A127 Seasonal and Spatial Variation in Local Weather Station Data From Knoxville, Tennessee

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After attending this presentation, attendees will understand the seasonal and spatial variation in ambient temperatures at the Anthropological Research Facility (ARF) in Knoxville, TN.

This presentation will impact the forensic science community in terms of competency and performance by supporting research that National Weather Service (NWS) weather stations may be an unreliable source of temperature information for use in Postmortem Interval (PMI) estimation.

Estimation of the PMI is crucial to medicolegal death investigation. Some PMI estimation methods rely on the quantification of biological processes driving human decomposition, of which ambient temperature is considered an important factor. Furthermore, anthropological research in human decomposition increasingly utilizes Accumulated Degree Days (ADD) as a way to incorporate ambient temperature into predictive models designed to translate this information into estimates of PMI. An underlying assumption of these models is that the practitioner has access to accurate and reliable temperature data. Dabbs addressed this assumption by examining temperature data from multiple NWS weather stations.[1] She found that differences in recorded temperatures between weather stations translated into potentially meaningful differences in PMI estimation. Additional studies have explored the underlying accuracy and reliability of NWS data through comparisons with localized ambient temperature data loggers.

This study expands upon Dabbs and others by investigating seasonal and spatial variation in temperature data retrieved from NWS weather stations and local data loggers.[1] Specifically, temperature data were collected between 2014-2017 from an NWS weather station located at the University of Tennessee Institute of Agriculture (UTIA), less than 0.5km from the ARF, and were compared to a digital thermometer permanently installed within the ARF. Maximum and minimum temperatures (°C) were compared between both temperature data sources using a Welch's two sample *t*-test in R (version 3.1).[2] Then, daily temperatures were grouped by season (i.e., spring, summer, fall, and winter) and compared between those same two sources. Results were considered statistically significant at the $p < 0.05$ ($\alpha = 0.05$) level.

Overall, the results of this study indicated that maximum and minimum daily temperatures collected across data sources differed by less than one degree. The results of the Welch's two sample *t*-test indicated no statistically significant difference between data sources when all data were pooled. When the data were separated by season, significant differences emerged. Spring (mean ARF 26.6°C, mean UTIA 25.0°C), summer (mean ARF 29.9°C, mean UTIA 31.0°C), and winter (mean ARF 12.9°C, mean UTIA 9.2°C) maximum temperatures were significantly different between sources, as were the minimum temperatures in the summer (mean ARF 20.9°C, mean UTIA 19.7°C). These results clarify earlier studies examining the correspondence between the NWS station data and data collected at specific sites of human decomposition by finding a seasonal link in the variability in temperature data across sources. These results not only have regional implications for decomposition research conducted in East Tennessee, but also have wide-reaching importance for future anthropological and entomological studies of human decomposition. It is strongly recommended that researchers and practitioners independently validate the reliability of their temperature data sources, especially in longitudinal studies encompassing multiple seasons.

Reference(s):

1. Dabbs G.R. Caution! All data are not created equal: The hazards of using National Weather Service data for calculating Accumulated Degree Days. *Forensic Science International.* 202 (2010): e49-52.
2. R Core Team. *R: a language and environment for statistical computing.* R Foundation for Statistical Computing, 2014; http://www.R-project.org.

Time Since Death, Accumulated Degree Days, Human Decomposition

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