Probabilistic Reporting in American Criminal Cases: A Baseline Study

Simon A. Cole & Matt Barno

Department of Criminology, Law & Society

University of California, Irvine

Research Assistance: Valerie King

Project Rationale & Goals

- CSAFE " . . . works to build a statistically sound and scientifically solid foundation for the analysis and interpretation of forensic evidence . . ."
- To what extent do we have "statistically sound . . . interpretation of forensic evidence" now?
- Can provide a baseline for CSAFE's efforts

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Key Questions

1. whether reports are consistent with published disciplinary standards
2. whether reports are probabilistic in nature and, if so, how probability is expressed

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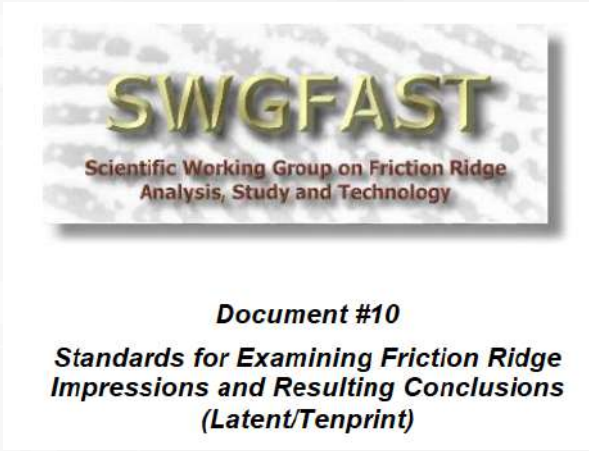
Standards

of uncertainty in reported results and associated estimated probabilities where possible.

Recommendation 2:

The National Institute of Forensic Science (NIFS), after reviewing established standards such as ISO 17025, and in consultation with its advisory board, should establish standard terminology to be used in reporting on and testifying about the results of forensic science investigations. Similarly, it should establish model laboratory reports for different forensic science disciplines and specify the minimum information that should be included. As part of the accreditation and certification processes, laboratories and forensic scientists should be required to utilize model laboratory reports when summarizing the results of their analyses.

Testimonial standards: probabilistic?



5.3.2.2. Individualization

Individualization is the decision by an examiner that there are sufficient features in agreement to conclude that two areas of friction ridge impressions originated from the same source. Individualization of an impression to one source is the decision that the likelihood the impression was made by another (different) source is so remote that it is considered as a practical impossibility.

DEPARTMENT OF THE ARMY
DEFENSE FORENSIC SCIENCE CENTER
4930 N 31ST STREET
FOREST PARK, GA 30297

CIFS-FSL-LP

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INFORMATION PAPER

SUBJECT: Use of the term "Identification" in Latent Print Technical Reports

"The latent print on Exhibit ## and the record finger/palm prints bearing the name XXXX have corresponding ridge detail. The likelihood of observing this amount of correspondence when two impressions are made by different sources is considered extremely low."

"The latent print on Exhibit ## and the standards bearing the name XXXX have corresponding ridge detail. The probability of observing this amount of correspondence is approximately ## times greater when impressions are made by the same source rather than by different sources."

DEPARTMENT OF JUSTICE
UNIFORM LANGUAGE FOR TESTIMONY AND REPORTS

Source Identification

'Source identification' is an examiner's conclusion that two friction ridge skin impressions originated from the same source. This conclusion is an examiner's decision that the observed friction ridge skin features are in sufficient correspondence such that the examiner would not expect to see the same arrangement of features repeated in an impression that came from a different source and insufficient friction ridge skin features in disagreement to conclude that the impressions came from different sources.

Source Identification

'Source identification' is an examiner's conclusion that two toolmarks originated from the same source. This conclusion is an examiner's decision that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics is such that the examiner would not expect to find that same combination of individual characteristics repeated in another source and has found insufficient disagreement of individual characteristics to conclude they originated from different sources.

Testimony reviews

- Simon A. Cole, *Where the Rubber Meets the Road: Thinking About Expert Evidence as Expert Testimony,* 52 Villanova Law Review 803 (2007).
- FBI/NACDL Hair Comparison Review (2015)
  - 269 transcripts
  - Erroneous testimony in 258 (96%)
    1. Donor pool is specific individual, rather than group
    2. Baseless probability given
    3. Computes statistic based on casework

The Washington Post
Democracy Dies in Darkness

Public Safety

Justice Department frames expanded review of FBI forensic testimony

Deputy Attorney General Sally Yates is expected to propose expanding the Justice Department's review of forensic testimony by the FBI Laboratory beyond hair matching to widely used techniques such as fingerprint examinations. (Evelyn Hockstein/For The Washington Post)

By Spencer S. Hsu March 21, 2016

The Justice Department on Monday proposed expanding its review of forensic testimony by the FBI Laboratory beyond hair matching to widely used techniques such as fingerprint examinations and bullet-tracing.

Officials also said that if the initial review finds systemic problems in a forensic discipline, expert testimony could be reviewed from laboratories beyond the FBI that do analysis for DOJ.

"The authority afforded to scientific experts is second to none, and we must make sure that our statements are clearly supported by sound science," Deputy Attorney General Sally Yates said.

Data Issues

What we want

- Record of each laboratory report and trial transcript for each discipline in each case
- Or, laboratory Protocol or Standard Operating Procedure (SOP) for each laboratory or identification unit

What we have

- Trial transcripts are not systematically archived, indexed, or made publicly available
  - May in some cases be possessed by litigants
  - Usually not possessed by expert or laboratory
- Laboratory reports are even less well archived, indexed, or made publicly available
  - May in some cases be possessed by litigants
  - Usually possessed by expert or laboratory, but no mandate to archive, index or make publicly available

Data Sources

Discipline	Report sample size	From Westlaw	From consultants	From CTS	Median year
Latent Prints	91	41	50	0	2009
Firearm and Tool Marks	48	25	23	0	2003
Questioned Document	52	52	0	0	2006
Shoe prints	381	0	0	381	2017

- Sample is opportunistic, non-random
- Sample is probably skewed toward higher quality expert evidence
- Data is heterogeneous across disciplines

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Presumptions

- All evidence is probabilistic in nature
- All evidence should therefore be reported in probabilistic fashion, meaning some probability no matter how small, should be assigned to each hypothesis
- “Categorical” reporting is at least suboptimal, if not worse
- Data > no data
- Absent data, the use of subjective probabilities might be preferable to the alternative

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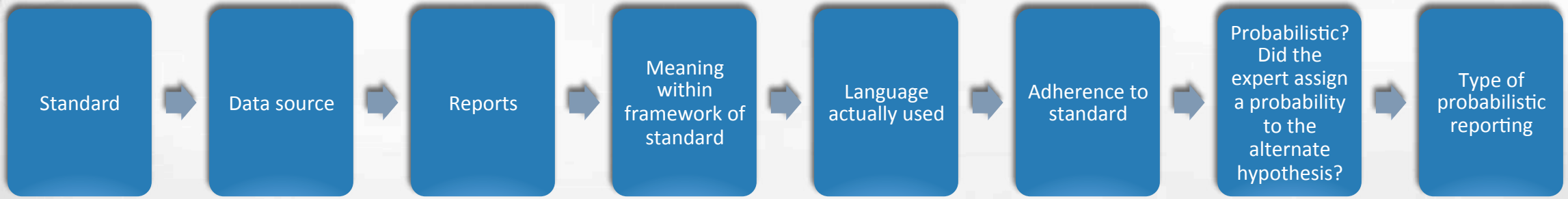
Process



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Types of Reporting

- Likelihood Ratio
- Random Match Probability
- Probability Inclusion
- Compound Probability of Exclusion
- Consistent with; Match
- Subjective Posterior Probability, Verbal Statement
- Subjective Posterior Probability, Numerical Statement
- Objective Posterior Probability, Verbal Statement
- Objective Posterior Probability, Numerical Statement
- Categorical Conclusion
  - Royal Statistical Society, *Communicating and Interpreting Statistical Evidence in the Administration of Criminal Justice: 1. Fundamentals of Probability and Statistical Evidence in Criminal Proceedings*

Standards

Discipline	Standard	Date
Latent Prints	SWGFAST #10	2011
Firearm and Tool Marks	AFTE Range of Conclusions	2011
Questioned Document	SWGDOC Standard Terminology for Expressing Conclusions . . .	2013
Shoe print	SWGTREAD Range of Conclusions	2013

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Firearm/toolmark (n=48)

Report type according to standard	n	Actual language used	n	Adherence to standard	Probabilistic	Statistical Report Type			
						Consistent/ match	Subjective posterior verbal	Subjective posterior numerical	Categorical
Exclusion	6	Exclusion	6	6	0	0	0	0	6
Inconclusive	14	Inconclusive	14	14	14	5	8	1	0
Individualization	28	Identified	12	12	2	0	2	0	10
		Same source/ person	16	16	0	0	0	0	16
Total	**48**		**48**	**48 (100%)**	**16 (33%)**	**4 (8%)**	**10 (21%)**	**1 (2%)**	**32 (67%)**

Shoe prints (n=381)

Report type according to standard	n	Actual language used	n	Adherence to standard	Probabilistic	Statistical Report Type			
						Consistent /match	Likelihood ratio	Subjective verbal probability	Categorical
Exclusion	168	Exclusion	46	46	0	0	0	0	46
		Not same source	23	17	0	1	0	0	22
		Not made	75	70	0	0	0	0	75
		Eliminated	24	4	0	0	0	0	24
Indications of non-association	2	Indications of non-association	2	2	2	2	0	0	0
Limited association	6	Limited association	1	1	1	1	0	0	0
		Similar	4	0	4	2	0	2	0
		Consistent/correspondence	1	0	1	1	0	0	0
Association	4	May have	2	0	2	0	0	2	0
		Similar	2	0	2	1	0	1	0
High degree of association	36	High degree of association	17	15	17	15	0	2	0
		Extremely/very strong support	6	0	6	0	6	0	0
		Consistent/Correspondence	7	0	7	7	0	0	0
		(Very) likely/probably	4	0	4	0	0	4	0
		Similar	2	0	2	2	0	0	0
Identification	165	Identification	62	61	0	0	0	0	62
		Same source	24	24	0	0	0	0	24
		Made	79	74	0	0	0	0	79
Total (%)	**381**		**381**	**314 (82%)**	**48 (13%)**	**32 (8%)**	**6 (2%)**	**11 (3%)**	**332 (87%)**

Summary

Discipline	n	Adherence to standard	Probabilistic	Statistical report type				
				Consistent /match	Likelihood ratio	Subjective verbal	Subjective numerical	Categorical
Friction Ridge	91	74%	1%	11%				89%
Firearm/ toolmark	48	100%	33%	8%		21%	2%	67%
Questioned documents	52	50%	50%	2%		48%		50%
Shoe prints	381	82%	13%	32%	2%	3%		87%

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Examples

A That print was identified as to Darick Obrian (sp) Anderson.

LP: *MI v. Anderson* (2012)

The questioned imprints, identified "Q2, Q5" were made by the right suspect shoes, identified "R". The questioned imprint, identified Q7 was made by the left suspect shoe, identified "L".

CTS Test #47HPNG-5331

Q And, within a reasonable degree of ballistic certainty, what can you tell us about those shell casings?
A In my opinion, all of these shell casings were fired by the same firearm.

US v. Harris (2016)

Results of Examinations:

It was determined that the non-overwritten questioned writing on specimen Q1 was prepared by GLADYS IHENACHO, known writer of specimen K1.

US v. Ihenacho (2011)

Denials of Probability

Q Yes Ma'am. So if we're doing - Do you deal with statistics?
A Absolutely not.

A They match - No. No; this is important, because you're putting statistics where it doesn't belong.

THE WITNESS:
Okay; good. The probability is very very low. Which was stated in when I make identification. Anything is possible, anything. But the probability, due to all the variables that I mentioned before, is close to zero.

F/T: *LA v. Boudoin (2011)*

We don't come with okay, there's a probability of, you know, 100,000 to 1 or whatever. It's either an exclusion, an individualization, or there's not enough information in the print to include or exclude. There's no probability.

LP: *WA v. Sims* (2009)

Conclusions: Language used

- High variability for actual language used
- Frequent use of vernacular, rather than standardized, terms
- Common tropes:
  - Identified/identical
  - Source
  - Made

Conclusion: probabilistic report

- Analysts almost never testify probabilistically about “identifications” or “exclusions” in these disciplines
- “Mid-scale” reports are inherently probabilistic
- Nonetheless, this probabilistic testimony was always subjective and almost always verbal
  - Exceptions:
    - Likelihood ratios in shoe prints
    - Numbers in F/T
- When numbers are used, they appear to be intuitions, rather than derived from data
- Almost no use of the range of possibilities discussed by RSS, other than categorical, consistent, and subjective verbal posterior
- Probability was denied nearly as often as it was invoked
- Baseline is nearly 0