A128 Assessing the Accuracy of Decomposition Scoring Methods in Arizona's Sonoran Desert

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Learning Overview: After attending this presentation, attendees will have a unique insight into which decomposition scoring methods for estimating Postmortem Interval (PMI) are most effective within the geographic region of the southern Arizona desert at the United States-Mexico border.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by demonstrating why the development of observationally based scoring methods within a statistically grounded model is necessary in forensic contexts.

The primary purpose of this research was to investigate whether existing methods of decomposition assessment can accurately estimate PMI in the southern Arizona environment to more effectively address the migrant death crisis.

In the past five years, more than 1,500 migrants have died in the attempt to cross the United States-Mexico border.[1] As forensic anthropologists and medical examiners attempt to identify these individuals by compiling biological profiles and estimating PMI, the use of accurate methodology is crucial. Megyesi et al. has become the standard method of quantitatively assessing decomposition.[2] Their approach calculates a point-based Total Body Score (TBS) that predicts Accumulated Degree Days (ADD) and, thereby, PMI.

A significant drawback of this method is its creation based on photographs of human remains and not from first-hand, systematic observational research of the processes of decomposition *in situ*. TBS is a modification of a similarly retrospectively developed method intended to assess decomposition in southern Arizona.[3] However, TBS assumes strict sequential processes of decomposition that are not necessarily reflected in observational studies and do not account for animal scavenging of remains. The TBS method has also been modified specifically for use on pig models to account for observed differences between species.[4] The Geographic Information Systems (GIS) method attempts to account for variability in decomposition by separating the body into 16 regions and assessing the presence or absence of a comprehensive trait list.[5] Overall, there is a significant dearth of observational studies from southern Arizona's Sonoran Desert. The present investigation explores the accuracy of the three aforementioned approaches (TBS, modified TBS, and GIS) for estimating PMI in this region.

Since the state of Arizona does not have a research facility with a human donor program, pig models (*Sus scrofa)* were used in the current study. Although pigs are not an idyllic proxy for predicting PMI in humans, they serve as acceptable proxies when pursuing specific research endeavors.[6] Such endeavors include comparing the efficacy of scoring methods in specific environments. Additionally, consistently warm temperatures in the summer months result in stronger correlations between pig and human decomposition processes.[6] As such, since the current study was methodologically focused and took place in the summer months of June and July, pigs served as adequate replacements for human subjects.

The experiment took place in Arivaca, AZ, approximately 15 miles from the United States-Mexico border. Four pigs between the weights of 130–170 pounds were euthanized on site and placed approximately ten meters apart in direct sunlight. Two of the pigs were clothed to more realistically portray the circumstances of human death and to test the effects of clothing on decomposition and scavenging activity. Decomposition was scored using the three methods twice per day—once in the morning and again in the late afternoon—until all four pigs were completely skeletonized.

As per Megyesi et al., ADD was calculated by adding the average temperatures of each day in degrees Celsius.[2] To assess the results of the three methods, statistical tests were run using R, and linear regression models were used to estimate PMI based on TBS scores and ADD. Random forest regressions were employed to predict ADD based on data collected through GIS scoring. The data were compared to known PMI to assess the accuracy of each of the three scoring methods. The preliminary results suggest that the commonly employed methods of scoring decomposition vary significantly in their ability to predict time since death along the United States-Mexico border in southern Arizona, with the GIS scoring system showing the most promise.

This research supports the notion that existing methods of TBS-based decomposition assessment do not accurately estimate PMI in the southern Arizona environment. This presentation seeks to emphasize the need for a more robust, context-specific research base when addressing the tragic deaths along the United States-Mexico border.

Reference(s):

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