A63 Longitudinal Comparison of the Megyesi and Moffatt Total Body Scoring (TBS) Methods for Estimating the Postmortem Interval (PMI)

Derek A. Boyd, MA, University of Tennessee, Knoxville, Knoxville, TN 37996; Kelly Sauerwein, PhD, University of Tennessee, Knoxville, TN 37996; Angela M. Dautartas, PhD, University of Tennessee, Knoxville, TN 37996-1525*

Learning Overview: After attending this presentation, attendees will better understand the limitations of relying on temperature-based predictive models for estimating the PMI.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by highlighting best practices regarding the use of these PMI estimation methods in forensic anthropological research and casework.

Knowledge of the PMI is crucial to medicolegal death investigation, but variation in human decomposition prevents practitioners from producing accurate and informative time-since-death estimates. To address this issue, Megyesi et al. retrospectively developed a regression-based method for predicting the PMI, termed the Total Body Scoring (TBS) method, that quantified the relationship between gross anatomical changes and the amount of accumulated temperature required to produce these changes.[1] Since its initial publication, the TBS method has had variable success estimating the PMI for decedents from a variety of different climates and depositional contexts. Moffatt et al. recently published a modified formula and methodology for PMI estimation, termed the Modified TBS (MTBS) method, that purportedly performs better than the TBS method.[2] The objective of this study was to independently and longitudinally validate the accuracy and precision of the MTBS method using 25 decedents who were received as donors by the University of Tennessee William M. Bass Body Donation Program between March 2014 and April 2017.

Temperature data (°C) were collected from Tinytag® data loggers and TBSs were obtained through daily observations (up to 112 days after placement) performed in person at the Anthropological Research Facility. Some donors (n=10) were scored assigned TBSs by multiple observers. To include these data, the TBSs for each donor were averaged across observers because observer disagreement was negligible (Cronbach α >0.90). All TBSs were input into the Megyesi et al. equation to produce daily Accumulated Degree Day (ADD) point estimates and associated 95% prediction intervals for each donor.[1] To facilitate validation of the MTBS method, each TBS was then reduced by three and input into the Moffatt et al. modified equation to produce ADD point estimates.[2] The associated 95% prediction intervals for each modified TBS were then taken from the data table provided by this study. Preliminary results demonstrate that the TBS method was able to more accurately estimate ADD than the MTBS method for the data set used here; however, prediction intervals were smaller for the MTBS method than for the TBS method, indicating higher precision for the former. Additionally, significant differences in ADD point estimates were observed between both methods investigated in this study (p<0.0001).

These findings suggest that, despite large prediction intervals, the TBS method is better at predicting ADD in East Tennessee; however, these results importantly demonstrate that there are instances in which neither method is able to accurately estimate time since death, regardless of statistical modifications, supporting recent studies that argue for continued caution in utilizing temperature-based predictive models that are based on gross presentation of decedents. It is strongly recommended that researchers and practitioners in other environments validate the reliability of the MTBS method in relation to the TBS method before considering the statistical modifications provided by Moffatt et al, and that future research projects consider longitudinally evaluating the efficacy of methods like those presented here across multiple seasons.[2]

Reference(s):

1. Megyesi M.S., Haskell N.H., Nawrocki S.P. Using Accumulated Degree Days to Estimate the Postmortem Interval From Decomposed Human Remains. *J Forensic Sci.* 2005; 50(3):1-9.
2. Moffatt C., Simmons T., Lynch-Aird J. An Improved Equation for TBS and ADD: Establishing a Reliable Postmortem Interval Framework for Casework and Experimental Studies. *J Forensic Sci.* 2016; 61(S1): S201-S207.

Time Since Death, Accumulated Degree Days, Human Decomposition