A64 Mattress Fires and Their Effect on the Destruction and Distribution of Remains in a House Fire Setting

Nicole H.W. Schwalbach, MA, Iowa DCI Criminalistics Laboratory, Ankeny, IA 50023*

Learning Overview: After attending this presentation, attendees will understand the principles of fire behavior and the cremation process, the incidence and risk associated with mattress fires, and how, during a house fire setting, mattresses affect the destruction and distribution of remains.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing a better understanding of how mattress fires can contribute to the destruction of a body, how they affect the dispersal and recovery of cremated remains, and how this information can aid in the event reconstruction leading up to and during the fire.

Forensically, burned and cremated remains are commonly encountered, due to both the relatively high fire death rate in the United States and the continued belief that human remains can be rendered unidentifiable or destroyed through burning.[1] In some cases, it is necessary to recover and identify remains from residential fires, with the goal being to identify the deceased and to determine the sequence of events leading up to and during the fire.

With mattress fires being responsible for 83% of fires started in the bedroom, and the low survival odds of persons in the vicinity of an ignited mattress, this research addresses the very specific scenario of fire fatalities that involve bed-settings with regard to if and how they contribute to the enhanced destruction and displacement of a body.[2] It was hypothesized that those bodies located on a mattress, compared to those located on the floor nearby, would demonstrate greater degrees of cremation based on skeletal element exposure, color change, and fracture incidence. It was also hypothesized that a mattress would result in greater displacement or dispersal of remains in cases where the fire resulted in multi-story structural collapse and would limit displacement or dispersal of remains where there was little to no collapse.

To address these hypotheses, two experiments were conducted. The first experiment investigated the contribution of a mattress alone to the cremation of a body. This involved a controlled setting involving two room-sized burn cells, each containing a complete bed set with a pig (*Sus domestica*) resting on top, and another pig resting on the floor nearby. Using a small amount of accelerant, the settings were ignited and allowed to burn until extinguishment became necessary. It was discovered that while nearly all of the mattress and bedding materials were consumed, all the carcasses remained largely intact. It was concluded, therefore, that while mattresses are considered a significant fuel source within the home, they alone do not significantly contribute to the destruction of a body to a point that would hinder identification or recovery.[3]

The second experiment investigated how a mattress affects both the destruction and dispersal of remains in a residential fire setting. Within a small single-story home, eight pigs were distributed throughout the floorplan—five on mattresses, three on nearby floors. The house was then ignited and allowed to burn without any extinguishment efforts. Subject remains were then mapped, recovered, and evaluated for cremation state. It was discovered that mattress specimens showed advanced cremation-related decomposition and fracturing when compared to the floor counterparts. It was also confirmed that mattresses have a variable effect on remains distribution dependent on the distance they fall during structural collapse. Those falling short distances showed limited, if any, dispersal, while those falling large distances were more greatly dispersed as a result of impact and interfering objects. Based on this research, investigators may be able to reconstruct a victim's final location and moments.

Reference(s):

1. US Fire Administration. Fire Death Rate Trends: An International Perspective. *Topical Fire Report Series*, 2011, 12(8).
2. US Fire Administration. Mattress and bedding fires in residential structures. *Topical Fire Research Series*, 2002, 2(17).
3. Ohlemiller T.J., Gann R.G. Estimating reduced fire risk resulting from an improved mattress flammability standard (NIST Technical Note 1446). *NIST, Fire Research Division*. Washington DC: US Government Printing, 2002.

Forensic Anthropology, Mattress Fires, Cremation

*Presenting Author