E96 Geographic Information Systems (GIS) and Predictive Modeling of Body Disposal Sites

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After attending this presentation, attendees will understand a new method of locating clandestine body disposal sites in the medicolegal context using GIS and predictive modeling.

This presentation will impact the forensic science community by presenting a new technique to assist in locating clandestine body disposal sites in the medicolegal context. Predictive modeling of body disposal sites will narrow search areas beyond the information provided by witness testimony and blind luck, which will maximize resources for law enforcement when searching for missing victims.

Homicide victims are often discovered by accident or located through witness testimony, both of which are unreliable methods.[1] Moving a victim's body from the scene of the crime to a secondary site for disposal may further complicate the discovery, delaying recovery, identification, and evidence collection. Homicides are exponentially more difficult to investigate, solve, and prosecute without a body. This current study seeks to improve search methods by creating predictive models of body disposal location, which can be used in conjunction with witness testimony and traditional law enforcement search techniques.

Predictive models were created using body disposal data collected from the Office of the Chief Medical Examiner (OCME), Connecticut, to explore the feasibility of predicting body disposal sites. Prior to creating predictive models, spatial statistical tests, including Moran's I, Kernel Density, and Ripley's *K*, were conducted to determine if body disposal sites were homogeneously distributed across Connecticut. Next, two predictive models were created: one inductive model and one deductive model, both using non-sites mimicking Complete Spatial Randomness (CSR). The final inductive model equation was determined using logistic regression and stepwise selection to remove non-significant variables. The final deductive model equation was determined using the weighted map-layer approach using only variables where site values were significantly different from non-site values. Both final equations were entered into arcGIS® 10.3 using the Spatial Analyst extension to generate the final predictive surfaces.[2]

Spatial statistical analyses confirm that body disposal locations are inhomogeneously distributed across Connecticut. Results indicate predictive models of body disposal location are 56%–59% more likely to predict body disposal site location in Connecticut than random chance. At present, the models are most successful at predicting body disposal sites in urban areas. Future modeling efforts should address predicting body disposal site location in rural areas.

Predictive models of body disposal location are not intended to replace the current methods of victim search and recovery; rather, they are intended to be yet another tool in the investigative toolkit. The results of this study indicate that predictive models of body disposal location have a real possibility of narrowing search areas and maximizing resources for law enforcement when searching for missing victims.

Reference(s):

1. A.E. Fruzzetti, K. Toland, S.A. Teller, and E.F. Loftus. Memory and eyewitness testimony. In: *Aspects of memory, Vol. 1: The practical aspects.* (2nd ed), ed. MM Gruneberg and PE Morris, 18-50 (Florence: Taylor & Francis, 1992).

2. ESRI, arcGIS® Desktop: Release 10.3. (Redlands, CA: Environmental Systems Research Institute, 2014).

Predictive Modeling, GIS, Forensic Anthropology