AMERICAN STATISTICAL ASSOCIATION
Promoting the Practice and Profession of Statistics

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National Commission on Forensic Science
U.S. Department of Justice
7th Street, NW
Washington, DC

Dear Commissioners,

I write to provide written comments of the American Statistical Association (ASA), which extend upon those delivered orally at your meeting in February. These comments were prepared by members of the ASA Ad Hoc Advisory Committee on Forensic Science (http://amstat.org/policy/forensicscience.cfm), whose initial work to support forensic science reform started soon after the release of the 2009 National Research Council report, "Strengthening Forensic Science in the United States: A Path Forward."

We at the ASA commend the creation of the National Commission on Forensic Science and offer to support your important work in any way we can. A prominent theme within "Strengthening Forensic Science" is the need to undergird the science in the forensic science disciplines. We are convinced statistical scientists can be helpful in this regard. As noted in a 2010 statement by the ASA Board of Directors on forensic science (http://amstat.org/policy/pdfs/Forensic_Science_Endorsement.pdf), "Statisticians are vital to establishing measurement protocols, quantifying uncertainty, designing experiments for testing new protocols or methodologies, and analyzing data from such experiments."

We wish you success in bolstering the science in forensic science and look forward to working with you to assist in your charge.

Sincerely,

David Morganstein

David Morganstein
2015 ASA President

April 23, 2014

Recommendations for the National Commission on Forensic Science from the ASA Ad Hoc Advisory Committee on Forensic Statistics

The forensic science community has received considerable attention over the last several years, partly as a result of the National Research Council report "Strengthening Forensic Science in the United States: A Path Forward." A prominent theme of that report is the need to bolster the science in the forensic science disciplines. Too often, forensic science is seen as a collection of techniques used to analyze and compare samples, rather than as a scientific discipline. This problem goes beyond perception; there is a need to build up a coherent logical and scientific framework for the forensic science disciplines.

The field has seen progress, including some administrative steps to address the problem. Indeed, among the latter, the creation of NCFS is a notable accomplishment. Nevertheless, progress in forensic science reform is slower than many would like and much work remains to be done. While forensic science-related "miscarriages of justice" may be relatively rare, they are very serious, and we should work to prevent them by increasing the use of sound scientific methods.

To address these issues, we have identified four steps to be taken in parallel to enhance scientific thinking to benefit the practice of forensic science.[1]

1. Ensure uniform use of the scientific method throughout the forensic sciences.

The scientific method unifies all of the scientific disciplines, including forensic science. To move decision-making in forensic science from heuristics (based on examiner training and experience) to data-based procedures (based on objective gathering of data at key process points), forensic science must utilize rigorous scientific methods, especially in (a) the development of methods based on measured data to support the decisions made during forensic evidence examinations and (b) the conduct of well-designed and executed experiments, both to improve and to validate forensic analysis procedures. Both phases require extensive statistical expertise working alongside subject-area expertise from the earliest stages; bringing statisticians into the process any later than that greatly limits the value that they can contribute with often damaging consequences (irrelevant or unusable data, poorly defined or invalid process, etc.) Principles of good experimental design (e.g., replication, blocking, randomization, blinding) ensure the soundness of the results and avoid the criticisms associated with poor designs.

[1] By "forensic science," we refer to the analysis of the full range of evidence types, including latent prints, firearms and toolmarks, hair and fibers, DNA, etc.

Indeed, sound statistical concepts must be incorporated at all stages of forensic science research and practice: development of methods, analysis of performance, and decision-making.

2. Insist on rigorous documentation of protocols. Careful documentation of the processes used in each forensic science discipline is a critical first step for quality control and for process improvement. It is also necessary to implement safeguards to ensure established protocols and procedures are followed.

Systematic documentation of forensic science processes provides a natural way to identify points where variability may arise among examiners or among laboratories (e.g., key decision points), thereby enabling scientific studies where appropriate. Such studies might, for example, focus on characterizing and continually improving the practice of forensic science. Consistent documentation is also helpful in standardizing procedures, and is essential for later review, both internal and external.

One useful documentation tool can be a detailed flowchart that shows how each step in an analysis follows from the previous one and leads to subsequent steps. A flowchart developed for a methodology or process depicts the key decision and data-collection points, which can be analyzed and studied to suggest improvements and ultimately to reduce errors. A particularly successful illustration of a flowchart and its useful consequences can be found in the 2012 report, “Latent Print Examination and Human Factors: Improving the Practice through a Systems Approach” (see Figure 1 of that report) from the NIJ-NIST Expert Working Group on Human Factors in Latent Print Analysis.

Once the process has been well defined and appropriate standards have been developed, mechanisms must be established to enforce the adherence of these standards, as well as to continually update them as more data and better procedures are identified through regular process monitoring.

3. Encourage a culture of openness to consulting outside experts.

Due to the sensitivity of the information law enforcement officials handle, a culture of "openness" in consulting outside experts has not been encouraged; where it exists, it is highly uneven across disciplines and laboratories. Confidentiality is important, yet other agencies have handled this matter while still consulting outside experts (e.g., the Intergovernment Personnel Act used widely by the National Institutes of Health, the U.S. Census Bureau, and other agencies.) Although clearance or non-disclosure agreements may be required, they need not be impediments to seeking outside experts (and, in many cases, the problems can be framed without divulging personal or sensitive information). Science advances most rapidly by professional exchange of ideas, so this culture should be encouraged, particularly as some

outside scientists may have expertise not readily available in-house. Cooperative centers and research grant programs could facilitate such interactions.

4. Establish a foundation in logic, decision theory, and statistical reasoning in educational and training programs for forensic science. Such a focus emphasizes a common decision framework across the forensic sciences and encourages contributions toward problem solutions from all forensic fields.

Educational programs in forensic science have consisted largely of courses focused on individual techniques (arson, handwriting analysis, latent print analysis, toolmarks and firearms, computer forensics, etc.). This approach fails to emphasize the common elements of quantitative logic, deductive reasoning, and statistical thinking, all of which are essential ingredients in making inferences from forensic evidence, but which are, under current educational systems, either poorly understood or, at best, under-appreciated. While some educational institutions are working on revised curricula, all forensic science programs should teach such a scientific underpinning, including (1) quantitative logic and deductive reasoning, (2) appreciation for and recognition of situations where uncertainty exists, and (3) methods of understanding how to quantify and interpret measures of uncertainty.

We believe the four steps described above will go a long way toward improving the scientific underpinnings of forensic science and we would be pleased to assist the commission in any way to ensure that this happens.