

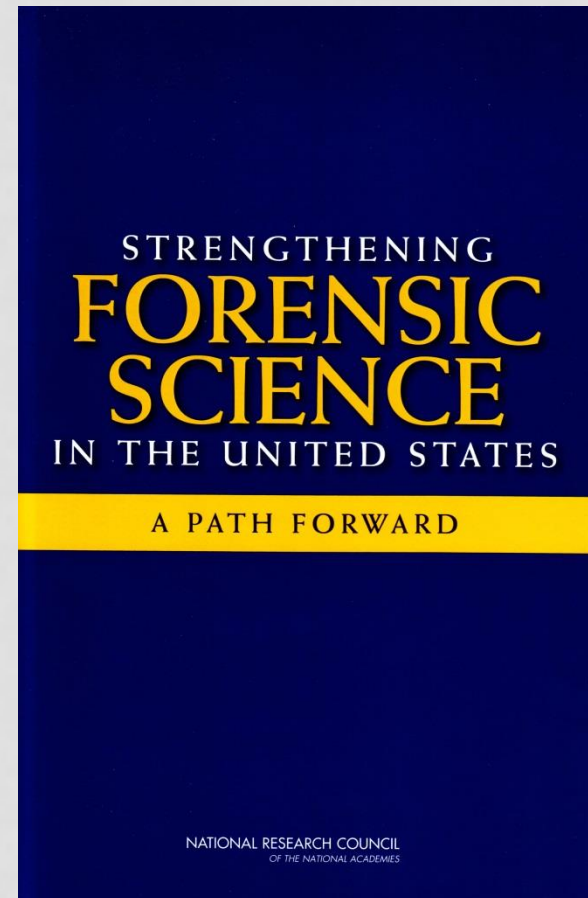
LATENT PRINT QUALITY IN BLIND PROFICIENCY TESTING: USING QUALITY METRICS TO EXAMINE LABORATORY PERFORMANCE

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STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD

- National Academy of Sciences (2009)
- Report detailed multiple concerns with the practice of forensic science
- Current state of proficiency testing
 - “A particular need exists for routine, mandatory proficiency testing that emulates a realistic, representative cross-section of casework”
- ASCLD/LAB and ASA echoed recommendation for proficiency testing reform



OPEN VS BLIND PROFICIENCY TESTING

Open/Declared Tests

- Analysts are aware they are being tested



Blind Tests

- Analysts are unaware they are being tested



CRITICISMS OF OPEN PROFICIENCY TESTS

- Open proficiency tests do not generalize to real-world casework
 - Test-taking behavior is not representative of routine casework
 - (Cembrowski & Vanderline, 1988; Gardner et al., 2020)
 - Tests are too easy
 - (Bayles, 2002; Koehler, 2008; 2013; Koertner & Swofford, 2018)



HOUSTON FORENSIC SCIENCE CENTER

- 2015: HFSC implemented blind proficiency test procedures in some disciplines
- November 2017: HFSC implemented a blind quality control (BQC) program in the Latent Print section
- Quality Division personnel submit 5% of all cases as blind cases
 - 10 BQC cases/month in 2018, 9 BQC cases/month in 2019
- All case outcomes are tracked



CURRENT STUDY

There is no research examining results from blind proficiency programs within crime laboratories

- I. Describe results from a blind proficiency testing program within a latent print unit of a crime laboratory
- II. Examine the quality of prints submitted as part of the program via quality metrics software
- III. Examine the potential association between latent print quality and resulting sufficiency determinations and conclusions



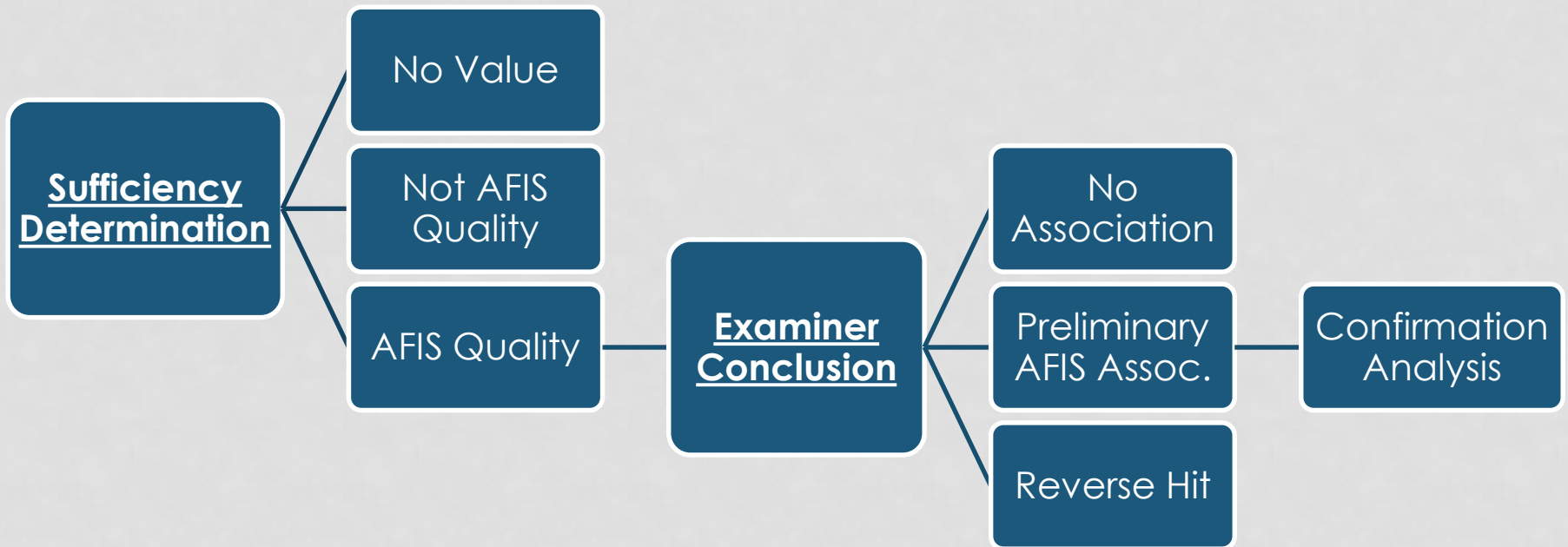
METHOD



- Most blind cases consist of 1 latent print, but some include as many as 13 prints
 - 94.3% fingerprints
 - 4.9% palm prints



LABORATORY PROCEDURES



BQC PROGRAM PROCEDURES

- HFSC enters five sets of record prints containing fictitious individual information into the local AFIS
- Some BQC cases have an associated alias whereas others do not (i.e., they are submitted by donors without an alias in the local AFIS)
- The BQC program submits latent lift cards and related case information into the workflow in the same way as real evidence

For further information: Hundl, C., Neuman, M., Rairden, A., Rearden, P., & Stout, P. (2019). Implementation of a blind quality control program in a forensic laboratory. *Journal of Forensic Sciences*, 65, 814-22.



PRINT QUALITY METRICS



- Objective evaluation of latent print quality and clarity
- Latent Quality Metrics (LQMetrics)
 - FBI's Universal Latent Workstation
 - Quality score (0 to 100)
 - **Good**: ≥ 65
 - **Bad**: 45 – 65
 - **Ugly**: ≤ 45

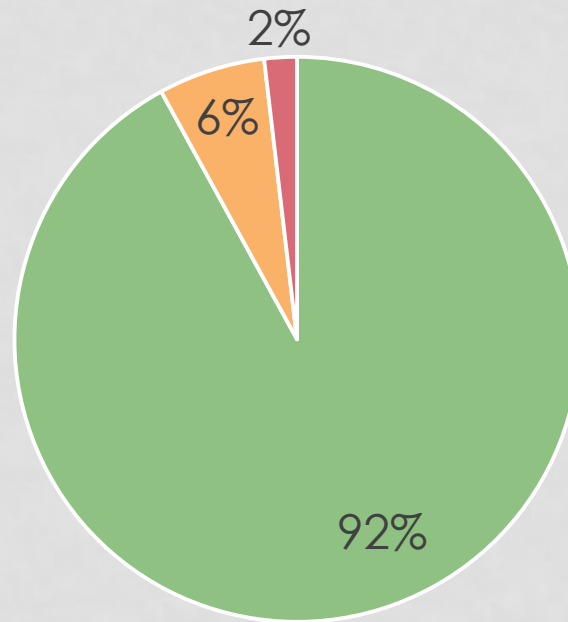


RESULTS



SUFFICIENCY DETERMINATIONS

376 Latent Prints Submitted
as Part of 144 Blind Cases



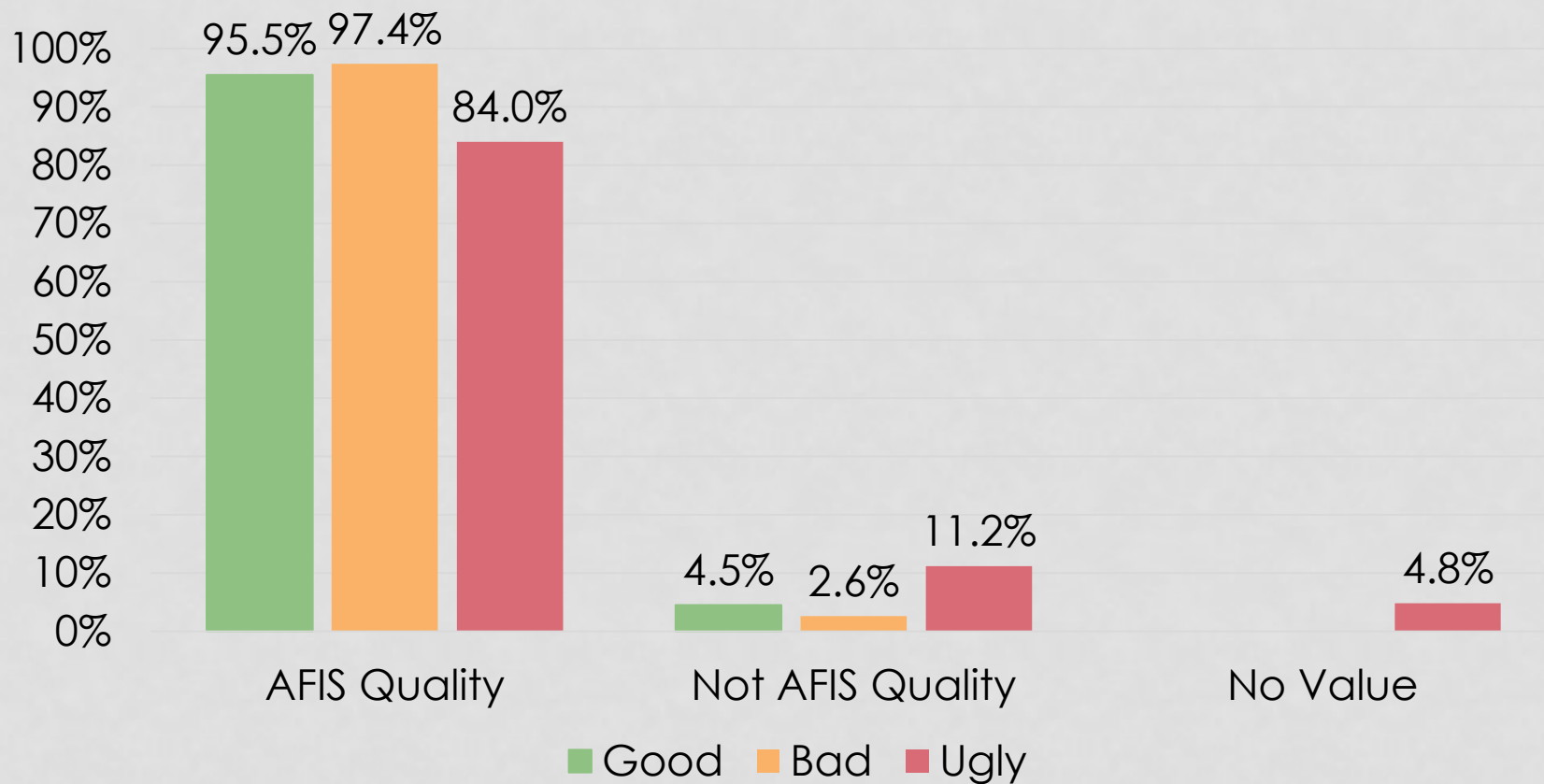
■ AFIS Quality

■ Insufficient AFIS Quality

■ No Comparative Value



EXAMINER SUFFICIENCY DETERMINATIONS AMONG GOOD, BAD, AND UGLY LATENT PRINTS



Note. $N = 372$ prints. Quality score: $M = 53.4$; $SD = 20.8$. There were 133 Good prints, 114 Bad prints, and 125 Ugly prints.

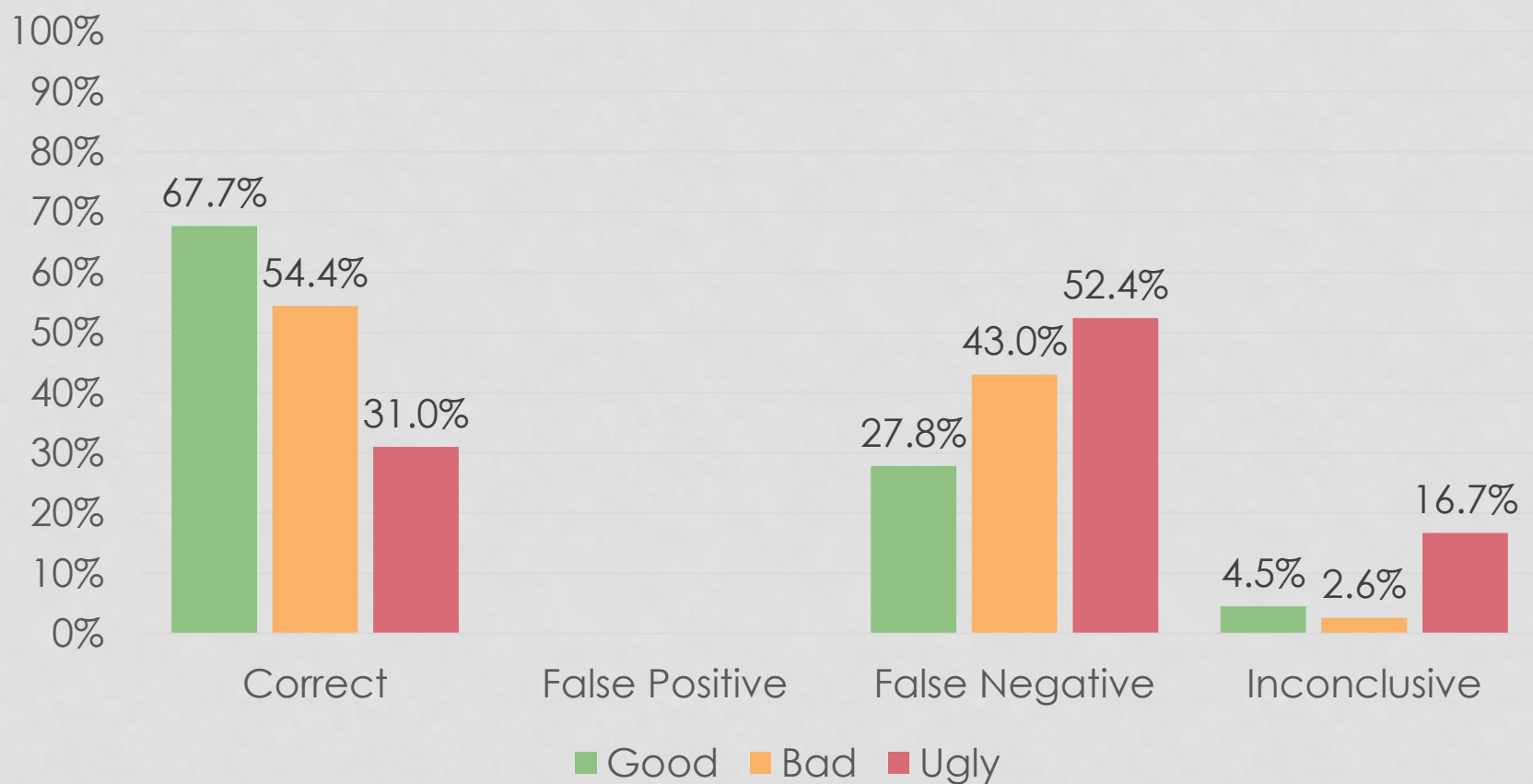


EXAMINER CONCLUSIONS

| Examiner Conclusion | Ground Truth | |
|-----------------------|---|--|
| | Association (302 source-present prints) | Exclusion (74 source-absent prints) |
| Potential Association | 33.0%; $n = 124$ <i>(Correct Association)</i> | 0.0%; $n = 0$ <i>(False Positive)</i> |
| No Association | 41.0%; $n = 154$ <i>(False Negative)</i> | 18.1%; $n = 68$ <i>(Correct Exclusion)</i> |
| No AFIS Search | 6.4%; $n = 24$ <i>(Potential False Inconclusive)</i> | 1.6%; $n = 6$ <i>(Potential False Inconclusive)</i> |



EXAMINER CONCLUSIONS AMONG GOOD, BAD, AND UGLY LATENT PRINTS



Note. N = 373 prints. There were 133 Good prints, 114 Bad prints, and 126 Ugly prints.



CONCLUSIONS

- Findings reflect outcomes of blind proficiency testing in one laboratory through first 2.5 years
- Findings represent truly blind, actual casework procedures
- BQC cases suggest:
 - False positive error rate: 0%
 - False negative error rate: 41%
 - Most false negatives resulted from true sources *not* being included among the top 10 candidates after an AFIS search



DIFFICULTIES IN EVALUATING OUTCOMES

Accuracy of Inconclusives

- How do we determine whether examiners correctly labeled prints as Insufficient quality for AFIS/No comparative value?
- Inconclusive determinations should not be automatically deemed correct
 - (Dror & Scurich, 2020)
- Some inconclusive determinations were likely correct while others were not

AFIS Databases

- Examiners arrived at “correct” conclusions in 51.1% of BQC prints
- Examiner/AFIS interaction and AFIS limitations appear to have influenced a large proportion of outcomes for other half
- When the correct source was present within the AFIS system, that source was *not* among the top 10 AFIS candidates in 58.3% of searches



DO BQC PRINTS SUCCESSFULLY EMULATE ACTUAL CASEWORK?

Latent Print Quality

- Quality score: $M = 53.4$
 - Average BQC print falls in the *Bad* category
 - Scores varied widely and were evenly distributed across the *Good*, *Bad*, and *Ugly* categories
- Open proficiency tests:
 - $M_s = 72.6$ & 74.4
 - (Gardner et al., 2020; Kelley et al., 2020)

Latent Print Clarity

- Clarity score: $M = 34.3$
- Casework at a federal laboratory:
 - $M = 36.6$
 - (Koertner & Swofford, 2018)



QUALITY METRICS AS OUTCOME PREDICTORS

Sufficiency Determination

- AFIS-quality prints...
- Not AFIS-quality prints....
- Prints of no comparative value...

- *Ugly* prints were less likely to be useable (in AFIS or otherwise) than prints in the other two categories

Examiner Conclusion

- *Good* prints were more than twice as likely to result in correct conclusions as were *Ugly* prints



UTILITY OF BLIND PROFICIENCY TESTING

- Overall, results highlight the utility of blind proficiency testing as a supplement to open proficiency testing
- Quality metrics offer objective indicators that could help ensure blind cases closely resemble routine casework
- Merit in screening prints for quality as a first step in analysis
 - Analysts might consider not proceeding with *Ugly* prints, and instead saving their time and decisional efforts for higher-quality prints





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