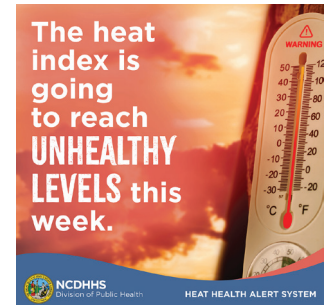


NCDHHS 2025 HEAT HEALTH ALERT SYSTEM EVALUATION SUMMARY REPORT

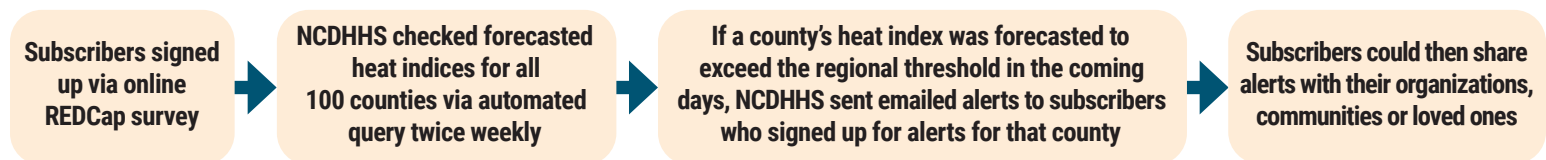
BACKGROUND

The NCDHHS Climate and Health Program operates a Heat Health Alert System (HHAS) each year from May 1- September 30 to provide advance notice when local heat indices are forecast to reach unhealthy levels. We began piloting this system in 2018 in a subset of counties in eastern North Carolina with support of partners from local health departments, emergency management, and community-based organizations. We expanded the system statewide to all 100 counties in 2024 by adopting new regional health-based heat index thresholds and opening registration to anyone who wanted to receive emailed alerts. Users signed up for alerts via an online survey and were assigned to one or more regional listservs based on the county/counties for which they registered. When the heat index was forecasted to exceed the threshold in a region, we sent emailed heat alerts to users who signed up for that region.



In 2025, we adopted new regional groupings of counties (see Figure 1) to more accurately group counties according to similar weather patterns and incorporated season-specific heat health thresholds (see Table 1) for the early, mid, and late summer season to better account for acclimatization throughout the summer. We also conducted outreach and worked with partners to increase awareness and participation in the alert system. We conducted a process evaluation of the statewide HHAS using data collected at point of registration, internal tracking data and historical forecast data. Results of this evaluation are presented here.

2025 HHAS Process



EVALUATION PURPOSE AND METHODS

The purpose of the evaluation was to:



Evaluation focus	We wanted to know...
Threshold Comparison	How often were the 2025 heat index thresholds exceeded during each part of the heat season (early, middle, late) from May 1, 2025-September 30, 2025, compared to how often the static 2024 heat index thresholds would have been exceeded?
Alert Distribution	Did we send out alerts when the threshold was exceeded? What proportion of days during the heat season when threshold(s) were exceeded did we succeed in sending out alerts? We defined a success as sending alerts to at least 95% of counties that exceeded their threshold on that day.
Alert Accuracy	How often did alerts sent out ≥3 in advance, as compared to 0-2 days in advance, align with the actual observed heat index for those days?
Heat Alert System Subscribers	How many subscribers were there at the end of the 2024 heat season (October 1, 2024) compared to the end of 2025 heat season (October 1, 2025)?
	Which populations did our heat alerts reach, and did they reach populations disproportionately impacted by extreme heat (e.g., older adults, children, those who do not have A/C, outdoor workers, etc.)?
	Across which of our 8 regions did our alerts reach? What is the distribution of subscribers across the 8 regions?
	Which sectors/organizations did our alerts reach?
	For what purposes are the heat alerts used?

RESULTS

THRESHOLD COMPARISON

During the 2025 heat season...

- **Early season (5/1/25 - 6/21/25)** – Using the 2025 thresholds, thresholds were exceeded 382 times during the early season, compared with 86 times had the 2024 thresholds been used – a difference of 296 additional threshold exceedances (**Table 2**).
- **Mid-season (6/22/25 - 8/11/25)** – Using the 2025 thresholds, thresholds were exceeded 838 times during the mid-season, compared with 1,192 times had the 2024 thresholds been used – a difference of 354 fewer threshold exceedances.
- **Late season (8/12/25 - 9/30/25)** – Using the 2025 thresholds, thresholds were exceeded 38 times during the late season, compared with 14 times had the 2024 thresholds been used – a difference of 24 additional threshold exceedances.
- **Total** – During the 2025 heat season, thresholds were exceeded 1,258 times; had we applied the 2024 thresholds to the 2025 heat season, we would have exceeded these thresholds 1,292 times.

ALERT DISTRIBUTION

59 days in the 2025 heat season where the heat index threshold was exceeded out of 152 possible days



1,258 county-level alerts were sent



NCDHHS was 100% successful in sending alerts when thresholds were exceeded

ALERT ACCURACY

- Alerts sent at least three days in advance aligned with the observed heat index on those days 73% of the time
- Alerts sent zero to two days in advance aligned with the observed heat index on those days 76% of the time

HEAT HEALTH ALERT SYSTEM SUBSCRIBERS



Of the 835 subscribers...

- 815 subscribed to English language alerts (**Table 3**)
- 18 subscribed to Spanish language alerts
- 2 subscribed to both English and Spanish language alerts

Demographics of subscribers

- 62.6% of subscribers belonged to a population disproportionately impacted by heat
- Subscribers most reported living in a rural area (22.4%), urban area (17.1%), or were over 65 years of age (12.1%)
- Fewer subscribers were currently experiencing homelessness (0.2%), or indicated English was not their first language (1.0%)

Populations with whom subscribers worked or volunteered

- 60% of subscribers worked with or served 1 or more disproportionately impacted populations
- Subscribers worked the most with racial or ethnic minorities (34.6%), older adults (33.4%) or youth aged 5-18 (33.9%)
- Subscribers worked less with urban residents (21.2%) or other outdoor workers (21.2%)

Populations receiving alerts

- 81.9% of subscribers reported:
 - They work with a population disproportionately impacted by heat and planned to share alerts with these populations, and/or
 - They personally belong to a population that is disproportionately impacted by heat

Regions reached

- Alerts reached all 8 regions
- Subscribers most registered for the following regions:
 - Region 2 (North Central) (40.2%)
 - Region 5 (North Coastal Plain) (31.1%)
- Fewer subscribers registered for Region 3 (Northeast) (12.5%)

Sectors/types of organizations reached

- 20 sectors and organization types reached
- Subscribers worked the most for a local health department (25.9%), state government (12.3%), or health care (11.5%)
- Subscribers worked less for tribal government (0.7%) or other tribal serving organizations (0.4%)

Planned use for alerts

- Most subscribers planned to use alerts to protect themselves or immediate family members (66.6%) or share with populations they work with or serve (65.6%)
- Subscribers also planned to use alerts for situational awareness or decision making at their job or volunteer service (60.0%)

KEY TAKEAWAYS

Threshold Comparison: Analysis of historical heat-related illness and climate data showed that lower thresholds were warranted during the early and late parts of the heat season when people's bodies are less acclimated to the heat. Results from this evaluation demonstrate 2025 thresholds were exceeded, and alerts were sent, more frequently during those periods than compared to if we had continued to use the 2024 static thresholds. Adoption of new, season-specific thresholds better addresses the increased risk of heat-related illness in the early and late parts of the heat season. Additionally, use of higher mid-season thresholds resulted in fewer alerts being sent as compared to if we had maintained the 2024 static thresholds, which were lower. This change better accounts for acclimatization to the heat during the middle part of the summer and reduces alert message fatigue.

Alert Distribution: We successfully distributed alerts on all days when heat index thresholds were exceeded. Alerts are warranted when the forecasted heat index is equal to the threshold to account for the risk on those days. In the 2026 heat season, alerts will be triggered to account for days where the maximum heat index equals the threshold.

Alert Accuracy: The HHAS has demonstrated accuracy at identifying threshold-exceeding days several days in advance most of the time. In 2025, alert accuracy was similar when comparing longer-lead to shorter-lead forecasts.

Heat Health Alert System Subscribers: We increased the total number of subscribers between the end of the 2024 and 2025 heat seasons, and we are reaching populations disproportionately impacted by extreme heat through the majority of subscribers' work. While our reach has expanded, we have identified areas for improvement to better target specific heat-vulnerable populations, regions, and sectors.

NEXT STEPS FOR CONTINUED IMPROVEMENT

- Update registration form to more accurately capture how participants intend to use alerts, and which populations are reached.
- Update automated forecast system to trigger alerts when the threshold is met or exceeded.
- Explore ways to increase automation throughout the system and incorporate additional alert dissemination methods, including text messaging.
- Improve and expand alert messaging content for specific populations disproportionately impacted by heat.
- Continue efforts to improve targeted outreach to agricultural and other outdoor workers, non-native English speakers, tribal government and other tribal organizations.
- Northeast NC (Region 3) had the least number of subscribers but the highest rate of heat-related illness according to the 2025 NC Annual Heat-Related Illness Surveillance Report. More work can be done to target this region.
- Expand advertising and outreach activities to spread awareness of the HHAS, and increase the number of subscribers.

NCDHHS is working to implement each of these recommendations to continue to improve our HHAS, with the aim of alerting the public about heat hazards, supporting heat preparedness planning, and helping to reduce heat-related illness across NC.

Acknowledgment

Thank you to the NC State Climate Office, and Duke Nicholas Institute for Energy, Environment and Sustainability's Heat Policy Innovation Hub for their support in developing the 2025 Heat Health Alert System.

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APPENDIX

Figure 1. 2025 Heat Health Alert System Regions

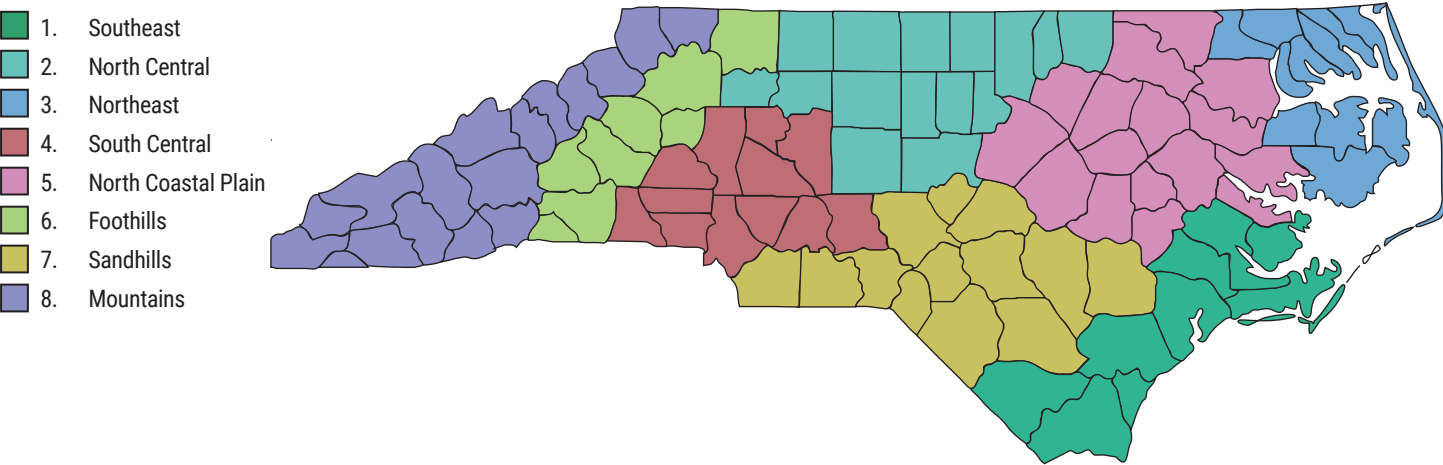


Table 1. 2024 and 2025 HHAS Heat Index Thresholds

2024 HHAS – 7 regions, static thresholds		2025 HHAS – 8 regions, seasonal thresholds			
Region Names	Heat Index Thresholds	Region Names	Heat Index Thresholds		
			Early (5/1/25-6/21/25)	Mid (6/22/25-8/11/25)	Late (8/12/25-9/30/25)
1. Northeastern NC	101°F	1. Southeast	95°F	103°F	100°F
2. Southeastern NC	103°F	2. North Central	94°F	102°F	98°F
3. Fayetteville Area + Montgomery	102°F	3. Northeast	95°F	104°F	101°F
4. RTP Area + Randolph, Guilford, Caswell	100°F	4. South Central	95°F	100°F	98°F
5. Triad Area	99°F	5. North Coastal Plain	98°F	104°F	98°F
6. Western NC	94°F	6. Foothills	92°F	97°F	94°F
7. Charlotte Area + Davidson, Davie	101°F	7. Sandhills	99°F	105°F	101°F
NA	NA	8. Mountains	85°F	94°F	90°F

Table 2. Frequency of 2024 and 2025 Threshold Exceedances From May 1, 2025 – September 30, 2025

2025 Heat Season	2024 Threshold Exceedances*	2025 Threshold Exceedances
Early season (5/1/25-6/21/25)	86	382
Mid-season (6/22/25-8/11/25)	1,192	838
Late season (8/12/25-9/30/25)	14	38
Total	1,292	1,258

* Had 2024 static thresholds been applied to the 2025 heat season

Table 3. Characteristics of HHAS subscribers (n=835)

Characteristics of HHAS Subscribers	N (%)
Survey language participants registered in	
English	815 (97.6%)
Spanish	18 (2.2%)
Both	2 (0.2%)
Regions participants registered for*	
Region 1 (Southeast)	218 (26.1%)
Region 2 (North Central)	336 (40.2%)
Region 3 (Northeast)	104 (12.5%)
Region 4 (South Central)	219 (26.2%)
Region 5 (North Coastal Plain)	260 (31.1%)
Region 6 (Foothills)	127 (15.2%)
Region 7 (Sandhills)	181 (21.7%)
Region 8 (Mountains)	151 (18.1%)
Sectors/organization types participants work for*	
Local Health Department	216 (25.9%)
County government	79 (9.5%)
Emergency Management	52 (6.2%)
Municipal government	30 (3.6%)
Tribal government	6 (0.7%)
Other tribal-serving organization	3 (0.4%)
State government	103 (12.3%)
Federal government	12 (1.4%)
Health care (including clinicians, community health workers, clinic staff)	96 (11.5%)
Faith-based organization	20 (2.4%)
Nonprofit community-based organization	76 (9.1%)
Private for-profit organization	38 (4.6%)
Parks and Recreation or other athletic department	10 (1.2%)
Education (K-12)	55 (6.6%)
Research institution	35 (4.2%)
Other†	35 (4.2%)
None of the above	115 (13.8%)
Populations participants work/volunteer with*	
Any vulnerable population	501 (60.0%)
Mobile home residents	196 (23.5%)
Older adults (65 or older)	279 (33.4%)
Racial or ethnic minorities	289 (34.6%)
People experiencing homelessness	210 (25.1%)
Children under 5 years old	264 (31.6%)
Youth aged 5-18 years	283 (33.9%)
Low-income residents or people who cannot afford their energy bills	242 (29.0%)
People who do not have access to central air conditioning at home	210 (25.1%)
People who do not have access to reliable transportation	241 (28.9%)
People who live alone	207 (24.8%)
Farmworkers or other agricultural workers	197 (23.6%)
Other outdoor workers	177 (21.2%)
Non-native English speakers	206 (24.7%)
Rural residents	247 (29.6%)
Urban residents	177 (21.2%)
Other‡	11 (1.3%)
Participant does not conduct outreach or serve any of these groups	267 (32.0%)

Populations participants belong to *	
Any vulnerable population	523 (62.6%)
I live in a mobile home	48 (5.7%)
I am over 65 years of age	101 (12.1%)
I am a racial or ethnic minority	99 (11.9%)
I am currently experiencing homelessness	2 (0.2%)
I take care of someone under age 5	70 (8.4%)
I or my household members cannot afford our energy bill	22 (2.6%)
I do not have access to reliable transportation	12 (1.4%)
I do not have access to central air conditioning at home	22 (2.6%)
I live alone	86 (10.3%)
I work in agriculture	23 (2.8%)
I work outside	64 (7.7%)
English is not my first language	8 (1.0%)
I live in a rural area	187 (22.4%)
I live in an urban area	143 (17.1%)
None of the above	181 (21.7%)
Prefer not to answer	89 (10.7%)
Planned use for heat alerts*	
Share with populations I work with or serve	548 (65.6%)
Protect myself or my immediate family members	556 (66.6%)
For situational awareness or decision making at my job or volunteer service	501 (60.0%)
Other§	7 (0.8%)
Populations reached	
Works with vulnerable populations and plans to share with them and/or belongs to a vulnerable population	684 (81.9%)

* Percentages don't total to 100% because survey participant could select more than one response

† Other sectors/organization types included Agriculture (n=3), Child Care (n=10), Community member (n=9), Higher education (n=6), Journalism (n=7).

‡ Other populations included People with disabilities (n=4), People with health conditions (n=3), People who are incarcerated (n=1), Outdoor recreation (n=1), Historically underrepresented communities (n=1), Pregnant people (n=1).

§ Other planned uses included Academic/scientific purposes (n=3), Protect my friends and neighbors (n=2), Protect my pets (n=1), Share on social media (n=1).



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