Commentary on: De Luca S, Bautista J, Alemán I, Cameriere R. Age-at-death estimation by pulp/tooth area ratio in canines: study of a 20th-century Mexican sample of prisoners to test Cameriere's method. J Forensic Sci 2011;56(5):1302–9.

Sir,

We would first like to congratulate the authors on their well-designed study involving the development of a workable regression model applicable to the Mexican population for determining age-at-death using pulp/tooth area ratios in canines. However, the wording of the closing remarks regarding the admissibility of forensic science evidence in the United States is potentially misleading, and we would like to take this opportunity to clarify these comments for readers.

The authors state that: "… during U.S. federal legal proceedings, the reporting of statistic error in forensic science applications is necessary in cases of legal admissibility according to the Daubert standard. This means that forensic techniques must be accurate; they must lead to very precise results with ranges that will correctly classify an individual at least 95% of the time" (p. 1307).

We would like to point out that the reporting of statistical error rates is *not* an absolute requirement for admission under the *Daubert* indicia in any federal legal proceedings in the United States. This is has been well established in both the legal literature and judicial practice (1–3). The *Daubert* indicia were never meant to be exclusively adhered to as criteria for admissibility. This was made clear in both the original *Daubert* opinion (4) and again by the Supreme Court in *Kumho*, where Justice Breyer wrote: "A trial judge determining the admissibility of an [expert's] testimony *may* consider one or more of the specific *Daubert* factors. The emphasis on the word 'may' reflects *Daubert*'s description of the Rule 702 inquiry as a 'flexible one'. […] The *Daubert* factors do *not* constitute a definitive checklist or test" (5, p. 138).

While trial judges have exercised their gatekeeping duty to prevent the admission of statistics that are unfounded, or unsupported by research (6), a failure to disclose a numerical error rate has never been singularly fatal to the admission of expert testimony in any federal case to date in the United States. Federal Rule 702 requires judges to consider whether the evidence purported is the product of reliable principles and methods (7), using criteria they see fit to apply in accordance with the type of evidence before them. They are not specifically required to assess "error rates" to determine expert scientific evidence admissible, although this may be one of several indicators they choose to pay heed.

We completely agree with the author's further statement that forensic techniques must be accurate. Just how accurate is a matter for debate that we need not enter into here; however, the requirement that the technique must correctly classify an individual 95% of the time is not (and has never been) a recognized legal standard. While 95% confidence levels are generally accepted among most scientists, there are instances where this is not so. A 95% confidence level may lead to confidence intervals (or ranges, to use the authors' term) that are so wide that they become meaningless. Factors such as sample size, population size, the relative randomness of the sample, and the number of observations will determine the most appropriate confidence level. Definitive reference to a "gold standard" of 95% is flawed from both a legal and a statistical standpoint, as confidence intervals should be calculated and applied on an individual basis in accordance with the factors associated with that particular study.

We agree that the reporting of error rates is highly desirable for forensic techniques and that accuracy rates must be high, but the literature does not support the notion that error rate reporting and 95% confidence levels are an absolute requirement under *Daubert* or any other legal (or scientific) standard. Despite this small point of contention, we would like to acknowledge the high quality of their age estimation research and thank them for their contribution to the field.

References

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5. *Kumho Tire Co Ltd v Carmichael* 526 US 137, 1999.
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