriate tools and language, while fostering agency and hope through reflective and service-oriented activities (Clayton et al., 2023).

ESTABLISH HEAT-RESPONSIVE MENTAL HEALTH AND STAFF PREPAREDNESS PLANS

Extreme heat places sustained strain on mental health, as demonstrated by significant increases in mental-health related emergency department visits during heatwaves (Nori-Sarma et al., 2022; Niu et al., 2023). Although heat events may not cause the immediate destruction associated with other disasters, their persistence and recurrence make them a significant mental-health risk for school communities, particularly when layered on existing stressors.

Mental health responses should be integrated into emergency planning, with heat-specific considerations modeled on plans used after other events — for example, through a multi-tiered system of support approach (Center on Positive Behavioral Interventions and Supports et al., 2022). Strategies may include increased counselor presence during extreme heat or pre-established partnerships with local providers or universities to deliver psychological first aid. Districts may also explore teletherapy partnerships to maintain continuity of care during heat-related closures when feasible, a strategy that was used successfully in Pasadena Unified School District after the 2025 wildfires (Pasadena Now, 2026). Additionally, training all staff to recognize altered mental states that signal distress or illness ensures timely referral and response. Proactive planning reduces crisis escalation and supports resilience among both students and educators.

COORDINATE HEAT RESPONSE WITH FAMILIES AND CAREGIVERS TO REDUCE DOWNSTREAM RISK

Extreme heat affects students beyond the school day, affecting their caregivers' well-being and potentially causing disruptions in day-to-day routines. Heat-related closures are harder to predict than events like snowstorms and disproportionately burden under-resourced families managing work, childcare, and cooling access simultaneously. Traditional emergency protocols are insufficient for these conditions.

Districts should implement heat-specific family and caregiver communication and support plans that provide early notice, clear explanations, and actionable guidance that is accessible to all families being served in that district. Translated communications, interpretation services, and culturally responsive outreach can help ensure that all families and caregivers can understand and act on the information provided. These measures are also an opportunity to utilize family and caregiver engagement practices for increased connection, community and transparency. Plans might include changes to schedules, early dismissals, canceled after-school activities, and updated school transport arrangements. Caregiver education on heat-related emotion dysregulation can help adults support children, and themselves, more effectively during prolonged heat. Schools should also connect families to practical supports, such as cooling-equipment grants, staffed assistance with applications, and neighborhood-based mutual aid.

CONDUCT HEAT EQUITY AUDITS SUPPORTED BY ONGOING MONITORING AND CONTINUOUS IMPROVEMENT

Heat risk is unevenly distributed across school systems. Most buildings lack adequate cooling and ventilation (Fisk, 2017), while campuses in historically disinvested neighborhoods





typically have less tree canopy and more heat-absorbing surfaces (Chiesa & Danks, 2023). Students with disabilities, chronic health conditions, or limited access to cooling at home may rely on schools as their primary refuge during extreme heat. Without a structured assessment, districts risk directing limited resources toward the most visible projects rather than the most urgent needs.

Districts should conduct systematic equity audits that examine both heat vulnerability and adaptive capacity across facilities, student populations, staffing, and neighborhoods. These audits should combine building assessments with geospatial tools (e.g., heat-island mapping, Social Vulnerability Index, EJScreen, National Risk Index) and should be validated through community engagement to capture micro-conditions that data alone may miss. In addition, districts should develop plans for continuous monitoring and improvement rather than rely on one-time audits. Audit findings must function as decision-making tools, directly informing capital planning, bond proposals, and operational priorities. When districts transparently show how investments are sequenced based on need, they build public trust and ensure that schools serving students with the greatest heat-related risks are protected first.

IMPLEMENT HEAT-AWARE FUNDING AND STAFFING POLICIES TO PREVENT COMPOUNDING INEQUITIES

Extreme heat is associated with absences (Simons et al., 2010), yet most funding and accountability systems treat attendance losses as fully controllable. When funding is tied to daily attendance, heat-related absences can trigger immediate fiscal penalties, disproportionately affecting schools serving students with limited home cooling or chronic health needs. Such policies risk punishing schools for protecting health and deepening inequities in already vulnerable communities.

District and state leaders should adopt heat-aware funding policies that distinguish heat-related absences from avoidable truancy. Existing tools, such as HeatRisk forecasts (National Weather Service, n.d.), can identify extreme heat periods eligible for protected attendance accounting. At the same time, districts must advocate for adequate staffing as a foundational heat-resilience strategy. Understaffed schools cannot rotate heat-exposed duties, provide breaks, or adjust schedules safely. Investments in substitute pools, paraprofessional support, transportation staffing, and flexible workload redistribution protect educators, reduce burnout, and stabilize learning systems under heat stress.

Conclusion

Extreme heat is no longer a distant or seasonal concern. It is a daily, compounding stressor that shapes the conditions under which children grow, learn, and develop. As this report demonstrates, its effects ripple across physical and mental health, brain development, well-being, behavior, and educational outcomes, placing sustained strain on the adults and systems that support children. These impacts are not evenly distributed; they amplify existing inequities and disproportionately affect those with the fewest resources and the greatest vulnerabilities. Yet within this challenge lies a critical opportunity. Schools, where children spend so much of their time, can become places of protection, stability, and adaptation. By recognizing extreme heat as a predictable, systemic risk and embedding coordinated, equity-centered responses into infrastructure, policy, and practice, school systems can reduce harm, protect learning, and promote resilience. The choices made now will determine whether rising temperatures erode educational opportunity or catalyze a transformation toward safer, healthier, and more adaptive learning environments for all students.

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About the Network for Resilient PK-12 Schools in Extreme Climates

Consisting of national organizations across health, education, design, and sustainability, the Network was developed to mobilize the collective expertise of these organizations to improve resiliency and well-being in PK-12 schools in the face of extreme weather events.



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