

**STATISTICAL TREATMENT OF CLASS EVIDENCE: TRACE ELEMENT  
CONCENTRATIONS IN BULLET LEAD**

**by**

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**ABSTRACT**

Forensic evidence plays an important role in the final courtroom decision concerning the guilt or innocence of a suspect. The question of interest is whether two items, one found at the crime scene and one found on the suspect, have a common origin. In this work, we consider trace element concentrations in bullet lead; we discuss two approaches to the problem of determining if bullet fragments found at a crime scene and bullets found with a suspect appear to have a common origin and to assessing the significance of such evidence. We used a dataset compiled by the FBI that includes trace element concentrations in the lead of 800 .38 caliber bullets (16 full boxes) produced by the four largest bullet manufacturers in the US. The results of our analysis suggest some difficulty in reliably measuring the quality of bullet lead evidence. While an empirical test developed in this work appears to have good statistical properties, there is no reliable measure of the probability of a coincidental match for the test.