



Physical Anthropology Section – 2011

H59 Errors, Error Rates, and Their Meanings in Forensic Science

Angi M. Christensen, PhD, Federal Bureau of Investigation Laboratory, 2501 Investigation Parkway, Quantico, VA 22135; Christian M. Crowder, PhD*, Office of the Chief Medical Examiner, 520 1st Avenue, New York, NY 10016; Stephen D. Ousley, PhD, Mercyhurst College, Department of Applied Forensic, Anthropology, 501 East 38th Street, Erie, PA 16546; and Max M. Houck, PhD, West Virginia University, 1600 University Avenue, 208 Oglebay Hall, Morgantown, WV 26506-6217

After attending this presentation, attendees will gain a clearer understanding of the different classes of errors pertinent to forensic methods and practice, and will be provided a better taxonomy for method development, validation, and quality issues in their daily work.

This presentation will impact the forensic science community by providing a clearer understanding of the different types of errors. This understanding will make error easier for practitioners to identify, control for and discuss, and will provide the courts with a better understanding of how to interpret the classes of error introduced in scientific testimony. Overall, this presentation will result in a higher quality of forensic practice.

The discussion of errors and error rates has gained momentum in forensic science following the rulings from the *Daubert* trilogy (*Daubert V. Merrell Dow Pharmaceuticals, Inc.*, *General Electric Co. v. Joiner*, and *Kumho Tire Co., Ltd. v. Carmichael*) and has accelerated with the National Academy of Sciences National Research Council's Report "*Strengthening Forensic Science in the United States: A Path Forward.*" While the concepts of testing, standards, peer review, and general acceptance are fairly easy to understand, identify, and evaluate, the issue of error has proven to be more problematic. It has become clear that a discussion of what "error" means and how it is applied in forensic sciences is warranted. Furthermore, the convergence of science and law has made the identification and interpretation of error in the courtroom an even greater challenge. This paper presents an overview of the concept of method error as it pertains to forensic science techniques and attempts to clarify the difference between method error and other types of error that may be encountered in a forensic examination. As part of this clarification, the notion of the so-called "zero error rate" is addressed, and why this is an impossible and inherently non-scientific claim.

Too often, forensic practitioners themselves misunderstand the meaning of technique or method error (method validity), often confusing it with practitioner (human) error. Statistical error (unexplained variation) inherent in a statistical model is yet another type of error that the practitioner needs to consider. Misunderstanding or conflating different classes of error may lead practitioners to be reluctant to address the issue of error as it relates to their discipline or their individual case results. This confusion can also be seen in the courts, where attempts have been made to derive a measure of method error from things like practitioner proficiency testing results. Certainly the courts are concerned with both method error and practitioner error, but practitioner error is not error in the scientific sense and, for the most part, does not relate to method validity.

Misunderstanding (and misuse) of the concept of method error by forensic practitioners is particularly evident in claims of a "zero error rate" for particular forensic techniques. What some practitioners fail to realize is that despite the strength of the basis for certain forensic association techniques (e.g., the uniqueness of fingerprints as a basis for their use in identification), experts can still make false matches. The issue of method error does not relate to the uniqueness of a particular

feature, but to how reliable and valid the methods of comparison are in determining a positive match, exclusion, or concluding that there is no scientific basis for either determination. Most forensic examination results require tempered conclusions, and practitioners need to demonstrate caution and distinguish errors from uncertainty and probability.

Error, *Daubert*, Validation