

Root and Cultural Cause Analysis of Report and Testimony Errors by FBI MHCA Examiners

An examination of why Microscopic Hair Comparison Analysis (MHCA) examiners at the Federal Bureau of Investigation (FBI) Laboratory made statements in reports and testimony exceeding the limits of the science for decades prior to 2000.

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ABS Group and its employees, subcontractors, advisors, and other designees cannot, individually or collectively, predict what events may happen in the future. We made a reasonable effort based on available information and scope of the work to assess the culture of the Federal Bureau of Investigation (FBI) Laboratory environment and make observations regarding the root and cultural causes that may have had an influence on their Microscopic Hair Comparison Analysis (MHCA) testimony and reports during the period analyzed. ABS Group accepts no responsibility for any event or impact that may affect the FBI, or any other person or entity using the results of this report.

PREFACE

This report documents a historical analysis of MHCA report and testimony errors that occurred for decades through 1999. This report does not reflect the status of the FBI Laboratory after 2000. The science associated with the MHCA process has not changed since the period we analyzed. However, the interpretation of how to communicate the limits of the MHCA process has evolved. As a result, some of the statements that were believed to be appropriate during the period analyzed, may have been judged as errors by the 2012 FBI MHCA Review.

The FBI provided ABS Group with all available reports and transcripts related to this analysis. These documents had been previously evaluated by the FBI, the Innocence Project (IP), and the National Association of Criminal Defense Lawyers (NACDL) as part of the 2012 FBI MHCA Review. ABS Group also received the corresponding evaluations from these parties. ABS Group did not perform an independent review of the error definitions developed and used by the 2012 Review team, nor did we perform an independent review of the application of the definitions to the transcripts and reports.

In this report, you will see mention of interviews conducted with current and former FBI personnel. The FBI notified potential interviewees of the opportunity to participate in this study. Once notified, all communication with these potential interviewees was solely with ABS Group. The FBI was not informed which of the potential interviewees actually participated.

In conducting our analysis, we considered many possible causes of the MHCA report and testimony errors that occurred. Consistent with our standard approach for root and cultural cause analysis, we used supporting and refuting data to judge which of the possible causes occurred and contributed to the MHCA report and testimony error events. We used this approach to provide transparency in our logic and to determine three levels of causation: causal events, root causes (management system weakness), and cultural causes.

We were charged with determining why individuals did not communicate in reports and testimony decades ago in a way that would be acceptable based on today's understanding of the limits of the MHCA science. In this report, we present the methods we used, how we applied these tools, the analysis results, and conclusions. We have found an analogy to highway speed limits very helpful in understanding the examiner's situation. The speed limit is analogous to the report and testimony guidance. Separate analogies are provided below for reports and testimonies because the situations resulting in the errors in examiner statements were somewhat different.

- **MHCA testimony analogy.** As it relates to FBI MHCA testimony, the results and conclusions in this report are analogous to MHCA examiners being told to drive on a road where the only posted speed limit sign says “drive carefully.” Then, over 20 years later, experts determined what the appropriate speed limits should have been, posted speed limit signs, and admonished drivers for speeding. In a similar manner, a key reason that the MHCA examiners did not comply with present-day limits during testimony is that the limits they were provided were vague and they did develop their own limits during the period analyzed.
- **MHCA report analogy.** As it relates to FBI MHCA reports, a higher-than-appropriate “speed limit” was posted by the mid-1980s. In this analogy, given you are driving on the exact same road in the exact same car for decades, the appropriate speed to drive should not change based on the

specifics of your car on that road. All along, the speed limit should have been lower. In a similar manner, a key reason for most of the MHCA examiner report errors is that they were provided inappropriate limits (the wrong speed limit was posted).

As it relates to this analogy, we were asked to answer why the appropriate “speed limits” were not determined or posted. For both MHCA reports and testimony the “limits of the science” have not changed; only the understanding and guidance for communication of those limits have changed.

ABSTRACT

Since the 1930s, the Federal Bureau of Investigation (FBI) Laboratory has supported the justice system by comparing hairs found at crime scenes to those from suspects and victims. The FBI generates reports and testifies in court on their hair comparison findings. After reversal of a few convictions, the FBI began a review of available court transcripts and reports in 2012. Their review found Microscopic Hair Comparison Analysis (MHCA) report and testimony errors in reviewed reports and transcripts that occurred for decades prior to 2000. These report and testimony errors occurred when examiners made statements beyond what the science of this discipline would support, such as stating the hair found at the crime scene came from a known source (e.g., suspect or victim). In 2015, the FBI publicly announced the interim findings of their internal review, which found errors in most of the reports and transcripts reviewed.¹ In 2017, the FBI sought a third party to analyze the root and cultural causes that likely contributed to these report and testimony errors occurring and not being abated by FBI management. ABSG Consulting Inc. (ABS Group), a risk management company with expertise in root and cultural cause analysis, was selected to perform the analysis. This report describes the investigation into the root and cultural causes that allowed these FBI-identified report and testimony errors to occur and continue unabated for decades prior to 2000.

1 FBI Laboratory Services, “FBI/DOJ Microscopic Hair Comparison Analysis Review,” 19 April 2015, www.fbi.gov/services/laboratory/scientific-analysis/fbidoj-microscopic-hair-comparison-analysis-review.

ACKNOWLEDGMENTS

We thank the FBI examiners and leaders who agreed to reflect on their careers and service. The stories and insights provided were essential for this report, especially perspectives on training, policies, procedures, management systems, and work culture from the 1950s through 1999.

We thank our points of contact at the FBI who responded to our many requests for information and answered our frequently pointed questions.

We appreciate the vast amount of information publicly available on this topic in the form of books, articles, television shows, videos, etc., which helped us to achieve a balanced view for this analysis.

We hope this report provides insight to help those impacted by the report and testimony errors, the FBI, and others better understand why these errors occurred and why they continued for decades.

LIST OF ACRONYMS

ASCLD	American Society of Crime Laboratory Directors
ASCLD/LAB	American Society of Crime Laboratory Directors/Laboratory Accreditation Board
CCA™	Cultural cause analysis
CCAM™	Cultural Cause Analysis Methodology
CESD	Causal Event Sequence Diagram
FBI	Federal Bureau of Investigation
IP	Innocence Project
MHCA	Microscopic Hair Comparison Analysis
NACDL	National Association of Criminal Defense Lawyers
OCR	Optical character recognition
RCA	Root cause analysis
SOURCE™	Seeking Out the Underlying Root Causes of Events
SWGMA™	Scientific Working Group on Materials Analysis
TWGMAT	Technical Working Group on Material Analysis

WORKING DEFINITIONS FOR THIS REPORT

This section provides working definitions of key terms used in this report.² They are not legal definitions.

TERMS RELATED TO MICROSCOPIC HAIR COMPARISON ANALYSIS

Case

A term used by the FBI Laboratory to describe the work associated with a request received from a law enforcement agency to review evidence relating to alleged criminal activity. There is an FBI *case* number associated with each request. Not all of the FBI *cases* led to court proceedings.

Exceeding the limits of the science

A statement made by an *MHCA examiner* in a *report* or testimony containing one of the three error types described in the definition of *report or testimony error* (on the next page). “Science,” as used in this document, is specific to the *MHCA* discipline.

Hairs and Fibers Unit

The FBI Laboratory unit that analyzed hair had several names during the period we analyzed. For the majority of that time it was referred to as the *Hairs and Fibers Unit*. It was previously called the Microscopic Analysis Unit and subsequently called the Trace Evidence Unit. This report exclusively uses *Hairs and Fibers Unit* for consistency and readability throughout this report.

Microscopic Hair Comparison Analysis (MHCA)

The use of a comparison microscope by a trained examiner to determine if there is an association between questioned hairs and a hair sample from a known source. Typically, this involves comparing hairs collected as evidence to a hair sample provided by a known source.

MHCA examiner

Individual who performed an *MHCA* while working in the *Hairs and Fibers Unit* of the FBI Laboratory.

Report

An FBI Laboratory *MHCA examiners'* written record of their *MHCA*.

² When these terms are used in this section and the *Executive Summary*, *Summary*, and *Conclusions* sections of this report, they are *italicized*.

Report or testimony error

A statement made by an *MHCA examiner* that exceeded the limits of the science of the *MHCA* discipline and was recorded in a *report* or transcript. The 2012 FBI *MHCA* Review defined three types of errors:³

- Error Type 1: The examiner stated or implied that the evidentiary hair could be associated with a specific individual to the exclusion of all others. This type of testimony exceeds the limits of the science.
- Error Type 2: The examiner assigned to the positive association a statistical weight or probability or provided a likelihood that the questioned hair originated from a particular source, or an opinion as to the likelihood or rareness of the positive association that could lead the jury to believe that valid statistical weight can be assigned to a microscopic hair association. This type of testimony exceeds the limits of the science.
- Error Type 3: The examiner cites the number of cases or hair analyses worked in the laboratory and the number of samples from different individuals that could not be distinguished from one another as a predictive value to bolster the conclusion that a hair belongs to a specific individual. This type of testimony exceeds the limits of the science.

Significance

There is no specific definition of *significance* as it applies to an *MHCA* conclusion that we were able to find; however, *significance* is a frequently used term. Consistent with common usage of the word as it applies to *MHCA*, we define statements of *significance* of a conclusion to be those made (in reports or during testimony) that describe or imply (1) the frequency of observing a specific hair characteristic or pattern of characteristics or (2) the size of the group of individuals that may also have a hair like the questioned hair. An example of a statement describing the significance of the conclusion is “...hair exhibited all of the same microscopic characteristics arranged in exactly the same way and again, based on my experience, that’s extremely rare.”⁴

Transcript

A written or audio record of the FBI *MHCA examiner’s* expert testimony.

³ FBI Laboratory, “Microscopic Hair Comparison Analysis,” 9 November 2012, www.mtacdl.org/attachments/CPE/Nelson/FBI_Limits_of_Science_Microscopic_Hair_Comparison.pdf

⁴ All quotes of *MHCA examiner* statements in this report are from *MHCA reports* or testimony unless otherwise noted. Portions of the quotes that were identified by the 2012 Review as *report or testimony errors* are underlined.

TERMS RELATED TO THIS ANALYSIS

Error events

The cumulative set of *report and testimony errors* within the scope of our study.

Causal event

An underlying reason why the *report and testimony error events* occurred, but it is not deep enough to be a *root cause*.

Root cause

A lower level in addressing “why it happened” that identifies particular management system weaknesses. For example, failure to establish policies and enforce them is a *root cause*.

Root cause analysis

The systematic analysis of the *root causes* that contributed to the *causal events*.

Cultural cause

The lowest level of addressing “why it happened” that identifies particular individual or organizational culture factors, social factors, or behavioral practices that contributed to the root causes. For example, lack of proactive leadership is a *cultural cause*.

Cultural cause analysis

A systematic analysis of *cultural causes* that contributed to the *root causes*.

Error-likely situation

A work situation in which there is greater chance for human error when performing a specific action or task in the presence of error precursors.⁵ Error precursors include, but are not limited to: unclear roles and responsibilities, vague standards, lack of knowledge, work group attitudes, work control processes, inaccurate risk perceptions, and mindsets. An example relevant to this study would be the lack of *sufficiently specific guidance*. Note: This is a widely used term in human error literature of organizations such as the U.S. Department of Energy, International Atomic Energy Agency,⁶ and Center for Chemical Process Safety.⁷

5 Department of Energy, *Human Performance Improvement Handbook*, Volume 1, www.standards.doe.gov/standards-documents/1000/1028-BHdbk-2009-v1/@images/file, p. 2-30

6 International Atomic Energy Agency, *Managing Human Performance to Improve Nuclear Facility Operation*, No. NG-T-2.7, 2013, p. 6

7 Center for Chemical Process Safety, Glossary, www.aiche.org/ccps/resources/glossary/process-safety-glossary/error-likely-situation

Malicious intent

A situation that occurs when an individual provides testimony that exceeds the limits of the science in an effort to convict someone they believe to be innocent.

Sufficiently specific guidance

Instructions for *MHCA reports* and testimony that enable an *MHCA examiner* to consistently write *reports* and testify without introducing *MHCA report or testimony errors* (see previously listed definition). Such instructions include:

1. Explicit bounds for what must be stated in *reports* or during testimony (e.g., the disclaimer that *MHCA* is not a means of individualization),
2. Explicit bounds for what cannot be stated or implied in *reports* or during testimony, including examples of words and phrases that cannot be used (e.g., cannot say “perfect match” or “I have looked at over 10,000 hair samples and so far I have not found two individuals that I couldn’t distinguish one from the other.”),
3. Guidance on how to handle situations where judges or attorneys lead *MHCA examiners* to provide testimony that exceeds the limits of the science (e.g., in response to questions during *MHCA* testimony),
4. Insights to support understanding of the guidance provided, and
5. Formal approval and control of this written guidance by appropriate FBI Laboratory management.

Thoughtful-compliance

A situation that involves an individual acting or performing consistent with the intent and limitations of the existing rules and requirements, even when existing rules and requirements do not provide *sufficiently specific guidance* for a particular situation.

EXECUTIVE SUMMARY

In 2012, the FBI began a review of statements made by their experts related to *Microscopic Hair Comparison Analysis (MHCA)*⁸ performed through 1999. As of June 2018, they had found errors in 856 of 1,729 *reports*; errors in 450 of 484 *transcripts*; and errors in *reports* and testimony of 31 of 35 *MHCA examiners* whose work was reviewed. The FBI hired ABS Group, a risk management company, to perform a *root and cultural cause analysis* to answer three questions (see below). After 1 year of analyzing more than 30,000 pages of reports, transcripts, FBI-supplied documents, public content, and interviewing 20+ current and former FBI personnel, our conclusions follow.

WHAT PATTERNS ARE EVIDENT IN THE REPORT AND TESTIMONY ERRORS?

Reports – Beginning around 1984, *MHCA reports* began and continued to frequently include a statement identified by the 2012 FBI MHCA Review as an error. Almost all *report errors* (over 98%) described the questioned hair using the phrases consistent with having originated from [individual’s name]⁹ or consistent with having come from [individual’s name] instead of “could have come from [individual’s name]” which the 2012 Review determined was not an error. The statement was generally consistent with guidance developed between 1982 and 1985 and formally presented by others in the field at an FBI-hosted international symposium on *MHCA* in 1985. The *reports* containing that statement were, at the time, reviewed and approved by *Hairs and Fibers Unit* leadership, but that statement was judged to be erroneous by the 2012 Review.

Testimony – Errors in *MHCA* testimony continued from 1971 (the earliest transcript available) through the end of the period analyzed at what appears to be a modestly decreasing rate. The *testimony errors* involved most of the *MHCA examiners*, not just a few of them. The FBI Laboratory management acted on the limited negative feedback they received on *MHCA* testimony during those years, but their response only had short-term impacts on the *testimony error* rate.

WHY DID THE REPORT AND TESTIMONY ERRORS OCCUR?

The most important cause of *report and testimony errors* was that *MHCA examiners* did not have *sufficiently specific guidance* (i.e., instructions for *MHCA reports and testimony* that enabled an *MHCA examiner* to consistently write reports and testify without error). This is identified as Causal Event A, *FBI Laboratory management, Hairs and Fibers Unit, and the individual MHCA examiners did not develop sufficiently specific guidance*, in Figure 1.

Regarding the management system weaknesses (*root causes*) driving Causal Event A, there was a cascading effect where not having what was needed in the beginning from the standup of the *Hairs and Fibers Unit* contributed to not being effective in the application of other management systems, particularly the lack of awareness of how often *MHCA report and testimony errors* were occurring. The original standup of the unit in

⁸ Terms from the *Working Definitions for this Report* are *italicized* when used in this section.

⁹ All quotes of *MHCA examiner* statements in this report are from *MHCA reports* or testimony unless otherwise noted. Portions of the quotes that were identified by the 2012 Review as *report or testimony errors* are underlined.

the 1950s and 1960s did not require development of *report* and testimony guidance, nor did it require the appropriate subject matter experts (legal, statistical, and quality assurance) to participate in their unit as stakeholders.

These management system weaknesses were driven by two cultural causes. The first cultural cause involved Laboratory management not providing sufficient leadership in (1) identifying how often *MHCA report and testimony errors* were occurring (e.g., by formally establishing criteria for determining *errors* and monitoring against those criteria), (2) responding to instances of issues with *MHCA testimony* (including third-party input), and (3) formalizing the methods used in the FBI Laboratory. The second cultural cause was overconfidence by Laboratory management in the belief that they did not need outside expertise (e.g., legal, statistical, and quality assurance) and did not see the value in formalized processes. As a result of these cultural weaknesses, the *sufficiently specific guidance* needed for *reports and testimony* was not created during the period we analyzed.

Regarding the causal chain described for *reports*, the *Hairs and Fibers Unit* leadership did not fully adopt the guidance communicated at the 1985 symposium nor did they fully formalize and document these standards for use by their *MHCA examiners* and reviewers. The underlying basis for the few orally communicated rules appears to have been lost over time. This resulted in *reports* that were, at the time, reviewed and approved by *Hairs and Fibers Unit* leadership but were subsequently judged by the 2012 Review to contain erroneous statements.

For testimony, the causal chain led to *MHCA examiners* not being sufficiently prepared in that they did not have *sufficiently specific guidance*. Therefore, it was not possible for the organization to provide appropriate training, and thus it was not a surprise that there were *testimony errors*.

Not providing *sufficiently specific guidance* to the *MHCA examiners* created an *error-likely situation*. Had such guidance been provided, the majority of the errors probably would not have occurred. We did not find any evidence of malicious intent by the *MHCA examiners* or the organization.

Almost all *MHCA examiners* made some statements containing errors in their *reports* and *transcripts*, with the exception of four *MHCA examiners* who had few *reports* and *transcripts* assessed by the 2012 Review. The causes described above that drove most of the errors were consistent across all *MHCA examiners*, including those with the highest number of errors and the highest error rates.

WHY DID THE REPORT AND TESTIMONY ERRORS CONTINUE FOR DECADES?

The lack of *sufficiently specific guidance* described in the causal chain above was the most important *causal event* for *report and testimony errors* continuing for decades. Two other important *causal events* are that the FBI Laboratory management did not (1) sufficiently detect *MHCA report and testimony errors* and (2) sufficiently respond to the limited negative input from third parties regarding *testimony*. *Reports* were reviewed by management, but without *sufficiently specific guidance* it is not a surprise that management did not detect the *errors*. There was no negative third-party feedback that we found for *reports*. For testimony, FBI management infrequently monitored live testimony or obtained *transcripts* of *MHCA examiner* testimony. When the first formal FBI Laboratory testimony monitoring program was put in place in 1995, it focused on items like examiner timeliness and attire. FBI management trusted that *MHCA examiners* would testify within the limits

of the science, but they did not confirm this trust was warranted by monitoring *MHCA examiner* testimony and using metrics to identify, track, and analyze trends in the occurrence of *errors*. Third-party feedback on *MHCA examiner* testimony received by the FBI was overwhelmingly positive. When issues were raised regarding *MHCA examiner* testimony, leadership did not perceive them as systemic and responded to them as isolated issues (e.g., with the specific individual).

The same two *cultural causes* that led to the occurrence of the *MHCA report and testimony errors* also contributed to their persistence. In addition to insufficient leadership and overconfidence (noted previously), we further conclude that insufficient performance monitoring was a *cultural cause* for *errors* continuing for decades.

CAUSAL EVENTS, PRIMARY ROOT CAUSES, AND MAJOR CULTURAL CAUSES

Figure 1 shows a summary of the analysis results. It includes our Causal Event Sequence Diagram (CESD)TM illustrating the progression of the 11 *causal events* (labeled A through K, which fall into 4 categories labeled 1.1, 1.2, 2.1, and 2.2) that led to the *report and testimony error events* on the far-right side of the diagram. The highest contributing *causal events* (first, second, and third) are also indicated on the CESD. These three *causal events* led to the vast majority of the *error events*. Below the CESD are the three primary *root causes* and the three major *cultural causes*.

This report describes the items in Figure 1 in depth, including the contribution of these causes to the *error events* and our logic for ranking the causes. Development of recommendations for these causes was outside the scope of this analysis.

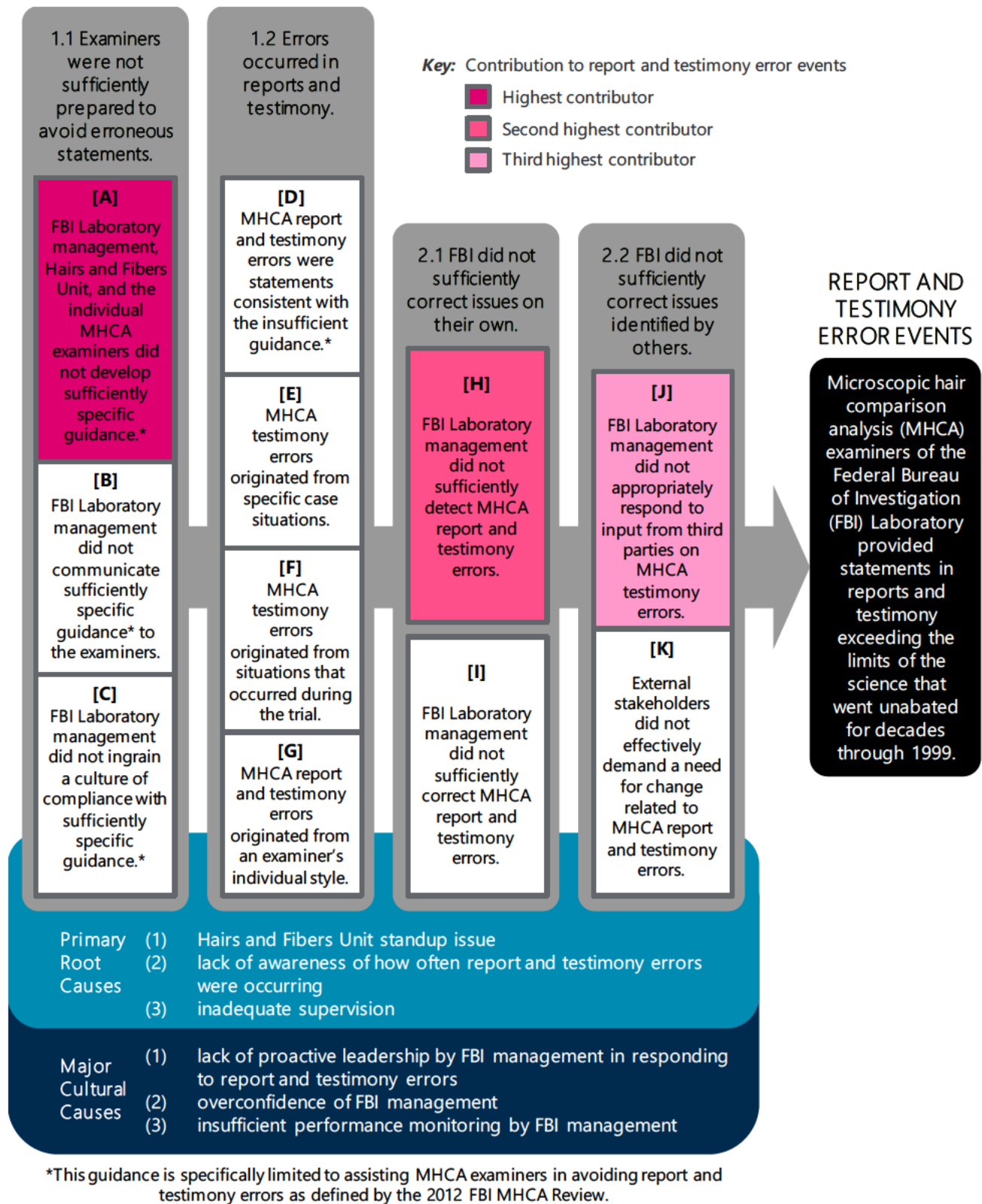


Figure 1. Causal Event Sequence Diagram, the three primary root causes, and the three major cultural causes.

SUMMARY

Examiners made errors in reports and testimony on human hair analyses.

In 2015, the FBI publicly announced that their expert testimonies on human hair contained errors that had occurred for decades. These errors occurred when *MHCA examiners*¹⁰ exceeded the limits of the science in *reports* or in their expert witness testimony based upon the criteria set in the 2012 FBI MHCA Review.¹¹ The 2012 Review examined statements made in *reports* and testimony related to analyses performed through December 31, 1999. After that date, DNA testing was routinely used in conjunction with *MHCA*. The science of *MHCA* can only narrow the possible source of a hair to a group of unknown size and not to an individual.¹² The FBI asked for an analysis to determine how and why the FBI Laboratory's management systems, culture, and behavior created an environment where these errors occurred and continued unabated for decades.

The FBI sought to determine which cases had report or testimony errors.

From 2009 through 2012, a few individuals who were convicted, in part on *MHCA* testimony, were exonerated through the use of DNA testing of the evidence. In 2012, the FBI committed to identify and review all *cases* associated with analyses performed prior to the end of 1999 where (1) hair evidence was found to be positive and probative and (2) the individual was convicted of the underlying crime.¹³

The ongoing 2012 FBI MHCA Review team includes individuals currently at the FBI and from two external groups: the National Association of Criminal Defense Lawyers (NACDL) and the Innocence Project (IP). The team defined three *testimony error types*, summarized as (1) the hair was associated to a specific individual, (2) statistics were stated or implied (e.g., "rarely -- very rarely"¹⁴) to describe the significance of a finding, and (3) the examiners used their experience to bolster the jury's confidence in their findings. The purpose of the ongoing 2012 Review is to determine what is an *error*, which *cases* were affected, how many *errors* occurred, and what types of *report and testimony errors* occurred. The 2012 Review did not seek to understand why these *report and testimony errors* occurred. However, the ABS Group analysis does focus on that point.

10 Terms from the *Working Definitions for this Report* are *italicized* when used in this section.

11 The FBI stated they notified the prosecutors and defense attorneys regarding the findings of the 2012 FBI MHCA Review.

12 FBI Laboratory, "Microscopic Hair Comparison Analysis," 9 November 2012, www.mtacd.org/attachments/CPE/Nelson/FBI_Limits_of_Science_Microscopic_Hair_Comparison.pdf

13 FBI National Press Office. "Department of Justice and FBI Joint Statement on Microscopic Hair Analysis" 19 Apr. 2015, www.fbi.gov/news/pressrel/press-releases/departments-of-justice-and-fbi-joint-statement-on-microscopic-hair-analysis.

14 All quotes of *MHCA examiner* statements in this report are from *MHCA reports* or testimony unless otherwise noted. Portions of the quotes that were identified by the 2012 Review as *report or testimony errors* are underlined.

The FBI provided current findings from their ongoing 2012 Review. The FBI released the initial findings from their 2012 Review in 2015. The data below, provided by the FBI, summarize the ongoing 2012 FBI MHCA Review findings as of June 2018:

23,547 total FBI cases were reviewed to determine if they met the *MHCA* criteria for further examination.

3,499 of the reviewed *cases* met the criteria for further review. These criteria include: (1) *MHCA* results were positive and probative, (2) the defendant was convicted, (3) no DNA analysis was performed on the evidentiary hair, (4) the *case* was submitted to the FBI Laboratory and the analysis occurred prior to December 31, 1999, and (5) the FBI provided an *MHCA report* to the contributing law enforcement agency. Of these *cases*, some were never brought to trial for a variety of reasons (e.g., a guilty plea, a decision not to prosecute); however, a laboratory *report* would still have been produced. It is unknown how many of these *cases* went to trial, but it is certain that only a fraction of them progressed to trials in which *MHCA examiners* actually testified.

484 *transcripts* were found after years of wide-scale searching by the FBI, the NACDL, and the IP. The search included direct requests to jurisdictions across the U.S., and a general plea from the FBI Director for states to provide information. These *transcripts* documented trials from 1971 through 2003 (associated with MHCA analyses that were completed prior to December 31, 1999).¹⁵

450 *transcripts* have errors and 34 *transcripts* are error free based on the definitions established and applied by the 2012 Review team. There are over 2,000 *testimony errors*.

1,729 *reports* were reviewed when *transcripts* were not available. In some instances, *reports* were reviewed and the *transcript* was later provided, so there were a few *cases* where both the *transcript* and the *report* were reviewed. These *reports* were written from 1973 through 2000 (associated with MHCA analyses that were completed prior to December 31, 1999).¹⁶

856 *reports* have errors (typically, 1 per report) and 873 *reports* are error free based on the definitions established and applied by the 2012 Review team.

¹⁵ There were four transcripts from testimony after December 31, 1999.

¹⁶ There were ten reports dated after December 31, 1999.

35 *MHCA* examiners contributed to the 2,213 *reports* and/or transcripts that were reviewed for *errors*.

31 *MHCA* examiners erred and 4 did not. The four examiners with no errors had very few reports and transcripts assessed by the 2012 Review team.

The FBI sought to understand why these errors happened and continued for decades.

Our team was told that by 2017, FBI leadership believed they had collected sufficient data on the affected *cases* and understood enough of what happened to move forward with a study into the underlying reasons (1) why the errors occurred and (2) why they continued unabated for so long. ABS Group performed a year-long analysis related to these “why” questions.

The justice system relies on microscopic comparison analysis of hair.

Law enforcement and investigators continue to find human hairs at crime scenes and request that the FBI microscopically analyze them and testify on the results. *MHCA* remains a source of data for the justice system. Since the early 1900s, the process of *MHCA* has not changed significantly. In the 1990s, FBI *MHCA* examiners contributed to the introduction of DNA-based analyses at the FBI Laboratory, which is now considered a connected, but separate, forensic process. The only forensic science discipline of interest in this analysis is *MHCA* of human hairs.

The FBI hired experts in root cause analysis and cultural cause analysis to investigate why persistent report and testimony errors occurred.

The FBI initiated this project with ABS Group to assess the underlying causes of *errors* in *MHCA* *reports* and expert witness testimony in U.S. federal, state, local, territorial, and international courts by FBI *MHCA* examiners. The ABS Group team consisted of personnel with experience in *root cause analysis*, *cultural cause analysis*, forensic laboratories, and law enforcement. This team performed interviews with a range of current and former employees involved with *MHCA*. We also reviewed relevant documentation, including open sources and documents provided by the FBI such as available *transcripts* of testimony, *reports*, and procedures. The ABS Group team focused on answering three questions:

What patterns are evident in the *report and testimony errors*?

Why did the *report and testimony errors* occur?

Why did the *report and testimony errors* continue for decades?

Answering the question on patterns involved examining *MHCA* *reports and transcripts* to identify patterns in the occurrence of the *error types* identified by the 2012 Review. Answering the “why” questions required investigating the underlying *root causes* (i.e., management system weaknesses) and the relevant organizational culture, social, and behavioral drivers for these management system weaknesses.

The FBI reinforced the need for thorough and independent analysis.

The FBI requested the ABS Group team to conduct a thorough and independent analysis to help them better understand what was happening during the period analyzed (1950s through 1999).

The FBI and ABS Group both believed it was important to maintain the anonymity of anyone who participated in the interviews. Providing anonymity allowed the current and former *MHCA examiners* and other FBI leadership to feel comfortable answering our questions.

ABS Group's scope included errors that met the 2012 Review criteria.

The scope of the analysis only included *report and testimony errors* in FBI Laboratory *MHCA examiner reports* and expert testimony that met the 2012 Review selection criteria. Further details of the scope are:

FBI Laboratory: While this methodology spread to other forensic labs and other entities, this analysis is only of the FBI Laboratory *MHCA reports* and associated expert testimony.

- Cases associated with pleas based on *reports* or expert testimony that occurred before conviction were included in our scope.
- Statements related to forcible removal of hairs were not in our scope, consistent with the 2012 Review selection criteria.

Interviews: During interviews and document reviews, all *MHCA examiner* testimony and *reports* were considered in the scope.

1950s through 1999: The period analyzed; however, *reports* were only available starting in 1973 and transcripts were only available starting in 1971. After December 31, 1999, *MHCA* associations were routinely being analyzed with DNA.

Human hairs: Our scope only included *report and testimony errors* related to human hairs (not animal hairs or fibers, although the *MHCA examiners* also had expertise in these areas). Examiner statements on the transfer of human hair were also included in our scope.

Courts: FBI testimony from trials in U.S. federal, state, local, and territorial courts, as well as international courts, were included in our scope.

The conclusions in this report are based on a wide range of data.

ABS Group's team spent over 1 year working on this analysis and gleaned data from:

- 24 interviews with individuals who currently or previously worked for the FBI
- 20,000+ pages of *MHCA* testimony from over 450 transcripts
- 9,000+ pages of *MHCA reports* from over 1,700 total *reports*
- 200+ internal FBI documents
- 100+ articles, books, videos, and other open source input
- 1 demonstration of *MHCA* techniques by personnel at the current FBI Laboratory in Quantico, VA

The ABS Group team used proven analysis techniques.

ABS Group used proven industry techniques and tools to guide our third-party, analytical, data-informed assessment of the causes that led to the *error events*, *causal events*, and associated *root and cultural causes*.

Timeline – This tool was used to establish the timing of relevant events occurring inside and external to the FBI Laboratory during the period analyzed.

Trending – This technique was used to analyze data from *reports* and *transcripts* to assess our hypotheses of what influenced *MHCA* performance as it relates to events on our timeline and the Causal Event Sequence Diagram™ (CESD).

CESD – This tool was used to analyze and show the progression of *causal events* that resulted in the *error events*.

Cause Analysis Traceability Matrix™ – This tool was used to show connectivity from the *causal events* to the *root and cultural causes*. Also contained in this matrix are the relevant supporting and refuting data for each *causal event*.

Root Cause Map™ – This map was used to brainstorm, analyze, and categorize potential *root causes* (management system weaknesses) for each *causal event* on the CESD.

Cultural Cause Analysis Methodology™ (CCAM) – This approach, centered around ABS Group's 12 essential features for an organization's cultural success, was used to systematically consider potential individual and organizational cultural, behavioral, and social drivers that led to the *root causes*. This approach was also used to rank the identified *cultural causes*.

CONCLUSIONS

The purpose of this study was to answer three questions.

The purpose of this study was to answer three questions regarding the errors made by FBI Laboratory *MHCA* examiners, as defined in the 2012 FBI MHCA Review, from a *root and cultural cause* perspective.

What patterns are evident in the report and testimony errors?

Reports – Beginning around 1984, *MHCA* reports began and continued to frequently include a statement identified by the 2012 Review as an *error*. Almost all the *report errors* can be attributed to that one statement type (e.g., The questioned hair was “consistent with having originated from [individual’s name]” and “consistent with having come from [individual’s name]”). These statements were consistent with guidance developed between 1982 and 1985 and formally presented by others in the field at an FBI-hosted international symposium on *MHCA* in 1985. The *reports* containing that statement were, at the time, reviewed and approved by *Hairs and Fibers Unit* leadership, but that type of statement was judged to be erroneous by the 2012 Review.

Testimony – *Errors* in *MHCA* testimony continued from 1971 (the earliest transcript available) through 1999 at what appears to be a modestly decreasing rate. The *testimony errors* involved most of the *MHCA* examiners, not just a few of them. The FBI Laboratory management acted on the limited negative feedback they received on *MHCA* testimony during those years, but their response only had short-term impacts on the *testimony error* rate.

Why did the report and testimony errors occur?

The most important cause of *report and testimony errors* was that *MHCA* examiners did not have *sufficiently specific guidance* (i.e., instructions for *MHCA* reports and testimony that enabled an *MHCA* examiner to consistently write reports and testify without error). This is identified as Causal Event A, *FBI Laboratory management, Hairs and Fibers Unit, and the individual MHCA examiners did not develop sufficiently specific guidance*, in Figure 2

Regarding the management system weaknesses (*root causes*) driving Causal Event A, there was a cascading effect where not having what was needed in the beginning from the standup of the *Hairs and Fibers Unit* contributed to not being effective in the application of other management systems, particularly the lack of awareness of how often *MHCA* report and testimony errors were occurring. The original standup of the unit in the 1950s and 1960s did not require development of *report* and testimony guidance, nor did it require the appropriate subject matter experts (legal, statistical, and quality assurance) to participate in their unit as stakeholders.

These management system weaknesses were driven by two cultural causes. The first cultural cause involved Laboratory management not providing sufficient leadership in

(1) identifying how often *MHCA report and testimony errors* were occurring (e.g., by formally establishing criteria for determining *errors* and monitoring against those criteria), (2) responding to instances of issues with *MHCA testimony* (including third-party input), and (3) formalizing the methods used in the FBI Laboratory. The second cultural cause was overconfidence by Laboratory management in the belief that they did not need outside expertise (e.g., legal, statistical, and quality assurance) and did not see the value in formalized processes. As a result of these cultural weaknesses, the *sufficiently specific guidance* needed for *reports and testimony* was not created during the period we analyzed.

Regarding the causal chain described for *reports*, the *Hairs and Fibers Unit* leadership did not fully adopt the guidance communicated at the 1985 symposium, nor did they fully formalize and document these standards for use by their *MHCA examiners* and reviewers. The underlying basis for the few orally communicated rules appears to have been lost over time. This resulted in *reports* that were, at the time, reviewed and approved by *Hairs and Fibers Unit* leadership but were subsequently judged by the 2012 Review to contain erroneous statements.

For testimony, the causal chain led to *MHCA examiners* not being sufficiently prepared in that they did not have *sufficiently specific guidance*. Therefore, it was not possible for the organization to provide appropriate training, and thus it was not a surprise that there were *testimony errors*.

We concluded that if *sufficiently specific guidance* had been provided to the *MHCA examiners*, they would not have been in the *error-likely situation* and probably would not have made the majority of the *errors*. We did not find any evidence of *malicious intent* by the examiners.

Almost all *MHCA examiners* made some statements containing errors in their *reports* and transcripts, with the exception of four *MHCA examiners* who had few *reports* and *transcripts* assessed by the 2012 Review. The causes described above that drove most of the errors were consistent across all *MHCA examiners*, including those with the highest number of errors and the highest error rates.

Table 1 contains additional information on the categories of guidance that were provided to the *MHCA examiners* during the period analyzed and the relationship of the *errors* to these categories of guidance. The guidance was not static over the period analyzed. For example, following the O. J. Simpson trial in the mid-1990s, *MHCA examiners* were told not to use the word “match.” As a result, “match” moved from the “could state” category to the “cannot state” category.

For *reports*, most errors fell into either the “could state” or “use your best judgement” categories. For example, hundreds of *reports* contained statements similar to: The questioned hair was “consistent with having originated from [individual’s name].” The

reports containing these statements were reviewed and approved during the period analyzed, but the statements were judged to be erroneous by the 2012 Review.

For testimony, most of the errors fell into either the “could state” or “use your best judgement” category. For example, many transcripts contained *MHCA examiner* statements similar to “I have looked at over 10,000 hair samples and so far I have not found two individuals that I couldn’t distinguish one from the other.” Statements like this were judged to be erroneous by the 2012 Review.

Table 1. Categories of guidance provided to MHCA examiners during the period analyzed.

Guidance Category	Description of the Category	Comments	Examples
Had to state	Statements that were required to be stated in <i>reports</i> and/or testimony.		For example, the statement: <u>"It is pointed out that hair comparisons do not constitute a basis for absolute personal identification."</u> ¹⁷ This limiting language was used in almost all <i>reports</i> reviewed. This was NOT judged to be an <i>error</i> by the 2012 Review.
Could state	Statements that could be stated in <i>reports</i> and/or testimony.	Some of the statements in these two categories were determined to be <i>errors</i> by the 2012 Review. Most of the <i>report errors</i> were of these two categories.	An example of a <i>report error</i> from the could-state category would be: <u>"consistent with having come from [individual's name]."</u> An example of a <i>testimony error</i> from the could-state category prior to the O.J. Simpson trial (<i>MHCA examiners</i> understood that "match" was allowed in testimony prior to the Simpson trial) was: <u>"Well, the head hair that matched with [the defendant] did not match the victim's head hair sample."</u>
Use your best judgement	Statements where no specific guidance was provided on their use in <i>reports</i> and testimony.	Most of the <i>testimony errors</i> were of these two categories.	An example of a <i>testimony error</i> from the use-your-best-judgement category (because there was no specific guidance on the use of "rare") was: <u>"... based on my experience it's extremely rare that I will see hairs from two people that are so alike I can't tell them apart."</u>
Cannot state	Statements that were not allowed in <i>reports</i> and testimony.		An example of a <i>testimony error</i> after the O.J. Simpson trial (<i>MHCA examiners</i> were directed by <i>Hairs and Fibers Unit</i> management to not use "match" following the Simpson trial) would be: <u>"Well, the head hair that matched with [the defendant] did not match the victim's head hair sample."</u> An example of a <i>testimony error</i> in this category after 1991 (1991 internal FBI memos stated that "the pitfalls of overstating results were discussed with MHCA examiners," ¹⁸ including the phrase "completely indistinguishable") would be: <u>"In other words, it was completely indistinguishable. I could not tell them apart."</u>

17 All quotes of *MHCA examiner* statements in this report are from *MHCA reports* or testimony unless otherwise noted. Portions of the quotes that were identified by the 2012 Review as *report* or *testimony errors* are underlined.

18 "Internal FBI memos to FBI Laboratory Director Hicks." 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

Why did the report and testimony errors continue for decades?

The lack of *sufficiently specific guidance* was the most important *causal event* for *report and testimony errors* continuing for decades. Two other important *causal events* are that the FBI Laboratory management did not (1) sufficiently detect *MHCA report and testimony errors* and (2) sufficiently respond to the limited negative input from third parties regarding testimony.

Reports were reviewed by management, but without *sufficiently specific guidance* it is not a surprise that management did not detect the *errors*. There was no negative third-party feedback that we found for *reports*.

For testimony, FBI management infrequently monitored live testimony or obtained transcripts of *MHCA examiner* testimony. When the first formal FBI Laboratory testimony monitoring program was put in place in 1995, it focused on items like examiner timeliness and attire. FBI management trusted that *MHCA examiners* would testify within the limits of the science, but they did not confirm this trust was warranted by monitoring *MHCA examiner* testimony and using metrics to identify, track, and analyze trends in the occurrence of *errors*. Third-party feedback on *MHCA examiner* testimony received by the FBI was overwhelmingly positive. When issues were raised regarding *MHCA examiner* testimony, leadership did not perceive them as systemic and responded to them as isolated issues (e.g., with the specific individual).

The same two *cultural causes* that led to the occurrence of the *MHCA report and testimony errors* also contributed to their persistence. In addition to insufficient leadership and overconfidence (previously mentioned), we further conclude that the cultural weakness of insufficient performance monitoring was a *cultural cause* for *errors* continuing for decades.

OTHER CULTURAL CAUSES THAT DROVE SOME REPORT AND TESTIMONY ERRORS

The ABS Group analysis identified nine additional cultural causes.

Nine additional *cultural causes* contributed to one or more *root cause* categories that drove the occurrence of one or more *causal events*. Unlike the *cultural causes* described previously, the nine *cultural causes* listed below **were not major** and only contributed to some *report and testimony errors*. They are further described, with examples, in Section 6.

1. The *Hairs and Fibers Unit* had a culture of limiting the documentation related to *MHCA examiners*.
2. The *Hairs and Fibers Unit* preferred informal communication.
3. The FBI Laboratory did not sufficiently value the accreditation process and standards until late in the period analyzed.
4. There was not a culture of *thoughtful-compliance* related to making *MHCA report* and testimony statements.
5. The *Hairs and Fibers Unit* did not defer to expertise.
6. The *Hairs and Fibers Unit* did not establish a questioning and learning environment.
7. The *Hairs and Fibers Unit* provided too much autonomy to the examiners during testimony.
8. Instead of acting like impartial scientists, the FBI Laboratory culture embraced FBI agent-examiners acting like detectives.
9. FBI leadership was perceived as not welcoming feedback from non-agent examiners when they first joined the FBI Laboratory.

Summary of the top causal events, primary root causes, and major cultural causes

Figure 2 provides a visual summary of the causal events, primary root causes, and major cultural causes.

Figure 2 shows a summary of the analysis results. It includes the CESD that shows the progression of the 11 *causal events* (labeled A through K, which fall into 4 categories labeled 1.1, 1.2, 2.1, and 2.2) that led to the *report and testimony error events* on the far-right side of the diagram. The highest contributing *causal events* (first, second, and third) are also indicated on the CESD. These three *causal events* led to the vast majority of the *error events*.

Below the CESD are the three primary *root causes* and the three major *cultural causes*.

This report describes the items in Figure 2 in depth, including the contribution of these causes to the *error events* and our logic for ranking the causes. Development of recommendations for these causes was outside the scope of this analysis.

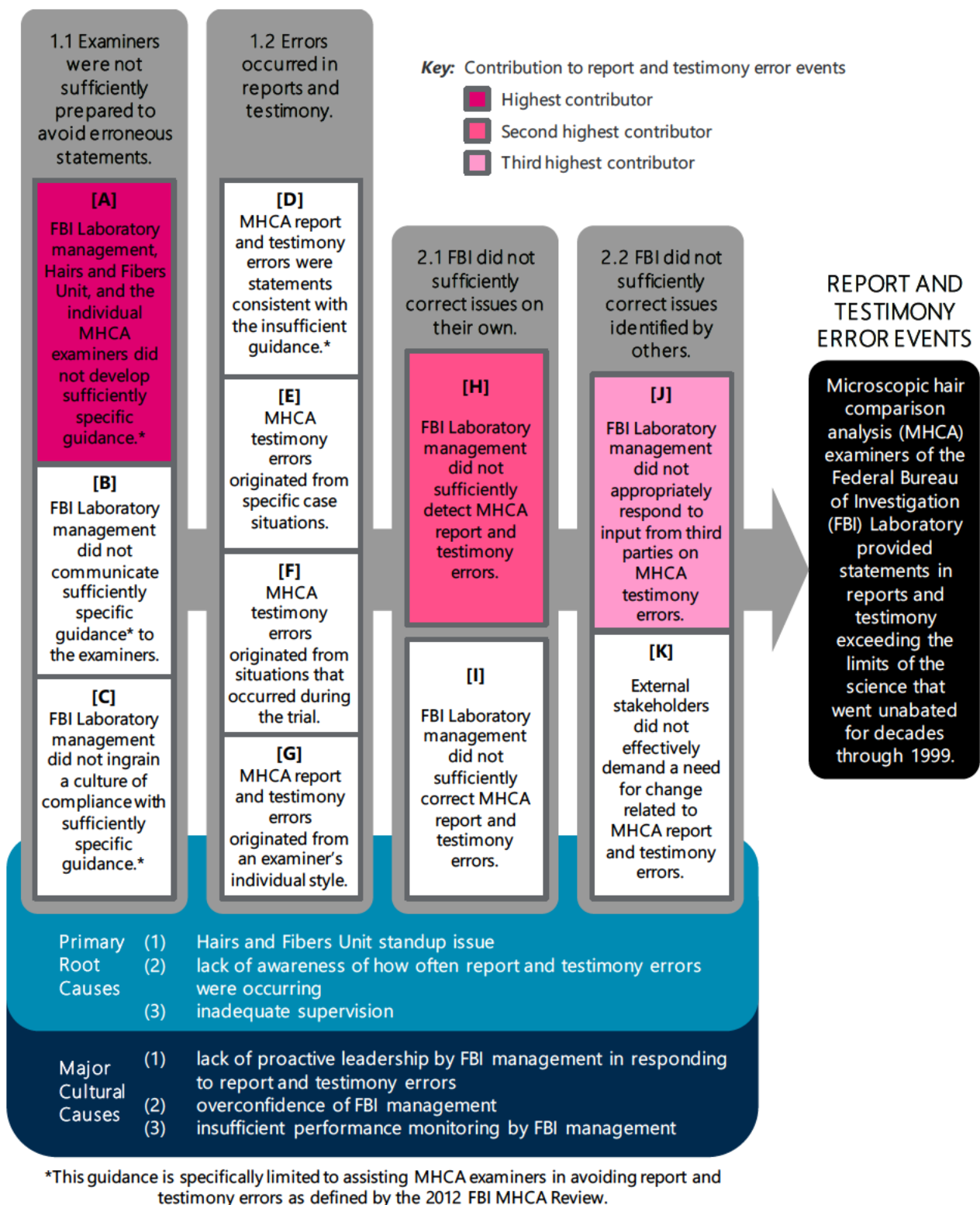


Figure 2. Causal event sequence diagram, the three primary root causes, and the three major cultural causes.

Epilogue

*MHCA
examiners
continue to
issue reports
and testify,
typically in
association with
DNA findings.*

The FBI continues to use *MHCA* to perform visual analysis of hair in response to requests from law enforcement agencies. Now, *MHCA* is routinely used in conjunction with DNA testing. FBI employees trained in *MHCA* continue to provide expert testimony if requested.

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INTRODUCTION

This section provides the purpose, objectives and scope of our analysis, the data collected to support our analysis and its limitations, and a description of our team.

1 INTRODUCTION

1.1 PURPOSES

The purpose of this analysis¹⁹ was to determine the underlying causes of the report and testimony errors identified by the ongoing Federal Bureau of Investigation (FBI) Microscopic Hair Comparison Analysis (MHCA) Review^{20, 21} (referred to going forward as the 2012 FBI MHCA Review or 2012 Review). Specifically, ABSG Consulting Inc. (ABS Group) was tasked with identifying the management system weaknesses and cultural causes of behavior during the period analyzed that led to the types of MHCA report and testimony errors identified in the 2012 Review.

1.2 OBJECTIVES

The FBI objectives for this analysis were for ABS Group to independently determine:

1. What patterns are evident in the report and testimony errors?
2. Why did the report and testimony errors occur?
3. Why did the report and testimony errors continue for decades?

1.3 SCOPE

This is a historical analysis of MHCA report- and testimony-related activities performed by the Hairs and Fibers Unit.²² Hair analysis began at the FBI Laboratory in the 1930s. We had interview data from the 1950s through 1999, and reports and trial transcripts from the early 1970s through 1999. Therefore, the overall period analyzed was from the 1950s through 1999, and the primary period analyzed was from the 1970s through 1999.

Further details of our scope are:

FBI Laboratory: While this methodology spread to other forensic labs and other entities, this analysis is only of the FBI Laboratory MHCA reports and associated expert testimony.

Cases that met the 2012 Review selection criteria: The 2012 Review case selection criteria include (1) MHCA results were positive and probative, (2) the defendant was convicted, (3) no DNA analysis was performed on the evidentiary hair, (4) the case was submitted to the FBI Laboratory and the analysis

19 In July 2017, the FBI awarded ABS Group contract number DJF-17-1200-K-0005475.

20 FBI Laboratory, “Microscopic Hair Comparison Analysis,” 9 November 2012, www.mtacd.org/attachments/CPE/Nelson/FBI_Limits_of_Science_Microscopic_Hair_Comparison.pdf

21 Reimer, Norman L. “The Hair Microscopy Review Project: An Historic Breakthrough for Law Enforcement and A Daunting Challenge for the Defense Bar.” *National Association of Criminal Defense Lawyers*, www.nacdl.org/champion.aspx?id=29488.

22 The unit was initially called the Microscopic Analysis Unit, then became the Hairs and Fibers Unit in the early 1970s, and then the Trace Evidence Unit in the late 1990s. We use Hairs and Fibers Unit throughout the report for simplicity.

occurred prior to December 31, 1999, and (5) FBI provided an MHCA report to the contributing law enforcement agency.

- Cases associated with pleas based on reports or expert testimony that occurred before conviction were included in our scope.
- Statements related to forcible removal of hairs were not in our scope, consistent with the 2012 Review selection criteria.

Interviews: During interviews and document reviews, all MHCA examiner testimony and reports were considered in scope.

1950s through 1999: The overall period analyzed; however, reports were only available starting in 1973 and transcripts were only available starting in 1971. After December 31, 1999, MHCA associations were routinely being analyzed with DNA.

Human hairs: Our scope only included report and testimony errors related to human hairs, not animal hairs or fibers although the MHCA examiners also had expertise in these areas. Examiner statements on the transfer of human hair were also included in our scope.

Courts: FBI testimony from trials in U.S. federal, state, local, and territorial courts, as well as international courts were included in our scope.

The scope of this analysis did not include:

- Status of MHCA at the FBI after 1999
- Activities by non-MHCA examiners at the FBI
- Development of recommendations
- Statements related to forcible removal of hairs (consistent with the 2012 Review selection criteria)

1.4 INDIVIDUAL ATTRIBUTION

The FBI and ABS Group both believed it was important to maintain the anonymity of anyone who spoke with us. Providing anonymity allowed the current and former MHCA examiners and other FBI leadership to feel comfortable answering our questions forthrightly. Specifically, names of FBI personnel are not used in this report because it is consistent with the goal of identifying organizational and system drivers of behavior that led to the MHCA testimony issues. This approach is also typically used by ABS Group in root and cultural analysis. Individual attribution is not needed for the analysis and does not assist with accomplishing the goals of the effort. Personnel are identified by their role or title, and not by name. As established by the FBI's initial project requirements to protect the anonymity of the individuals who participated in the interviews, ABS Group disposed of all documentation related to this project. As a result, we retained no means to connect statements in this report to specific interviewees.

1.5 DATA AVAILABLE AND LIMITATIONS

ABS Group's team spent over 1 year working on this analysis and used the following data:²³

24 interviews with individuals who currently or previously worked for the FBI

20,000+ pages of MHCA testimony from over 450 transcripts

9,000+ pages of MHCA reports from over 1,700 total reports

200+ internal FBI documents

100+ articles, books, videos, and other open source input

1 demonstration of MHCA techniques by personnel at the current FBI Laboratory in Quantico, VA.

ABS Group reviewed all transcripts and reports the FBI provided and used the information to assist in the analysis. ABS Group did not perform an independent review of the (1) error definitions developed and used by the 2012 Review team and (2) the application of the definitions to the transcripts and reports that team reviewed.

Interviews

We attempted to interview 47 personnel (actually interviewed 24) who currently or previously worked for the FBI, with a focus on personnel who worked in the Hairs and Fibers Unit from the 1950s through 1999. We were not able to interview the remaining individuals for a variety of reasons (e.g., they declined to participate or were deceased). Among the people interviewed, there were several factors that may have affected the information provided: (1) detailed memories of events that occurred long ago may have been limited or inaccurate, (2) it may have been difficult to recall events in the proper sequence or place them in the correct time frame, and (3) some mentioned health issues that may have affected their recollection of the events.

To address the limitations in the interview data, we reviewed documentation created during the period analyzed, including MHCA examiner reports and transcripts, procedures, policies, articles, and other documentation.

Transcripts

The FBI could not obtain some transcripts related to MHCA examiner testimony from the relevant court (e.g., federal, state, local, territorial, and international). Much of the period analyzed was in an era when records and filing systems were largely paper-based, making it more difficult and time-consuming to locate and reproduce the transcripts. Over 450 transcripts were obtained representing some of the MHCA examiner testimony that occurred from 1971 through 2003 (associated with MHCA analyses that were completed prior to December 31, 1999). A large number of transcripts were available for one examiner, but

²³ Appendix A lists the data sources used in this analysis.

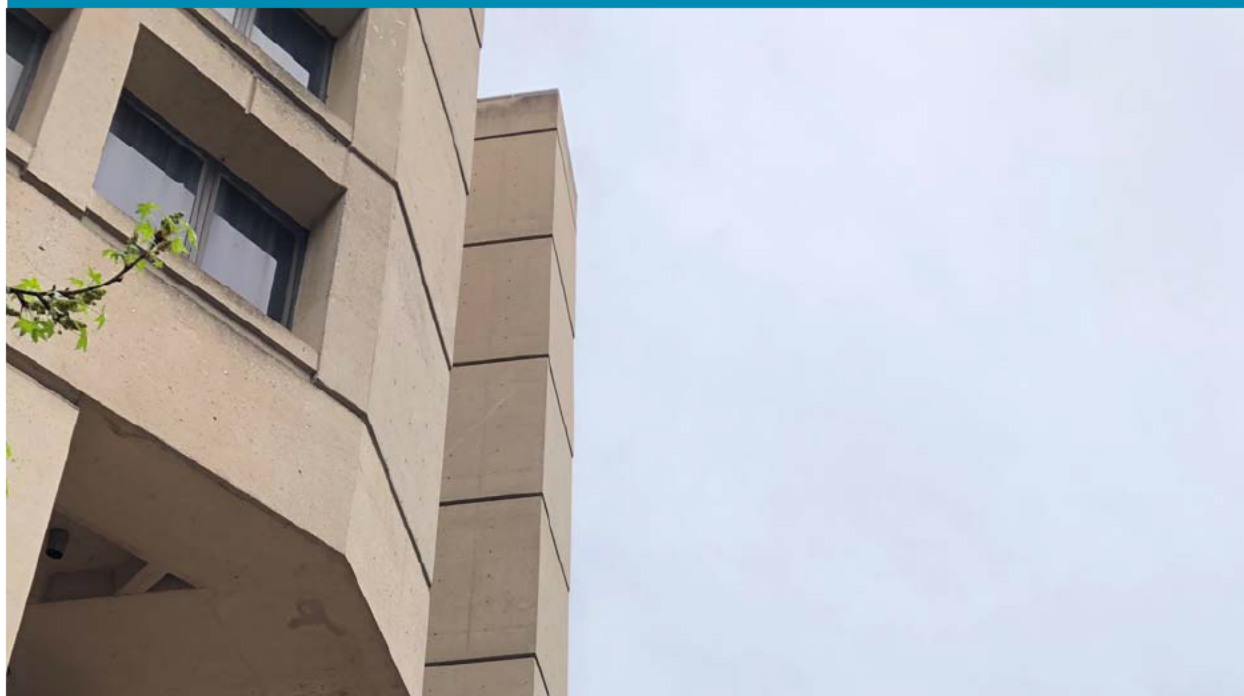
that was, in part, the by-product of the transcripts being obtained and kept with the records of an investigation in the mid-1990s.

Reports

When transcripts were not available, the FBI sought the related MHCA laboratory reports. Over 1,700 reports from 1973 through 2000 were obtained by the 2012 Review team. The 2012 Review team used the same criteria for identifying MHCA report errors that were used during review of the transcripts. The reports and the associated results of the 2012 Review team's examination were provided to ABS Group. In some instances, a report was reviewed and the associated transcript was provided later.

Documentation

ABS Group requested procedures and records from the FBI for the period analyzed. For a variety of reasons, the documentation provided to ABS Group was limited. For example, none of the written procedures were dated earlier than 1995 because prior to the mid-1990s, there were few if any formalized written procedures for MHCA examiner tasks, including testimony preparation. In addition, there may have been issues with the FBI filing system that affected their ability to locate older documentation specific to this study. Also, ABS Group requested records of negative third-party feedback for the MHCA examiners from the period we analyzed. These records were historically stored in FBI personnel files and were unavailable to us.



STATEMENT OF PROBLEM

This section provides an overview of the events that triggered this root and cultural cause analysis, outlines the three report and testimony error types identified by the 2012 FBI MHCA Review, and provides updated statistics from the FBI on the status of their 2012 Review.

2 STATEMENT OF PROBLEM

In 2012, the FBI MHCA Review^{24,25} was begun by a group that included the FBI, the National Association of Criminal Defense Lawyers (NACDL), and the Innocence Project (IP). The joint effort to review MHCA reports and testimony for statements that exceeded the limits of the science was launched after several events occurred, including most importantly the exoneration of a few individuals in the Washington, D.C., area between 2009 and 2012.²⁶ These individuals had served lengthy prison sentences and their convictions were, in part, impacted by testimony of FBI MHCA examiners. According to the FBI, “The purpose of the 2012 FBI MHCA Review is to ensure that FBI Laboratory examiner testimony regarding microscopic hair comparison analysis met accepted scientific standards.”²⁷

Microscopic hair comparison analysis (MHCA) examiners of the Federal Bureau of Investigation (FBI) Laboratory provided statements in reports and testimony exceeding the limits of the science that went unabated for decades through 1999.

2.1 THE THREE REPORT AND TESTIMONY ERROR TYPES

In performing the 2012 Review, the joint partnership identified three types of errors that would result in statements that exceeded the limits of the science.²⁸

Error Type 1: *The examiner stated or implied that the evidentiary hair could be associated with a specific individual to the exclusion of all others. This type of testimony exceeds the limits of the science.*

Error Type 2: *The examiner assigned to the positive association a statistical weight or probability or provided a likelihood that the questioned hair originated from a particular source, or an opinion as to the likelihood or rareness of the positive association that could lead the jury to believe that valid statistical weight can be assigned to a microscopic hair association. This type of testimony exceeds the limits of the science.*

Error Type 3: *The examiner cites the number of cases or hair analyses worked in the laboratory and the number of samples from different individuals that could not be distinguished from one another as a predictive*

24 FBI Laboratory, “Microscopic Hair Comparison Analysis,” 9 November 2012, www.mtacd.org/attachments/CPE/Nelson/FBI_Limits_of_Science_Microscopic_Hair_Comparison.pdf

25 Reimer, Norman L. “The Hair Microscopy Review Project: An Historic Breakthrough for Law Enforcement and A Daunting Challenge for the Defense Bar,” *National Association of Criminal Defense Lawyers*, www.nacdl.org/champion.aspx?id=29488.

26 Alexander, Keith L. *DNA Tests Set Free D.C. Man Held in Student's 1981 Slaying*, Washington Post, December 16, 2009; Hsu, Spencer S. *Kirk L. Odem Officially Exonerated; DNA Retesting Cleared Him in D.C. Rape, Robbery*, Washington Post, July 13, 2012; Hsu, Spencer S., *D.C. Judge Exonerates Santae Tribble in 1978 Murder, Cites Hair Evidence DNA Test Rejected*, Washington Post, December 14, 2012.

27 FBI Laboratory Services, “FBI/DOJ Microscopic Hair Comparison Analysis Review.” 19 April 2015, www.fbi.gov/services/laboratory/scientific-analysis/fbidoj-microscopic-hair-comparison-analysis-review.

28 FBI Laboratory, “Microscopic Hair Comparison Analysis,” 9 November 2012, www.mtacd.org/attachments/CPE/Nelson/FBI_Limits_of_Science_Microscopic_Hair_Comparison.pdf

value to bolster the conclusion that a hair belongs to a specific individual. This type of testimony exceeds the limits of the science.

The 2012 Review team examined over 1,700 reports from 1973 through 2000 and over 450 transcripts of MHCA examiner testimony from 1971 through 2003 (associated with MHCA analyses that were completed prior to December 31, 1999) to identify instances of statements exceeding the limits of the science. Their analysis showed that there were over 800 errors in reports and over 2,000 errors in the transcripts with about 50% of the reports and about 90% of the transcripts having at least one error. ABS Group was not and has not been involved in the 2012 Review.

On 5 July 2017, the FBI awarded ABS Group a contract to perform a root cause analysis to identify the behavioral, organizational culture, group, social, and/or other similar factors that led to or contributed to errors identified in the 2012 Review. Our team was told that by 2017, FBI leadership believed they had collected sufficient data on the affected cases and understood enough of what happened to move forward with a study into the underlying reasons why the errors occurred and why they continued unabated for so long.

The 2012 Review did not seek to understand why these report and testimony errors occurred. Understanding why the errors occurred was the focus of our analysis.

2.2 FINDINGS OF THE 2012 REVIEW

The FBI released the initial findings from their 2012 Review in 2015. The 2012 Review is ongoing, and its current findings, as of June 2018, are summarized below. The terms: *case*, *transcript*, *report*, *MHCA examiner*, and *report or testimony error* are defined in the *Working Definitions for this Report* to support your understanding of the following information.

23,547 total FBI cases were reviewed to determine if they met the MHCA criteria for further examination.

3,499 of the cases met the criteria for review. The 2012 Review case selection criteria include (1) MHCA results were positive and probative, (2) the defendant was convicted, (3) no DNA analysis was performed on the evidentiary hair, (4) the case was submitted to the FBI Laboratory and the analysis occurred prior to December 31, 1999, and (5) the FBI provided a MHCA report to the contributing law enforcement agency. Of these cases, some were never brought to trial for a variety of reasons (e.g., a guilty plea, a decision not to prosecute); however, a report would still have been produced. It is unknown how many of these cases went to trial, but it is certain that only a fraction of them progressed to actual trials in which MHCA examiners testified.

484 transcripts were found after years of widescale searching by the FBI, NACDL, and the IP. The search included direct requests to jurisdictions across the U.S. and a general plea from the FBI Director for states to provide information. These transcripts document trials

from 1971 through 2003³⁰ (associated with MHCA analyses that were completed prior to December 31, 1999).

450 transcripts have errors and *34* transcripts are error-free based on the definitions established and applied by the 2012 Review team. There are over 2,000 testimony errors.

1,729 reports were reviewed when transcripts were not available. In some instances, reports were reviewed and the transcript was later provided, so there were a few cases where both the transcript and the report were reviewed. These reports were written from 1973 through 2000³¹ (associated with MHCA analyses that were completed prior to December 31, 1999).

856 reports have errors (typically, 1 per report) and *873* reports are error free based on the definitions established and applied by the 2012 Review team.

35 MHCA examiners contributed to the 2,213 transcripts and/or reports that were reviewed for errors.

31 MHCA *examiners* erred and *4* did not. The four examiners with no errors had very few reports and transcripts assessed by the 2012 Review team.

³⁰ There were four transcripts from testimony after December 31, 1999.

³¹ There were ten reports dated after December 31, 1999.



METHODOLOGY

This section describes the approach developed for this analysis and also provides a description of the tools used to analyze the data systemically and comprehensively.

3 METHODOLOGY

This section describes the methods used by ABS Group to achieve the objectives of this study.

- Section 3.1 provides a high-level explanation of our seven-step approach.
- Section 3.2 describes the tools used in implementing this approach and how they were adapted for this analysis. Additional details for some of the tools are included in Appendices C and D (Root Cause Map and Cultural Cause Analysis, respectively).

3.1 APPROACH

The key steps of this analysis included: (1) understanding the problem, (2) identifying data sources, (3) collecting data, (4) analyzing data, (5) developing results, (6) developing conclusions, and (7) reporting the results and completing the project.

Step 1. Understanding the problem

This first step involved an initial review of several key documents and a demonstration of MHCA techniques by personnel at the FBI Laboratory in Quantico, VA. During this step we agreed with the FBI on the following statement for the report and testimony error events being analyzed: *Microscopic hair comparison analysis (MHCA) examiners of the Federal Bureau of Investigation (FBI) Laboratory provided statements in reports and testimony exceeding the limits of the science that went unabated for decades through 1999.*

Step 2. Identifying data sources

This step focused on identifying the relevant documents available for review and scheduling interviews with current and former FBI Laboratory MHCA examiners.

Step 3. Collecting data

This step involved obtaining documents that were publicly available; reviewing documents provided by the FBI (MHCA reports, trial transcripts, written procedures, and other documents); and performing interviews. Appendix A includes a listing of documents reviewed (other than FBI-provided MHCA reports and transcripts). In addition to the documents listed in Appendix A, we reviewed MHCA reports and trial transcripts provided by the FBI. All of these MHCA reports and transcripts contained statements by FBI Laboratory MHCA examiners that were related to analyses performed through 1999.

Another major data collection effort involved interviewing 24 FBI personnel, primarily former MHCA examiners. We developed a detailed interview guide to facilitate consistent questioning of the interviewees. Each of these meetings included at least two ABS Group interviewers and lasted between 2 and 8 hours. The majority of the interviews were conducted in person at a location of the interviewee's choosing, but a few of the interviews were conducted by phone.

Step 4. Analyzing data

As data were collected on various events from document reviews, we built a timeline showing the occurrence of the events perceived as most relevant to the analysis. In addition, we (1) analyzed the 1,700+ reports and 450+ transcripts to identify trends in words and phrases used by MHCA examiners and (2) performed more detailed reviews on a sample of the reports and transcripts to verify our understanding of the context of the errors.

Step 5. Developing results

The initial step in developing the results was to create a Causal Event Sequence Diagram (CESD) (see Section 3.2). This development involved combining (1) the information from a cause and effect tree³² that summarized hypothetical causal events and (2) available sequence information regarding the progression of the causal events to the error events. This enabled us to identify sequences of causal events that led to the MHCA report or testimony error events. We then developed a traceability matrix that included:

- Each causal event on the CESD
- Supporting and refuting data related to each causal event
- Root causes related to each causal event based on using our root cause analysis (RCA) approach
- Cultural causes related to the causal events based on using our cultural cause analysis™ (CCA) approach

The team used the supporting and refuting information to (1) eliminate some hypothetical causal events that were shown to have not contributed to the error events and (2) confirm the remaining causal events as contributors to the error events. These contributing causal events were then included in the sequence shown in the CESD. The team then developed criteria for ranking the relative importance of causal events, root causes, and cultural causes. Once these rankings were determined, the team then finalized the traceability matrix.

Section 3.2 describes the general methodologies and key adaptations for the following tools used in the analysis: timeline, trending, CESD, traceability matrix, RCA, and CCA.

Step 6. Developing conclusions

This step focused on communicating a succinct description of our team’s understanding of the causal events, root causes, and cultural causes for the MHCA report and testimony error events. Specifically, we highlighted the causal events that were the highest contributors to the error events, described the primary root causes associated with the causal events, and then described the major cultural causes driving those root causes. We also described our conclusions regarding other cultural causes that made some contributions. Providing recommendations was beyond the scope of this work.

32 ABSG Consulting, Inc.; “Root Cause Analysis Handbook, Guide to Efficient and Effective Investigation, Third Edition;” 2008, Rothstein Associates Inc.; ISBN 978-1-931332-51-4.

Step 7. Reporting the results and completing the project

This step involved incorporating all the elements of the work into a single document. This report went through several internal reviews as well as a process that allowed current FBI management to provide comments for our consideration. As established by the FBI's initial project requirements to protect the anonymity of the individuals who participated in the interviews, ABS Group disposed of all documentation related to this project. As a result, we did not retain a means to connect statements in this report to specific interviewees.

3.2 TOOLS AND TECHNIQUES

As described in Section 3.1, we used a timeline and trending in performing our analysis. We used a CESD, a traceability matrix, RCA, and CCA to analyze the information collected and to develop the results. This section provides an overview of these key tools/techniques and significant adaptations needed for this work. Table 2 provide a list of tools and techniques used in the Analysis Results sections (Section 4 and Section 5, respectively).

Table 2. List of tools and techniques used in analysis and results.

Section	Tools and Techniques Used
4 - Analysis	Timeline Trending
5 - Results	Causal event sequence diagram (CESD) Traceability matrix Root cause analysis (RCA) Cultural cause analysis (CCA)

Tools and Techniques Used for Data Analysis

Timeline

A timeline is a widely used tool that, in its simplest form, lists events in chronological order. A timeline can be developed to describe a particular event or a series of relevant events. For this study, the timeline developed does not describe one particular event, rather, it shows a sequence of relevant events on a variety of subjects that occurred from the 1950s through 1999. We also summarized this information in a single page diagram (see Figure 7 in Section 4.2) highlighting key events over the period analyzed.

Trending

Trending is a widely used approach to analyze potential patterns in data. In our analysis, we used the reports and transcripts provided by the FBI to identify potential trends in (1) the occurrence of MHCA report and testimony errors and (2) use of words and phrases associated with MHCA report

and testimony errors. The output of this effort was a series of graphs showing apparent trends, a statistical assessment of the significance of the trends, and conclusions regarding several postulated influencers on the trends (see Sections 4.3 through 4.5 and Appendix B).

Tools and Techniques for Developing Results

Causal Event Sequence Diagram (CESD)

The CESD flows from left to right and shows sequences of causal events that can lead to an MHCA report or testimony error event. When one of these causal event sequences occurs, it produces one of the MHCA report or testimony error events. Interrupting the sequence of events leading to error events will prevent an error event from occurring.

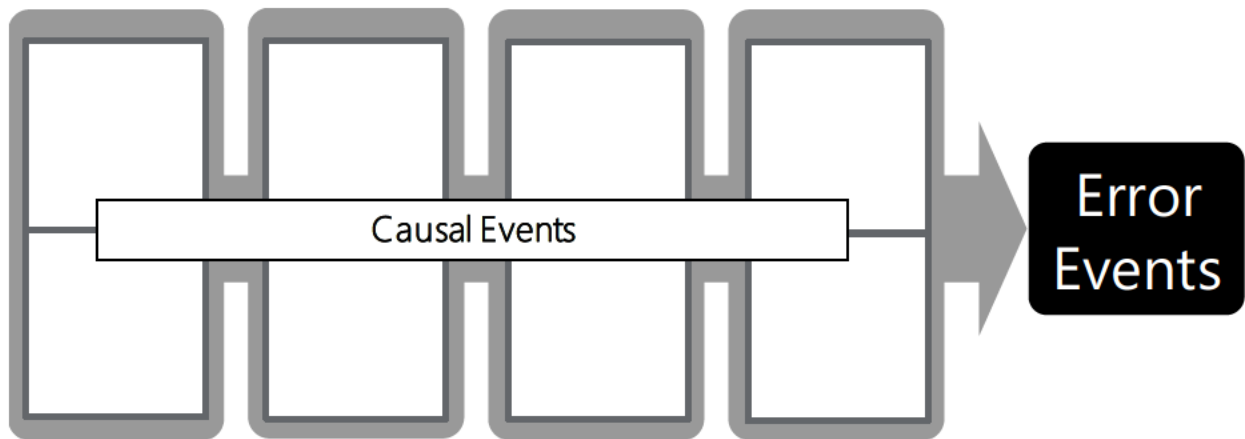


Figure 3. Schematic view of a causal event sequence diagram.







Criteria for ranking the contribution of a causal event to the occurrence of the error events include the following:

- The fraction of the error events directly impacted by this causal event.
 - For example, a causal event judged as having a high contribution would contribute to the vast majority of the error events. Conversely, a causal event judged as having a lower ranking would contribute to only a few of the error events.
- The degree to which other causal events will have an increased probability of occurring (e.g., an error-likely situation) given the occurrence of this causal event, with the maximum degree being a certainty of failure.
 - An example of an increased probability of occurring: If the speed limit is 50 mph but the posted sign just says “Drive Carefully,” drivers are more likely to exceed the speed limit because they would be in an error-likely situation.
 - An example of certainty of failure: If I do not know the speed limit, I cannot communicate the correct speed limit to you.

Traceability Matrix

After the CESD was developed, the traceability matrix was created to structure the analysis at the causal event level, root cause level, and cultural cause level. The contents of the traceability matrix (which is in Section 5.4) and the associated icons for each portion of the matrix are shown in Table 3.

Table 3. Summary of the contents of the traceability matrix.

Icon	Description	
	The causal event description and its level of contribution to the error events.	
	Conclusions regarding the level of contribution to the error events and a summary of the significance of the causal event.	
	Supporting data for the causal event. These statements indicate that the causal event occurred and contributed to one or more of the report or testimony error events.	The balance of the supporting and refuting data for each causal event was used to determine which causal events occurred and contributed to the report and testimony error events. It also was used to identify the highest causal event contributors to the error events.
	Refuting data for the causal event. These statements indicate that the causal event did not occur, contributed to few, if any, of the error events.	
	The results of the root cause analysis that was performed for each causal event.	
	The results of the cultural cause analysis that was performed for each causal event.	

Root Cause Analysis

The causal events on the CESD were the starting point for the RCA. We determined that there were 11 causal events of interest so the team performed 11 separate RCAs. Each RCA identified specific management system weaknesses (e.g., hazard identification-related, supervision-related) that contributed to the occurrence of that particular causal event.

RCA is a tool for identifying management system weaknesses that contributed to the occurrence of the MHCA report or testimony error events being investigated. We used the ABS Group Root Cause Map™ to help structure our approach. The Root Cause Map and a description of how it is used are provided in Appendix C. The Root Cause Map has seven layers of events and is designed to guide the analysis from a specific causal event to specific management system weaknesses. The team used the Root Cause Category level from the Root Cause Map to categorize the management system weaknesses associated with each causal event from the CESD. Table 4 provides the criteria for ranking the root causes.

Table 4. Criteria for ranking root causes.

Ranking	Criteria
Primary	<ul style="list-style-type: none"> Addressing these root causes (i.e., management system weaknesses) would be expected to substantially reduce how often error events occur. These root causes had substantial impacts on one or more of the highest contribution causal events. These root causes typically drive the occurrence of additional root causes.
Other	<ul style="list-style-type: none"> Addressing these root causes would be expected to moderately or minimally reduce how often error events occur. These root causes generally had modest or minimal impacts on one or more of the highest contribution causal events or substantial impacts on one or more of the lower contribution causal events.

Cultural Cause Analysis

The culture of the Hairs and Fibers Unit at the FBI Laboratory during the period analyzed was a driver for the associated root causes (management system weaknesses) identified by the RCA. Thus, the team performed a separate cultural cause analysis for each of the 11 causal events at the lowest level of development of the CAET. This third level of analysis first identified cultural causes associated with the root causes for the causal event. We then associated each cultural cause with 1 or more of the 12 essential features for an effective organizational culture described in ABS Group's Cultural Cause Analysis Methodology™ (CCAM) (see Appendix D).

Essential feature analysis is part of the CCAM developed by ABS Group for supporting organizational culture analysis. Specifically, the tool structures examination of the cultural causes and the identification and categorization of relevant weaknesses for an organization. The original tool is most frequently used to gauge safety culture of an organization; we modified it for this application to assess the organizational culture influencing examiner testimony. As applied in this study, organizational culture weaknesses are identified, and 1 or more of the 12 essential features are associated with each of them.

Based on the weaknesses observed for the relevant essential features, we described cultural causes. Cultural causes drove or reinforced weaknesses in management systems, which then allowed the occurrence of one or more causal events and ultimately contributed to one or more error events. Table 5 provides the criteria for ranking the cultural causes.

Table 5. Criteria for ranking the cultural causes.

Ranking	Criteria for the Level
Major	<ul style="list-style-type: none"> Addressing weaknesses in the culture related to this cultural cause is expected to substantially reduce how often future error events occur. Weaknesses in the culture related to this cultural cause are a substantial driver for the overall weaknesses in achieving a culture that would have avoided the error events.
Other	<ul style="list-style-type: none"> Addressing weaknesses in the culture related to this cultural cause is not expected to substantially reduce how often future error events occur. Weaknesses in the culture related to this cultural cause were not a substantial driver for the overall weaknesses in achieving a culture that would have avoided the error events.

Integration of the Tools

The relationship among all the tools used to generate the results is shown in Figure 4. Causal events are oriented flowing left to right. Each causal event has supporting and refuting data that explain why our team concluded this event did occur and contributed. The management system weaknesses (root causes) for the causal events are depicted in blue below the causal events. The cultural causes shown in dark blue are the lowest level of our analysis. For flow of this diagram, it can be read as: the cultural causes led to the management system weaknesses (root causes), which allowed causal events to occur, resulting in the error events.

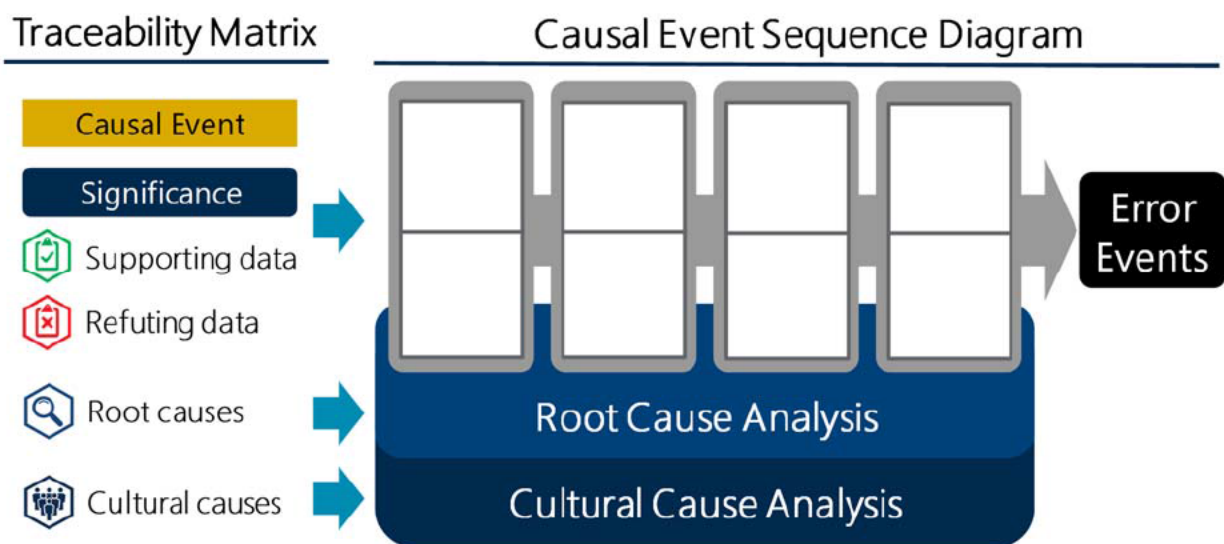
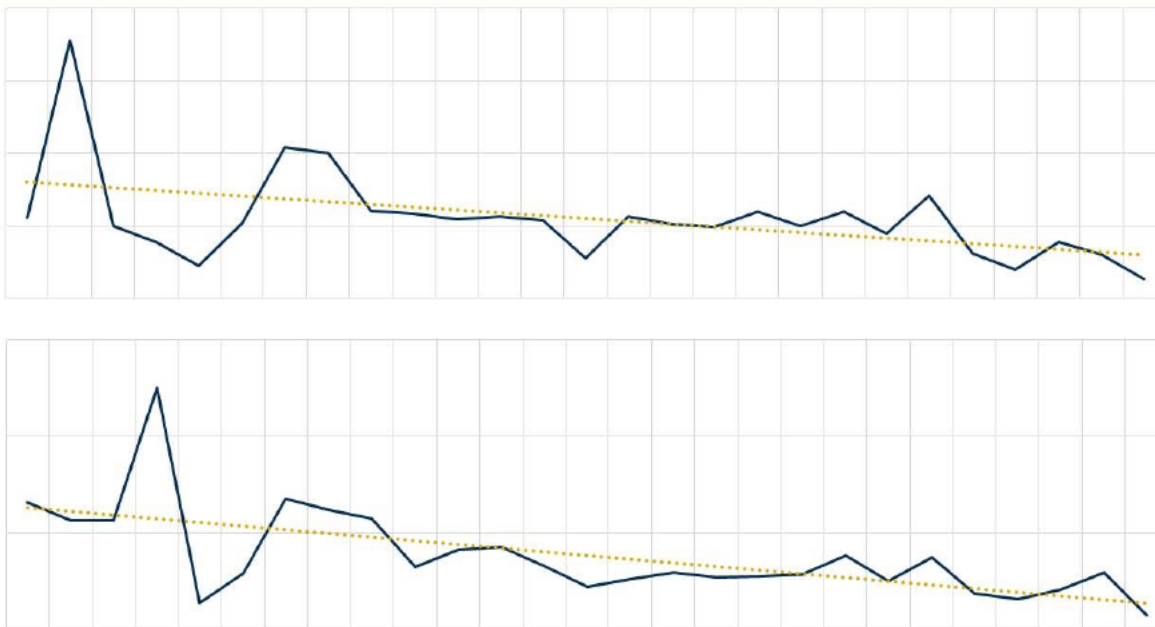


Figure 4. Relationship of tools and techniques used in this analysis.



ANALYSIS

This section includes (1) analysis of the data collected, (2) background regarding MHCA within the FBI Hairs and Fibers Unit, (3) analysis of errors in reports and transcripts, and (4) analysis of the management systems and culture to provide a basis for later discussions in the *Results* section (Section 5).

4 ANALYSIS

This section provides a summary of the analysis process.

Section 4.1 provides an overview of our data collection process, describes the types of data collected, and characterizes the quality of the data we analyzed.

Section 4.2 provides background regarding MHCA within the FBI Hairs and Fibers Unit and a timeline of significant events.

Section 4.3 describes our analysis of the report errors identified by the 2012 Review.

Section 4.4 provides a characterization of the testimony errors identified by the 2012 Review.

Section 4.5 provides an analysis of the use of words and phrases associated with testimony errors.

Section 4.6 provides a summary and analysis of the management systems in place.

Section 4.7 provides a summary and analysis of the Hairs and Fibers Unit culture during the period analyzed.

Section 4.8 provides a transition from the analysis to the results.

4.1 DATA COLLECTION

Data collection included interviews and obtaining documents, MHCA reports, and MHCA transcripts.

Interviews

The FBI invited 47 individuals to participate in interviews with the ABS Group analysis team. These individuals were current FBI employees (e.g., at the FBI Laboratory or elsewhere) or former FBI employees (e.g., retired or working elsewhere). The list primarily included MHCA examiners and Hairs and Fibers Unit Chiefs who worked in the Hairs and Fibers Unit during the period analyzed, but also included people who worked as technicians in the Hairs and Fibers Unit or other roles in the FBI during the period analyzed. Multiple attempts were made to contact the potential interviewees to provide them an opportunity to participate in the interviews.

Participation in the project was voluntary for all personnel. In addition, the FBI was not informed of who participated in the interviews. Several measures were implemented to protect the anonymity of all who chose to participate, including the use of coded information.

As shown in Figure 5, we were able to interview 24 of the 47 potential interviewees.

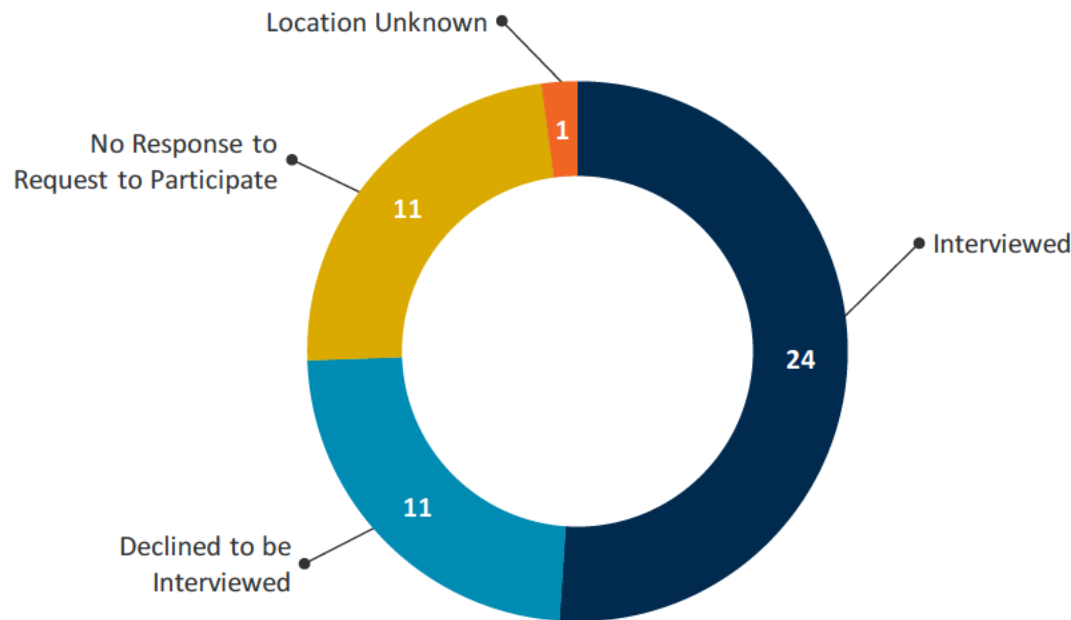


Figure 5. Status of individuals invited and available to participate.

The majority of the interviews were done in person, and the remainder were done over the phone. All interviews involved at least two ABS Group representatives and one interviewee. Interviews were scheduled to last from 2 to 4 hours, with the actual interviews ranging from 30 minutes to over 8 hours. A number of factors affected the length of the interviews, including the amount of time the individual spent in the Hairs and Fibers Unit, the FBI Laboratory, the FBI, and the individual's ability to recall events during the period analyzed.

An interview guide was developed by the ABS Group team to help consistently direct and support the interviews. Questions were related to the activities of the Hairs and Fibers Unit, the management systems in place (root cause topics), and the culture of the Hairs and Fibers Unit during the period analyzed. The interview questions were designed in an open-ended style to elicit a free-form answer from the interviewee. As a result, the order in which the topics were covered and the coverage of each topic varied from interview to interview.

Documents

Documents other than MHCA reports and transcripts. The ABS Group team initially identified the types of documentation that were available and likely to provide useful information about both the processes used in the Hairs and Fibers Unit and the underlying drivers of performance for the personnel in that unit. Most of the documents reviewed were generated during the period analyzed. However, some documents generated after 1999 were reviewed if documentation from the period analyzed could not be

located (e.g., the first MHCA training program provided was dated July 2006), or the documents addressed relevant issues from the period analyzed (e.g., the National Academy of Sciences report³³ from 2009).

In general, the types of documents reviewed included:

- Internal FBI guidelines for performing MHCA, reporting the results, and testifying in court
- Internal FBI communications regarding the Hairs and Fibers Unit
- Industry guidelines for performing MHCA, reporting the results, and testifying in court
- Requirements and commentary regarding (American Society of Crime Laboratory Directors/Laboratory Accreditation Board) ASCLD/LAB accreditation standards and accreditation of the FBI Laboratory
- Reports from other groups, such as the Office of Inspector General, related to performance of the FBI Laboratory in general, and specifically, the Hairs and Fibers Unit
- Reviews and studies by other groups, such as the National Academy of Sciences, related to forensics analysis in general, and MHCA in particular
- Academic textbooks and other books related to MHCA and to the performance of the FBI Laboratory
- Newspaper articles describing issues identified with FBI testimony related to MHCA and other analysis processes within the FBI Laboratory
- Documentation from the IP and the NACDL

As the analysis progressed, documents were added to and deleted from the original list. Some of the documents that the team requested were not available for review. Based on interviews, MHCA examiner-related documentation from the period analyzed was limited, and the FBI record management system's limitations at the time may have contributed to the difficulty in locating historical documents.

Reports

The FBI provided the ABS Group team with 1,729 reports documenting MHCA analyses. The FBI also provided documentation of the report errors identified by the FBI, the IP, and the NACDL as part of the ongoing 2012 Review.

The ABS Group team reviewed a sample of the reports and all of the 2012 Review report evaluation forms from the FBI, the IP, and the NACDL, to understand the general content of the reports and the report errors identified by the 2012 Review.

Transcripts

The FBI provided the ABS Group team with over 450 transcripts containing MHCA testimony. The majority contained MHCA examiner testimony in U.S. federal, state, local, and territorial trials. The remaining documents were generally MHCA testimony in depositions or, in a few cases, testimony in

33 Committee on Identifying the Needs of the Forensic Sciences Community, National Research Council. "Strengthening Forensic Science in the United States: A Path Forward." Aug. 2009, www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf.

international courts. The FBI also provided documentation of the testimony errors identified by the FBI, the IP, and the NACDL in the transcripts as part of the ongoing 2012 FBI MHCA Review. The transcripts ranged from about 15 pages to several hundred pages in length.

The ABS Group team reviewed the transcripts to understand the general content of the testimony and the testimony errors identified by the 2012 Review.

In addition, the ABS Group team performed trending analyses of the FBI-identified testimony errors and an independent analysis of the use of several words and phrases (e.g., rare, unusual, unique, strong) generally associated with these testimony errors. (see Sections 4.3 through 4.5 and Appendix B.)

4.2 BACKGROUND REGARDING MHCA WITHIN THE FBI HAIRS AND FIBERS UNIT

Organizational Structure of the Hairs and Fibers Unit

During the period analyzed, the Unit had several names. It was initially called the Microscopic Analysis Unit, then the Hairs and Fibers Unit, and finally the Trace Evidence Unit. This group is referred to as the Hairs and Fibers Unit throughout this report. The Hairs and Fibers Unit expanded considerably from its inception in the 1950s until the end of the period analyzed in 1999. It began with a single examiner and eventually grew to about 10 examiners and 10 technicians, with administrative and management staff supporting their work. The MHCA examiners performed both MHCA and microscopic fiber examinations. Some of the examiners had additional specialties, such as microscopic examination of feathers or wood. In general, the MHCA examiners worked with technicians who did most of the evidence receiving and processing work, such as inventorying the evidence and scraping items to recover the hairs. The MHCA examiners did all the microscopic comparison work, developed conclusions, wrote the reports, and testified to the results.

Examiners typically stayed in their position for about 6 years. About 25% of the examiners stayed for 10 or more years, while some left before their initial training was complete, often to take another position in the FBI Laboratory. Up until the mid-1990s, all the examiners were FBI agents with science backgrounds and several years of field experience prior to being assigned to the FBI Laboratory. Most examiners who left the Laboratory returned to field positions within the FBI. In the mid-1990s, FBI Laboratory management made a concerted effort to return agents to the field. By the late 1990s, most of the agent-examiners had been replaced by scientists who had been directly hired into the examiner positions.

The Unit Chief managed the workflow within the Unit and usually performed some case work. Cases were assigned by the Unit Chief, primarily based on the workload of the examiners. Exceptions included: high-profile cases that were assigned to more experienced examiners and situations where other examiner specialties were relevant. In addition, cases were sometimes assigned based on examiner preference.

By the late 1990s, the Hairs and Fibers Unit had been renamed the Trace Evidence Unit and was part of the Scientific Analysis Section. As of 1997, other Units within the Scientific Analysis Section³⁴ included Chemistry Unit, Automated Operations Support Unit, Materials and Devices Unit, Forensics Science Systems Unit, Latent Case Management Center, DNA Unit (two units), Firearms-Toolmarks Unit,

³⁴ *FBI Mission, History and Organization, LD Quality Manual, Mission.F30-Rev. 1*, Issue Date: 06/30/97, 12 pages

Photographic Unit, and Hazardous Materials Response Unit. Other sections included the Investigation Operations and Support Section, Latent Fingerprints Section, Special Projects Section, and the Forensic Science Research and Training Center. Each section was headed by a Section Chief who reported to the FBI Laboratory Director.

Basic MHCA steps

The MHCA process during the period analyzed had five basic steps as shown in Figure 6. Because report and testimony errors would only occur during the last two steps, potential errors/issues that could occur during the first three steps, Evidence Collection, Processing, and Comparison, were considered out of scope. However, there are activities that occur during these first three steps that could have had an impact on MHCA reports and MHCA examiner testimony. The relevant activities are described in Section 5.

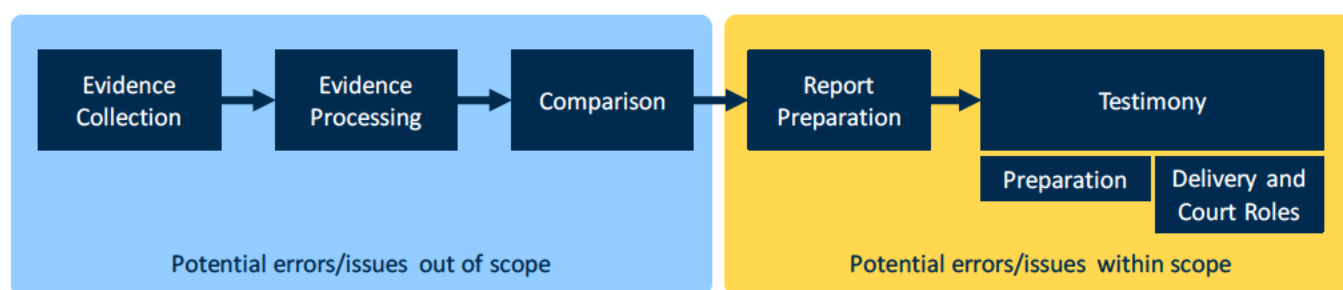


Figure 6. Five steps of the MHCA process.

Evidence collection. During this step, potentially relevant items were collected at the crime scene and other locations. Items collected relevant to MHCA typically included hairs, objects that could have contained hairs (e.g., clothing, bedding), and sweepings from an area. In some instances, during the period analyzed, MHCA examiners went to the location to perform or guide the evidence collection. Based on interviews, this was infrequent at the start of the period analyzed and decreased toward the end of the period analyzed. The MHCA examiners, particularly those who were themselves qualified field agents, may have interfaced with other law enforcement personnel and learned additional background related to the case while performing this step. For example, they may have learned background information related to potential suspects, such as their criminal history, and about other evidence at the crime scene.

Evidence processing. Once evidence was received at the FBI Laboratory from the submitting law enforcement agency, it was processed so the MHCA examiner could perform the MHCA. For example, a shirt would have been scraped to dislodge hairs that could have been on it and those hairs were mounted on glass slides. These activities were almost always performed by the technicians in the Hairs and Fibers Unit under the supervision of the MHCA examiners.

Comparison. In this step, during the period analyzed, the MHCA examiner inspected two groups of hairs, “known” and “questioned.” Hairs collected from suspects or victims were referred to as “known” samples because the origin of the samples is known. Hairs collected from the crime scene were referred to as “questioned” samples because the origin was unknown or questioned. The examiner first inspected the known hairs to describe about 15 microscopic characteristics of the known sample. Then, the examiner

inspected the questioned hairs to determine if the characteristics of the known and questioned samples were consistent.

During this step, some examiners may have communicated with the submitting agency to gather background information regarding the alleged crime and the investigation. Some of this background information could assist the examiner in performing the comparison. For example, in examining a shirt, it was helpful to know who owned the shirt and where it was found. The MHCA examiner might then have used this information to determine which potential associations to investigate. It would not be surprising to find a suspect's hair on the victim's shirt if they lived in the same house. During these communications, the MHCA examiner might also have learned about additional aspects of the underlying crime or investigation not necessary to support their examination, such as other evidence implicating a suspect.

There were three conclusions that the examiner could reach from performing the comparison step.³⁵

1. If the MHCA examiner determined that no significant differences are found, it could be stated that the questioned hairs and the known hair sample exhibited the same microscopic characteristics and were consistent with originating from the same source. This result was often described as “an association.” The contributor of the known sample could be, along with an unknown number of other individuals, the source of the questioned hairs. There was very limited research indicating how many people share the same microscopic hair characteristics. In other words, there was no general scientific basis to conclude that combinations of microscopic hair characteristics were common or rare. In a 2004 update to an internal guide³⁶ on performing MHCA, the FBI Laboratory states:

“Studies have been conducted to determine the significance of hair associations. Some of these studies attempted to establish a mathematical probability of a match. The FBI Laboratory does not use the mathematical calculations of other researchers nor does it support the feasibility of establishing a numerical probability of a hair match.”

2. If the MHCA examiner determined that the questioned hair exhibited both similarities and differences to the known hair sample, no conclusion could have been reached as to whether or not the hair originated from the known hair sample. This result was often described as “similarities and differences,” or “inclusive.”
3. If the MHCA examiner determined that the questioned hair was microscopically dissimilar to the known hair sample, then accordingly the questioned hair could not have originated from the source of the known hair sample. This result was often described as an “exclusion” because the contributor of the known sample was excluded as the source of the questioned hairs.

Report preparation. During the period analyzed, the report generally contained a listing of all of the evidence received, notes on the processing of the evidence, MHCA examiner observations about the known sample, and the conclusions of the MHCA. In addition, based on our analysis of the reports provided to us,

35 TEU procedures Manual, HairISOrev1.doc; Issue date: 11/19/2007, Rev. 1, Section 6.4, page 8.

36 Deedrick, D. W., and Koch, S. L. “Microscopy of Hair Part 1: A Practical Guide and Manual for Human Hairs.” Federal Bureau of Investigation. 2004.

during the period analyzed (1970s through 1999) the reports would almost always include a statement similar to: “It is pointed out that hair comparisons do not constitute a basis for absolute personal identification.” This limiting language was NOT judged to be an error by the 2012 Review.

Prior to 1999, one examiner in the FBI Laboratory was designated the primary examiner (or coordinating examiner) for a case with their tasks including conducting examinations, administratively coordinating auxiliary examiners, generating worksheets and reports, and assembling the appropriate documentation to send to file.³⁷ This resulted in the primary or coordinating examiners writing an integrated report that included the results of all the Laboratory work performed by the various disciplines involved in the case. For example, if evidence from a case included MHCA, as well as serology analyses, the MHCA examiner could have been designated the primary examiner for the case. The MHCA examiner would perform the MHCA analyses and coordinate work on the evidence with the serology examiner. When the serology analysis was complete, the serologist would provide their results to the primary examiner so the primary examiner could write a single report that included both MHCA and serology results.

In 1997, the practice of the primary examiner writing an integrated report that included the results of all of analyses performed at the FBI Laboratory was discontinued. This was replaced by the coordinating examiner who performed a similar function until 1999³⁸ when individual examiners were required to issue separate reports for their own work directly to the evidence submitters. Based on interviews and document reviews, the changes appear to have been driven by the Office of Inspector General investigation recommendations³⁹ and efforts to achieve ASCLD/LAB accreditation.

Prior to being sent to the evidence submitting agency, the report(s) would be reviewed by the primary examiner’s/coordinating examiner’s Unit Chief. Based on interviews, the Unit Chief’s review of reports was performed throughout the entire period analyzed.

When the report step was completed, the evidence was generally returned to the evidence submitting agency.

When appropriate, the MHCA examiner’s report was provided to both the prosecutor and the defense attorney.

Testimony, preparation, and delivery. This subsection provides a brief summary of the MHCA examiner testimony preparation process during the period analyzed, the phases of testimony, and the court personnel involved during testimony.

37 Federal Bureau of Investigation, Laboratory Division, Case Documentation and Review Policies and Procedures, Revised 11-6-96.

38 Kerr, Donald M. “Federal Bureau of Investigation Laboratory Division Quality Manual.” Case Documentation and Review Practices, 10 CaseDoc 022699.pdf - REV. 4, QAM 022699 to 082999, 26 Feb. 1999, pp. 68-76.

39 United States Department of Justice/Office of Inspector General. “The FBI Laboratory: An Investigation into Laboratory Practices and Alleged Misconduct in Explosives-Related and Other Cases (April 1997).” *Executive Summary*. April 1997, p. 47-49.

Preparation for Testimony

Only qualified MHCA examiners would provide testimony. As part of the training that occurred prior to becoming a qualified examiner, the trainee would complete three moot courts. During these moot courts, experienced MHCA examiners role played the nonexaminer roles (judge and attorneys). In these roles, experienced MHCA examiners provided relevant guidance to the trainee regarding restrictions on statements that could be used in court.

Testimony for a case could occur months or years after the completion of the examination by a qualified examiner. Once summoned to testify, an MHCA examiner would typically prepare for testifying by reviewing the report and their notes. In almost all cases, the MHCA examiner did not re-examine or reinspect the known and questioned hair samples as part of testimony preparation because, in general, the evidence had been returned to the submitting agency. The examiner may have referred to these notes or the report during their testimony if permitted by the judge. Any material admitted by the court became part of the court record. Some examiners also used visual aids, such as overhead transparencies or posters.

Near the time of the trial, the examiner would sometimes meet with the prosecutor, or in rare cases, the defense attorneys when they were called by the defense counsel to testify. This meeting generally consisted of a review of the examination that was performed and the types of questions that would assist in communicating the results of the analysis to the jury.

Delivery of Testimony

Phases of examiner testimony typically included qualification to be an expert witness, MHCA methodology explanation, direct examination, cross examination, and redirect/re-cross-examination. Considering all the testimony transcripts reviewed, the examiners made some statements exceeding the limits of the science in all phases except the qualification phase. The following paragraphs provide both the desired performance for all phases and some examples of statements that exceeded the limits of the science for all applicable phases.

1. **Qualification to be an expert witness.** The MHCA examiner is asked about their training and experience so the examiner can be accepted as an expert witness by the court.
 - *Ideally: Without making any statements that exceeded the limits of the science, the examiners would have presented their credentials, background, training, and experience sufficiently for the judge to qualify them as an expert witness in the field of MHCA.*
 - We conclude:
 - Interviewees indicated that they were unaware of any instance where an FBI Laboratory MHCA examiner was not allowed to testify as an expert witness in the area of MHCA.
2. **MHCA methodology explanation.** The MHCA examiner explains the general steps in performing MHCA and the conclusions that can be reached from the analysis.

- *Ideally: Without making any statements that exceeded the limits of the science, the examiners would have presented an explanation of the methodology, providing the court with sufficient understanding of the capabilities of the methodology and the steps applied to the case.*
- We conclude:
 - The methodology explanation ranged from a brief overview to a detailed presentation with supporting visuals.
 - Examples of statements exceeding the limits of the science from the MHCA examiner transcripts during this phase of testimony include:

Example 1:⁴⁰

Counsel: Now, in making your microscopic examination, [Agent], can you say in your opinion whether or not a particular hair came from a particular individual?

Examiner: Well, the most that we can state is that it's consistent with having originated or come from that person.

Example 2:

Examiner: Then I look at all the features. And the fact that hair from different people looks different, is what I base my comparisons on.

3. Direct examination. The MHCA examiner is asked questions about the specific evidence related to the case and any conclusions the examiner may have reached in regard to that evidence.

- *Ideally: Without making any statements that exceeded the limits of the science, the examiners would have answered questions from the attorney (prosecution or defense) who called them to testify.*
- We conclude:
 - These questions often addressed the significance of the MHCA examiner results and the attorney who called the witness focused on eliciting testimony that will support their position. The answers to the questions often involved providing clarifications on MHCA, including analogies.
 - Examples of statements exceeding the limits of the science from the MHCA examiner transcripts during this phase of testimony include:

Example 1:

Counsel: And if I understood your opinion correctly, in this case you are of the opinion that the hair that was found on the door post in that car was consistent with having come from [defendant].

Examiner: That is correct.

⁴⁰ All quotes of MHCA examiner statements in this report are from MHCA reports or testimony unless otherwise noted. Portions of the quotes that were identified by the 2012 Review as report or testimony errors are underlined.

Example 2:

Counsel: Have you, in fact, in your study found -- a study of hairs and comparisons, have you, in fact, found hairs which matched on 20 points and -- and you cannot -- you cannot find any differences in any way, which were from different hairs, different people?

Examiner. In approximately 10,000 individual hair exams that I've done over the last seven years, I've found this on two occasions.

4. **Cross examination.** The opposing counsel (generally the defense counsel) asks additional questions concerning the MHCA examiner's qualifications, experience, MHCA methodology, the evidence, and associated conclusions reached by the examiner.
 - *Ideally: Without making any statements that exceeded the limits of the science, the examiners would have answered cross examination questions.*
 - We conclude:
 - These questions were usually intended to cast doubt on the results previously presented and to question the description of the significance of the MHCA results. The questions often attempted to emphasize the uncertainty associated with the MHCA process. In addressing this, the examiner could be asked to provide a statistical basis or to imply a probability.
 - Examples of statements exceeding the limits of the science from the MHCA examiner transcripts during this phase of testimony include:

Example 1:

Counsel: So, all you are saying is it looks like, from your analysis, that the hair samples, which you got from [individual's name], look like the same type of hair samples which were obtained from the dress?

Examiner. I am saying that there were hairs found on the dress which exhibited the same microscopic characteristics as the known samples from [individual's name] and were consistent with having originated from him.

Example 2:

Counsel: You've indicated that based on your experience and training it would be unlikely that a random person picked from the population would have hair where the characteristics would match or appear as like [defendant's] hair as the unknown sample did in this case, correct?

Examiner. I would think it to be extremely unlikely, yes.

Example 3:

Counsel: Okay. So your FBI policy here is saying I cannot tell you that this hair originated from let's say myself?

Examiner: I can't tell you that with a hundred percent positiveness, that's correct, but it is, in my opinion, the basis of a very strong association. It's highly likely that it came from you, but I can't discount the possibility that there is some other individual out there whose hairs look just like yours and I can't tell them apart.

5. **Redirect/re-cross-examination.** These questions were often trying to remove any doubt cast during the cross examination. The questions might again focus on framing the limits of the science for MHCA emphasizing the amount of uncertainty associated with the process. In addressing this, the examiner could be asked to provide a statistical basis or to imply a probability.

- *Ideally: Without making any statements that exceeded the limits of the science, the examiners would have answered redirect/re-cross examination questions.*
- We conclude:
 - Examples of statements exceeding the limits of the science from the MHCA examiner transcripts during this phase of testimony include:

Example 1:

Counsel: In other words, we don't know how many other people have the same microscopic characteristics of their hair follicles as the one that you identified as [the defendant's] hair from the clothing of [the victim], isn't that correct?

Examiner: Yes, that is correct. I have no idea whether anyone would have the same microscopic characteristics.

Example 2:

Counsel: The microscopic characteristics that you found to be consistent in this case are common variables?

Examiner: I didn't find any rare characteristics, no.

Counsel: Well, the question was they are common, right?

Examiner: Each individual characteristic is common. It's the sum total of all these characteristics that happen to be exactly alike, and the question here in the known sample that make it unique.

Counsel: Nothing unusual raises the likelihood of a match from merely consistency, correct?

Examiner: I didn't understand the statement correctly.

Counsel: The characteristics you found consistent, there is nothing unusual about those characteristics that would make it more likely that the sample and the known hair came from the same person?

Examiner: Well, I didn't find any rare characteristics --

Counsel: I think that's another way of agreeing with me. I'll go on to the next question.

Court Roles

The following provides an overview of the typical court roles involved in MHCA testimony, our understanding of the ideal conditions, and some insight into the actual conditions during the period analyzed.

1. Examiner

- *Ideally: The examiner's testimony would have remained within the limits of the science, and would have efficiently and effectively communicated the results of the MHCA.*
- We conclude:
 - The significance of the examiner's findings were generally not included in the FBI Laboratory report, and it was left to the examiner to convey the significance in court without exceeding the limits of the science. During court testimony in 1979, one of the MHCA examiners indicated that it was the Unit's policy to not include the significance in the reports (although we did not find a written policy on this issue during the period analyzed).
 - One exception to this was the use of the phrases consistent with having originated from [individual's name] and consistent with having come from [individual's name], which may have been used after about 1985 to indicate a stronger association of the known and questioned hairs. Laboratory management did not provide the MHCA examiners with a written procedure or guideline for testimony that addressed appropriate methods for communicating the significance of their findings regarding limits of the science during testimony. Documents which specifically provided approved language within the limits of the science were not identified during the period analyzed.
 - Based on interviews and document reviews, there were no explicit criteria regarding statements that exceeded the limits of the science. The guidance that was provided fell into the four categories outlined in Table 6. This supported an environment where individuals made their own judgments regarding such statements and there was no meaningful feedback loop inside or outside the FBI regarding the inappropriateness of those statements. This was supported by a mindset in the Hairs and Fibers Unit that they were the best at providing MHCA testimony and they were doing the best they could; thus, there was nothing more to be done to improve testimony guidance.

Table 6. Categories of guidance provided to MHCA examiners.

Guidance Category	Description of the Category	Comments	Examples
Had to state	Statements that were required to be stated in <i>reports</i> and/or <i>testimony</i> .		For example, the statement: <p><u>"It is pointed out that hair comparisons do not constitute a basis for absolute personal identification."</u>⁴¹</p> <p>This limiting language was used in almost all reports reviewed. This was NOT judged to be an <i>error</i> by the 2012 Review.</p>
Could state	Statements that could be stated in <i>reports</i> and/or <i>testimony</i> .	Some of the statements in these two categories were determined to be <i>errors</i> by the 2012 Review. Most of the <i>report errors</i> were of these two categories.	An example of a <i>report error</i> from the could-state category would be: <p><u>"consistent with having come from [individual's name]."</u></p> <p>An example of a <i>testimony error</i> from the could-state category prior to the O.J. Simpson trial (<i>MHCA examiners</i> understood that "match" was allowed in testimony prior to the Simpson trial) was: <p><u>"Well, the head hair that matched with [the defendant] did not match the victim's head hair sample."</u></p></p>
Use your best judgement	Statements where no specific guidance was provided on their use in <i>reports</i> and <i>testimony</i> .	Most of the <i>testimony errors</i> were of these two categories.	An example of a <i>testimony error</i> from the use-your-best-judgement category (because there was no specific guidance on the use of "rare") was: <p><u>"... based on my experience it's extremely rare that I will see hairs from two people that are so alike I can't tell them apart."</u></p>
Cannot state	Statements that were not allowed in <i>reports</i> and <i>testimony</i> .		An example of a <i>testimony error</i> after the O.J. Simpson trial (<i>MHCA examiners</i> were directed by Hairs and Fibers Unit management to not use "match" following the Simpson trial) would be: <p><u>"Well, the head hair that matched with [the defendant] did not match the victim's head hair sample."</u></p> <p>An example of a <i>testimony error</i> in this category after 1991 (a 1991 internal FBI memo stated that "the pitfalls of overstating results were discussed with MHCA examiners,"⁴² including the phrase "completely indistinguishable") would be: <p><u>"In other words, it was completely indistinguishable. I could not tell them apart."</u></p></p>

41 All quotes of MHCA examiner statements in this report are from MHCA reports or testimony unless otherwise noted. Portions of the quotes that were identified by the 2012 Review as errors are underlined.

42 "Internal FBI memos to FBI Laboratory Director Hicks." 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

2. Defense counsel

- *Ideally: If the MHCA examiner made a statement that exceeded the limits of the science when being examined by the prosecution, the defense counsel would have objected to the statement. If the MHCA examiner made a statement that exceeded the limits of the science when being examined by defense counsel, the defense counsel would have asked the examiner to clarify.*
- We conclude:
 - Based on interviews and transcript reviews, defense counsel seldom objected to statements that exceeded the limits of the science. Based on interviews, MHCA examiners indicated that defense counsels were not as knowledgeable as the prosecutors of the limits of the MHCA science. Transcript reviews showed that most defense counsels did not object when statements that were later identified as errors by the 2012 Review were made by the MHCA examiners.
 - In general, the FBI did not routinely solicit nor receive feedback from defense counsel. Based on interviews and document reviews, MHCA examiners primarily sought and received feedback from the prosecutors.

3. Prosecutor

- *Ideally: If the MHCA examiner made a statement that exceeded the limits of the science when being examined by the defense counsel, the prosecutor would have objected to the statement. If the MHCA examiner made a statement that exceeded the limits of the science when being examined by prosecutor, the prosecutor would have asked the examiner to clarify.*
- We conclude:
 - While at times prosecutors did seek clarification to examiner statements that exceeded the limits of the science, most of these statements went unaddressed by the prosecutors. In addition, at times a prosecutor would present the examiner with a statement that exceeded the limits of the science and would ask the examiner to confirm the statement (see Question 9 in Section 4.5 for additional transcript analysis related to testimony issues being prompted by prosecutors, defense counsel or judges).

4. Judge

- *Ideally: The judge would have first ruled on the admissibility of MHCA testimony and provided any instructions regarding limitations for the specific case. Then, when an examiner made statements that exceeded the limits of the science and the defense counsel objected, the judge would have sustained the objection. The judge would have also counseled the examiner against making statements that exceeded the limits of the science.*
- We conclude:
 - Based on interviews and document reviews, historical acceptance of MHCA testimony in the court system (a long history of precedents where MHCA testimony was admissible) reduced the potential for judges facilitating effective challenges to MHCA examiner testimony that exceeded the limits of the science.
 - Based on transcript reviews, when the defense counsel objected to examiner statements that exceeded the limits of the science, the judges would often ask the

examiner to clarify their statement. Upon clarification of the statement by the examiner, the judge would ask the examiner to continue their testimony without limitations.

5. Jury

- *Ideally: The jury would not have heard any testimony that exceeded the limits of the science and would have correctly understood, interpreted, and weighed the examiner's testimony resulting in conviction of the guilty and exoneration of the innocent. If statements exceeded the limits of the science, the jury would have disregarded such statements when weighing the examiner's testimony.*
- We conclude:
 - MHCA examiner statements that were later judged to exceed the limits of the science were not always identified as such during testimony. As a result, juries could hear testimony that exceeded the limits of the science without knowing it.

6. FBI oversight in court

- *Ideally: Testimony would have been monitored by FBI Laboratory personnel at a sufficient frequency and with sufficient scope to identify any statements by MHCA examiners that exceeded the limits of the science.*
- We conclude:
 - Based on interviews and document reviews, there was no tradition within the FBI or the FBI Laboratory to have controls for expert witness testimony regarding conformance to the limits of the science. For example, the Office of Inspector General report in 1997⁴³ stated:

The FBI Laboratory has not had a uniform program for training examiners with respect to testifying in court, has not had clear guidelines concerning the scope of examiner testimony, and has not had a program for the effective monitoring of testimony. Under ASCLD/LAB, an essential criterion is that the laboratory monitor the testimony of its examiners.
 - It was not standard practice to measure non-conformances for testimony regarding conformance to the limits of the science. Only occasionally did a representative of the FBI Laboratory go to the court to monitor the examiner's testimony. Even when a monitoring program was put in place, the monitoring did not focus on explicit statements regarded as exceeding the limits of the science.
 - The Hairs and Fibers Unit placed reliance on the experience of the examiner and appears to have assumed that there were no issues with testimony. There was a very limited active approach to solicit feedback.
 - There was no formal feedback loop requiring the examiner and the supervisor to discuss issues with testimony after it occurred.

43 United States Department of Justice/Office of Inspector General. "The FBI Laboratory: An Investigation into Laboratory Practices and Alleged Misconduct in Explosives-Related and Other Cases (April 1997)." *Part Eight: Conclusion*. April 1997.

General history of MHCA

As part of our analysis, we developed a detailed timeline of events relevant to MHCA as performed at the FBI Laboratory during the period of interest. This included items such as when personnel were MHCA examiners at the FBI Laboratory, when FBI documents were produced, when changes occurred in testimony guidance, when external groups were formed and issued testimony guidance, and when accreditation was undertaken by various laboratories.

Figure 7 is a simplified version of the timeline showing events most relevant to understanding the analysis results. A brief explanation for each item on the timeline follows.

Events in the 1950s

- **Development of the MHCA process at the FBI.** During the 1950s, the FBI began initial development of their MHCA processes. During the initial formation of the Hairs and Fibers Unit, materials and consultation from subject matter experts (primarily university professors) were the foundation for the initial approaches used to perform MHCA. Guidance developed during this period focused on the FBI Laboratory aspects of the process and not on court testimony.

Events in the 1970s

- **ASCLD.** In 1974, the American Society of Crime Laboratory Directors (ASCLD) provided a channel for communications between FBI Laboratory personnel and personnel at the other laboratories. ASCLD also issued numerous position statements. They supported improvements in the forensic sciences through activities such as: proficiency testing, ethics standards for MHCA examiners, accreditation for laboratories, certification of MHCA examiners, standardized methods and procedures, root cause analysis, and bolstering the scientific basis of forensics. Another organization, ASCLD/LAB was formed as a separate accrediting body for forensic laboratories in 1981.

Events in the 1980s

- **1985 international symposium, hosted by the FBI Laboratory.** From June 25-27, 1985, the FBI Laboratory hosted an International Symposium on Forensic Hair Comparisons at the FBI Academy. According to the foreword to the proceedings, the “symposium was attended by 172 scientists from industrial, university, and forensic laboratories around the world. Prominent scientists from the United States, Australia, Canada, France, Great Britain, India, Japan, China, Switzerland, and West Germany attended lectures on topics such as hair growth, the chemistry and morphology of hair, and the comparison of hairs by protein analysis, to name a few. In addition, short oral presentations and poster sessions described techniques for examining (sic) hairs.”

REPORT COVERAGE	1950s	
	1950s	Initial development of MHCA processes at the FBI Laboratory
	1970s	
	1974	American Society of Crime Laboratory Directors was formed (ASCLD)
	1974-1982	Gaudette publishes several papers on potential use of MHCA-related statistics
	1977	53-page guide describing MHCA written by FBI for internal use
	1980s	
	1981	ASCLD/LAB formed to accredit forensic laboratories
	1982	Several subcommittees formed, including subcommittee on <i>Report Writing, Conclusions, and Court Testimony</i>
	1985	FBI hosts International Symposium on Forensic Hair Comparisons
	1990s	
	1991	Complaint about MHCA examiner use of “perfect match”
	1993-1997	Agent-examiners replaced with scientists over several years
	1994	Precursor to Scientific Working Group on Materials Analysis (SWGMA) formed
	1994-1997	Office of Inspector General report on investigation into Laboratory Practices and Alleged Misconduct in Explosive-Related and Other Cases ⁴⁴
	1995	Quality Assurance Unit created at the FBI Laboratory First formal written Laboratory procedures issued, including testimony monitoring procedure O. J. Simpson trial testimony by MHCA examiner
	1998	FBI Laboratory accredited by ASCLD/LAB. 150+ other publicly funded laboratories accredited before FBI Laboratory and 400+ publicly funded laboratories ASCLD/LAB accredited by 2012 ⁴⁵
	1999	Integrated Laboratory report written by one examiner eliminated Began routine use of Mitochondrial DNA analysis for associated hair evidence
	2000s	
	2009-2012	Exonerations occurred in the D.C. area
	2012-Present	2012 FBI MHCA Review project

Figure 7. Timeline of significant events during the period analyzed.

44 United States Department of Justice/Office of Inspector General. “The FBI Laboratory: An Investigation into Laboratory Practices and Alleged Misconduct in Explosives-Related and Other Cases (April 1997).” April 1997.

45 ASCLD Board of Directors. “Board Position Statement: Accreditation.” 20 August 2014, www.ascl.org/wp-content/uploads/2014/08/ASCLD-Board-Position-on-Accreditation.pdf.

- **Report and testimony subcommittee recommendations.** A subcommittee presented numerous report and testimony guidelines as part of a paper and presentation at the 1985 symposium. This subcommittee, along with several others, had been formed as the result of a 1982 meeting in Chicago, Illinois. This history was summarized at the 1985 symposium by Norman Erickson.⁴⁶

“[At the 1982 meeting in Chicago] a number of papers were presented on the subject of forensic examination of human hair. A panel discussion on forensic microscopy was also held and the discussion, not surprisingly, turned to hair examination. It became apparent that there was little uniformity in the approach taken by various examiners, in what they thought significant in conducting a hair examination and in how they viewed and expressed their conclusions.

[A] number of those present who conducted hair examinations agreed to work together to try and reach some consensus views on a number of the aspects of hair examination. The Committee on Forensic Hair Comparison was thus formed. The Committee had (and still has) no official status of any kind, no sanction by any parent group and no official endorsements. It is simply a voluntary assembly of individuals knowledgeable on the subject of forensic examination of human hair who have agreed to act cooperatively in their attempts to improve the state of their art.

Barry Gaudette agreed to chair the Committee which initially consisted of 11 individuals and has now grown to approximately 20 individuals. There has been a total of six subcommittees established to work on the subject areas of Definition and Standardization of Terms, Protocol for Hair Comparison Characteristics, Report Writing, and Court Testimony, Training, and Quality Assurance.”

- **Six conclusions identified by report and testimony subcommittee.** The proceedings of the 1985 symposium included a paper by the Committee on Forensic Hair Comparison, Subcommittee 4, Report Writing, Conclusions, and Court Testimony. It identified six potential conclusions that can be reached, including three statements based on the strength of the association made:⁴⁷

1. The questioned hair is consistent with having come from John Doe.

This conclusion must be based upon a strong association between the questioned hair and the known sample. There are several factors, such as the questioned hairs having intrasample variation, which is found to be microscopically similar to the comparison sample, or the presence of unusual hair characteristics or hair treatment such as dying, bleaching, etc., which strengthen the association. Other tests such as sex determination or enzyme typing may provide additional support for this conclusion.

⁴⁶ Shaffer, Stephen A. *Draft Guidelines for the Establishment of Quality Assurance Programs in the Forensic Hair Comparison of Human Hair, Interim Report of the Subcommittee on Quality Assurance of the Committee on Forensic Hair Comparison*, presented at the Proceedings of the International Symposium on Forensic Hair Comparisons: FBI Academy, Quantico, Virginia, June 25-27, 1985.

⁴⁷ *Proceedings of the International Symposium on Forensic Hair Comparisons*, FBI Academy, Quantico, Virginia, June 25-27, 1985, p. 108.

2. The questioned hair could have come from John Doe.

When only a limited association can be made between the questioned hair and the comparison sample, this conclusion would apply. Some of the factors which influence arriving at this conclusion are the presence of hair fragments, or the lack of any distinctive features in the questioned hair, for example, white hair.

3. John Doe qualifies as being the donor of the questioned hair.

This statement indicates to the reader that John Doe cannot be eliminated as a possible source of the questioned hair. It does not take into account whether there is a strong or limited association.

4. The questioned hairs could not have originated from John Doe.

This conclusion is based upon finding significant macroscopic and/or microscopic dissimilarities between the questioned hair and the comparison sample. The examiner must ensure that several factors are satisfied before this statement can be made, for example, the possibility that the hairs are atypical is remote, the known sample is adequate and representative with little intrasample variation.

5. The questioned hair is not consistent with having come from John Doe.

This conclusion applies when there are dissimilarities between the questioned hair and the comparison sample; however, there are factors present which do not allow the examiner to conclude categorically that John Doe could not be the donor of the questioned hair, for example, inadequate comparison samples, incomplete questioned hairs, a lengthy time lapse between the offense and the collection of the comparison sample.

6. No conclusion as to origin could be reached.

As stated earlier, there are cases in which no conclusion can be reached. One might find both similarities and differences between the questioned hair and the comparison sample or the questioned hair may be very minute. In these situations, the results are uninterpretable and no conclusion can be made as to whether the questioned hair could have originated from a specified source.

Qualifying Statements

Qualifying statements should strengthen or weaken the conclusion. Factors such as unusual characteristics or dyeing pattern, which would strengthen the opinion, should be indicated. Conversely, if there are factors which tend to weaken the conclusion, that is, common featureless hairs, then this should also be stated.

These qualifying statements will vary depending upon each specific case.

Note that using some of these six conclusions would be considered exceeding the limits of the science by the definitions used in the ongoing 2012 Review (see Section 2 for the definitions of the three error types used by the 2012 Review).

The subcommittee also noted that “The consensus from all reports received was that microscopical examination of hairs, unlike fingerprints, do not permit a positive identification to be made, except in a few rare instances.”⁴⁸

Regarding the use of probabilities, the subcommittee stated:

“We are aware two individuals may have matching hair characteristics and the two samples cannot be differentiated by present-day methodology, hence the chance of the coincidental match can occur. The probability data from the published research of Gaudette, co-authored by a statistician and verified by other statisticians, has shown when a positive hair comparison has been made by a qualified hair examiner the chances of coincidental matches are relatively rare. The hair could match that of another individual, but it is much more likely to have originated from the same source to which it was compared. Gaudette’s probability data on positive hair comparisons on Caucasian scalp hairs can be stated in several ways such as an estimate of the average odds against that one questioned hair having originated from another specific Caucasian individual would be about 4500 to 1 (800 to 1 for pubic hairs). All hair examiners should be aware of the several published papers on this topic. On this topic the subcommittee recommends:

- 1. The results of the Gaudette studies should not be introduced in the court unless asked directly about his published research.*
 - 2. It will be left to laboratory policy or the individual examiner whether he can personally substantiate and defend in court the findings from these studies.*
 - 3. Further research by other examiners is required in this very important area.”⁴⁹*
- **Limits of testimony based on MHCA examiner experience.** Some discussion at the conference indicated that the limits of MHCA testimony are dependent on the experience of the MHCA examiner. For example, an FBI agent stated in the conference proceedings:⁵⁰

“In regard to the uniqueness of Negroid and Mongoloid hairs, it all boils down to how many you look at. The FBI Laboratory is in a unique position because it conducts all the examinations for Washington, D.C. which has a population of approximately 80 percent Negroid, plus we do a number of other cases.”

And,

“It boils down to the experience of the examiner: the more you look at hairs, the more uniqueness they have.”

⁴⁸ *Proceedings of the International Symposium on Forensic Hair Comparisons.* FBI Academy, Quantico, Virginia, June 25-27, 1985, p.110.

⁴⁹ *Proceedings of the International Symposium on Forensic Hair Comparisons:* FBI Academy, Quantico, Virginia, June 25-27, 1985, p.110.

⁵⁰ *Ibid*, p. 112

Gaudette of the Royal Canadian Mounted Police replied to a question concerning how to use his statistical research.⁵¹

“What you can tell them obviously is going to depend on whatever you feel comfortable with yourself. There are a number of ways of getting across the value of hair evidence. Statistical data is only one of those kind of possibilities.

You can quote additional studies in the literature that have been done by other authors. You can do some tests yourself. One of the things that we try to encourage our people to do is to take 100 questioned hairs and compare them all to a known sample and see what kind of results they get. Assuming you get good results on a test like that you can use that kind of example, provided you used it only as an example, and you did not try to get any statistical data from a study like that. That would be another way of approaching it.”

- **The future of forensic hair comparison.** The 1985 symposium also included a paper by Barry Gaudette entitled: *The Future of Forensic Hair Comparison*.⁵² The paper reviews each of the steps in the “physical evidence process: occurrence of the evidence, its recovery, analysis, interpretation and presentation.” In regard to the last step, he comments:

“This step, which includes report writing and court testimony, is nevertheless also likely to be changed in the future. Through definition and standardization of terminology and production of recommendations concerning report writing and court testimony [summarized above], the Committee on Forensic Hair Comparison has made a contribution in this area. Future research aimed at improving report writing and court testimony in forensic hair comparison would likely be fruitful. Such research could take the form of assessing the impact of various statements and phrases on lay audiences.”

- **Report content versus testimony statements.** At the end of the symposium was a panel discussion on numerous issues, including testimony. In a discussion between Dr. Peter De Forest and others at the symposium:⁵³

Dr. De Forest states: *“I have a problem with the divergence from a laboratory report in which the conclusion is these hairs could have shared a common origin to the presentation of testimony in court when the expert says something to the effect that, ‘Yes, these hairs were found to be similar, and in my experience, I have examined thousands of hairs and I have never found two hairs from different sources that were alike.’ I think that is very misleading and it is not substantiated by any data. Any comment on that?”*

After a lengthy discussion,⁵⁴ Dr. De Forest asks: *“How does that relate to my original question about at what point do you overstate that opinion? At what point, Dr. Roe, do we reach the point where we have overstepped that bound of forensic conservatism?”*

Dr. Roe replies: *“I do not know. I wish we did know. We instinctively feel that dealing with a single or a small number of hairs which you have of necessity to treat as individuals that unless there is something fairly obviously significant, something out of the ordinary in the known sample, then the significance of a match is*

51 Ibid, p. 201

52 Ibid, p. 127-134

53 Ibid, p. 204

54 Ibid, p. 205

not likely to be very high. When we have an unusual feature, our opinion is obviously much stronger. There is little obvious coordination in the strength of stated opinion in court because that is something that is very difficult to control. It is something rather individual and based on experience.”

- **Summary by a senior FBI MHCA examiner.** A senior FBI MHCA examiner summarized the overall situation⁵⁵ when he said the following as part of discussion at the closing of the symposium:

“From the nature of the questions and responses it is very apparent that hair identifications or hair comparisons are a very subjective type of analysis. We seem to be struggling with questions like, what really constitutes an adequate sample; what constitutes an adequate questioned specimen; and how significant is a hair comparison?”

- **Attendance at the symposium.** Based on transcript reviews, some MHCA examiners mentioned they attended or made presentations at the symposium.
- **FBI did not formally adopt the guidance provided by the Report Writing, Conclusions, and Court Testimony Subcommittee.** A few of the interviewees mentioned the symposium and that MHCA testimony guidance was discussed. They also mentioned that the FBI did not tailor and formally adopt the guidance discussed at the symposium. MHCA testimony guidance was not documented in any formal quality documents (in written procedures, training materials, or quality assurance manual) by the FBI prior to 2000. We did not consider the 53-page guide written by one of the MHCA examiners in 1977 to be a formal quality document in regard to testimony because it only contained a brief paragraph on the subject.
- **Symposium did not result in sufficiently specific guidance.** The 1985 symposium did not result in sufficiently specific guidance being adopted by the FBI. The FBI did not formally adopt the guidance presented by the subcommittee on reports and testimony. However, data from ABS Group report and transcript analysis indicates they may have adopted some of the guidelines outlined.
- **Symposium proceedings available in the FBI Laboratory, but not used.** Copies of the 1985 symposium proceedings were available following the symposium in hard copy, and later on the internet. In addition, we observed several copies present during the demonstration we participated in at the current FBI Laboratory facility in 2017. However, during our interviews, some of the interviewees working in the Hairs and Fibers unit at the time did not remember the symposium and some of the interviewees did not recall that the symposium proceedings contained MHCA report and testimony guidance.

Events in the 1990s

- **Complaint related to MHCA examiner testimony and associated memo.** In 1991, the FBI received a complaint in regard to the use of “perfect match” during testimony. We could not determine if this complaint came from an internal or external source, but one source did indicate it

⁵⁵ Ibid, p. 209

was from an “outside expert.” A memo⁵⁶ that was issued in 1991 indicated that an MHCA examiner overstated his conclusions during testimony.

This is an excerpt from the 1991 FBI internal memo:

“This is to advise you that recommended counseling of [examiner’s name] and recommended discussions with all Hair and Fibers Examiners and trainees by Unit Chief [name] took place in 1991...the Unit Chief, Hair and Fibers Unit (HFU) [counseled] [examiner’s name] against the use of numbers in describing the significance of [his/her] hair associations and against the use of terminology such as “perfect match” when describing microscopically associated hairs.

Laboratory leadership reviewed the testimony and found “no obvious error or misrepresentation of the state of hair examination that could lead to erroneous conclusions by a jury.” However, leadership did determine the examiner:

“... may have overemphasized his opinion in two areas. He offers that on two occasions of the 10,000 known hair samples he has examined, he was unable to distinguish known samples from two individuals. Although this is not given as a probability that hairs come from a particular individual, it is too easily interpreted as such by a jury. In order to avoid this, the significance of hair associations should be given without the use of numbers. [The examiner] has been instructed by Unit Chief [name] not to quote his experience in such a way that it could be interpreted as a statistic during testimony or during discussions with contributors and prosecutors....On several occasions during the testimony, [examiner] uses terminology such as ‘completely indistinguishable’ and ‘perfectly matched’ to describe hairs that [he/she] has associated microscopically...it is [his/her] responsibility to present a clear, unbiased, accurate representation of the strengths and limits of the technique. This can be accomplished by using standard terminology taught in the Hairs and Fibers Unit such as “the question hair exhibits the same microscopic characteristics as those seen in the known sample.”

- **Hiring of examiners directly into the FBI Laboratory.** Beginning in 1993, there was a push to return many of the agent examiners from the FBI Laboratory back to the field and replace the agent-examiner-scientists with “professional support examiners”⁵⁷ directly hired into MHCA and other examiner positions. This changeover was accomplished over several years with a goal of completing the transition by October 1998. Some MHCA agent-examiners did remain at the FBI Laboratory after the transition, sometimes in management positions.
- **Office of Inspector General investigation.** In the early 1990s, an Explosive Unit examiner made numerous complaints about the quality of the work performed at the FBI Laboratory, primarily in regard to the work in the Explosives Unit. Following some internal investigations, the Office of

56 “Internal FBI memos to FBI Laboratory Director Hicks.” 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

57 FBI Laboratory Division Goals and Objectives, Quality Manual, Object.F30-Rev. 2, Issue Date: 06/30/97, 4 pages

Inspector General eventually performed an investigation that focused on 13 examiners, one of whom was in the Hairs and Fibers Unit. Their report was issued in 1997.⁵⁸

Related specifically to the MHCA examiner's work, the investigation found "scientifically flawed testimony" and "testimony beyond the examiner's expertise." Additional relevant issues related to general Laboratory practices included "inadequate record management and retention system by the Laboratory", and failure to make a commitment to pursuing accreditation by the American Society of Crime Laboratory Directors/Laboratory Accreditation Board before 1994."⁵⁹

The Office of Inspector General investigation identified the special agent in the Hairs and Fibers Unit included in their investigation "falsely testified that [the agent] had performed a tensile test on a purse strap and also testified inaccurately and outside [the agent's] expertise concerning the test results."⁶⁰ The report recommended reassignment and potential disciplinary action for several of the examiners, including the agent in the Hairs and Fibers Unit. "The FBI should assess what disciplinary action is now appropriate for [this agent]."

The Office of Inspector General goes on to say: "We cannot understand the Laboratory's failure to further investigate the allegations that [a metallurgical examiner] made about the [Hairs and Fibers Unit examiner]." We did not find any evidence that the Office of Inspector General investigation resulted in an internal review of testimony to determine if similar issues existed with other MHCA examiners.

The Office of Inspector General did not specifically identify MHCA testimony that exceeded the limits of the science by FBI Laboratory MHCA examiners as a potential issue.

- **Precursor to SWGMAT formed.** Also in 1994, the precursor to the Scientific Working Group on Materials Analysis (SWGMAT) was formed. The Scientific Working Groups were developed and led by the FBI to facilitate communications between personnel from different laboratories and to develop consensus approaches for various forensic tools, including MHCA. The first SWGMAT guidelines on performing MHCA were not issued until 2005⁶¹, which was after the period analyzed for this study.
- **Quality Assurance Unit formed.** The Quality Assurance Unit was created in 1995 to coordinate the FBI Laboratory's efforts to achieve ASCLD/LAB accreditation. Many of the processes that needed to be formally put in place to achieve accreditation would impact Units across the entire Laboratory. The QA Unit was charged with implementing Laboratory-wide written procedures.⁶²

58 Bromwich, Michael R. "FBI Laboratory: An Investigation into Laboratory Practices and Alleged Misconduct in Explosives Related and Other Cases." Diane Pub Co, 01 Apr. 1997, books.google.com/books?id=PpjvumZdqo8C&printsec=frontcover#v=onepage&q&f=false.

59 The FBI Laboratory was accredited in 1998.

60 This testimony was not within the scope of our analysis as it was not testimony related to MHCA.

61 Scientific Working Group for Materials Analysis (SWGMAT). "Forensic Human Hair Examination Guidelines." Apr. 2005, www.nist.gov/sites/default/files/documents/2016/09/22/forensic_human_hair_examination_guidelines.pdf.

62 Laboratory Division, Laboratory Quality System, Revised 11/6/96

This effort led to the first formal written procedures, such as the first formal written procedure for performing MHCA and the first formal written procedure for monitoring examiner testimony. Some of the written procedures had undergone several revisions by the time the FBI Laboratory received ASCLD/LAB accreditation in 1998. By then, about 150 other laboratories had been accredited. By 2012, about 400 laboratories had been accredited.⁶³

- **O. J. Simpson trial testimony by an FBI MHCA examiner.** Also in 1995, MHCA testimony was provided by an FBI examiner as part of the O.J. Simpson trial. During the testimony, there was an objection regarding the MHCA examiner's use of the word "match" to describe the link between the known and questioned hair samples. The judge in the trial barred "the use of the word 'match' to describe those unknown specimens resembling hair samples from identified sources."⁶⁴ Following the trial, interviewees indicated that FBI MHCA examiners were directed by the Hairs and Fibers Unit Chief to stop using "match" and only use the phrase *the microscopic characteristics of the known and questioned hairs were consistent*, which the 2012 Review determined was not an error.
- **The first formal written procedures were developed.** Starting in 1995, the first Laboratory and Hairs and Fibers Unit written procedures were developed. As the FBI Laboratory worked towards achieving accreditation, the procedures were revised several times in the late 1990s.
- **The first testimony monitoring program was put in place.** During most of the period analyzed (early 1950s through 1999), no formal MHCA testimony monitoring program was in place. In general, Laboratory management was not aware of the specific testimony provided by an MHCA examiner and made minimal efforts to monitor performance. Based on interviews, management generally requested and reviewed only a couple of transcripts per year. In addition, the MHCA examiners would not routinely request and review transcripts of their testimony or the testimony of others once they became a qualified MHCA examiner. Also, it was rare that one qualified MHCA examiner would observe the MHCA testimony of another qualified MHCA examiner. There was also limited negative, third-party feedback regarding MHCA examiner testimony (this is addressed in Causal Event K).

Beginning in 1995, the FBI Laboratory Division instituted an MHCA testimony monitoring program^{65, 66} that required Laboratory managers to monitor the performance of each MHCA examiner at least once per year. This requirement was put in place during the effort to achieve Laboratory accreditation and was not implemented specifically to verify that MHCA testimony was within the limits of the science. However, the program put in place did not require an evaluation of the content of the MHCA testimony. The six criteria in the monitoring process included: (1) courtroom demeanor, (2) personal appearance, (3) ability to communicate results, (4) ability to maintain composure, (5) use of visual aids (if applicable), and (6) overall evaluation.

63 ASCLD Board of Directors. "Board Position Statement: Accreditation." 20 Aug. 2014, www.asclcd.org/wp-content/uploads/2014/08/ASCLD-Board-Position-on-Accreditation.pdf.

64 Margolick, David. *Hairs Resembling Simpson's are Identified by an Expert*, The New York Times, July 1, 1995

65 Laboratory Division, Court Testimony Monitoring Program, Revised 7-31-95, 5 pages

66 Lind, Richard T to FBI Laboratory. "Court Testimony and Court Testimony Monitoring Policy." 06 Feb. 1997.

The 1995 version of the procedure also indicated that feedback should be received from court officials (i.e., “Evaluation by one or more officers of the court using the testimony evaluation form provided by the FBI Laboratory Division which is completed and returned to the Unit Chief/Supervisor”). However, in January 1998,⁶⁷ the form was retitled “Prosecutorial Evaluation of Examiner Testimony.” Examiners were then directed in step 2.2.3 to “Provide prosecutor with copy of “Prosecutorial Evaluation of Examiner Testimony” form upon each court appearance.” There were no requirements to seek or resolve comments from other court officers. A revision⁶⁸ a month later, in February 1998, changed the process back to soliciting input from all court officials and the name of the form was changed to “External Evaluation of Examiner Testimony.” During interviews, some MHCA examiners indicated the evaluation forms were provided to other court officers (e.g., defense counsel and judges) in some instances.

The 1998 revision also added a requirement that MHCA testimony content was part of the monitoring process. The February 1998 version of the procedure included the same evaluation criteria for external feedback and added the following nine questions for internal monitoring performed by Laboratory personnel:

1. Did examiner testify within scope of his/her expertise?
2. If examiner was asked questions beyond his/her expertise, did the examiner decline to answer?
3. Did examiner testify accurately?
4. Did examiner completely disclose his/her involvement in the case?
5. Was examiner clear, straightforward, and objective in his/her answers on direct examination? On cross examination?
6. Did examiner limit his/her conclusions to those that logically followed from the underlying data and analytical results?
7. If examiner testified as a summary witness:
 - Did examiner accurately and completely describe the analyses or conclusions made by others?
 - Did examiner testify clearly that he/she did not perform the examination(s) under discussion?
8. Did examiner maintain appropriate demeanor/composure while testifying?
9. Please comment on the examiner’s overall performance....

While potentially implied by Question 3, none of these questions directly addressed the issue of testimony in relationship to the limits of the science. With no sufficiently specific guidance in place, it is unclear that responses to Questions 3, 5 and 6 would result in an assessment of whether the testimony provided exceeded the limits of the science. ABS Group was not provided any completed forms to review. The policy indicates they are only required to be retained for a maximum of four years, so there may not be any forms available from the period analyzed.

67 Laboratory Division, Court Testimony Monitoring Policy, LD Quality Manual, Testimon.A06 - Rev. 3, Issue Date: 01/06/98, 7 pages

68 Laboratory Division, Court Testimony Monitoring Policy, LD Quality Manual, Testimon.B27 - Rev. 4, Issue Date: 02/27/98, 10 pages

As a result, Unit management had no effective method to identify MHCA testimony that exceeded the limits of the science for most of the period analyzed and a very limited ability during the final few years of the period analyzed.

- **Primary examiner eliminated.** In 1999, the generation of an integrated report by the primary examiner/coordinating examiner was discontinued. See *Basic MHCA steps* in this report for additional details on this transition.
- **Routine use of DNA analysis in analysis of hair.** After 1999, the FBI Laboratory began the routine use of DNA analysis when appropriate for hair examinations. In most cases following an association from MHCA, mitochondrial DNA testing was performed. Although DNA analyses had been available for a few years prior to 2000 and was used in some cases prior to 2000, it became the norm after 1999 to perform appropriate DNA testing in all cases. It should be noted that an appropriate MHCA association can be made, even if the DNA analysis results are an exclusion. This is due to the scientific limitations of an MHCA comparison. Hence, a hair may be visibly indistinguishable from another hair, and not be associated by DNA. A DNA exclusion does not mean the MHCA association was made incorrectly.

Events after 1999

The timeline also includes one significant event that occurred after the period analyzed, because it was identified as the triggering event for the 2012 FBI MHCA Review that, in turn, resulted in this analysis.

- **Individuals in the Washington, D.C. area exonerated.** From 2009 through 2012, a few individuals who were convicted, in part on MHCA testimony, were exonerated through the use of DNA testing of the evidence.^{69, 70, 71}

As noted previously, the ABS Group analysis described in this document was launched by the FBI to aid in understanding why the errors identified by the 2012 Review occurred.

4.3 ANALYSIS OF REPORTS

This section provides the analysis of reports written by MHCA examiners in the FBI Laboratory. Although primarily focused on MHCA examiner testimony, the 2012 Review also performed review of 1,700+ reports and documented the results of their reviews on evaluation forms. The ongoing 2012 Review determined about half of the reports had an error in the language the examiner used to describe their findings (defined as Error Types 1, 2, and 3 by the 2012 Review).

69 Alexander, Keith L. "DNA Tests Set Free D.C. Man Held in Student's 1981 Slaying." *The Washington Post*. 16 Dec. 2009.

70 Hsu, Spencer S. "Kirk L. Odem Officially Exonerated; DNA Retesting Cleared Him in D.C. Rape, Robbery." *The Washington Post*. 13 July 2012, www.washingtonpost.com/local/crime/kirk-l-odem-officially-exonerated-dna-retesting-cleared-him-in-dc-rape-robbery/2012/07/13gJQAuH3piW_story.html?utm_term=.6841295e8bd0.

71 Hsu, Spencer S. "D.C. Judge Exonerates Santae Tribble in 1978 Murder, Cites Hair Evidence DNA Test Rejected." *The Washington Post*. 14 Dec. 2012, www.washingtonpost.com/local/crime/dc-judge-exonerates-santae-tribble-in-1978-murder-based-on-dna-hair-test/2012/12/14/da71ce00-d02c-11e1-b630-190a983a2e0d_story.html?utm_term=.5008eb62609.

Background on FBI Laboratory MHCA examiner reports

These reports typically contained details on (1) the evidence provided to the FBI, (2) information on what hairs were found during scraping of evidence, (3) findings from the examiner on their review of the characteristics of the hairs examined, (4) as well as other relevant case and MHCA information. The MHCA report was written and submitted to law enforcement before the MHCA examiner testified in the trial.

Generally, the examiners and technicians hand-wrote their reports, then the FBI Laboratory typing pool typed the reports before they were released to the requesting law enforcement agency. For almost the entire period analyzed, the MHCA reports were included as part of one FBI Laboratory-wide report. In 1999, the MHCA reports were independent, standalone, and provided to law enforcement without other Laboratory unit's information (e.g., results from serology or ballistics).

2012 FBI MHCA Review report statistics as of June 2018

The FBI provided the following statistic on the report errors assessed by their ongoing review as of June 2018. Based on the definitions established and applied by the 2012 Review team, 856 reports have errors (typically, 1 per report) and 873 reports are error free. The 2012 Review generated final evaluation forms for each report. They contained the FBI case number, the date of the review, date of the FBI Laboratory report, name of the MHCA examiner issuing the report, whether the FBI Laboratory results included a positive association, whether the report contained limiting language (i.e., a disclaimer), and an assessment of whether the report included inappropriate statements (that may have been deemed acceptable and appropriate at the time, but were determined in 2012 to be in error). The error type and the page number were also cited in the evaluation form along with a quote of the error (if necessary).

MHCA reports provided to our team by the FBI Laboratory

Figure 8 is a bar graph showing the number of reports and associated final evaluation forms by year that the FBI provided to ABS Group. In general, few reports written prior to 1982 were provided to ABS Group. The peak number of reports occurred in 1986 and steadily declined until the end of the period analyzed in part because transcripts were available for review in lieu of reports. Ten reports from 2000 were included in the analysis because they were associated with MHCA completed prior to December 31, 1999.

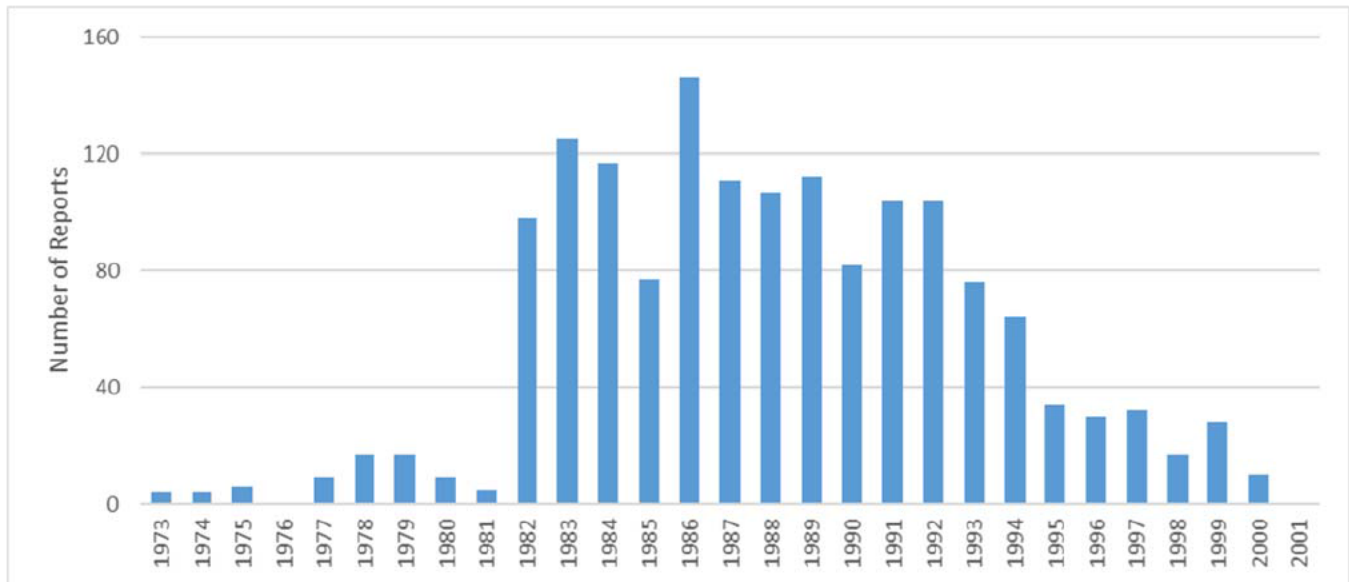


Figure 8. Total number of MHCA reports by year.

Findings from our report analysis

ABS Group reviewed a sample of the reports and all of the final evaluation forms provided to our team by the FBI. Our analysis attempted to answer several questions, such as those presented below. A number of questions regarding these reports were developed to help structure our analysis and conclusions. These questions were developed based on hypotheses that emerged during interviews and review of related open source information.

- When did the report errors begin and what was the trend over time?
- What types of report errors were identified?
- Where did the phrase *consistent with having originated from [individual's name]* originate?
- Did the FBI Hairs and Fibers Unit adopt the industry guidance from the international symposium?
- Did it matter “who” wrote the report?

ABS Group was not involved in the development of the definitions of the three error types assessed by the 2012 Review nor the application of these definitions by the 2012 Review team to identify MHCA report errors. Additionally, ABS Group did not independently verify the accuracy of the evaluation forms provided to ABS Group.



1. When did the report errors begin and what was the trend over time?

Based on the final report evaluation forms available to us, errors in reports began in 1977 as shown in Figure 9. The percentage of reports with errors steadily increased from about 50% in 1985 to almost 100% at the end of the period analyzed.

To evaluate the impact of Unit leadership on the percentage of reports with errors, we overlaid in the chart below (1) Unit Chief transitions within the Hairs and Fibers Unit and (2) percentage of reports without limiting language. Limiting language should have been included in each report and can be thought of as a disclaimer. Limiting language would typically say something similar to “hair comparisons are not a basis for absolute personal identification.” This limiting language was NOT judged to be an error by the 2012 Review. For both trends shown on the graph below, a low percent is desired. Reports with no errors were desired, and reports with limiting language were desired.

Report Analysis Finding 1

The first report error occurred in 1977. By 1985, about half of the reports had an error. By 1998, nearly all reports had an error.

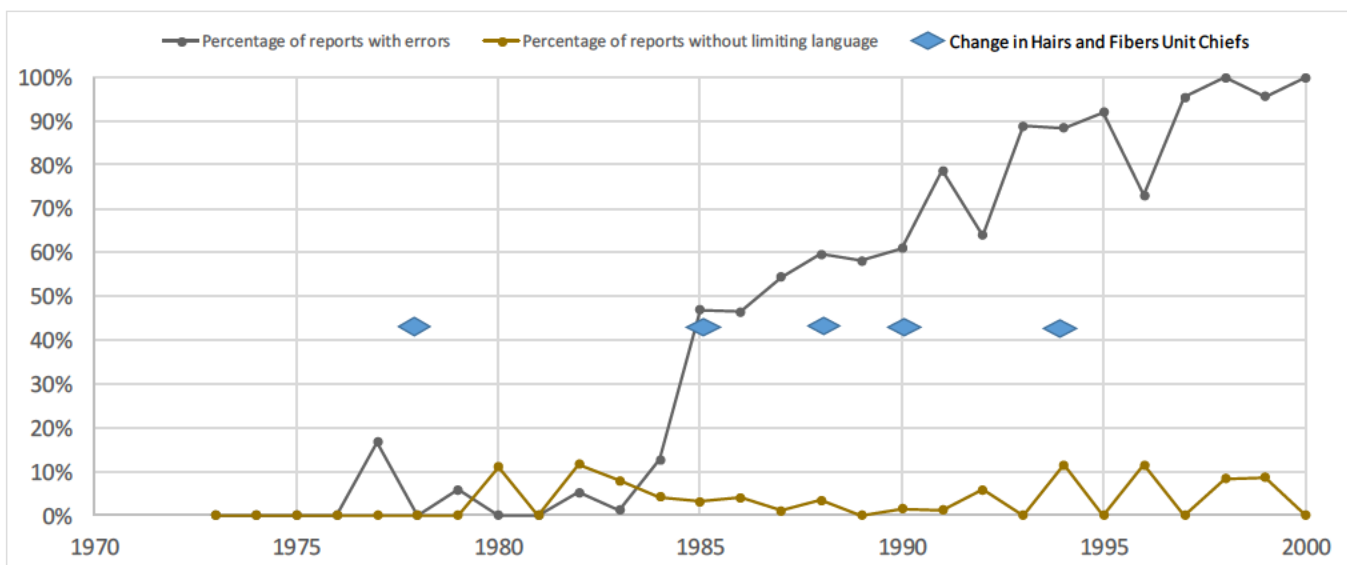


Figure 9. Trend of percentage of reports with errors and trend of percentage of reports without limiting language with markers indicating changes in Hairs and Fibers Unit Chiefs.



2. What type of report errors were identified?

Almost half of the FBI Laboratory MHCA reports had statements judged to be report errors by the 2012 Review. Almost all report errors (over 98%) described the questioned hair using the phrases consistent with having originated from [individual's name] or consistent with having come from [individual's name]. A few of the reports (less than 1%) contained phrases like probably originated from [individual's name], likelihood that these hairs originated from [individual's name] ..., matched the victim, and can be associated with [individual's name], which were assessed as errors. These phrases were categorized by the 2012 Review as Type 2 Errors. Most of the testimony errors were Type 2 Errors. An appropriate alternative for these phrases would be “*could have come from [individual's name]*.”

Report Analysis Finding 2

Almost all report errors were identified as Error Type 2 and contained phrases like “consistent with having originated from [individual's name]” in the MHCA conclusion.



3. Where did the phrase “consistent with having originated from” originate?

The two statements, consistent with having originated from [individual's name] and the appropriate statement *could have come from [individual's name]*, aligned closely with guidance developed between 1982 and 1985 that was formally presented at an FBI-hosted international symposium on MHCA in 1985. ABS Group concluded that this symposium guidance originated between 1982 and 1985 in preparation for the 1985 symposium. The guidance was provided by a committee at the symposium that consisted of six individuals from other related law enforcement agencies or international laboratories. No FBI Laboratory employees were on the committee that provided this guidance.

Report Analysis Finding 3

The phrase consistent with having originated from [individual's name] originated from the international MHCA community.

Guidance provided at the 1985 FBI-hosted international symposium by a committee on forensic hair comparison.⁷² The following is an excerpt from the subcommittee’s conference presentation. Note that conclusion 1 includes the phrase consistent with having come from [individual's name] and conclusion 2 includes the appropriate phrase “*could have come from [individual's name]*.”

“For the reader to understand the significance of the results, it is necessary for the examiner to render a conclusion. Some cases, for various reasons permit no conclusions and only the results are reported. From the reports received, with conclusions, there was a diversity of opinion with respect to these conclusions. These ranged from a single sentence statement to nine possible conclusions and the criteria for making these conclusions. Meaningful conclusions can only be made on the basis of several factors such as the adequacy in quantity and quality of the comparison sample, the individual characteristics of each hair and most

⁷² “Proceedings of the International Symposium on Forensic Hair Comparisons: FBI Academy, Quantico, Virginia, June 25-27, 1985.” U.S. Government Printing Office, Proceedings of the International Symposium on Forensic Hair Comparisons: FBI Academy, Quantico, Virginia, June 25-27, 1985, www.ncjrs.gov/pdffiles1/Digitization/116592NCJRS.pdf.

importantly, the examiner's personal experience. This experience can only be gained by proper training including numerous blind test exercises on various hair specimens followed by a continuous application of hair examination procedures through casework. It is this subcommittee's view that there are several basic conclusions a hair examiner could reach.

1. The questioned hair is consistent with having come from John Doe.

This conclusion must be based upon a strong association between the questioned hair and the known sample. There are several factors, such as the questioned hairs having intrasample variation which is found to be microscopically similar to the comparison sample, or the presence of unusual hair characteristics or hair treatment such as dying (sic), bleaching, etc., which strengthen the association. Other tests such as sex determination or enzyme typing may provide additional support for this conclusion.

2. The questioned hair could have come from John Doe.

When only a limited association can be made between the questioned hair and the comparison sample, this conclusion would apply. Some of the factors which influence arriving at this conclusion are the presence of hair fragments, or the lack of any distinctive features in the questioned hair, for example, white hair.

3. John Doe qualifies as being the donor of the questioned hair.

This statement indicates to the reader that John Doe cannot be eliminated as a possible source of the questioned hair. It does not take into account whether there is a strong or limited association.

4. The questioned hairs could not have originated from John Doe.

This conclusion is based upon finding significant macroscopic and/or microscopic dissimilarities between the questioned hair and the comparison sample. The examiner must ensure that several factors are satisfied before this statement can be made, for example, the possibility that the hairs are atypical is remote, the known sample is adequate and representative with little intrasample variation.

5. The questioned hair is not consistent with having come from John Doe.

This conclusion applies when there are dissimilarities between the questioned hair and the comparison sample; however, there are factors present which do not allow the examiner to conclude categorically that John Doe could not be the donor of the questioned hair, for example, inadequate comparison samples, incomplete questioned hairs, a lengthy time lapse between the offense and the collection of the comparison sample.

6. No conclusion as to origin could be reached.

As stated earlier, there are cases in which no conclusion can be reached. One might find both similarities and differences between the questioned hair and the comparison sample or the questioned hair may be very minute. In these situations, the results are uninterpretable and no conclusion can be made as to whether the questioned hair could have originated from a specified source.

Qualifying Statements

Qualifying statements should strengthen or weaken the conclusion. Factors such as unusual characteristics or dyeing pattern which would strengthen the opinion should be indicated. Conversely, if there are factors which tend to weaken the conclusion, that is, common featureless hairs, then this should also be stated. These qualifying statements will vary depending upon each specific case."



4. Did the FBI Hairs and Fibers Unit adopt this industry guidance from the 1985 International Symposium?

Based on trending of data from final report evaluation forms, document reviews, and interviews, ABS Group concluded that the FBI Hairs and Fibers Unit adopted the guidance provided at the international symposium. The guidance provided by the subcommittee included six potential conclusions that can be reached. (See the subsection on the 1985 Symposium in Section 4.2 of this report for additional details related to the 1985 symposium.) Among the six proposed conclusions are three statements based on the strength of the association made:

1. The questioned hair is consistent with having come from John Doe
(used when there is a strong association)
2. The questioned hair could have come from John Doe
(used when there is a limited association)
3. John Doe qualifies as being the donor of the questioned hair
(used when John Doe cannot be eliminated as a possible source of the questioned hair)

In the early years after the symposium, the MHCA examiners frequently used the first two statements while the third appears to have been rarely used. In later years, the MHCA examiners appear to only use the first (strongest) phrase when reporting an affirmative conclusion.

Another reason we concluded this language was adopted and approved by the Unit, is that the MHCA reports were reviewed by Unit Chiefs throughout the period analyzed as MHCA reports required their approval before being issued. If these statements had not been adopted, the Unit Chiefs would have noted this and modified the reports accordingly. This confirms that unit management approved of the language provided at the symposium: consistent with having come from [individual name] and consistent with having originated from [individual name].

ABS Group also concluded that the guidance was not *formally* adopted and documented. Regarding documentation, ABS Group concluded that the examiners did not consistently have the six possible conclusions from the symposium notes in front of them when writing reports nor did Unit Chiefs consistently apply these six possible conclusions when reviewing reports. The FBI Laboratory had many copies of books containing details (as presented above) from the symposium, but based on interviews, MHCA examiners soon stopped using these books, and did not reference them. Because of failure to formally adopt and document the guidance, the use of the strongest conclusion, consistent with having originated from John Doe or consistent with having come from John Doe, was used more frequently rather than the more nuanced (weaker) affirmative conclusion. Of note, the weaker affirmative conclusion was not judged to be an error by the 2012 Review. Had the MHCA examiners used all three of the affirmative conclusions, there would have been fewer report errors.

Report Analysis Finding 4

The Laboratory informally adopted guidance developed for the 1985 FBI-hosted international symposium on MHCA.

The trend in Figure 9 shows that consistent with having originated from [individual name] and consistent with having come from [individual name] (which was later classified as an error by the 2012 Review) was used with an increasing frequency until it became the norm towards the end of the period analyzed. Hence, almost all reports from the years 1997 through 2000 contained at least one error.



5. Did it matter “who” wrote the report?

ABS Group concluded through our analysis of this data by examiner that the number of errors in an MHCA report was primarily impacted by *when* the examiner was in the Hairs and Fibers Unit rather than *who* wrote the report. As shown in Figure 9, reports written prior to 1984 had very few errors, while most reports written after 1985 had errors in them. There were a few MHCA examiners with lower error rates (less than 50%) even after 1985, but the primary driver of error rates was the date of the report.

Report Analysis Finding 5

The number of report errors was primarily affected by *when* it was written rather than by *who* wrote it.

4.4 CHARACTERIZATION OF TESTIMONY ERRORS FROM THE 2012 REVIEW

Using the three error types defined by the ongoing 2012 FBI MHCA Review and documented on the final evaluation forms for each testimony transcript, ABS Group analyzed the testimony error data distribution by examiner, by year, and by error type.

Distribution of testimony errors by examiner

Transcripts were provided for 28 MHCA examiners. The distribution of total errors (Types 1, 2, and 3) by examiner is shown in Figure 10. Most examiners had at least one error in one or more of their transcripts. Figure 10 also shows one very large region which represents one examiner's testimony errors. The FBI had far more transcripts for this particular examiner as this examiner was the focus of an FBI review, so they requested transcripts for this examiner much earlier than they did for the other examiners. Therefore, the data has a significantly larger number of transcripts from this examiner than from other examiners.

In Figure 11, we normalized the testimony error data by the number of transcripts so that the distribution is not skewed by high number of transcripts that were available for one of the MHCA examiners. The distribution shows more even distribution of the errors across the MHCA examiners. We performed a similar analysis to understand the distribution across the MHCA examiners using a different methodology (see Question 1 in Section 4.5).

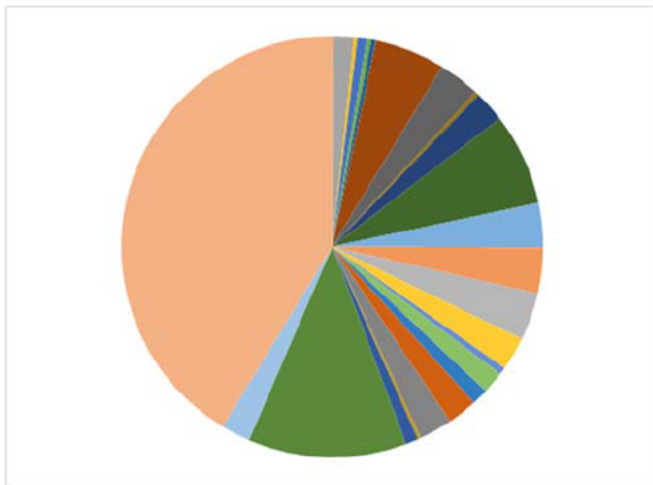


Figure 10. Total errors by examiner.

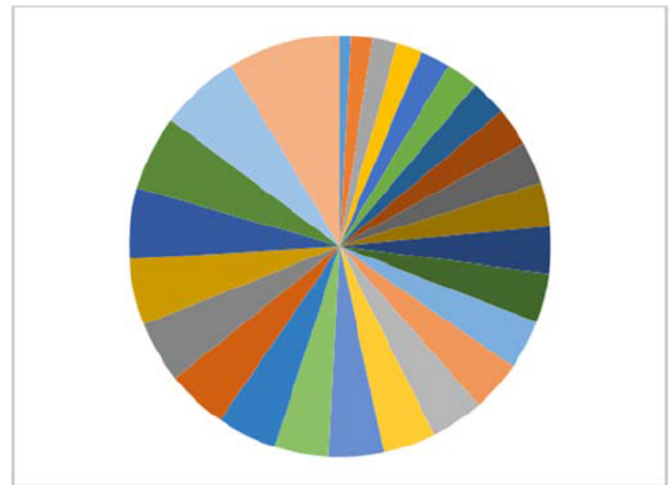


Figure 11. Errors per transcript by examiner.

Trending of testimony error types (Types 1, 2, and 3) by year

The number of errors per transcript by type and by year is shown in Figure 12. Overall, there were significantly more findings of Error Type 2 and relatively few from Error Type 3.

There is significant deviation in the data from year to year with no obvious trends overall.

In general, for the period analyzed:

- Error Type 1: Consistent with zero to two per transcript
- Error Type 2: Varied more widely with a range of zero to five per transcript. Similar to reports, this error type was the most prevalent
- Error Type 3: Consistently low with a slight decreasing trend

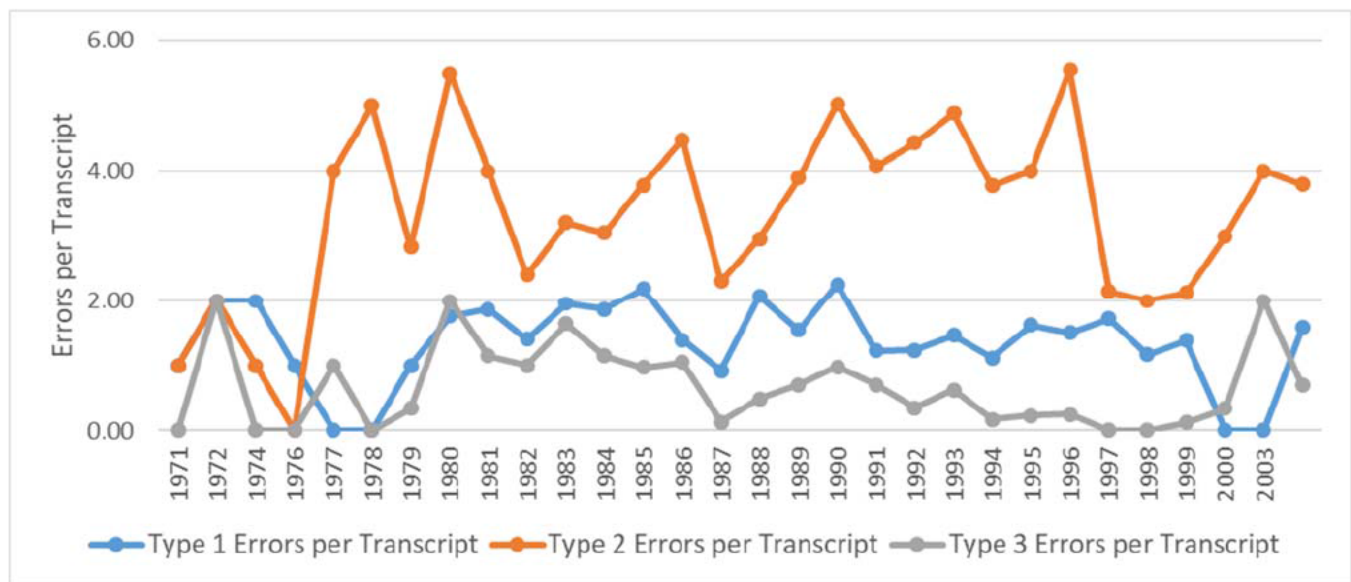


Figure 12. Errors per transcript for the three error types by year.

4.5 ANALYSIS OF TRANSCRIPTS

This section provides our independent analysis of the words and phrases examiners used during testimony that exceeded the limits of the MHCA science.

To maintain anonymity, there are no examiner names in this report. Our goal was to evaluate management system weaknesses and cultural causes, not fact-finding related to specific examiners. The analysis related to one specific examiner is only included to illustrate the impact of management system and cultural changes on the individual exceeding the limits of the science in testimony.

In this analysis section, we intentionally do not use the word “error” when referring to our analysis and instead use “word or phrase.” Our assessments were independent of the 2012 FBI MHCA Review. Our analysis was not duplicative of the 2012 Review as we were analyzing the transcripts using a different method and for a different purpose.

The ABS Group team is not composed of lawyers, and any representation in this section of excerpts from actual testimonies or examples we provide are only samples of words and phrases that met our criteria. Our analysis was completed by analytical and systematic means in a relatively short period of time to help ensure consistency of this review.

Purpose of this analysis

The ongoing 2012 FBI MHCA Review identified three error types that categorized the testimony exceeding the limits of the science as defined in Section 2. The FBI, NACDL, and the IP identified the errors where there were MHCA conclusions in trial transcripts and the defendant was convicted. To gain additional insight for this root cause and cultural cause analysis, our team analyzed the transcript data by words and phrases rather than by error type. Evaluating these words and phrases individually allowed us to understand possible impacts of management system and cultural changes.

The goals of the analysis were to understand (1) how the use of particular words or phrases changed during the period analyzed and (2) what events in the timeline may have influenced that evolution. The purpose of this analysis is to identify overall trends across the period analyzed to aid in understanding the influence of management system and culture changes.

Correlation versus causation

In performing these analyses, we could not distinguish between correlations and causation. Correlation simply means that two events occur together in the data. When you see one factor in the data, you also see the other. The two factors may or may not be causally related.

Please keep in mind that most of our data show correlations to events. They may suggest a causal link, but there was insufficient data to prove a causal link with any significant statistical confidence.

Considerations made in data presentation

Looking at the number of uses of a particular word or phrase in testimony exceeding the limits of the science (uses) per year on its own is misleading because of the wide range in the number of transcripts for

each year. For example, if Year X had 1 transcript with 5 uses of a word and Year Y had 10 transcripts with 5 word uses in each transcript, the total number of errors in Year X would be 5 (1 x 5) and the total for Year Y would be 50 (10 x 5). However, the rate of *uses per transcript* was the same for both years. To address this, the data was first normalized to the number of transcripts. Using this approach, both Year X and Year Y would have the same rate of 5 *uses per transcript*.

We also noted that the transcripts varied greatly in length. Some were only 15 pages long while others were hundreds of pages in length. The more the MHCA examiner testified, the more opportunities there were to use the words or phrases. If an examiner testified for 4 hours, they would have more opportunities to err than if they only testified for 20 minutes. The longer transcripts could be the result of more MHCA examiner testimony if the case was complex (lots of evidence items), if there were multiple defendants, if the attorneys asked numerous questions, or if the examiner provided a more detailed description of the MHCA process. To address this variation in the transcripts, we also developed graphs of word or phrase *uses per transcript page*. However, this approach also has some limitations because some of the factors driving the length of the transcript are unrelated to MHCA. For example, fiber comparison testimony, verbose or frequent objections, and sidebar discussions contribute to the length of the transcript without lengthening the associated MHCA examiner testimony.

Presenting both analyses helps counter the influence of the factors noted above. Trends apparent in both analysis approaches are less likely to be flukes of the data set.

Transcript availability and the span of our analysis

ABS Group received a copy of almost all transcripts related to MHCA that the FBI has for the years of our analysis. Additionally, the FBI was not able to locate, despite significant effort, a transcript for every trial where MHCA examiners testified. As a result, the transcript dataset discussed in this section is only a sample of the full population of trials that may have been impacted by MHCA testimony exceeding the limits of the science. It is not a random sample of work product from all examiners in all years of our study period.

The overall period we analyzed spans from the 1950s through December 31, 1999; however, the transcript analysis section of this report focuses on 1971 through 2000 due to the limitations of the transcript data. The first available transcript was dated 1971, shown in Figure 13 at the left end. The last available transcript applicable to our analysis was dated 2000, shown in Figure 13 at the right end. It is included because that testimony was associated with hair comparisons completed through 1999. Of note, if an examiner testified and it impacted multiple defendants, the transcript was only counted once for our analysis as the examiner only testified one time.

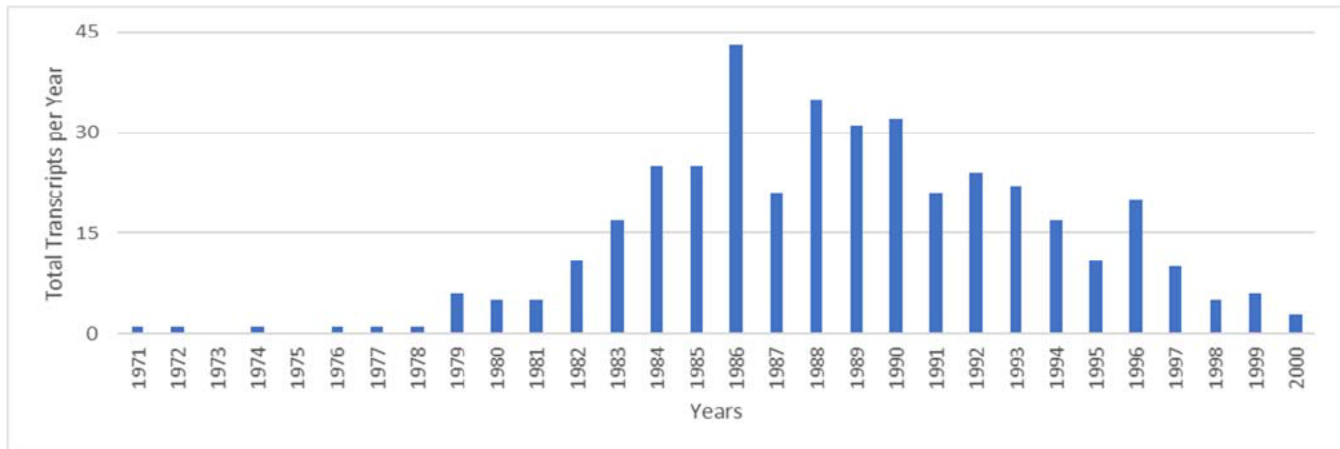


Figure 13. Transcripts obtained by the ongoing 2012 FBI MHCA Review and provided to ABS Group for the current analysis.

Words and phrases selected for analysis (that exceeded the limits of the science)

The FBI provided all transcripts related to the period analyzed to ABS Group for analysis. Our team compiled this list from reviewing words or phrases that the 2012 Review identified, at least once, as exceeding the limits of the science. Of all the words and phrases identified by the 2012 Review as errors, these were selected because we believed they would best illustrate how the changes in management systems and cultures developed over time.

Table 7. Words and phrases used in MHCA testimony analysis.

Word or Phrase	Example Search Terms
Completely indistinguishable	Completely indistinguishable
Consistent with	Consistent with coming from [individual's name], having come from [individual's name], originating from [individual's name], having originated from [individual's name], [individual's name], is consistent with being a contributor, [individual's name] is consistent with being a source
Exact	Exact, exactly, just like
Face analogy	Analogy, face, eye
Indistinguishable	Indistinguishable, identical
Individualization	Individualization, individualize, individualized, degree of individuality
Match	Match, matches, matched, matching, match up
Perfect match	Perfect match, perfectly matched, matches the known hairs perfectly, match perfectly, matches perfectly, matched perfectly, perfectly matches, perfectly matching, matching perfectly

Word or Phrase	Example Search Terms
Probability/statistic	Probable, probably, statistic, out of, one in, one of, study, never, always, remote, often, percent, likely, unlikely, infrequent, infrequently
Rare	Rare, rarely
Same	Same
Scientific certainty	Scientific certainty, exact science
Seldom	Seldom
Stronger/confident	Strong, stronger, confidence, confident, degree of certainty, significant
Unique	Unique, uniquely, uniqueness
Unusual	Unusual, not usual, unusually, not usually

Method of analysis

The method used by ABS Group to identify the **use of words and phrases associated with errors** was different from that used by the FBI, the IP, and the NACDL to identify **testimony errors**. Some of the key differences were:

- ABS Group’s use of optical character recognition (OCR), to systematically search the provided documents for words and phrases as described in Table 7.
- ABS Group evaluated the use of the words and phrases in context determine if the use of the word or phrase was associated with an error.

Appendix C contains more details regarding the methods used by ABS Group to perform our analysis of the use of words and phrases associated with errors.

The use of these words or phrases in testimony exceeding the limits of the science (referred to throughout this section simply as “uses”) was identified by evaluating the context of each OCR result and recording reference documentation to allow for independent review. Categorical information was also recorded to create meaningful groupings during data analysis.

Our team was careful as we analyzed the 400+ transcripts for the words contained in Table 7. When the word or phrase was identified, we reviewed the context around it to help ensure it was used in a way that exceeded the limits of the science.

For example, using rare in the sentence:

Examiner: It's very, very rare for us to find two (2) individuals who have head hairs that look alike.

would be counted as a use of the word “rare.” However, the use of rare in the statement:

Examiner: I do have a reference collection, but I don't always need to use it. In the majority, I rarely need to use it at this point.

would not have been counted as a use of the word “rare.”

To facilitate consistency, the analysis was performed by one ABS Group analyst for each word or phrase in its entirety across all of the provided transcripts. The resulting data were compiled and processed using a database to evaluate overall trends within the data and the potential influences of management system and cultural changes identified in the timeline.

Poor scan quality of some of the provided documents challenged the OCR software due to low resolution, improper page alignment, stray markings, stains, and underlined or highlighted text. In some of these cases, we manually reviewed the documents for the words and phrases of interest. Every use of a word or phrase may not have been captured in our analysis due to this issue. However, the objective of this review is not to quantify the uses present in the provided documents, but rather to characterize the overall trends within the limitations of the OCR approach used in the transcript analysis.

Findings from our transcript analysis

The purpose of this analysis is to identify and qualitatively characterize overall trends across the period analyzed to aid in understanding the influence of management system and cultural changes. The results of this analysis are not intended to be quantitative and should not be interpreted as such.

To structure the conclusions from our analysis, a number of questions are presented in Table 8. These questions were developed based on hypotheses that emerged during interviews and our analysis of related open-source information to determine what conclusions, if any, could be drawn from the data.

Table 8. Summary of transcript analysis and associated conclusions.

Transcript Analysis Question	Findings
1. Were most of the testimony issues caused by one or two MHCA examiners?	Testimony issues were systemic, occurring across nearly all MHCA examiners, but there were two examiners who had higher levels of testimony issues. However, it is possible that if the entire data set was available the testimony issues would be more consistent across all examiners.
2. When did the testimony issues begin?	Our team concluded, based on interview data, that testimony issues began at the start of the Hairs and Fibers Unit when MHCA examiners first started testifying. Based on the transcripts available (from 1971 through 2003) issues began at least by 1971 which is the year of the first transcript.
3. Were there improvements over time?	There appears to be minimal improvement in testimony not exceeding the limits of the science from 1971 to 2000.
4. What was the impact of the 1985 International Symposium on Forensic Hair Comparisons?	Data suggest that the 1985 symposium may have resulted in a slight apparent decrease in testimony not exceeding the limits of the science and an increased consistency in how examiners presented their conclusions in testimony.
5. Was the examiner counseling that occurred in 1991 effective?	Data show counseling was effective for the specific individual involved in the initial issue, but did not fully correct the problem.
a. Did counseling of the specific individual correct the use of “perfect match”?	Individual counseling for the one examiner involved in the initial issue was effective in that the examiner did not subsequently use the word “perfect match.”
b. Did counseling of the specific individual correct the use of “completely indistinguishable”?	Individual counseling for the one examiner involved in the initial issue was effective in that the examiner only used the phrase “completely indistinguishable” once after the counseling.
c. Did counseling of the specific individual correct the use of numbers that could be interpreted as probabilities?	The data show a slight apparent decrease in the use of words that could be interpreted as probabilities before and after the counseling.
d. Was Unit counseling focused on correcting the use of “perfect match” effective?	There is no conclusion from this analysis because there were insufficient data to perform the analysis (e.g., there were only two instances of the use of “perfect match” in the testimony by examiners other than the examiner counseled).

Transcript Analysis Question	Findings
e. Was Unit counseling focused on correcting “completely indistinguishable” effective?	There is no conclusion from this analysis because there were insufficient data to perform the analysis (e.g., there were no other instances of the use of “completely indistinguishable” by other examiners in testimony).
f. Was Unit counseling focused on correcting the use of numbers that could be interpreted as probabilities effective?	Unit counseling focused on correcting the use of numbers that could be interpreted as probabilities was ineffective.
6. Did agent-examiner testimony have a higher usage rate than non-agent examiner testimony?	Data suggest that non-agent examiners had an apparently lower usage rate than agent-examiners. In addition to the differences between the agents and non-agent examiners, this difference may have resulted from improvements to management systems, such as improved training, or cultural changes.
7. What was the impact of the O. J. Simpson trial on the use of the word “match”?	Data indicate that the use of the word “match” decreased after the O. J. Simpson trial. There are many potential drivers of this decrease, including lessons learned from the Simpson trial, as well as, efforts to achieve accreditation and improvements in response to the Office of Inspection General report.
8. What was the impact of examiner experience on testimony?	There was no significant change in the use of words that exceed the limits of the science as examiners gained experience.
9. Were the testimony issues prompted or unprompted?	The majority of testimony exceeding the limits of the science was stated by MHCA examiners without being prompted.



1. *Were most of the testimony issues caused by one or two MHCA examiners?*

A fundamental question we sought to answer is whether almost all instances of testimony exceeding the limits of the science involved one or two examiners while other examiners generally did not have instances of testimony issues. Based on our transcript analysis, we concluded that testimony exceeding the limits of the science was not isolated to one or two examiners but was a widespread, systemic issue across nearly all examiners. Data show the two examiners perceived to be the most prone to overstatements did, indeed, have a higher rate of testimony exceeding the limits of the science; however, almost all examiners exceeded the limits of the science during testimony. There was no data refuting this conclusion.

Transcript Analysis Finding 1

Testimony issues were systemic, occurring across nearly all MHCA examiners, but there were two examiners who had higher levels of testimony issues. However, it is possible that if the entire data set was available the testimony issues would be more consistent across all examiners.

Figure 14 and Figure 15 show three bars. The first and second bar are average rate of testimony exceeding the limits of the science for each of the examiners perceived to be more prone to overstatements during testimony. The third bar is the average for all other MHCA examiners, and this bar excludes the two examiners perceived to be more prone to overstatements during testimony. The reason two charts are provided is that the data is normalized in two different ways: across transcripts in Figure 14 and across transcript pages in Figure 15.

The examiner shown in the figures below as Examiner A used the words and phrases on average about twice as often as his/her peers. The examiner shown in the figures below as Examiner B used the words and phrases on average about 30% more than his/her peers.

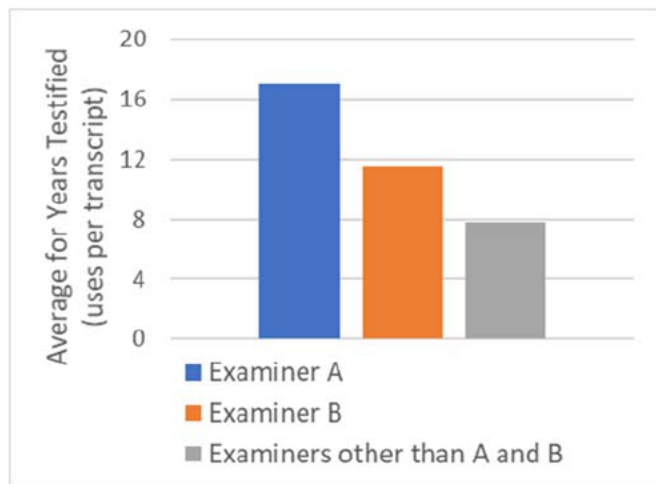


Figure 14. Average word/phrase uses per transcript for the two most egregious examiners and the other examiners for the entire period analyzed.

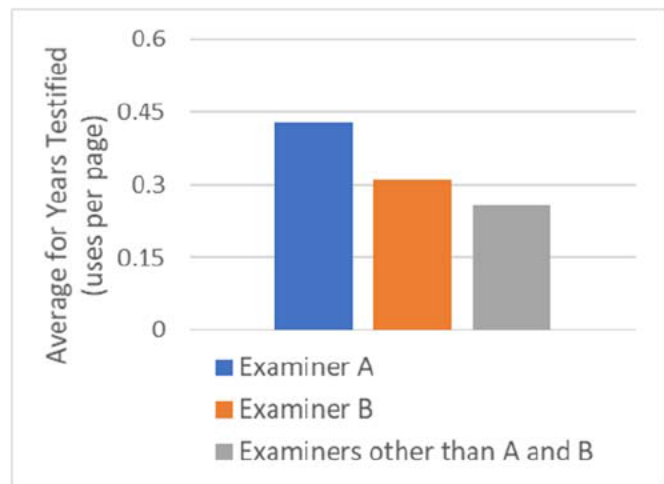


Figure 15. Average word/phrase uses per transcript page for the two most egregious examiners and all others for the entire period analyzed.

To evaluate each examiner's performance relative to their peers, we compared the average rate of testimony exceeding the limits of the science for each examiner, as shown in Figure 16 and Figure 17. In the charts below, each examiner is represented by a point centered on a vertical line. The point represents the average uses for each examiner across the years they testified. The vertical lines show statistical variation in the data for each examiner. A short vertical line indicates that the examiner's rate of uses was relatively consistent, while a tall vertical line indicates that the examiner's rate of uses varied widely. Data for this analysis were limited to examiners with testimony that exceeded the limits of the science in more than one year, which explains why there are 22 bars instead of 28.

In these comparisons, the variation of all examiners overlaps (the bars associated with the data points overlap), which means that the data are insufficient to demonstrate that there was a meaningful difference between the examiners. It is possible that the averages for all examiners were essentially the same given the variation in the data.

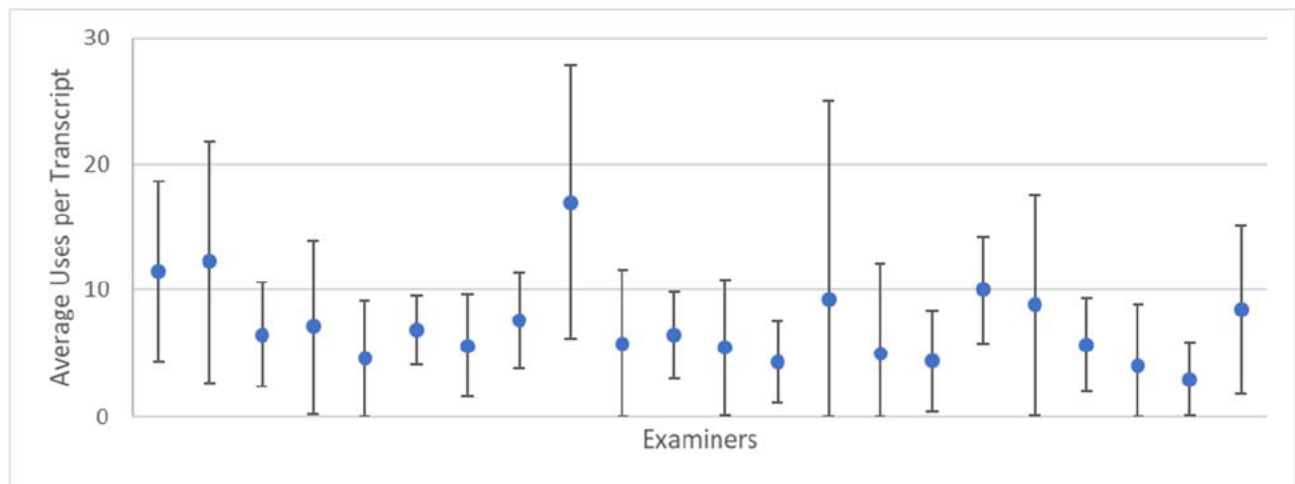


Figure 16. Average word/phrase uses per transcript for each examiner with testimony that exceeded the limits of the science in more than one year.

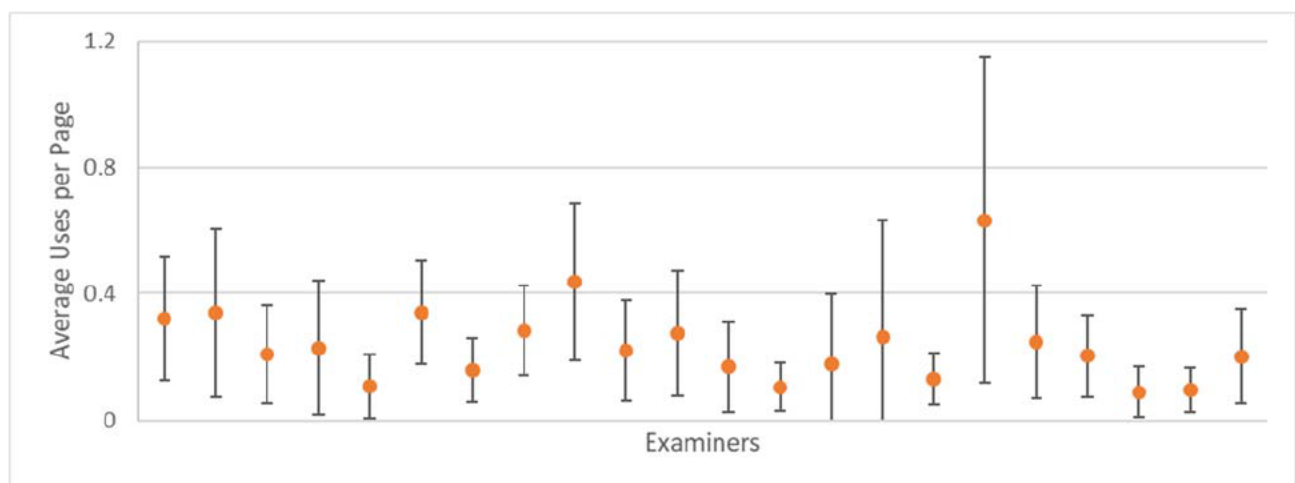


Figure 17. Average word/phrase uses rate per transcript page for each examiner with testimony that exceeded the limits of the science in more than one year.



2. When did the testimony issues begin?

There was a perception that statements exceeding the limits of the science first began appearing around 1985. This perception was disproved by both the FBI and ABS Group analyses.

Our examination of the ongoing 2012 FBI MHCA Review data verified that almost all transcripts from 1971 through 1985 had errors. The errors began with the first transcript the FBI was able to locate and continued for the entirety of the period analyzed as shown in Figure 18. This figure shows the total errors (Error Types 1, 2, and 3) by year reported from the ongoing 2012 FBI MHCA Review as of June 2018.

Transcript Analysis Finding 2

Our team concluded, based on interview data, that testimony issues began at the start of the Hairs and Fibers Unit when MHCA examiners first started testifying. Transcript data confirm that the issues began at least by 1971, which is the year of the first transcript.

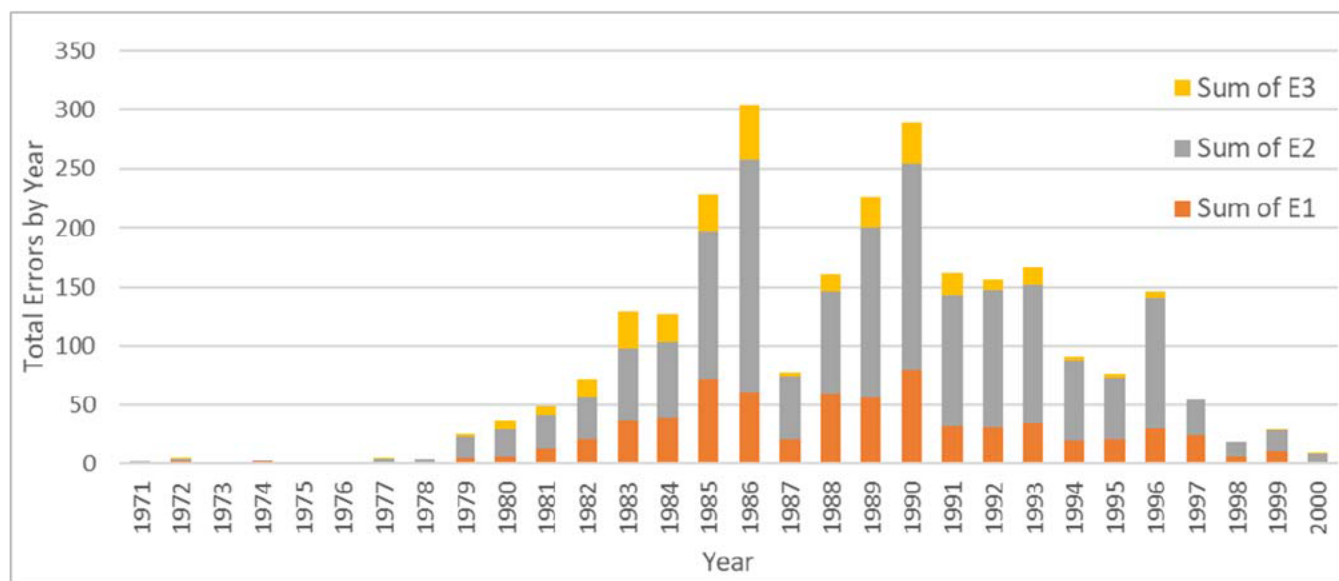


Figure 18. Total testimony errors (Error Types 1, 2 and 3) by year (1971-2000) based on the 2012 Review.

Based on our independent transcript analysis for words and phrases described in Table 7, our team reached a similar conclusion. The results of our analysis are presented in Figure 19 which shows the same data in two different ways.

1. The bars show the total count of words and phrases that exceeded the limits of the science. This total count is not normalized. The y-axis for the bars is located on the right side of Figure 19.
2. The line shows the testimony exceeding the limits of the science normalized by the number of transcripts for each year. The y-axis for the line is located on the left side of Figure 19.

Overlaying the normalized values over the total count of words and phrases helps illustrate that although the total testimony exceeding the limits of the science for years before 1979 appears low on the bar chart,

the uses per transcript is high for years before 1979. This indicates that the shorter bars for years before 1979 are due to less transcript data for those years.

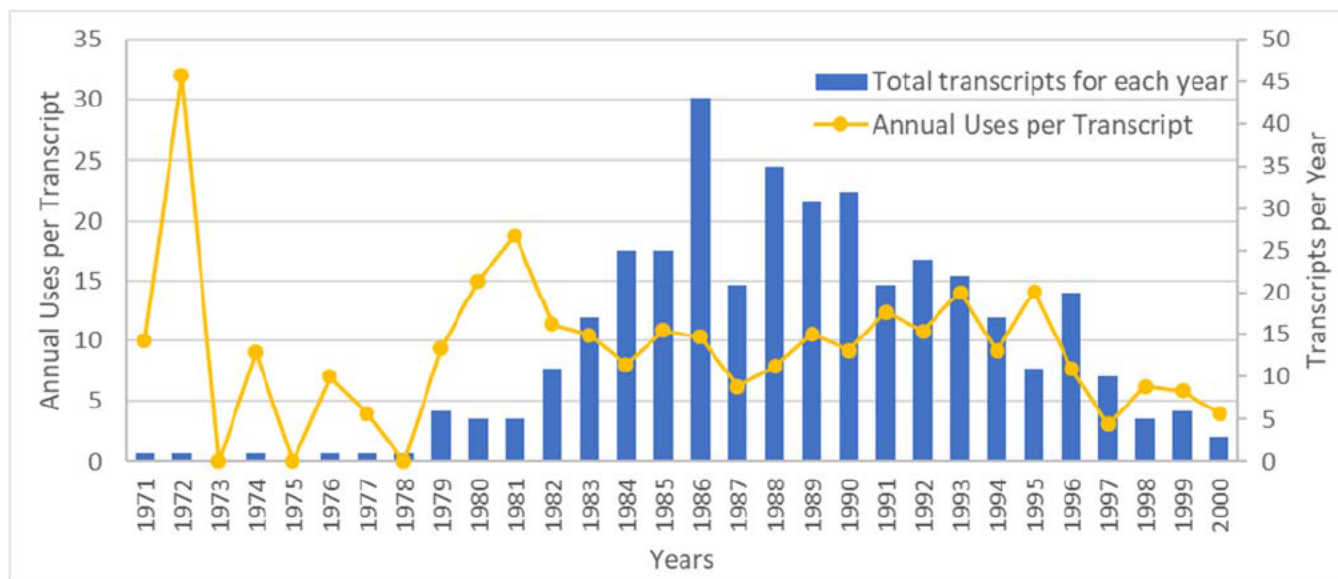


Figure 19. Word/phrase uses per transcript by year (1971-2001) overlaid with total transcripts by year based on ABS Group analysis.

Both the FBI and ABS Group analyses confirm that the testimony issues began at least by 1971. ABS Group concluded that the errors began when MHCA first began testifying based on our analysis, the 2012 Review data, as well as information collected during interviews with past MHCA examiners.



3. Were there improvements over time?

The first two figures below show the rate of testimony exceeding the limits of the science averaged for each year of the period analyzed. Figure 20 is normalized by the number of transcripts and Figure 21 is normalized by the number of transcript pages. Both trends appear to show a decreasing trend of testimony exceeding the limits of the science over the period analyzed.

Transcript Analysis Finding 3

There appears to be minimal improvement in testimony not exceeding the limits of the science from 1971 to 2000.

When considerations are made to account for statistical limitations, shown in Figure 22 and Figure 23, this decrease is somewhat obscured but may still be present. There was insufficient data to calculate statistical uncertainties for 1971 through 1977. Based on our analysis, we concluded there may be a minimal improvement in testimony not using words and phrases exceeding the limits of the MHCA science from 1971 to 2000.

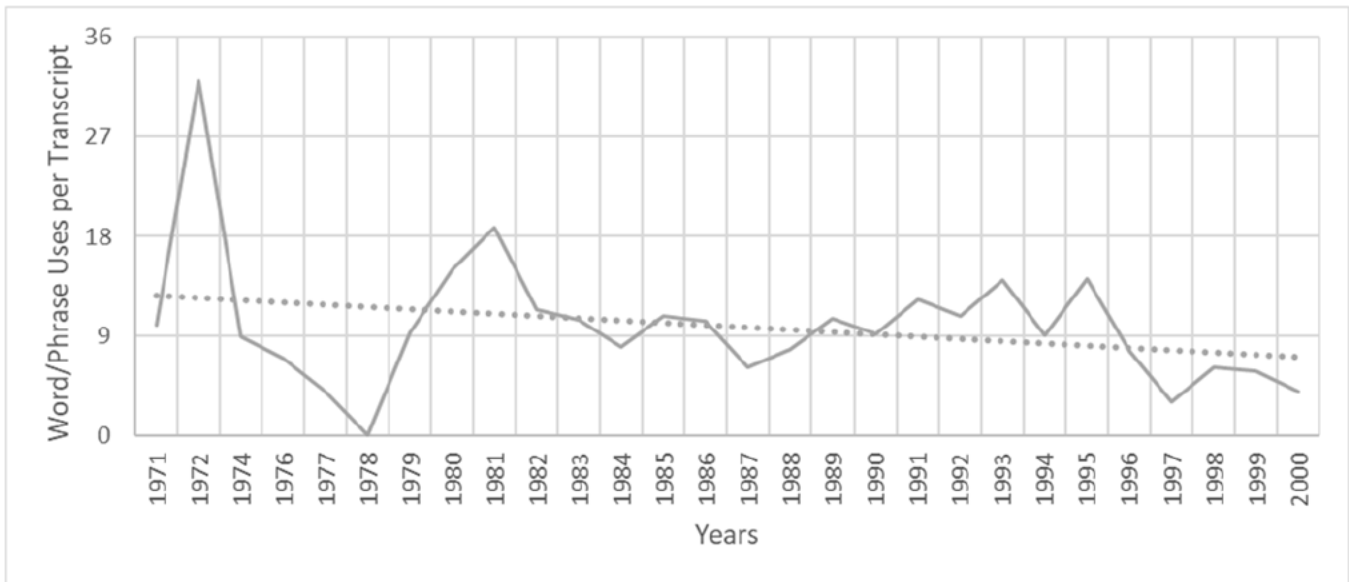


Figure 20. Trend of all word/phrase uses per transcript by year (1971-2000) based on ABS Group analysis.

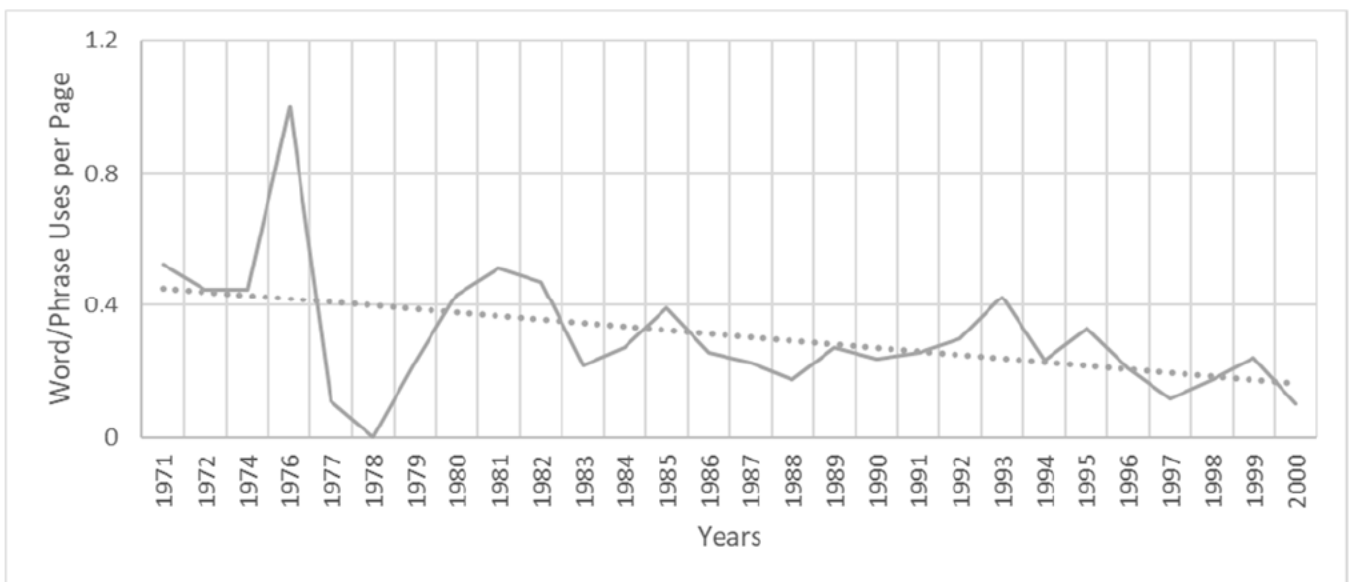


Figure 21. Trend of all word/phrase uses per page by year (1971-2000) based on ABS Group analysis.

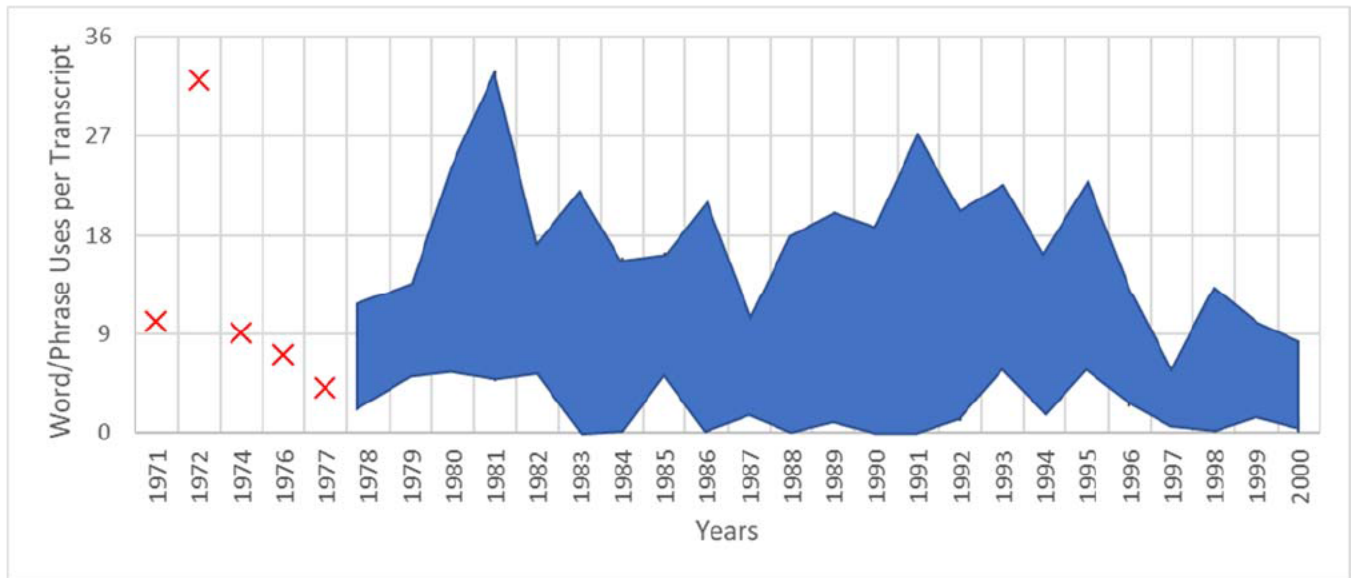


Figure 22. Trend of all word/phrase uses per transcript by year (1971-2000) with statistical uncertainty included (based on ABS Group analysis).

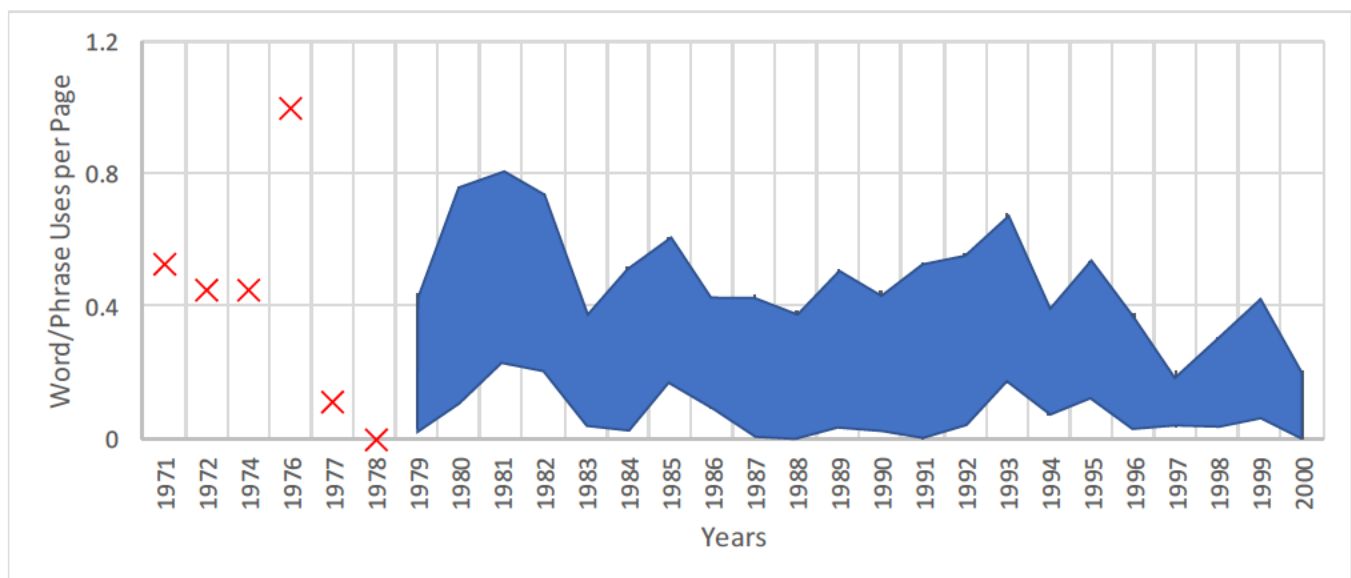


Figure 23. Trend of all word/phrase uses per transcript page by year (1971-2000) with statistical uncertainty included (based on ABS Group analysis).



4. What was the impact of the 1985 International Symposium on Forensic Hair Comparisons?

As discussed in depth in Section 4.3 *Analysis of reports*, the 1985 International Symposium on Forensic Hair Comparisons subcommittee was tasked with providing testimony guidance to the MHCA community.

The transcript data appear to show a decrease in testimony exceeding the limits of the science after 1985. However due to statistical limitations, the strength of the data is not sufficient to validate that there was more than an apparent decrease after 1985 in instance of testimony exceeding the limits of the science.

The data also show a decrease in the variation in the rate of testimony exceeding the limits of the science between transcripts after 1985. Based on our transcript analysis, we concluded that there may be evidence to suggest an increase in consistency how examiners presented their conclusions after 1985.

Figure 24 and Figure 25 show the trend of testimony exceeding the limits of the science averaged for each year of the period analyzed with a marker indicating the date of the 1985 International Symposium on Forensic Hair Comparisons.

Transcript Analysis Finding 4

Data suggest that the 1985 symposium may have resulted in a slight apparent decrease in testimony not exceeding the limits of the science and an increased consistency in how examiners presented their conclusions in testimony.

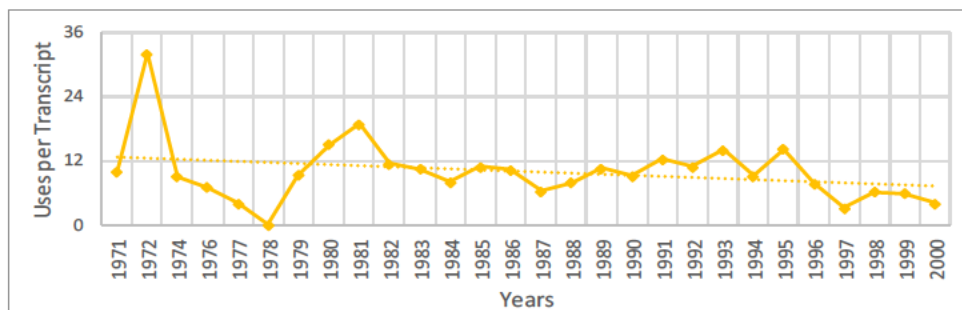


Figure 24. Use of words/phrases per transcript for all MHCA examiners (1971-2000).

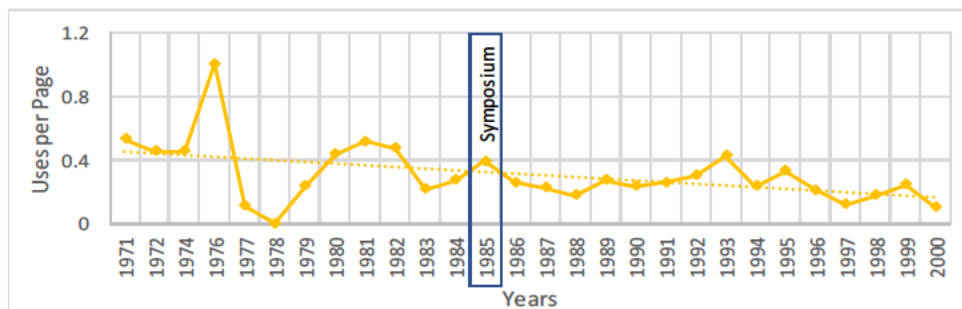


Figure 25. Use of words/phrases per transcript page for all MHCA examiners (1971-2000).

The average testimony exceeding the limits of the science for the three years before the 1985 symposium was compared to the average for the three years after 1985. This comparison, per transcript in Figure 26 and per page in Figure 27, shows that variation in the before and after groups overlap, meaning that there is insufficient evidence to demonstrate a change after 1985. However, the span of the after group is less than that of the before group in Figure 27, suggesting that there may have been an increase in consistency between transcripts in the rate of testimony exceeding the limits of the science after 1985.

This is another example of a correlation where there may not be a causal relationship. As discussed in this subsection, other factors or events, such as management system improvements in the 1990s, could have caused or contributed to the apparent differences.

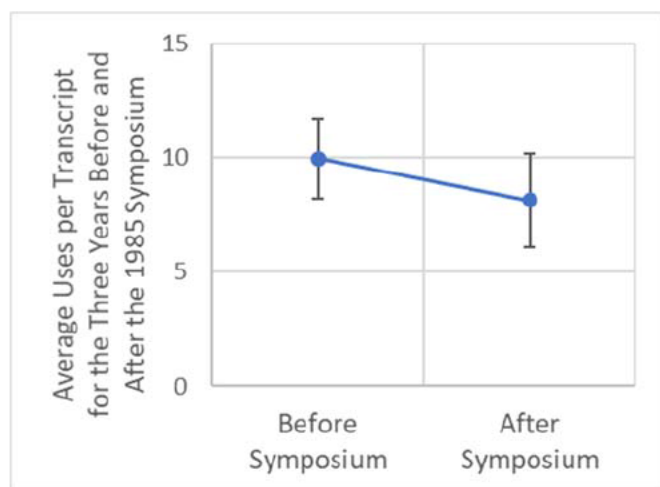


Figure 26. Average word/phrase uses per transcript before and after the 1985 international symposium (data from 1971-2000).

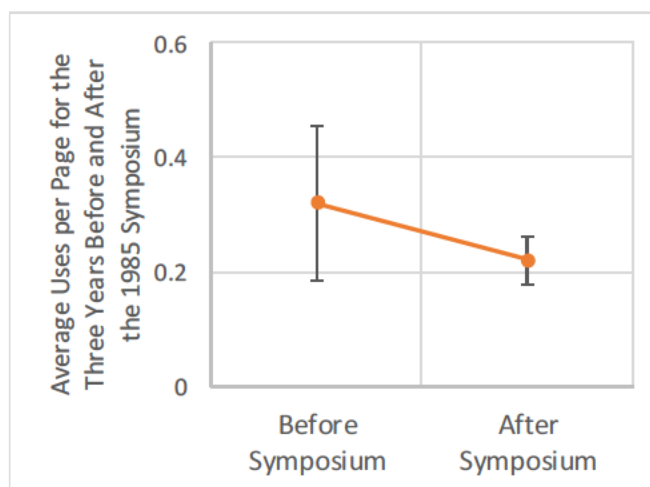


Figure 27. Average word/phrase uses per transcript page before and after the 1985 international symposium (data from 1971-2000).



5. Was the examiner counseling that occurred in 1991 effective?

An internal memo written in 1991 communicated that one agent was counseled on exceeding the limits of the science and that discussions were held with all MHCA examiners with a focus on correcting the use of “perfect match” and “completely indistinguishable,” which were deemed to exceed the limits of the science. These discussions also warned all MHCA examiners to avoid the use of numbers that could be misinterpreted as probabilities and exceed the limits of the science.

This is an excerpt from the 1991 FBI internal memo:⁷³

Transcript Analysis Finding 5

Data show counseling was effective for the specific individual involved in the initial issue, but did not fully correct the problem.

⁷³ “Internal FBI memos to FBI Laboratory Director Hicks.” 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

“This is to advise you that recommended counseling of [examiner’s name] and recommended discussions with all hair and fibers examiners and trainees by unit chief [name] took place in 1991...the Unit Chief, Hair and Fibers Unit (HFU) [counseled] [examiner’s name] against the use of numbers in describing the significance of [his/her] hair associations and against the use of terminology such as “perfect match” when describing microscopically associated hairs... Although this is not given as a probability that hairs come from a particular individual, it is too easily interpreted as such by a jury. In order to avoid this, the significance of hair associations should be given without the use of numbers...On several occasions during the testimony, [examiner’s name] used terminology such as “completely indistinguishable” and “perfectly matched” to describe hairs that [he/she] has associated microscopically...it is [his/her] responsibility to present a clear, unbiased, accurate representation of the strengths and limits of the technique. This can be accomplished by using standard terminology taught in the Hairs and Fibers Unit such as ‘the question hair exhibits the same microscopic characteristics as those seen in the known sample.’”

Interviewees who worked in the FBI Laboratory at the time this memo was issued indicated that they were not aware that anyone had been counseled, nor did they remember being counseled themselves.

To fully evaluate the effectiveness of examiner counseling described in the 1991 internal memo, a separate analysis was conducted to assess each of the following:

- a. counseling of the specific individual focused on correcting the use of “perfect match”
- b. counseling of the specific individual focused on correcting the use of “completely indistinguishable”
- c. counseling of the specific individual focused on the use of numbers that could be interpreted as probabilities
- d. Unit counseling focused on correcting the use of “perfect match”
- e. Unit counseling focused on correcting the use of “completely indistinguishable”
- f. Unit counseling focused on the use of numbers that could be interpreted as probabilities



5a. Did counseling of the specific individual correct the use of “perfect match”?

There are many variations of the phrase “perfect match” that were recorded as testimony exceeding the limits of the science in our analysis, including but not limited to “perfectly matched,” “matched perfectly,” “match perfectly,” “matches perfectly,” and “perfectly matching.” These variations are captured in our analysis of the phrase “perfect match” as described in Table 7.

The data show counseling the specific individual discussed in the memo was effective in eliminating his/her use of the phrase “perfect match” and its variations. The counseled examiner did not use the phrase “perfect match” again in testimony exceeding the limits of the science after 1991 based on the analysis of transcripts provided to ABS Group by the FBI Laboratory.

Transcript Analysis Finding 5a

Individual counseling for the one examiner involved in the initial issue was effective in that the examiner did not subsequently use the word “perfect match.”

Figure 28 shows the total uses per year of the phrase “perfect match” in testimony by the counseled examiner exceeding the limits of the science for each year in which that examiner testified with a marker indicating the year the internal memo was issued.

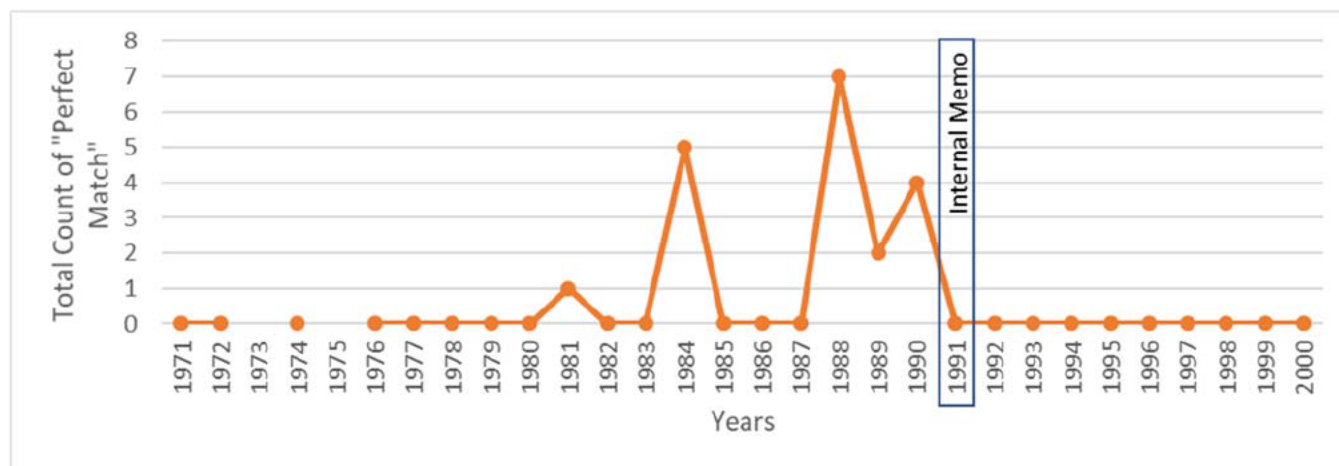


Figure 28. Use of “perfect match” per transcript by year for counseled examiner.



5b. Did counseling of the specific individual correct the use of “completely indistinguishable”?

The data show that individual counseling focused on correcting the use of “completely indistinguishable” was effective excluding one instance.

The counseled examiner did not use the phrase “completely indistinguishable” in testimony exceeding the limits of the science after 1991 for nearly 7 years; however, in a single trial in 1998, this examiner uses the phrase “completely indistinguishable” once.

Figure 29 shows the total uses per year of the phrase “completely indistinguishable” in testimony by the counseled examiner exceeding the limits of the science for each year in which that examiner testified with a marker indicating the year the internal memo was issued.

Transcript Analysis Finding 5b

Individual counseling for the one examiner involved in the initial issue was effective in that the examiner only used the phrase “completely indistinguishable” once after the counseling.



Figure 29. Count of “completely indistinguishable” by year for counseled examiner.



5c. Did counseling of the specific individual correct the use of numbers that could be interpreted as probabilities?

Use of numbers that could be interpreted as probabilities in testimony exceeding the limits of the science was captured in our analysis of words and phrases indicating or implying a probability as described in Table 7.

The data do not show individual counseling focused on correcting the use of numbers that could be interpreted as probabilities was effective.

Transcript Analysis Finding 5c

The data show a slight apparent decrease in the use of words that could be interpreted as probabilities before and after the counseling.

The trend of words and phrases indicating or implying a probability in testimony by the counseled examiner exceeding the limits of the science appears to decrease in Figure 30 and Figure 31. However, when the average for the three years before the 1991 internal memo is compared to the average for the three years after 1991, per transcript in Figure 32 and per page in Figure 33, the variation in the before and after groups overlap. This indicates that there is insufficient evidence to demonstrate a change after 1991 in the use of words and phrases indicating or implying a probability in testimony by the counseled examiner exceeding the limits of the science. As a result, we concluded that there was only a slight apparent decrease in the usage of words that could be interpreted as probabilities.

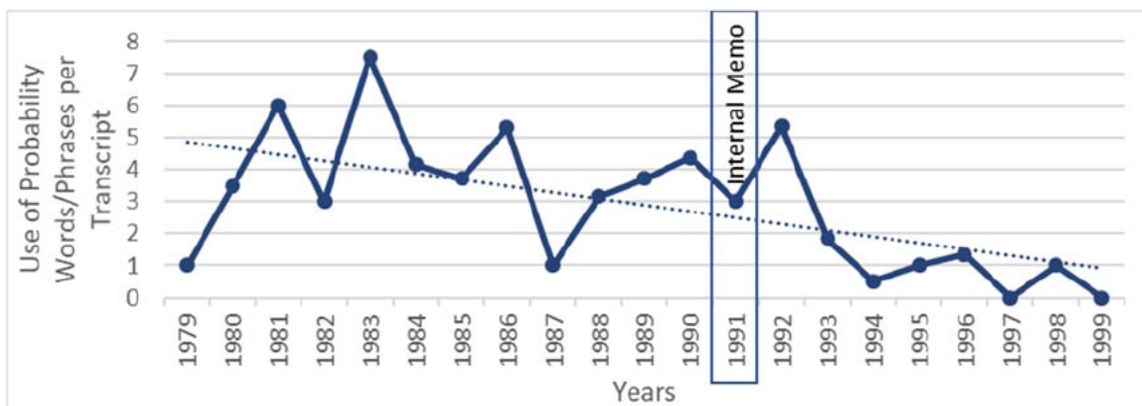


Figure 30. Use of probability words/phrases per transcript by year for counseled examiner.

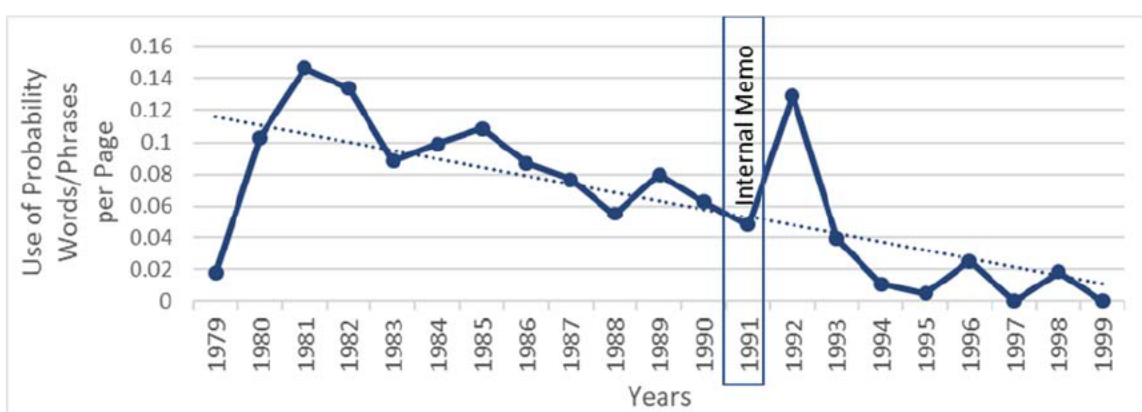


Figure 31. Use of probability words/phrases per transcript page by year for counseled examiner.

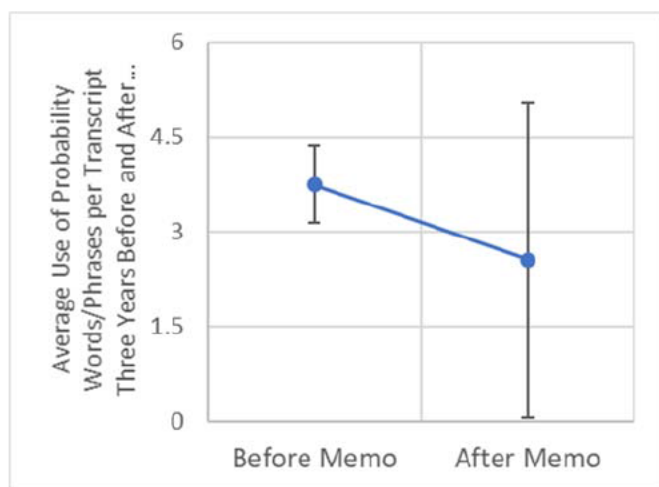


Figure 32. Average use of probability words/phrases per transcript for the 3 years before and after the 1991 memo for the specifically counseled examiner.

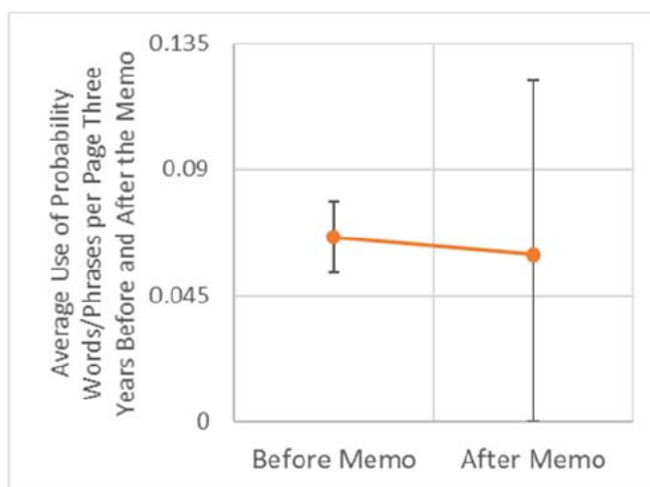


Figure 33. Average use of probability words/phrases per transcript page for the 3 years before and after the 1991 memo for the specifically counseled examiner.



5d. Was Unit counseling focused on correcting the use of “perfect match” effective?

There are only two instances in which examiners other than the one who was specifically counseled used the phrase “perfect match” or a variation of that phrase as described in Table 7. One of these instances occurred before 1991 when the Unit was trained not to say “perfect match.” The second instance occurred after 1991. In both of these instances, examiners were making hypothetical statements.

This offers little information to evaluate the effectiveness of Unit counseling focused on correcting the use of “perfect match.” Therefore, we draw no conclusions from this analysis.

Transcript Analysis Finding 5d

There is no conclusion from this analysis because there were insufficient data to perform the analysis (e.g., there were only two instances of the use of “perfect match” in the testimony by other examiners).



5e. Was Unit counseling focused on correcting “completely indistinguishable” effective?

There are no instances in which examiners other than the one who was specifically counseled used the phrase “completely indistinguishable” in testimony exceeding the limits of the science.

This offers no information to evaluate the effectiveness of Unit counseling focused on correcting the use of “completely indistinguishable.” Therefore, we draw no conclusions from this analysis.

Transcript Analysis Finding 5e

There is no conclusion from this analysis because there were insufficient data to perform the analysis (e.g., there were no other instances of the use of “completely indistinguishable” by other examiners).

Review of “indistinguishable”

Given that there were no data on “completely indistinguishable” for examiners other than the one who was specifically counseled, we analyzed the transcript data for the word “indistinguishable” for the subgroup of examiners present in the Hairs and Fibers Unit at the time of the 1991 internal memo. The trend of this subgroup is provided below in Figure 34 and Figure 35. We do not know if the examiners were counseled on using the word “indistinguishable” apart from “completely indistinguishable.” This trend is interesting, however, as it shows an increase in the use of “indistinguishable” in testimony exceeding the limits of the science around the time counseling was reported to have occurred, but we do not have data that credibly

explains why this increase occurred.

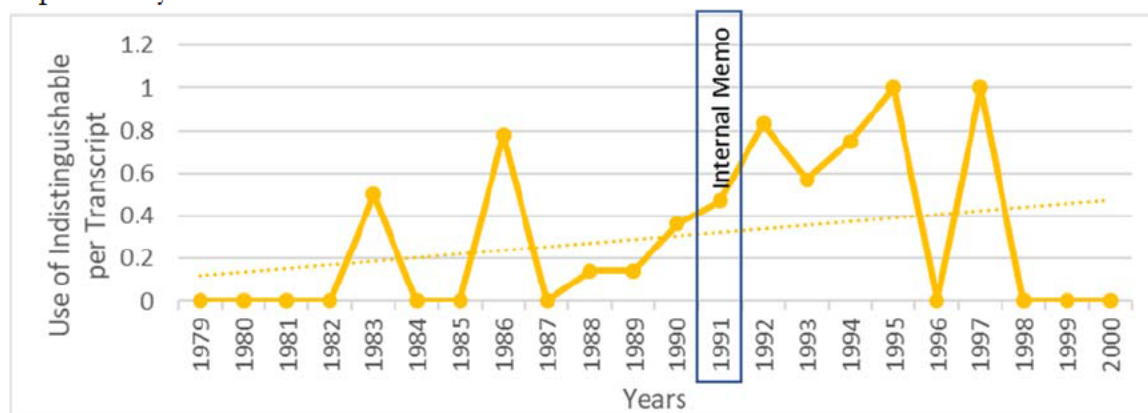


Figure 34. Use of “indistinguishable” per transcript for examiners present in the Hairs and Fibers Unit at the time of the 1991 memo.

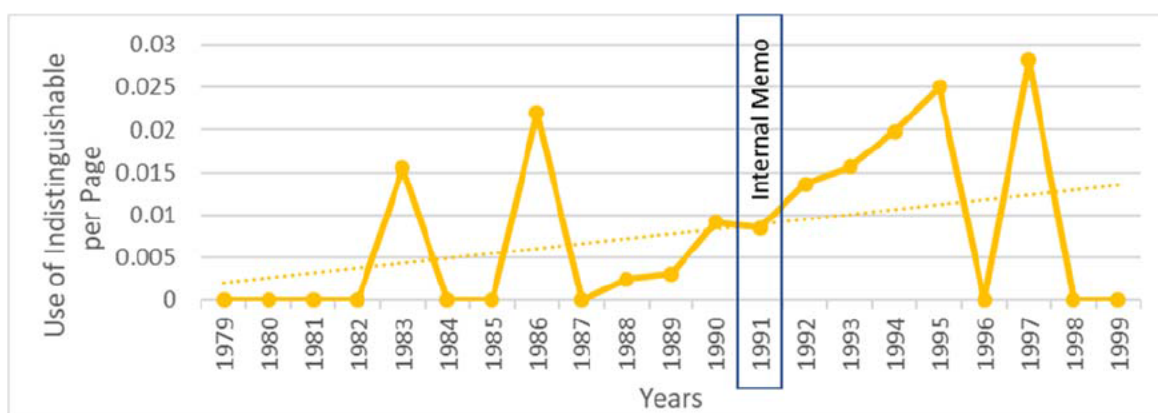


Figure 35. Use of “indistinguishable” per transcript page for examiners present in the Hairs and Fibers Unit at the time of the 1991 memo.

Additionally, a comparison of the average use of “indistinguishable” for the three years before 1991 and the three years after 1991, displayed per transcript in Figure 36 and per page in Figure 37, show that variation in the before and after groups do not overlap, meaning that there is sufficient evidence to demonstrate an increase after 1991 in the use of “indistinguishable” in testimony exceeding the limits of the science for this subgroup of examiners. Again, we do not have data that credibly explain why this increase occurred.

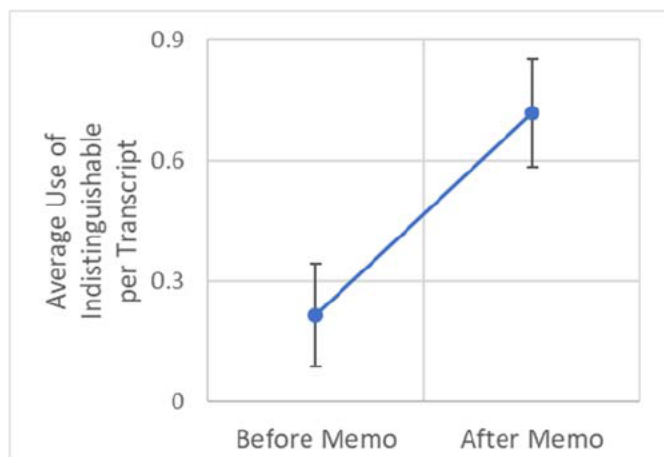


Figure 36. Average use of “indistinguishable” per transcript for the 3 years before and the 3 years after the 1991 memo for examiners present in the Hairs and Fibers Unit at the time of the 1991 memo.

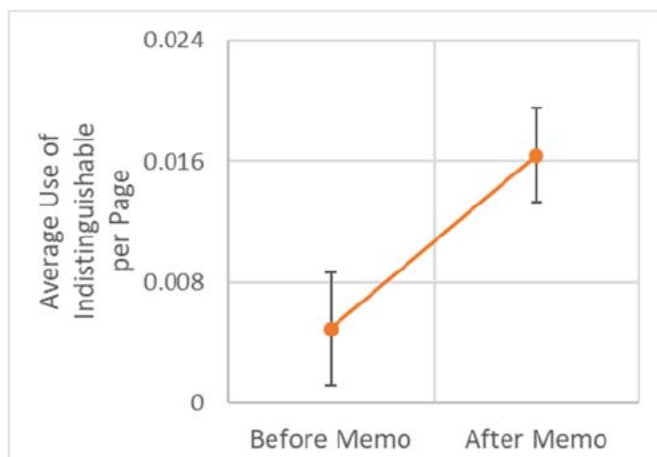


Figure 37. Average use of “indistinguishable” per transcript page for the 3 years before and the 3 years after the 1991 memo for examiners present in the Hairs and Fibers Unit at the time of the 1991 memo.



5f. Was Unit counseling focused on correcting the use of numbers that could be interpreted as probabilities effective?

Use of numbers that could be interpreted as probabilities in testimony exceeding the limits of the science was captured in our analysis of words and phrases indicating or implying a probability as described in Table 7.

The data do not show Unit counseling focused on correcting the use of numbers that could be interpreted as probabilities was effective.

The trend of words and phrases indicating or implying a probability in testimony by the subgroup of examiners present in the Hairs and Fibers Unit at the time of the 1991 internal memo appears to decrease in Figure 38 and Figure 39. However, when the average for the 3 years before the 1991 internal memo is compared to the average for the 3 years after 1991, per transcript in Figure 40 and per page in Figure 41, the variation in the before and after groups overlap. This indicates that there is insufficient evidence to demonstrate a change after 1991 in the use of words and phrases indicating or implying a probability in testimony by this subgroup of examiners.

Transcript Analysis Finding 5f

Unit counseling focused on correcting the use of numbers that could be interpreted as probabilities was ineffective.

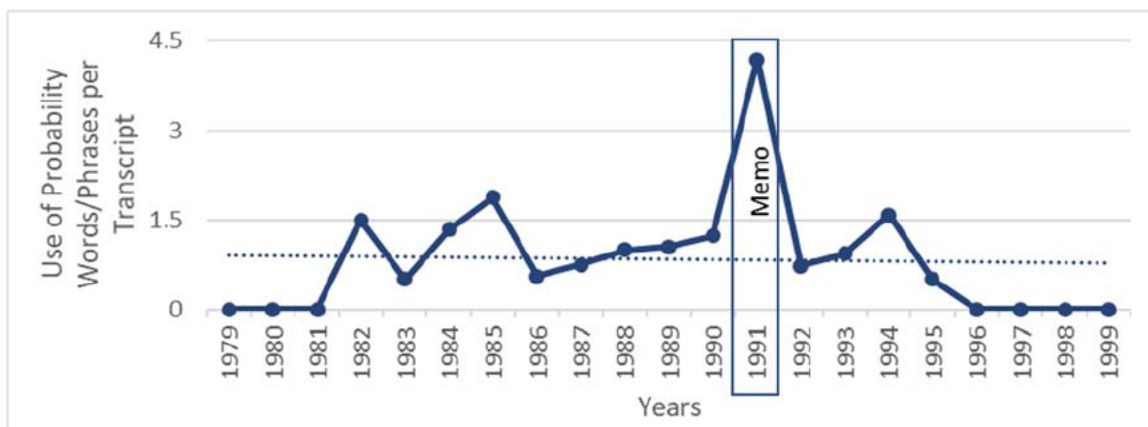


Figure 38. Use of probability words/phrases per transcript for examiners present in the Hairs and Fibers Unit at the time of the 1991 memo.

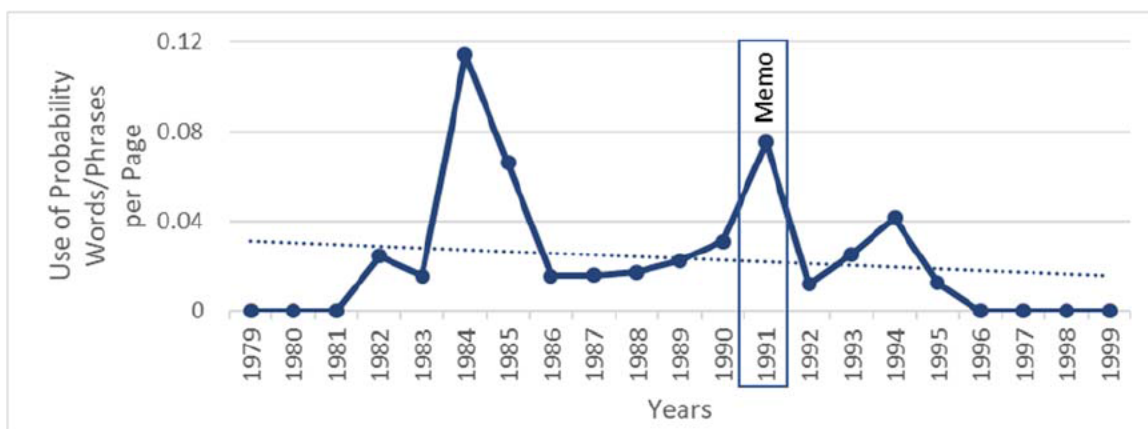


Figure 39. Use of probability words/phrases per transcript page for examiners present in the Hairs and Fibers Unit at the time of the 1991 memo.

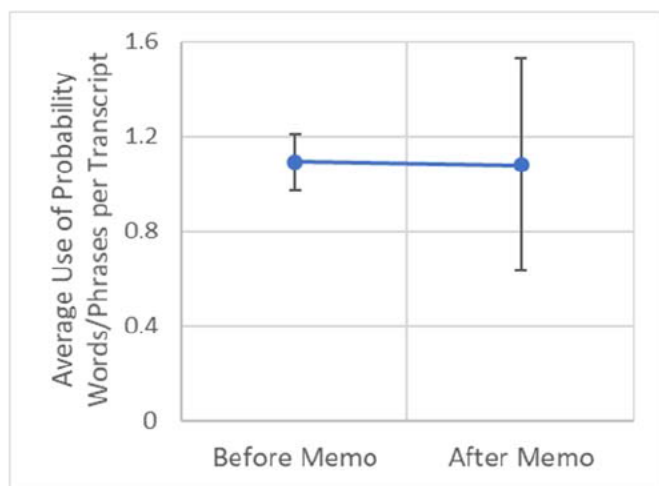


Figure 40. Average use of probability words/phrases per transcript 3 years before and after the 1991 memo for examiners present in the Hairs and Fibers Unit at the time of the 1991 memo.

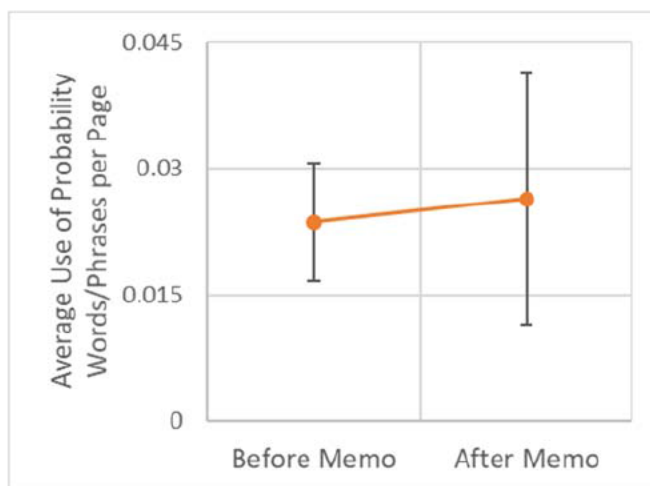


Figure 41. Average use of probability words/phrases per transcript page 3 years before and after the 1991 memo for examiners present in the Hairs and Fibers Unit at the time of the 1991 memo.



6. Did agent-examiner testimony have a higher usage rate than non-agent examiner testimony?

ABS Group addressed whether the rate of issues in agent-examiners' testimony was higher than for non-agent examiners (the scientists who were directly hired into the examiner positions starting in 1994).

Because non-agent-examiners did not start testifying until 1996, there may be factors other than agent status that led to the perceived difference in frequency of testimony exceeding the limits of the science. To investigate this, a comparison was made for the years in which both groups were in the lab as indicated by the blue box in Figure 42.

Transcript Analysis Finding 6

Data suggest that non-agent examiners had an apparently lower error rate than agent-examiners. In addition to the differences between the agents and non-agent examiners, this difference may have resulted from improvements to management systems, such as improved training, or cultural changes.

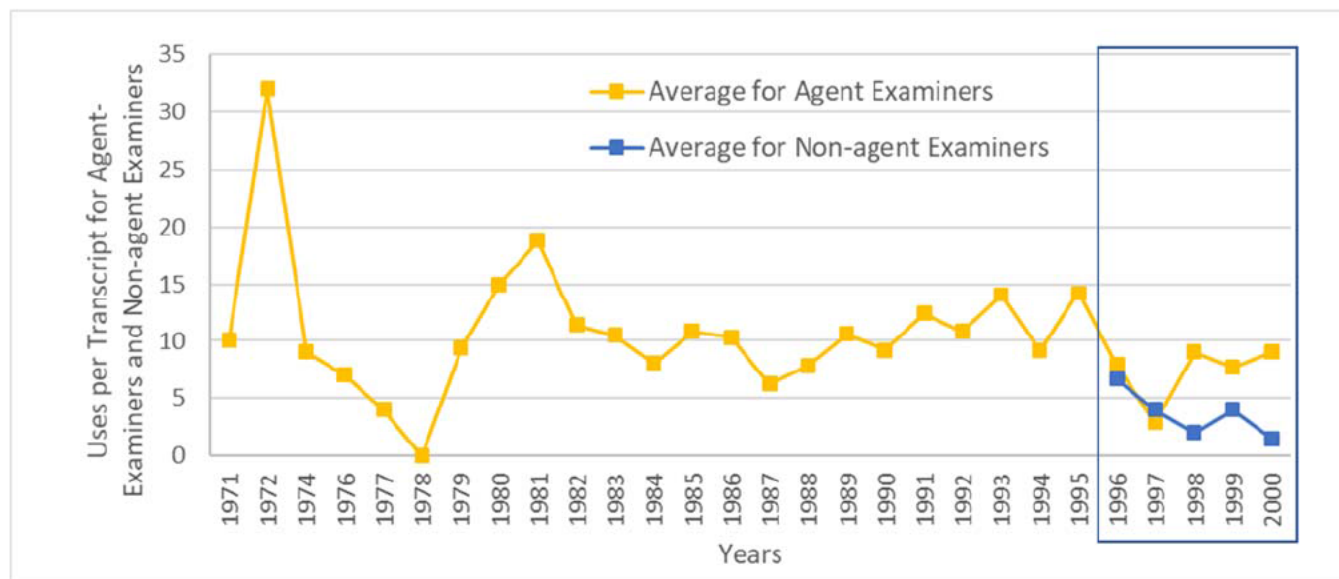


Figure 42. Trend of average word/phrase uses per transcript for agent-examiners and non-agent examiners.

The data appear to show that the average rate of testimony exceeding the limits of the science was higher for agent-examiners than for non-agent examiners. However, when the average for the agent-examiner group is compared to the average for the non-agent examiner group, the variation in the two groups overlap, which is why we have concluded there is only an apparent difference between the rates for the two groups. The difference may have resulted from a variety of changes occurring in the Hairs and Fibers Unit at that time. Such changes included management system changes (e.g., training and procedure improvements) and culture changes occurring simultaneously with the shift to non-agent examiners.

This comparison of the average testimony exceeding the limits of the science for the period from 1996 to 2000 between agent-examiners and non-agent examiners is shown per transcript in Figure 43 and per page in Figure 44.

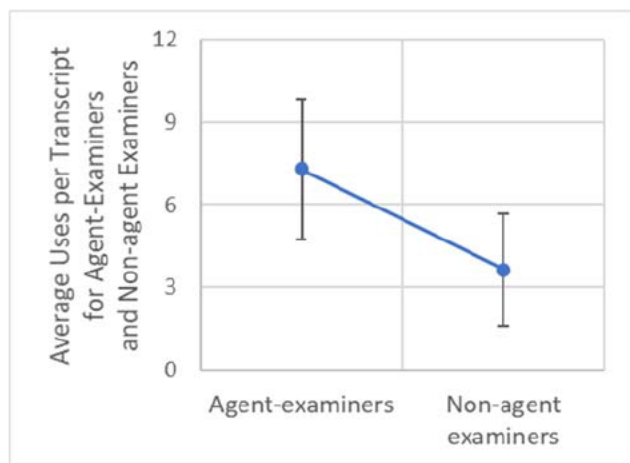


Figure 43. Average word/phrase uses per transcript for agent examiners versus non-agent examiners (1996-2000).

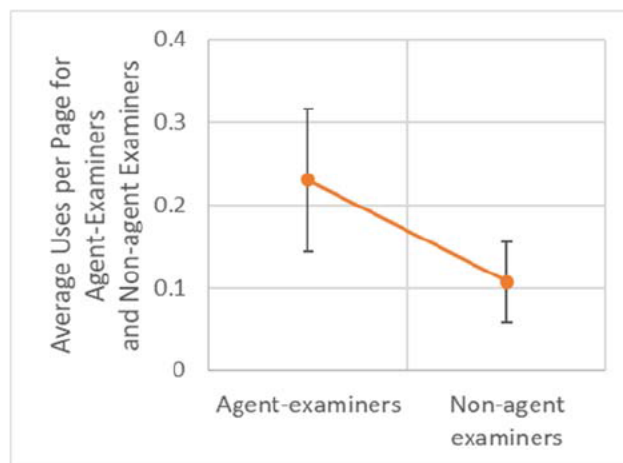


Figure 44. Average word/phrase uses per transcript page for agent examiners versus non-agent examiners (1996-2000).



7. What was the impact of the O. J. Simpson trial on the use of the word “match”?

In the 1995 trial of O. J. Simpson, an active agent-examiner provided MHCA testimony. Defense counsel argued the use of the term “match” by the examiner exceeded the limits of the MHCA science. The judge in the trial eventually ruled that the examiner could not use the term “match” in his testimony. Our team wondered if this highly public MHCA testimony impacted future testimony by MHCA examiners.

After the O. J. Simpson trial, the use of the word “match” in testimony exceeding the limits of the science is less than that of the years prior to 1995, suggesting that the lessons learned from the O.J. Simpson trial may have reduced the use of the word “match” in subsequent testimony.

Figure 45 and Figure 46 show the trend in the use of the word “match” in testimony exceeding the limits of the science averaged for each year of the period analyzed with a marker indicating the date of the O. J. Simpson trial.

Transcript Analysis Finding 7

Data indicate that the use of the word “match” decreased after the O. J. Simpson trial. There are many potential drivers of this decrease, including lessons learned from the Simpson trial, as well as efforts to achieve accreditation and improvements in response to the Office of Inspection General report.

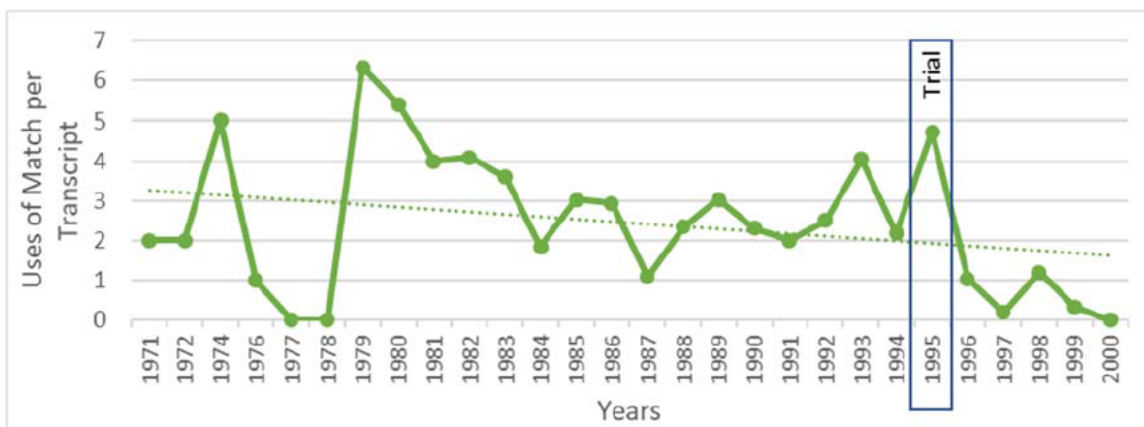


Figure 45. Use of “match” per transcript for all MHCA examiners (1971-2000).

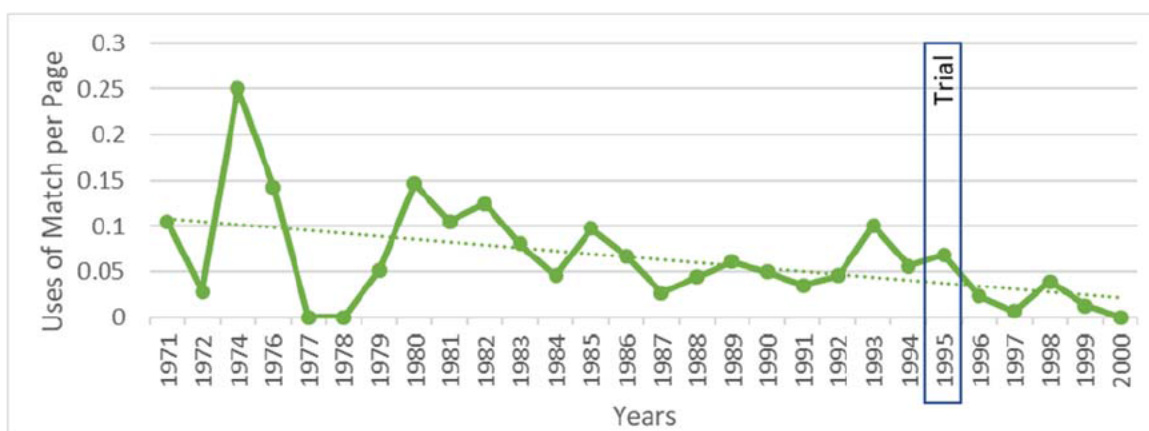


Figure 46. Use of “match” per transcript page for all MHCA examiners (1971-2000).

The average use of the word “match” in the 3 years before the O. J. Simpson trial in 1995 was compared to the average in the 3 years afterward. These comparisons, shown per transcript in Figure 47 and per page in Figure 48, show that variation in the before and after groups do not overlap, indicating that there is sufficient evidence to demonstrate a change after 1995.

This is another example of a correlation where there may not be a causal relationship. Other factors or events, such as the FBI Laboratory’s work toward achieving ASCLD-LAB accreditation and the Office of Inspector General report also occurred at about the same time as the trial. These events could have caused or contributed to the differences shown.

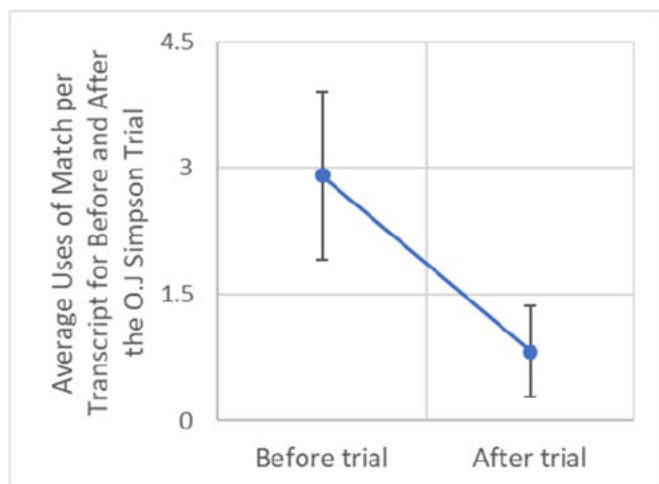


Figure 47. Average use of “match” per transcript for the 3 years before and the 3 years after the 1995 O. J. Simpson trial.

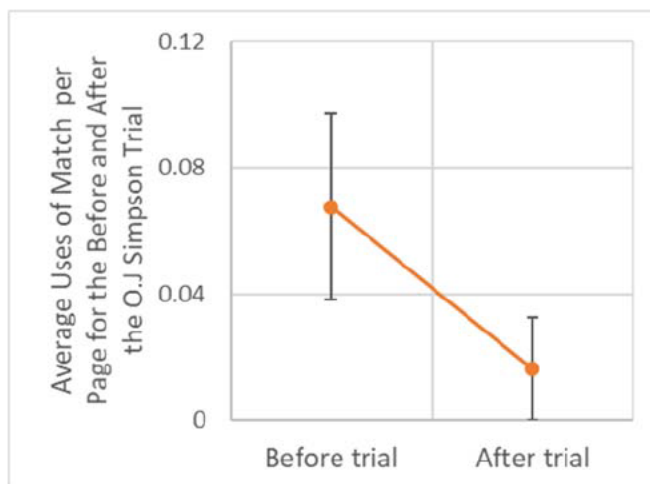


Figure 48. Average use of “match” per transcript page for the 3 years before and the 3 years after the 1995 O. J. Simpson trial.



8. What was the impact of examiner experience on testimony?

Nearly all interviewees said new MHCA examiners were taught to be conservative in testifying and that they could be more confident in their testimony as they became more experienced. Our team questioned if new MHCA examiners had fewer instances of testimony exceeding the limits of the science than more experienced MHCA examiners because they were told to be more conservative in their conclusions.

Based on transcript analysis, our team can neither prove nor disprove this perception as the strength of the data is insufficient.

In evaluating the potential influence of experience, the data were limited to examiners who testified for five or more consecutive years. The five-year break point was chosen to balance experience with size of the data set. Five years of testimony would provide the examiner with a lot of experience, but the data set would also include more examiners (many of them testified for at least 5 consecutive years). The rate of testimony exceeding the limits of the science was averaged for the first year for these examiners and compared to that of the fifth year of consecutive testimony. This comparison, per transcript in Figure 49 and per page in Figure 50, shows that variation in the first and fifth year of consecutive testimony groups overlap, indicating that there is insufficient evidence to demonstrate a change over 5 years of consecutive testimony.

Transcript Analysis Finding 8

There was no significant change in the use of words that exceed the limits of the science as examiners gained experience.

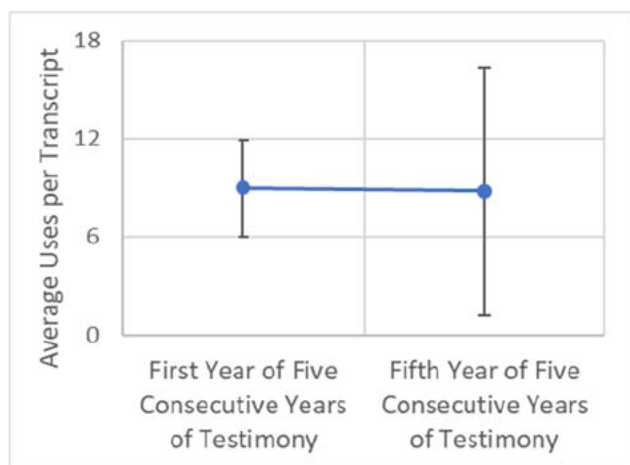


Figure 49. Average word/phrase uses per transcript for the first and fifth years of 5 years of testimony for all examiners with 5 consecutive years of testimony (data from 1971-2000).

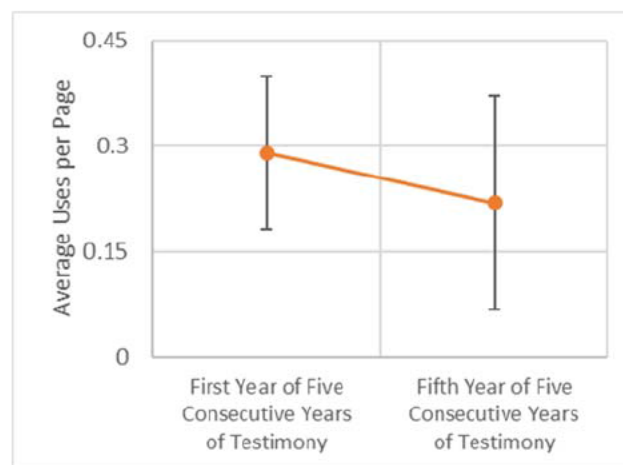


Figure 50. Average word/phrase uses per transcript page for the first and fifth years of 5 years of testimony for all examiners with 5 consecutive years of testimony (data from 1971-2000).



9. Were the testimony issues prompted or unprompted?

Our team wondered if MHCA examiners were prompted to give testimony exceeding the limits of the science by the questions they were asked by prosecutors, defense attorneys, or judges. During interviews, several examiners mentioned that they felt “tricked” into providing statements stronger than they wanted to provide. We also learned from interviews that a substantial part of the three moot courts an MHCA examiner would participate in during training focused on understanding the tactics of prosecutors and defense attorneys and how to help ensure the examiners would be able to provide testimony that characterized their results appropriately under this pressure.

For example, in this hypothetical example, a prosecutor might prompt the examiner to use a word or phrase that exceeds the limits of the science like:

Was the hair collected from the car just similar to the defendant’s hair or was it exactly the same as the defendant’s hair?

and the examiner might reply:

It was exactly the same as the defendant’s hair.

This would be a prompted and restated use because the examiner restated the word or phrase from the question in his or her response.

Transcript Analysis Finding 9

The majority of testimony exceeding the limits of the science was stated by MHCA examiners without being prompted.

Table 9 shows the four testimony response types used in this analysis (unprompted, prompted and restated, prompted and uncorrected, prompted but corrected). In this table, we also provide a hypothetical example of each category.

Based on our transcript analysis, we concluded that the majority of testimony exceeding the limits of the science by MHCA examiners was unprompted. The data show about 10% of instances were prompted, but the overwhelming majority were unprompted. (see Figure 51).

Table 9. Categories used for testimony prompting analysis.

Response Type	Description ⁷⁴
Unprompted	MHCA examiner stated the word or phrase exceeding the limits of the science without being led. A hypothetical example: <i>Counsel:</i> What were your conclusions? <i>Examiner:</i> The questioned hair sample matched the defendant.
Prompted and restated	MHCA examiner restated the word or phrase exceeding the limits of the science in response to a question containing the word or phrase exceeding the limits of the science. A hypothetical example: <i>Counsel:</i> Did the hair found in the car match the defendant? <i>Examiner:</i> Yes, the questioned hair sample matched the defendant.
Prompted and uncorrected	MHCA examiner responded affirmatively to a question containing the word or phrase exceeding the limits of the science without offering a qualifying statement <i>Counsel:</i> Did the hair found in the car match the defendant? <i>Examiner:</i> Yes.
Prompted but corrected (not recorded as testimony exceeding the limits of the science)	MHCA examiner responded negatively (e.g., “no”) to a question containing the word or phrase exceeding the limits of the science. A hypothetical example: <i>Counsel:</i> Did the hair found in the car match the defendant? <i>Examiner:</i> No. MHCA examiner responded appropriately to a question containing the word or phrase exceeding the limits of the science by offering a qualifying statement. Two hypothetical examples: <i>Counsel:</i> Did the hair found in the car match the defendant? <i>Examiner:</i> The questioned hair sample is consistent with the known hair sample collected from the defendant. -OR- <i>Counsel:</i> Did the hair found in the car match the defendant? <i>Examiner:</i> I can’t say that. What I can say is the hair from the car and the hair sample from the defendant were microscopically consistent.

⁷⁴ All examples in this table are hypothetical and NOT from MHCA examiner testimony.

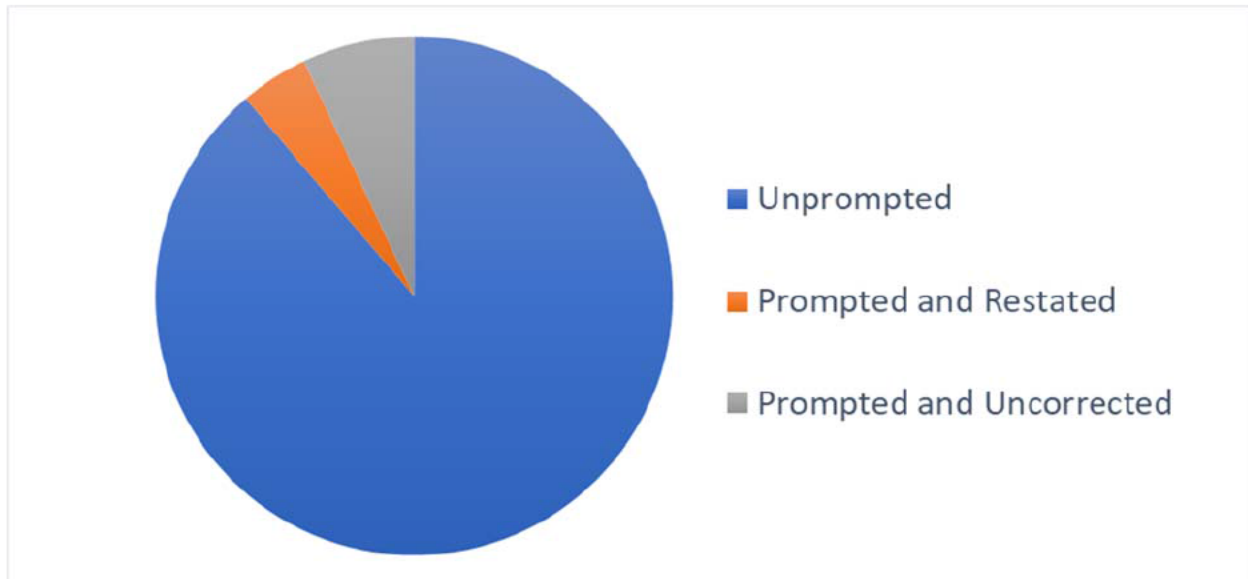













Figure 51. MHCA testimony exceeding the limits of the science (unprompted, prompted and restated, and prompted and uncorrected).

4.6 ANALYSIS OF MANAGEMENT SYSTEMS

This section contains a summary of our team’s understanding of the management systems in place in the Hairs and Fibers Unit during the period analyzed. For the purposes of this report, we define “management system” as a system put in place by management to encourage desirable behaviors and discourage undesirable behaviors. Examples of management system elements include policies, procedures, training, and incentives. As is typical for a work environment, the FBI Laboratory management systems influenced the behavior of their Hairs and Fibers Unit examiners. The period of our analysis spanned from the 1950s through 1999, and the management systems evolved over that time. The characterizations we provide in this section are based on internal FBI documents, external document research, and interviews with current and past examiners. We examined specific management system topic areas where data allowed. The information in this section is structured to parallel (including the indicated color code) the ABS Group’s Root Cause Map™ (see Appendix C) that includes the following 11 management system elements:

-  Design Issue
-  Equipment Reliability Program Issue
-  Documentation and Records Issue
-  Materials/Parts and Products Issue
-  Hazard/Defect Identification and Analysis Issue
-  Procedures Issue
-  Human factors Issue
-  Personnel Training and Qualifications Issue
-  Supervision Issue
-  Verbal and Informal Written Communication
-  Personnel Performance Issue

In this section, we characterized the status of the management systems during the period analyzed to provide a foundation for the *Results* and *Conclusions* in Sections 5 and 6, respectively. Our observations and conclusions regarding the connection of these management systems to the causal events are addressed in Section 5.4.

Design

Standup of the Hairs and Fibers Unit. Based on interviews, the ABS Group team concluded there was no formal standup of the Hairs and Fibers Unit. The Hairs and Fibers Unit evolved over many years as a specialized group to analyze hair submitted for analysis by law enforcement agencies. The unit began with one MHCA examiner and built up to about 10 examiners and 10 technicians. The Hairs and Fibers Unit personnel were pioneers in hair analysis, meaning they did not have a template to guide them in the creation of their specific unit, their techniques, report writing, and their testimony, although there were other existing units in the FBI Laboratory that could be helpful. There did not appear to be a formal commissioning of the unit where goals, objectives, and most importantly, the potential for report and testimony beyond the limits of the science were formally identified. This approach appears to be in line with industry and government practices at the time, where units were not formally designed.

MHCA methods and testimony. The methods initially developed by the Hairs and Fibers Unit were an adaptation of available references on the subject and notes on MHCA from the 1950s from a university professor, Dr. Paul LeLand Kirk. Dr. Kirk was a noted chemist and forensic scientist who specialized in microscopy. He wrote several crime scene investigation books presenting techniques on investigating physical evidence such as hairs and fibers. MHCA practices evolved based on a variety of external engagements, interactions, and conferences with other subject matter experts in this industry. During the period we analyzed, the FBI was a leader in this discipline.

Equipment reliability

There was no evidence that equipment reliability was an issue related to MHCA testimony. The MHCA examiners did not indicate during our interviews that there were any issues with the availability or reliability of their equipment or physical environment that could lead to MHCA report or testimony statements exceeding the limits of the science.

Documentation and records

Reports from MHCA examiners on a case. Documentation of MHCA examiner activities was minimal. The primary documentation of MHCA examiner activities was their Laboratory notes and report. Some examiners used a basic template as a starting point for writing their report. Some other MHCA examiners mentioned during our interviews that they kept their own template or used a prior report as the template for the next report. This is consistent with what we observed when reviewing the reports and trending the report errors.

Reports integrated from all FBI Laboratory tests on the case. A primary examiner (up until 1997) or coordinating examiner (1997-1999) would compile an integrated FBI Laboratory report that incorporated the results from all the tests and analyses performed at the FBI Laboratory. The primary examiner would typically use notes and/or dictation from the other examiners to create the integrated report. During this process, the primary examiner would learn of the results of all the other analyses performed at the FBI Laboratory. The Hairs and Fibers Unit MHCA examiners were often assigned as primary examiners because they were frequently the first to receive the evidence.

Transcripts. Transcripts of MHCA examiner testimony were not routinely obtained by the FBI when they became available. Transcripts would be obtained for cases where the MHCA examiner might testify again on the same case (e.g., retrial, motions) or there was a complaint regarding the testimony. In general, transcripts had to be purchased from the court reporting companies, and this expense was avoided if there was no anticipated need for the transcript.

Records of external feedback. Several MHCA examiners mentioned during interviews that records from external parties providing positive feedback were typically sent to the FBI Laboratory Director or Unit Chief and filed in the individual's personnel record. Records from external parties providing negative feedback may have been sent to the Unit Chief and then filed in the personnel record for up to a year until the individual's annual evaluation was complete. At that time, the negative feedback was incorporated into the annual review and discarded. FBI personnel records were not made available to our team.

Records management system. During interviews, several interviewees indicated that the FBI records management system was not reliable during the period analyzed. The examiner or the Unit Chief would often keep duplicate copies of case files in their office as a reliable and accessible backup to the central files.

Investigation records. Records of some investigations into MHCA testimony issues were provided to our team⁷⁵ in the form of memos that documented the issues and actions taken.

Materials/parts and products

There were no materials, parts, or product control issues identified related to this analysis. This management system element is typically applicable to organizations that produce a tangible product. MHCA testimony was not considered a tangible product. Reports were addressed in the Documentation and Records section above.

Hazard/defect identification and analysis

This management system element covers several relevant issues, including proactive analysis, reactive analysis, auditing/measurement, internal monitoring, and court personnel feedback.

Proactive analysis. In the case of MHCA testimony, we did not observe that a formal, proactive assessment of the potential for MHCA testimony to exceed the limits of the science was conducted. Proactive analyses are performed to identify potential risks and develop appropriate responses in an effort to avoid potential performance issues like those the FBI Laboratory experienced. These proactive analyses usually ask a few fundamental questions:

- What types of performance issues could occur?
- What could cause these performance issues?
- What safeguards are already in place to prevent, detect, and mitigate these issues?
- How often could performance issues occur with our existing safeguards?
- What additional safeguards should be put in place to reduce the occurrence of the performance issues?

Reactive analysis. In the case of MHCA testimony, we did not see reactive analysis (root cause analysis) used to broadly learn from the identified issues. Little effort appears to have been expended on determining the extent of the few identified issues such as assessing whether the same testimony issue occurred before in other trials or with other examiners. Solutions also appeared to narrowly address individual examiner issues instead of identifying and addressing broader underlying system issues. Reactive analysis is performed in response to identified performance issues. Its purpose is to learn from experience and avoid future problems because addressing the underlying causes is usually more effective in changing behavior. Fundamental questions asked in these types of analyses include:

- What types of performance issues occurred?
- Why did the performance issues occur?

⁷⁵ “Internal FBI memos to FBI Laboratory Director Hicks.” 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

- Have they or could they happen elsewhere, with other people?
- What actions should be taken to prevent recurrence of these performance issues?

Auditing/Measurement. Auditing and measurement activities are performed to determine if actual performance is consistent with management's expectations. For the Hairs and Fibers Unit, one aspect of auditing/measurement would involve monitoring of MHCA testimony to determine if the examiners provided testimony consistent with FBI Laboratory management's expectations. Up until 1995^{76,77}, no formal testimony monitoring program was in place. Interviewees indicated that most of the time, no one in the FBI Laboratory was aware of how they testified. One examiner indicated that unless someone objected to what you said and it made its way back to the FBI, no one knew if there was an issue with an examiner's testimony. From 1995 to 1998,^{78,79,80} the testimony monitoring program did not include monitoring of the testimony content. For example, it solicited feedback on the appearance and demeanor of the examiner when testifying. While these are important aspects of providing expert witness testimony, the criteria did not address the actual testimony provided by the examiner. In early 1998, the program was revised to include criteria related to the content of the testimony. It included both external feedback (i.e., from prosecutors and defense counsel) as well as internal monitoring by Hairs and Fibers Unit management.

Internal monitoring. The 1995 and 1997 testimony monitoring procedures required that the testimony of each examiner be reviewed once per year by FBI personnel. It did not specifically require an assessment of whether the testimony was within the limits of the science. When asked about testimony monitoring, one supervisor mentioned he was not aware of how examiners testified, but he had no reason to believe it was "bad." Another supervisor stated he did not know how agents testified. He could have reviewed transcripts, but he did not. None of the Unit Chiefs interviewed indicated they had been made aware of MHCA examiner testimony exceeding the limits of the science during the period analyzed. If the MHCA examiner had questions or issues after testimony, the Unit Chief would assist them in resolving the issue through informal discussions. These lessons learned were occasionally shared with other MHCA examiners through memos typically from the Unit Chief. However, we were only provided one example⁸¹ of this type of lessons learned approach being used.

Court personnel feedback. Based on interviews, some interviewees referred to the *court* feedback form as the *prosecutor* feedback form while others specifically mentioned providing the form to all court personnel. One revision of the Testimony Monitoring Policy⁸² labeled the form: "Prosecutorial Evaluation of Examiner

76 Laboratory Division, Court Testimony Monitoring Program, Revised 7-31-95, 5 pages

77 Lind, Richard T to FBI Laboratory. "Court Testimony and Court Testimony Monitoring Policy." 06 Feb. 1997.

78 Laboratory Division, Court Testimony Monitoring Policy, LD Quality Manual, Testimon.E08 - Rev. 1, Issue Date: 05/09/97, 5 pages

79 Laboratory Division, Court Testimony Monitoring Policy, LD Quality Manual, Testimon.J31 - Rev. 2, Issue Date: 10/31/97, 5 pages

80 Laboratory Division, Court Testimony Monitoring Policy, LD Quality Manual, Testimon.A06 - Rev. 3, Issue Date: 01/06/98, 7pages

81 "Internal FBI memos to FBI Laboratory Director Hicks." 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

82 Laboratory Division, Court Testimony Monitoring Policy, LD Quality Manual, Testimon.A06 - Rev. 3, Issue Date: 01/06/98, 7pages

Testimony.” Based on interviews, most of the feedback from court personnel was positive feedback from prosecutors. Based on interviews, negative feedback from prosecutors generally occurred when the examiners did not testify as strongly as the prosecutors desired. Sometimes the feedback from the prosecutors would include the verdict in the trial, but often the MHCA examiners did not know the trial verdict. Feedback forms were considered personnel records, so they were filed in the MHCA examiner’s personnel file and only retained until the next performance appraisal was completed. The lack of a central filing location made it difficult for Laboratory personnel to perform a comprehensive review of all issues.

Based on interviews and transcripts, for at least some portion of the period analyzed, the MHCA examiners participated in a blind comparison testing program using “dummy” cases that were developed by the Forensic Science Research and Training Center (a section of the FBI Laboratory Division located at the FBI Academy). There was no documentation we were provided or could locate regarding the details of this program. As a result, we could not explore the potential impacts of this program further. Because this testing focused on the accuracy of the comparison and report writing steps and not on MHCA examiner testimony, we judged this testing program relevant to the report writing errors but unrelated to the causes of the MHCA testimony issues we examined.

Procedures

Prior to about 1977, there were no formal standard operating procedures for MHCA examiner activities. Instead, oral teaching was the primary method used to communicate methods and practices. In 1977, the Unit created the first guide that outlined the FBI’s approach for hairs and fibers analysis. The 53-page guide⁸³ was used both for training and as a procedure to standardize the approach.

The 1977 guide included the following guidance on report writing:

“The report should be clear, concise, and easily understandable. It would rarely serve any useful purpose to include technical terminology foreign to the layman such as a detailed description of individual characteristics. It should contain information pertinent to the requests made by the contributor of the evidence and the examination conducted. The evidence examined should be clearly listed and identified as to origin, either through description or contributor’s reference numbers. The results of the examination should be set out and followed by a statement giving the examiner’s conclusions. It may be desirable to include a clarifying statement in which the limiting factors of an examination are set forth.”

An example is provided in the 1977 guide:

“Results: Four brown head hairs were found on specimen Q1. These hairs are of Caucasian origin and have been dyed and were found to exhibit the same microscopic characteristics as hairs in specimen K1. Therefore, the found brown head hairs found in the Q1 cap could have come from the source represented by specimen K1.”

It is pointed out that hairs do not possess a sufficient number of unique individual microscopic characteristics to be positively identified as having originated from a particular person to the exclusion of all others.

83 Hicks, John W. “Microscopy of Hair: A Practical Guide and Manual.” Federal Bureau of Investigation, 1977

Note that the statement of results (the first two sentences) sets forth fairly completely those determinations that can be made; i.e., that the hairs came from the head, that they exhibit Caucasian characteristics, that they have been dyed, and that the Q hairs are consistent with the K hairs in microscopic appearance. The conclusion follows, then, that given these results, the Q hairs could have come from the source of the known sample. The last paragraph is optional and is given so that a lay reader may better understand the nature of the identification. It may be modified in any number of ways to accurately describe the limits or exclusions of a particular conclusion.”

The 1977 guide also included only one paragraph on testimony which stated:

“Testimony of expert witnesses should proceed with the same basic constituents as found in the report; namely, the statement of results and the conclusions derived from those results. The witness should be prepared to discuss the process by which his results were obtained and this, of course, should justify the ultimate conclusion. He should endeavor to promote a better understanding on the part of the court and jury into the method of his examination.”

In about 2004, two Hairs and Fibers Unit examiners revised the guide.⁸⁴ The section on report writing was modified to:

“The information contained in the report should be limited to a factual statement of findings concerning the examination conducted. An interpretation of the evidence is saved for court testimony that includes an explanation about the basis for the examinations. The report should be clear, concise, and easily understood. Technical terminology that is foreign to a layperson or contributor does not serve a useful purpose. The report should contain information pertinent to the requests made by the contributor of the evidence and to the examinations performed. A listing of the items of evidence and their origin, either a description or the contributor’s reference number, should be included. Results of examinations should be set out clearly, followed by a statement of the examiner’s conclusions. A statement may follow to clearly state the limiting factors of hair examinations.”

An example is provided in the 2004 guide:

“Results of examinations: Caucasian head hairs that exhibit the same microscopic characteristics as hairs in specimen K1 were found on the Q1 knit cap. Accordingly, these hairs can be associated to John Doe, the identified source of K1 hairs.

Hair comparisons are not a means of absolute personal identification. The statement of results sets forth, fairly completely, those determinations that can be made (i.e., that the hairs came from the head, that they exhibit Caucasian characteristics, and that the Q hairs are consistent with the K hairs in microscopic appearance). The resulting conclusion is that given these results, the Q hairs can be associated with John Doe, the source of the K hairs. The last paragraph is optional and is given so that a reader who is not generally familiar with hair examinations can better understand the limits of hair identification.”

The section on testimony was modified in 2004 to:

“Expert witness testimony should include an education component on hair evidence for the jury and judge and a statement of the results as reported. The witness should be prepared to discuss the procedures used in reaching the conclusion(s) and to defend opinions. An expert witness should

⁸⁴ Deedrick, D. W., and Koch, S. L. “Microscopy of Hair Part 1: A Practical Guide and Manual for Human Hairs.” Federal Bureau of Investigation. 2004.

endeavor to promote a better understanding of the methods of examination, the theory of the transfer of trace materials, and the strengths and limitations of the science.”

The 2004 version goes on to say regarding significance and value:

“The forensic analysis of hair has been accepted in courts of law for many years, but this does not necessarily validate the science. The reliability of hair examinations must be weighted with the education and training of the examiner, as well as with the procedures used in the analysis. The examinations must be objective and impartial, and the weight placed on the results must be in accordance with the experience and training of the examiner.

.... It is recognized that hair comparisons do not constitute a basis for absolute personal identification. Whereas hairs cannot be positively identified as originating from a particular individual, it is unusual to find different individuals having the same hair characteristics. This is based on evidentiary samples received in casework and on proficiency tests prepared in the Laboratory.

Studies have been conducted to determine the significance of hair associations. Some of these studies attempted to establish a mathematical probability of a match. The FBI Laboratory does not use the mathematical calculations of other researchers nor does it support the feasibility of establishing a numerical probability of a hair match.”

In 1991, some testimony guidance was provided in the form of a memo⁸⁵ in response to a complaint about an MHCA examiner’s testimony. One of the examiners was counseled by the hair and fibers unit (HFU) Unit Chief “*against the use of numbers in describing the significance of [his/her] hair associations and against the use of terminology such as “perfect match” when describing microscopically associated hairs.*” In addition, the memo indicated that discussions were held with other Hairs and Fibers Unit MHCA examiners regarding the “*pitfalls of overstating results.*”

Our team concluded that until 1995, the 1977 document and 1991 memo were the only written guidance on testimony. We asked over 20 interviewees and searched available documentation. There is no indication that testimony guidance beyond this one paragraph and few phrases in the memo existed prior to the development of the Unit and Laboratory procedures in the mid-1990s. Based on external news media sources, a training manual may have existed before 1977, but it was not available from the FBI nor from any of the interviewees.

Interviewees said training was the same for everyone who came in, but there were no set written procedures or written methods that served as the basis for the training. Examiners primarily learned from experience and working with other examiners. In the mid-1990s, the Quality Assurance Unit was formed to facilitate standardization across the FBI Laboratory and accelerate the progress to obtain ASCLD/LAB accreditation. As part of this effort, the Hairs and Fibers Unit started formalizing methods and created formal written

85 “Internal FBI memos to FBI Laboratory Director Hicks.” 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

procedures to meet the accreditation standards. The first “Protocol for Forensic Fiber Examinations” that was provided to the ABS Group analysis team was dated March 1997.⁸⁶

Similar to the testimony monitoring procedure mentioned above, the FBI Laboratory developed an overall Quality Control manual in the mid-1990s during its drive for ASCLD/LAB accreditation. The Quality Control manual addressed Laboratory-wide MHCA-related topics such as document control, case documentation, auditing, and corrective action processes. The FBI Laboratory was accredited in 1998.

Human factors

Human factors covers a broad set of issues related to human capabilities. In the case of MHCA reports and testimony, the relevant human factors areas are related to information the examiners would obtain about the case that could consciously or unconsciously influence the examiner during report writing or testimony.

Evidence collection. In some instances, MHCA examiners were also called to the scene to perform or guide the evidence collection. This was infrequent at the start of the period analyzed and became even less frequent toward the end of the period analyzed. At some point during the period analyzed, this process became more structured with the creation of “go kits” for evidence collection. The MHCA examiners may have interfaced with law enforcement personnel and learned additional background related to the alleged crime while performing this step. For example, they may learn background information related to potential suspects and about other evidence at the crime scene.

Integrated reports. As described previously, primary examiners and coordinating examiners would generally integrate the results of the analyses performed by themselves and the other examiners at the FBI Laboratory. Through this process, they would gain knowledge of the results of other examinations performed at the FBI Laboratory.

Discussions with the submitting agency personnel. Discussions between the MHCA examiners and personnel from the submitting agency could have allowed the MHCA examiners to gain additional general knowledge about the individuals potentially involved in the associated crime. Based on interviews, the agent-examiners were more likely to have more detailed discussions of this sort as they sometimes had frequent discussions with the law enforcement personnel related to the cases they were processing.

Familiarity with court personnel. Based on interviews and transcript reviews, some MHCA examiners testified in the same area repeatedly and were familiar with some of the court personnel (i.e., prosecutors and judges).

Personnel training and qualifications

Based on interviews and document reviews, the training was described as being similar to an apprentice program throughout the period analyzed. The trainee’s learning was guided by a qualified MHCA examiner acting as their mentor. An interviewee mentioned that, in the early 1950s, notes on MHCA from Dr. Kirk were used to develop the first MHCA guide. MHCA examiners did not have a training guide until 1977,

⁸⁶ Hicks, John W. “Microscopy of Hair: A Practical Guide and Manual.” Federal Bureau of Investigation, 1977

when one of the senior MHCA examiners wrote a 53-page guide.⁸⁷ The report and testimony guidance provided in that guide is described in the Procedures section above. Based on interviews, the training materials included numerous memos from Laboratory and Hairs and Fibers Unit personnel on various topics. We were unable to examine any of the materials that would have been used prior to 2000. The earliest version of the MHCA training materials (which also covered fibers) that was provided to us was dated 2006.⁸⁸

All examiners hired up until about 1994 were FBI agents. For MHCA examiners who were FBI agents, they received 16 weeks of agent training at Quantico before field assignments as law enforcement officials. Some testimony training was included as part of initial agent training. Civilians hired as examiners (which started in 1994) were not required to go through agent training or have field experience before starting at the FBI Laboratory. Initial training for all MHCA examiners (agents and civilians) was at least a year-long program similar to an apprenticeship. An experienced examiner acted as a mentor, and the new hire was encouraged to learn from what the mentor and other examiners in the unit were working on during their training. In addition to the microscopic work performed by the examiners, they also learned techniques for evidence processing that was largely performed by the technicians assigned to the Hairs and Fibers Unit. Training elements included: group discussions, assigned reading materials, hands-on work, proficiency tests, oral exams, and moot courts.

Some MHCA examiners commented that the literature review was somewhat unstructured as there were no specific objectives associated with reviewing books, papers, or articles. However, they also stated that subsequent training helped them determine what knowledge from these literature reviews was important.

Hands-on experience. Based on interviews, the trainee examiners worked on actual cases under the supervision of a qualified examiner. However, the qualified examiner (not the trainee) performed all the comparison work and developed a conclusion. The trainee typically performed an assessment of the same evidence to determine if their findings were the same as the qualified examiner.

Proficiency tests of MHCA skills. Based on interviews and transcripts, multiple proficiency tests were part of the training. Most focused on the microscopic comparison work of the examiner. Final testing often included matching 50 questioned hairs to associated known hairs. During most tests, the MHCA examiner knew that the 50 questioned hairs matched to one, and only one, of the known hairs.

Initial testimony proficiency skills tested through moot courts. Based on interviews, MHCA examiners had to pass three moot courts during training. A moot court is a simulated court proceeding to help examiners prepare to give testimony during trial. The simulated court experience was used to help examiners by having them articulate the results of their analysis under realistic conditions. Examiners had approximately six months of training on hair analysis, then testified in a moot court on MHCA. This was followed by about six months training on fibers and a moot court on that subject. Finally, examiners

87 Hicks, John W. "Microscopy of Hair: A Practical Guide and Manual." Vol. 2, Federal Bureau of Investigation, 1977.

88 "Trace Evidence Unit Physical Scientist-Forensic Examiner Training Manual." Training Program-Physical Scientist-Forensic Examiner Trace Evidence Unit, TRAINING MANUALS/PHYS SCIENTIST-FORENSIC EXAM TRNG MAN 1, Revision 1, 12 Dec. 2006, pp. 1-76.

completed a moot court involving both hairs and fibers. During moot courts, senior Hairs and Fibers Unit MHCA examiners would play the roles of judge, defense attorney, and prosecutor. Attorneys, such as those from the FBI Office of the General Counsel, were not involved in MHCA moot courts. Some examiners stated that attorney participation was not needed as the examiners understood the limits of the science, and legal counsel participation was not desired as their involvement would slow the examiner's progress.

Ongoing testimony proficiency testing. There was no formal ongoing training related to MHCA testimony. After the initial training, MHCA examiners participated in periodic meetings with their supervisors. These meetings sometimes included discussion of current testimony issues and recommended changes. It appears that not all examiners attended the meetings (they could have been out testifying or on vacation), and there was no specific follow-up for those who were absent. There was some mention of periodic MHCA examiner training being implemented in the late 1990s, but there was no documented evidence of it.

Throughout the period analyzed, the training evolved based, in part, on new literature published in the field. Based on interviews and document reviews, several Hairs and Fibers Unit personnel attended the 1985 symposium. In addition, several MHCA examiners mentioned attendance at other conferences in the late 1980s and 1990s. No specific conferences were mentioned.

Training others. The FBI Laboratory personnel provided general training to external law enforcement agencies on MHCA. Based on interviews, Hairs and Fibers Unit personnel were involved in leading two-week training courses on hairs and fibers analysis, mostly for local and state laboratories. The courses were typically held two or three times a year. These courses were abbreviated in nature, and the attendees were not qualified as MHCA examiners by the FBI.

Supervision

Oversight of reports and comparison work. Prior to the 1980s, there were no independent reviews of the comparisons and conclusions of the examiners. To clarify, the examiner reports were reviewed by the Unit Chief prior to being issued, but the comparison work itself was not independently checked. Starting around 1980, if a comparison resulted in an association, an independent confirmation of the association was usually performed. If the other examiner disagreed on the conclusion of an association, these disagreements were usually resolved between the original two examiners. The two examiners would explain their reasoning and it almost always resolved the issue. If it could not be resolved between the two examiners, a third-party review would occur. Initially, the examiner could choose anyone to perform the confirmation and their office-mate was often selected. Some interviewees said that they used their office-mate mostly for convenience. In the 1990s, the independent review moved from being an option to a requirement, and the second reviewer was selected by the Unit Chief based on several criteria. Note that the independent review was not a blind review; the second examiner knew the first examiner had concluded that there was association.

Report reviews. Throughout the period analyzed, the Unit Chief reviewed the reports produced by the MHCA examiners. However, sufficiently specific guidance for writing reports did not exist during the period analyzed. In addition, there were no formal written procedures during the period analyzed that provided specific guidance on what statements could be and had to be in the reports, nor on what

statements were forbidden. Although the guidance from the 1985 symposium was informally adopted, the basis for using the six conclusions developed by the *Report Writing, Conclusion, and Court Testimony* subcommittee (see Section 4.3) was not retained over time because of the lack of formal documentation.

Testimony. Unit Chiefs and other MHCA examiners would not normally be aware of the specific testimony provided by other MHCA examiners. No formal testimony monitoring program was in place until 1995 and transcripts were not routinely obtained (and therefore, not reviewed) throughout the period analyzed. When the testimony program was initially put in place, it did not focus on testimony content. When the program was revised in 1998⁸⁹, there were several questions that looked at the content of the testimony, including: (1) Did examiner testify within scope of their expertise?, (2) Did examiner testify accurately?, and (3) Did examiner limit their conclusions to those that logically followed from the underlying data and analytical results? However, without sufficiently specific guidance, it was unlikely that the testimony monitoring would be consistent or effective.

Verbal and informal written communication

Based on interviews, document reviews, and report and transcript reviews, there were no identified issues that originated with verbal and informal written communication.

Personnel performance

Staffing. Prior to 1994, all the examiners in the Hairs and Fibers Unit were also FBI agents. After several years of field experience, agents who entered the FBI under the science program or had science education backgrounds were often recommended to join the FBI Laboratory. Based on interviews, some agents eagerly joined the Hairs and Fibers Unit while others were more reluctant. After 1994, the FBI Director started a “transition from agent to professional support examiners”⁹⁰ in an effort to move agents back into the field. These non-agent examiners (i.e., professional support examiners) did not go through initial FBI agent training and did not spend years in the field as the agent-examiners did before becoming MHCA examiners.

The result of this change appears to have been a reduction in the interaction of the MHCA examiners with the law enforcement agency personnel who submitted the evidence. The agent-examiners were more familiar with the work done in the field by the agencies submitting evidence and were accustomed to performing investigative work. As a result, agent-examiners were more likely to be aware of additional aspects of the investigation, such as potential suspects and other non-MHCA evidence against a suspect.

Rewards and incentives – productivity. Based on interviews, the primary organizational incentive for MHCA examiners was related to productivity, measured by the number of cases that the examiner processed. Productivity also appears to be the primary metric that was tracked. The primary incentive of a high case processing rate encouraged *exclusions* because the level of effort required to perform the

⁸⁹ Laboratory Division, Court Testimony Monitoring Policy, LD Quality Manual, Testimon.A06 - Rev. 3, Issue Date: 01/06/98, 7pages

⁹⁰ FBI Laboratory Division Goals and Objectives, Quality Manual, Object.F30-Rev. 2, Issue Date: 06/30/97, 4 pages

comparison and documentation steps was less than that required for an association. Also, if an examiner's analysis resulted in an exclusion, it was much less likely to involve court testimony, which would reduce their productivity. Some interviewees were told when they received an annual bonus that it was for processing the most cases in the unit that year.

Rewards and incentives – convictions. There was no incentive for a high association rate or a high conviction rate. A retired examiner very sternly told us after several open-ended questions on this topic:

“There was no bonus for positive matches. They did track how many cases that you worked and the number of times you testified to make sure that you were in the right ballpark. Typically, we would testify on average between 20 and 25 times a year. There were no pressures at any time for us to make a match. It was always a case of: You found what you found; and there is no pressure to come up with one answer or another.”

In most cases, Laboratory personnel were not aware of the outcome of the trials. Based on interviews, at some point, a Hairs and Fibers Unit person searched through older cases to determine the verdicts and added them to the case files. The motive for this documentation is unknown. Some examiners mentioned that other examiners may have been driven, in part, by a desire to assist in the prosecution of criminals and kept personal statistics. But, we were not able to validate this assertion. We were able to identify situations where MHCA examiners were in the “investigation” mode, they let the “evidence speak for itself.”

Rewards and incentives – MHCA results match the DNA results. When DNA analysis evolved, a metric was established to track the outcomes of the MHCA process as compared to the DNA results; however, in later years this was abandoned. It should be noted that an appropriate MHCA association can be made, even if the DNA analysis results are an exclusion. This is due to the scientific limitations of an MHCA comparison. Hence, a hair may be visibly indistinguishable from another hair, and not be associated by DNA. A DNA exclusion does not mean the MHCA association was made incorrectly.

Rewards and incentives – travel. An examiner indicated that when receiving a bonus one year, he was told that the bonus was for traveling a lot for testimony. As one examiner said during an interview, “We could get [an] incentive bonus for being on the road.”

4.7 ANALYSIS OF CULTURE

This section summarizes the team’s understanding of the status of the Hairs and Fibers Unit culture from the 1950s through 1999. The information in this section is structured to parallel the ABS Group’s CCAM with 12 essential features of a good organizational culture are listed below and described in Appendix D.

1. Core Values
2. Strong Leadership
3. High Standards of Performance
4. Culture Emphasis and Approach
5. Sense of Vulnerability
6. Empower Individuals
7. Deference to expertise
8. Communication
9. Questioning and Learning Environment
10. Mutual Trust
11. Timely Response to Issues and Concerns
12. Continuous Monitoring of Performance

Core values

Valued being an integral part of the justice system. Based on interviews, MHCA examiners wanted to perform ethically in support of the criminal justice system. They viewed their role as a vital part of the criminal justice system, and performing their tasks in an ethical manner allowed the system to function properly.

One agent-examiner said during an interview, “I joined the FBI to get the bad guys.” Most MHCA examiners wanted to be part of the FBI first and foremost, with the FBI Laboratory either being a way into the FBI (the science program) or they were recruited from the field and told to work in the FBI Laboratory.

Valued ethical behavior. Based on interviews, the importance of ethical behavior was understood and a strong desire was ingrained in the examiners to perform ethically.

Valued educating jurors. Based on interviews and transcript reviews, MHCA examiners believed a key goal of their testimony was to educate the jury to enable jurors to make informed decisions. They worked to find ways to effectively communicate their findings, including the significance of their findings to the jurors. One examiner said during an interview, “Examiners in trial typically talk to the jurors like they are their friends, answering questions they know their friends would ask in advance.” Nearly all the individuals we interviewed seemed to be educators by nature.

Valued hard work. Based on interviews, hard work was valued by the MHCA examiners and Hairs and Fibers Unit management. They had a constant backlog of requests, and they worked diligently to process cases. One examiner said during an interview, “There was always a backlog and pressure to process cases. But, nothing more so than any other job. So, it did not affect your ability to work. Pressure for specific cases would typically be political, high profile, involving children, or peer pressure to keep up.” Nearly all the

individuals we interviewed appeared to be hard workers, even in retirement, and proactive, on-time type individuals.

Valued skilled examiners. Based on interviews, Hairs and Fibers Unit management saw skilled examiners as a key to good performance. Significant effort went into preparing examiners to perform their tasks through their rigorous training program.

Valued autonomy. Based on interviews and document reviews, Hairs and Fibers Unit management gave the MHCA examiners freedom to execute their work independently. Management believed that once trained, MHCA examiners should be able to properly perform their tasks appropriately with little oversight. This was most pronounced in court appearances, where supervision generally did not know what the examiners actually stated during testimony.

Valued status-quo. Several examiners indicated that they were not encouraged to identify issues with existing Hairs and Fibers Unit practices unless it helped the efficiency of case processing or furthered the science. One MHCA examiner made a suggestion for improving the training program he had just completed and was subsequently reprimanded for questioning the validity of the program.

Valued being an FBI agent. Based on interviews, Hairs and Fibers Unit management and the MHCA agent-examiners believed that there were no potential adverse impacts of FBI agent training and field experience on testimony. There was a clear sense from interviewees that the organization valued agent-examiners based on the belief that agents can do anything better than non-agents. In the 1990s, when non-agent examiners were hired into the Hairs and Fibers Unit, a hierarchy initially developed valuing agent-examiners over the non-agent examiners. We noted a difference between the culture of field-agent/investigator culture and the “professional support examiner” culture. The field agent-examiner typically was more focused on conclusions that could be reached from the evidence, whereas the non-agent examiner was focused more on the results of the scientific analysis. FBI Laboratory leadership seemed to value the culture of detective over scientist.

Did not value formalization of management systems processes. During most of the period analyzed, there was not an emphasis on documenting MHCA examiner activities. Based on information provided during interviews and confirmed by a lack of documentation, it appears that thorough documentation of MHCA examiners activities was not a core value. Activities performed by the technicians were documented in more detail. In addition, for most of the period analyzed, the Hairs and Fibers Unit did not have formal written procedures. Some interviewees expressed their perception that it was not the norm in forensics to have written procedures. However, another MHCA examiner was surprised at the lack of documentation and stated during an interview he was “shocked at the lack of formality given that this was the FBI.” Some interviewees indicated that at the time they did not see the value in developing formal written procedures.

As leaders in their field, the FBI MHCA examiners trained many state, local, and other Laboratory examiners in the science of the MHCA process and held an international conference on MHCA that was

attended by over 170 scientists from industry, university, and forensic laboratories around the world.⁹¹ However, the FBI did not demonstrate leadership in achieving Laboratory accreditation. About 175 other publicly funded crime laboratories were ASCLD/LAB accredited before the FBI Forensics Laboratory.⁹² Some laboratories became accredited in the early 1980s; however, there was not a significant commitment from the FBI Laboratory to achieve accreditation until the mid-1990s, with accreditation occurring in 1998.

Protocols were not written until accreditation. As the Hairs and Fibers Unit grew from a single individual to a group of over 20, the need for formal written procedures increased. Even when written procedures for Hairs and Fibers Unit activities were developed, they did not include sufficiently specific guidance to enable an MHCA examiner to consistently write reports and testify without error.

Strong leadership

Leadership backed examiner's decisions. There was strong management support for examiners performing their work and setting priorities. Several MHCA examiners mentioned that whatever issues arose, they were confident that Laboratory management would support their actions.

Leadership drove enhancements in quality control, but little emphasis was placed on testimony. Quality control activities related to tasks performed in the FBI Laboratory steadily increased throughout the period analyzed, even prior to the formation of the Quality Group in the mid-1990s. For example, reports produced by the MHCA examiners were reviewed by the Unit Chief throughout the period analyzed. However, the one area where quality control activities were almost non-existent until 1995 was in the one key activity that occurred outside the FBI Laboratory - testimony. Even after the testimony monitoring program was in place, Laboratory leadership did not have a specific evaluation requirement to determine if the language used in testimony exceeded the limits of the science (although one of the questions on the evaluation form did ask about the "accuracy" of the testimony). ASCLD-LAB accreditation requirements did not have specific requirements to monitor the content of testimony, just that a testimony monitoring was in place. As a result, Laboratory leadership did not effectively determine if testimony exceeding the limits of the science occurred during an MHCA examiner's testimony.

Leadership decision making based on organizational needs versus individual desires. Agents in the field frequently did not want to be assigned to the FBI Laboratory but were threatened with dismissal if they did not comply. Some examiners did not want to testify, but again were threatened with dismissal. Sometimes, examiners hired into the FBI Laboratory requested field-assignments and were told no, as training their replacement would be too difficult. Generally, the organization's need was more important than the individual's desire. As one examiner told us during an interview:

"People would only leave the Laboratory if they retired. No one could get transferred back to the field, even if they requested to be or had fulfilled their time in the Laboratory. After one agent publicly expressed his frustration and not being able to return

91 "Proceedings of the International Symposium on Forensic Hair Comparisons: FBI Academy, Quantico, Virginia, June 25-27, 1985." U.S. Government Printing Office, www.ncjrs.gov/pdffiles1/Digitization/116592NCJRS.pdf, page iii.

92 ASCLD Board of Directors. "Board Position Statement: Accreditation." 20 Aug. 2014, www.asclد.org/wp-content/uploads/2014/08/ASCLD-Board-Position-on-Accreditation.pdf.

to a field assignment and left the FBI, agents slowly started being able to get transferred out of the Laboratory. Before this event, agents were forced to stay in the Laboratory. The Unit Chief wouldn't let them out."

Lack of leadership support for accreditation. As leaders in their field, the FBI MHCA examiners trained many state, local, and other Laboratory examiners in the science of the MHCA process and held an international conference on MHCA that was attended by over 170 scientists from industry, university, and forensic laboratories around the world.⁹³ However, the FBI did not demonstrate leadership in achieving Laboratory accreditation. About 175 other publicly funded crime laboratories were ASCLD/LAB accredited before the FBI Forensics Laboratory.⁹⁴ Some laboratories became accredited in the early 1980s; however, there was not a significant commitment from the FBI Laboratory to achieve accreditation until the mid-1990s, with accreditation occurring in 1998.

High standards of performance

High standard for quality inside the FBI Laboratory. Balance was achieved between productivity (efficiency) and quality (effectiveness) for in-Laboratory processes. While productivity was an important metric, for Laboratory activities, quality of the processes that occurred at the FBI Laboratory steadily improved, even prior to the push for accreditation. Extensive initial training continued to be practiced, even when the workload was substantial.

High standard of accountability. MHCA examiners felt personally accountable for the work that they were performing and the impact their work had on the criminal justice system. Several examiners expressed extreme disappointment in themselves when in training they asked a colleague to quality check a confirmation of two hairs and the other examiner disagreed with their association.

High standard for FBI representatives. MHCA examiners understood how they impacted the criminal justice system as an FBI agent. Several interviewees described the "cloak of the FBI, aura or presence of the FBI" where they felt extremely important in a court room. The expectation was to be prompt, well-kempt, and well-spoken.

High standard not enforced for testimony. The enforcement of the high standards did not occur for testimony potentially exceeding the limits of the science, which was performed outside the FBI Laboratory. High standards were not enforced because methods for measuring and monitoring did not exist for most of the period analyzed. Testimony exceeding the limits of the science became acceptable because of the lack of negative feedback from management.

Did not achieve thoughtful-compliance. There were occurrences where MHCA examiners adhered to the specific requirements, but not the intent behind the requirement. For example, the MHCA examiners were trained in 1991 not to say "perfect match" and the data suggest this training worked; however, the

93 "Proceedings of the International Symposium on Forensic Hair Comparisons: FBI Academy, Quantico, Virginia, June 25-27, 1985." U.S. Government Printing Office, www.ncjrs.gov/pdffiles1/Digitization/116592NCJRS.pdf, page iii.

94 ASCLD Board of Directors. "Board Position Statement: Accreditation." 20 Aug. 2014, www.asclد.org/wp-content/uploads/2014/08/ASCLD-Board-Position-on-Accreditation.pdf.

examiners kept saying “indistinguishable” and other phrases that strongly indicated the hairs were likely from the same source.

Without exception, we found the MHCA examiners we interviewed to be respectful of the FBI Laboratory rules. Given a rule, we believe they would have followed it. However, the Hairs and Fibers Unit culture did not sufficiently emphasize the importance for understanding *why* certain decisions were made and *why* certain rules existed and the nuances therein.

High standard not enforced regarding agent-examiner acting like detectives. There are many benefits of having FBI agents in the FBI Laboratory, but management did not control the down-sides of that approach. For many decades, only FBI agent-examiners were allowed to work in the FBI Laboratory. The FBI agent-examiner role was not just to provide the analysis results, but also to assist in integrating those results with other information about the case to help draw conclusions. Many agent-examiners were pulled from the field to work in the FBI Laboratory because they had a science-related background. In the mid-1990s, non-agents were admitted to the Hairs and Fibers Unit.

Statements made, or the significance of the statement, in testimony by some examiners were influenced by:

- The examiner knew other Laboratory results (e.g., the Firearms/Tool Marks Unit had made a match to the suspect) and that boosted confidence in their own MHCA match.
- The examiner learned about the background of the suspect and knew, in some instances, that the suspect had an extensive criminal history.
- The examiner knew unnecessary information about the *case*.
- Some examiners were familiar with the judges and prosecutors in their cases. Assignment of cases was generally based on workload, but at times, cases were assigned based on examiner preference.

When we explored how this culture began, we learned:

- The FBI desired the MHCA examiners to perform in a “competent and impartial manner.”⁹⁵
- As FBI agents, they typically spent some part of their career before working at the FBI Laboratory as a field-agent where they were trained as law enforcement agents, and they were also trained and testified as fact-witnesses. As one examiner told us during an interview, “Agents were part of a fraternity, chasing criminals... They followed direction. They approached cases like agents.”
- Even when they entered the FBI Laboratory, FBI agent-examiners retained their agent identity first and foremost. Being an agent-examiner brought social and financial perks like: prestige, higher pay, and the ability to carry a gun every day.

An example of this role duality (between agent and examiner) is that at some point, the MHCA examiners started supporting the crime-scene investigators with evidence collection. In some cases, based on interviews and transcript data, examiners collected hair from the crime scene, completed the MHCA, then testified on the results in the trial.

95 “Trace Evidence Unit Physical Scientist-Forensic Examiner Training Manual.” Training Program-Physical Scientist-Forensic Examiner Trace Evidence Unit, TRAINING MANUALS/PHYS SCIENTIST-FORENSIC EXAM TRNG MAN 1, Revision 12, December 12, 2006, pp. 1-76.

Culture emphasis and approach

Workplace culture not documented. Typical of most government agencies at the time, the workplace culture was not assessed or documented during the period analyzed. There was no assessment of workplace climate or organizational culture.

Sense of vulnerability

Confidence in their expertise as an MHCA examiner. During interviews some MHCA examiners expressed why they had to use phrases other than *“could have come from the individual,”* which the 2012 Review determined was not an error. For example, one examiner explained during an interview:

“What does ‘Could have come from the individual’ mean? We never really defined that. But now, they are saying that we were overstating the findings and we need to explain what ‘could have’ means. You cannot leave the jury hanging, or you sound like a meteorologist – it could rain tomorrow.”

Overconfidence that testimony was within the bounds of science. Some Unit Chiefs indicated that they assumed the examiners were all testifying within the limits of the science without any specific feedback that it actually was within the limits. Given that assumption, there was no need to monitor the testimony. Also, given that assumption, there were no risks associated with MHCA testimony issues, so there would be no need to assess the potential risks.

Examiners were leaders on the topic of hair analysis and outside advice was not helpful. The Hairs and Fibers Unit viewed their MHCA examiners as being the most proficient examiners in the discipline. They performed more analyses from a wider spectrum of sources than any other Laboratory in the world. Because everyone else was less proficient and less experienced, less weight could be placed on other’s advice and practices. They indicated that others outside their discipline, such as attorneys and statisticians did not understand their practices and work environment (e.g., what they experienced during testimony) so their advice would not be practical or helpful.

Documentation makes you vulnerable to external inquiry. Documentation of work processes for examiner activities was weak. The culture was to avoid documenting activities if it was not required to support MHCA testimony. Limited documentation of examiner activities was not seen as a potential vulnerability, but was viewed as an approach for limiting risk.

Vulnerability was a weakness. There was little focus on increasing clarity in testimony guidance. In an ideal system, an MHCA examiner would be able to definitively, consistently, and correctly determine in every situation whether a potential statement was within the limits of the science for MHCA. With little documented testimony guidance in place, it was difficult for MHCA examiners to perform in that manner. MHCA examiners were required to testify as part of their role, even if they did not want to testify. An examiner telling others that they did not like to testify was deemed a weakness by others. As one examiner told us during an interview, “No one looked forward to doing testimony because you were on your own. You were out of your element and not in control. It’s like you’re all dressed, practiced, and ready to go play tennis but all the other people on the field are outfitted and ready to play football.”

Empower individuals

Training supported success. MHCA examiners underwent extensive initial training in an effort to prepare themselves for situations they could encounter when performing their work. This continued even in times of high workload.

Resources to support success. The examiners were provided appropriate resources (e.g., time, equipment, staffing, systems, funds for travel) to complete their responsibilities with the exception of written procedures/guidelines.

Not empowered to be a critic. Individuals were not empowered to identify and address vulnerabilities in the MHCA processes, including testimony.

Not empowered to seek external FBI Laboratory support. Individuals were not encouraged to seek the involvement of personnel outside their unit, such as attorneys and statisticians, in improving MHCA processes.

Not empowered to question expertise. Negative feedback, especially from non-agent examiners when they first entered the FBI Laboratory, was not well received by management. The non-agent examiners brought a fresh perspective to Laboratory activities that we suspect (but could not formally conclude from the anecdotal evidence) may have been threatening to the existing MHCA examiners and other agent-Laboratory leadership.

One examiner said Leadership went so far as reprimanding them for communicating a process deficiency. There are no data to suggest that this was more than a short-term issue during the transition from solely using agent-examiners. This issue left some non-agent examiners believing leadership did not want feedback and led to missed opportunities to identify, respond, and prevent issues.

Deference to expertise

Examiners with many years of experience were at the core of Hairs and Fibers Unit operations.

During initial startup, the Unit sought out external expertise to provide guidance. As the Hairs and Fibers Unit grew to become a dominant participant in the field, they were less apt to value outsider inputs.

The Hairs and Fibers Unit did not seek assistance from outside the FBI Laboratory to provide guidance in improving the MHCA processes. There was limited funding of outside groups (universities, research laboratories) to perform research into MHCA processes. The FBI Research Laboratory focused on new methodologies (e.g., DNA analyses), not on MHCA, which already had a long history of acceptance in the court systems. The FBI legal counsel was not included in testimony training for MHCA examiners, establishing testimony limits for MHCA, or monitoring MHCA testimony. Statisticians were not involved in establishing testimony limits, even though FBI examiners had weak backgrounds in statistics (although they did tend to have science degrees).

There was no intentional and sustained effort to involve experts (e.g., they were confident in their own expertise) in the interpretation of potentially erroneous statements in MHCA reports and testimony. The data we were able to collect on this topic were mainly in regard to involvement of internal FBI legal counsel.

When the FBI Laboratory assigned legal counsel to the FBI Laboratory in the 1990s, the Hairs and Fibers Unit did not welcome that person's help with training (including moot courts) and guidance for writing reports and providing testimony.

Based on interviews, most MHCA examiners who were in the Hairs and Fibers Unit from the 1950s through 1990s believed the FBI lawyer's input would not be helpful because the lawyers, in general:

- Were not technical experts (an MHCA examiner said during an interview, "Lawyers do not know science.")
- Did not have much exposure to MHCA testimony

MHCA examiners in the Hairs and Fibers Unit believed they had a good understanding of the legal system in regards to MHCA testimony because the Unit had seasoned MHCA examiners with lots of courtroom testimony experience, and they had received substantial positive feedback and minimal negative feedback.

Some MHCA examiners believed their ability to effectively communicate their scientific opinion to the jury would be encumbered by guidance from the FBI's legal counsel. This was expressed during an interview as, "[the FBI lawyers] are trying to put a legal opinion on my scientific conclusion."

Communication

The communication between the MHCA examiners and Unit and Laboratory management appeared to be sufficient. Staff meetings and memos to the MHCA examiners occurred at a sufficient frequency. MHCA examiners were willing to bring up implementation issues with managers.

Communications were not holistic. Guidance provided during periodic meetings communicated via memos was not integrated into formalized policies and written procedures. For example, after two instances of negative feedback, the lessons learned were shared in group meetings and not more formally communicated. In one of these instances, the Hairs and Fibers Unit Chief described the corrective actions using words such as "discussed," "cautioned," "counseled," and "instructed."

Another example, is that testimony guidance was initially provided orally to examiners when they joined the Unit. New MHCA examiners were trained through an apprentice model that included strenuous agent-examiner facilitated moot courts. After initial training, testimony guidance and updates continued to be shared verbally.

Questioning and learning environment

Continuous improvement in methodologies was a core value of the FBI Laboratory. But it applied to new methods or improving the ability to achieve individualization (e.g., to be able to associate a questioned hair with a single individual instead of a group of unknown size). Informal, undocumented MHCA testimony guidance was seen as "good enough."

There was not a culture of learning from experience, where issues were viewed as opportunities to identify and address underlying organizational system causes. Instead, each issue was addressed as a personnel issue, isolated to a single individual.

We understand some lessons learned were discussed verbally in meetings at the time, but not captured and integrated into organizational knowledge for retention. Because they did not create and retain lessons learned records, they did not have a central set of records for adverse events that occurred. Based on interviews and response to one complaint,⁹⁶ records of feedback (positive and negative) and records of the FBI's actions taken in response were typically filed in an individual's personnel file instead of a location that would support a transparent and learning culture.

Mutual trust

Management and examiner trust was high. There was a high level of trust between management and the examiners/technicians. Both trusted that the others would work to appropriately accomplish the organizational mission.

Peer-to-peer trust was very high. Examiners relied on other examiners to provide their training, assist in moot courts, and review comparison results. They believed their fellow examiners were competent and ethical.

Peer response to signs of peer bad behavior was lacking. The trust in their unit was so high that one examiner known for saying bombastic things around the office was trusted to not say those bombastic phrases in court. Others thought he was kidding. An examiner told us during an interview “[That examiner] might be a little ‘chirpy.’ After moot court, [that examiner] would say something and everyone would say ‘you can’t say that.’ [That examiner] would say ‘I know – but I want to.’” The peer group noticed that even though the examiner expressed a *desire* to be more conclusive in court, they trusted that he was not doing so.

Trust was insular. The MHCA examiners had trust in their unit comrades, Unit Chief, and possibly the FBI Laboratory. Based on interviews, our team concluded the examiners trusted their unit and FBI Laboratory employees, but did not trust other support units in other areas of the FBI.

MHCA examiners welcomed observation within the FBI Laboratory. The MHCA examiners were proud of their arduous moot courts for new examiners and offered for others in the FBI Laboratory to come watch them test out the new examiner. Not all candidates passed moot courts, and it was grounds to remove the person from their job. This did occur.

Timely response to issues and concerns

Tracking of action items to resolve performance issues appeared to be informal based on a few memos we reviewed. Training materials included a collection of memos on various policy matters. This does demonstrate some level of organization related to capturing and sharing lessons learned.

96 “Internal FBI memos to FBI Laboratory Director Hicks.” 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

Continuous monitoring of performance

Performance metrics did not include comparison results (exclusion, no exclusion, indeterminate) or outcomes of trials (conviction/pleas/no conviction). In most cases, Laboratory personnel were not aware of the outcome of the trials.

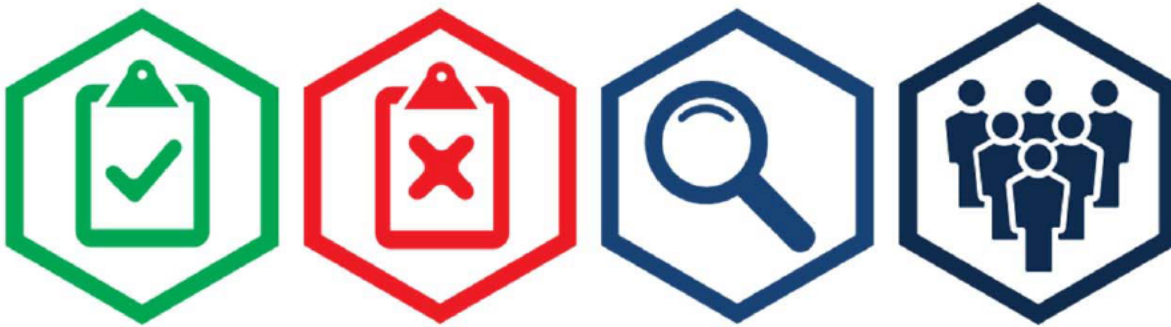
Throughout the period analyzed, MHCA examiner reports were reviewed by someone within the Hairs and Fibers Unit. The rigor of these reviews increased through the period analyzed.

As noted elsewhere, MHCA examiners were given a high level of autonomy. As a result, there was minimal monitoring of their testimony. This resulted in all examiners having a high degree of autonomy when testifying, which resulted in the issues that follow:

- A few examiners were perceived by other examiners as acting on their own during testimony – that they could say whatever they wanted. We understand that the FBI Laboratory wanted examiners to represent themselves in reports and in court as an FBI Laboratory examiner consistent with the training and guidance they had received. But, based on interviews, some examiners perceived that when they took the stand they were expert witnesses first and FBI employees second, with their opinion based on their analysis, education, and experience. These few individuals were perceived as undisciplined by several interviewees.
- Former MHCA examiners would testify after extended absences from the FBI Laboratory, but FBI Laboratory management did not have a process or program to update these individuals on the current testimony language guidance. In the few instances where the limited testimony guidance had changed, the returning MHCA examiners were not informed or trained on the new guidance.

4.8 USING ANALYSIS INFORMATION TO SUPPORT THE DEVELOPMENT OF THE RESULTS

The *Results* section that follows uses our analysis information for the detailed development of the causal events, the associated root causes, and the cultural causes.



RESULTS

This section identifies what caused the MHCA report and testimony errors and why the errors went unabated for decades. The first part of this section describes the error events that scoped our project, then steps through the construction of a Causal Event Sequence Diagram that describes the causal events that led to the error events. Also included is an analysis of the causal events, root causes, and cultural causes that allowed error events to continue for decades. This section concludes with observations about the level of contribution for both the root and cultural causes.

5 RESULTS

The previous sections of this report provided our team's observations and fact-finding about the status of the management systems and culture in the FBI Laboratory Hairs and Fibers Unit. Leaping directly from fact-finding and observations to root cause identification is a common error of root cause analysts. To avoid this pitfall, our team focused on the set of error events identified by the 2012 Review and then deliberately worked our way through a structured analysis to understand the management system weaknesses and behaviors that allowed those error events to occur. This section describes our process for exploring the error events and their underlying causes.

5.1 ANALYSIS APPROACH

Performing root and cultural cause analysis basically involves asking and answering “why” repeatedly. The “why” questions start with the error events of interest and then follow a logic structure to work down to the causal event level. These causal events are then analyzed for root cause and cultural issues. We used a standard analysis tool, commonly known as a Cause and Effect Tree, to initially structure the answers to these “why” questions. For presentation in this report, we show the results of the “why” questions in the CESD shown in Figure 52. The following subsections describe the error events and each of the three levels of events (causal events, root causes, and cultural causes) in the CESD.

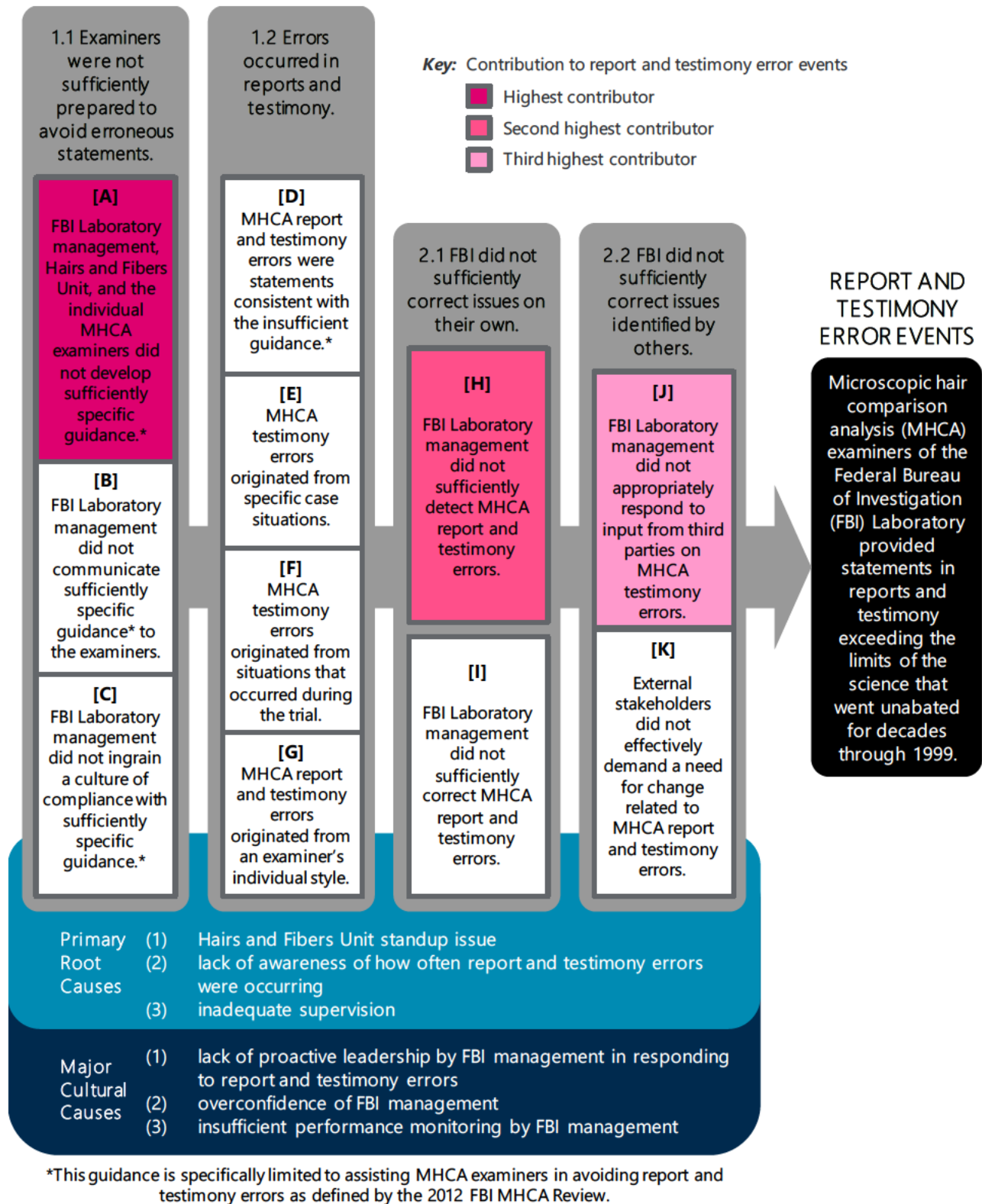


Figure 52. CESD with the causal events, primary root causes, and major cultural causes.

5.2 THE ERROR EVENTS

This section provides step-by-step development and structuring of the CESD shown in Figure 52. In the initial scoping of this project, our team agreed with the FBI on the following statement for the report and testimony error events being analyzed: *Microscopic hair comparison analysis (MHCA) examiners of the Federal Bureau of Investigation (FBI) Laboratory provided statements in reports and testimony exceeding the limits of the science that went unabated for decades through 1999* as shown in Figure 53. The scope of our study is discussed further in Section 1.3.

The error events were chronic losses because they included multiple instances of report and testimony errors that occurred over several years. Based on the reports and transcripts, we were provided, report errors predominantly occurred between 1985 and 1999 while testimony errors likely occurred throughout the entire period (1950s through 1999).

REPORT AND TESTIMONY ERROR EVENTS

Microscopic hair comparison analysis (MHCA) examiners of the Federal Bureau of Investigation (FBI) Laboratory provided statements in reports and testimony exceeding the limits of the science that went unabated for decades through 1999.

Figure 53. The report and testimony error events.

Our team used a structured analysis technique to hypothesize and brainstorm a broad range of possible reasons why these error events occurred, and throughout the data identification and data collection stage, we expanded, explored, and proved or disproved the various hypotheses we developed. During the final analysis stages of this project, we eliminated hypotheses that were proved untrue, and characterized the causes we believe occurred and contributed to these error events.

5.3 CAUSAL EVENTS LEADING TO THE ERROR EVENTS

For the chronic report and testimony error events, the sequence diagram had to address two fundamental issues: (1) the report and testimony errors were not prevented (they occurred) and (2) the report and testimony errors were not detected and corrected. For the MHCA report and testimony errors:

- Report and testimony errors were not prevented was specifically described by Intermediate Causal Event 1: *MHCA examiners, given their preparation, provided statements in reports and testimony that exceeded the limits of the science.*
- Report and testimony errors were not detected and corrected was specifically described by Intermediate Causal Event 2: *FBI Laboratory management did not abate MHCA statements in reports and testimony that exceeded the limits of the science.*

Given these two specific events, the resulting top level of CESD is shown in Figure 54. The CESD shows that if Intermediate Causal Event 1 and Intermediate Causal Event 2 occur, then this will lead to the error events. Or, if either Intermediate Causal Event 1 or Intermediate Causal Event 2 are prevented or eliminated, then the error events will be prevented or eliminated. For readability, this top level of the CESD is not shown in the final CESD.

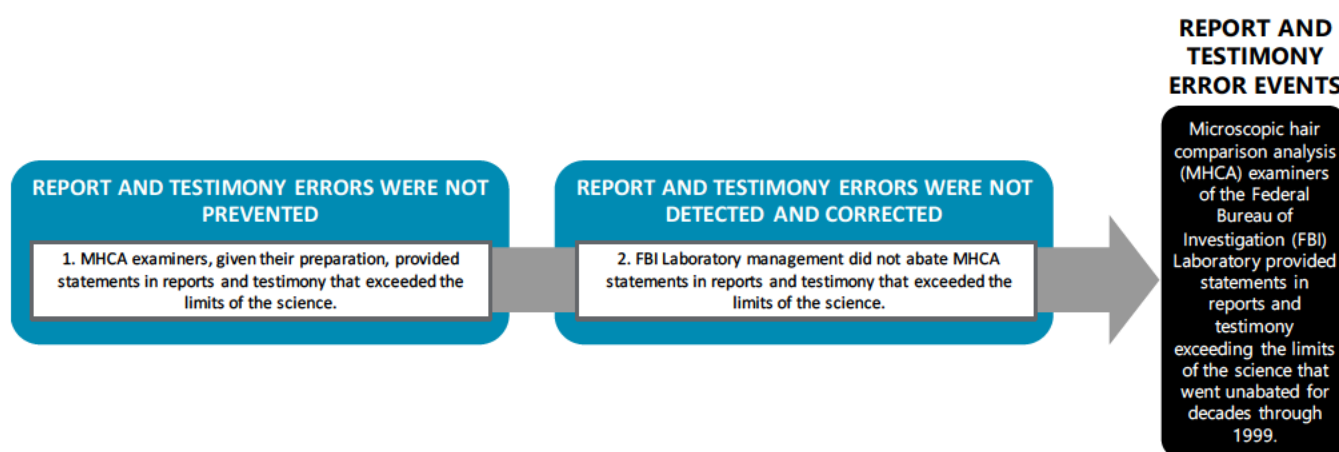


Figure 54. Top level of the CESD.

The two causal events on the top level of the CESD were expanded to provide additional detail as follows:

As shown in Figure 55, Intermediate Causal Event 1 was split into two Intermediate Causal Events, *1.1 Examiners were not sufficiently prepared to avoid erroneous statements*, and *1.2. Errors occurred in reports and testimony*. Intermediate Causal Event 1.1 focuses on issues with the preparation for testimony, and Intermediate Causal Event 1.2 focuses on the fact that the MHCA examiners, given the preparation issues, provided statements in reports and testimony that were judged to be errors by the 2012 Review. Report and testimony errors occur (they are not prevented) when Intermediate Causal Events 1.1 and 1.2 occur.

Note that if Intermediate Causal Event 1.1 occurs, it is more likely that Intermediate Causal Event 1.2 will occur. In other words, if the MHCA examiners were not prepared, they were more likely to provide statements in reports and testimony that exceeded the limits of the science (Causal Event 1.2). However, even sufficiently prepared MHCA examiners could still provide statements in reports and testimony that exceeded the limits of the science.

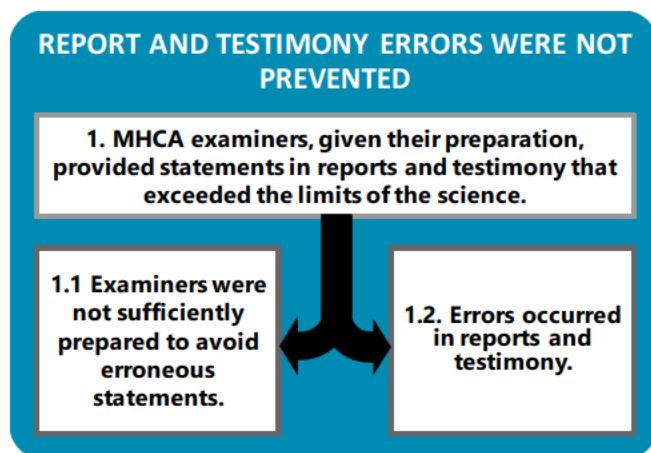


Figure 55. Second level of the CESD associated with “Report and Testimony Errors Were Not Prevented.”

As shown in Figure 56, Intermediate Causal Event 2 was split into two Intermediate Causal Events, *2.1 FBI did not sufficiently correct issues on their own* and *2.2. FBI did not sufficiently correct issues identified by others*. Intermediate Causal Event 2.1 focuses on issues with the FBI Laboratory management not independently driving effective correction of MHCA examiner report and testimony errors, and Intermediate Causal Event 2.2 focuses on issues with the external stakeholders not driving effective change within the FBI Laboratory related to MHCA report and testimony errors.

Intermediate Causal Events 2.1 and 2.2 represent two missed opportunities for detecting and correcting the MHCA errors. If the FBI had independently corrected the issues causing the report and testimony errors, then the sequence would have been interrupted and subsequent errors would have been prevented. Or, if the external stakeholders had been successful in driving change within the FBI that would have corrected the issues causing the report and testimony errors, the sequence would also have been interrupted, preventing subsequent errors.

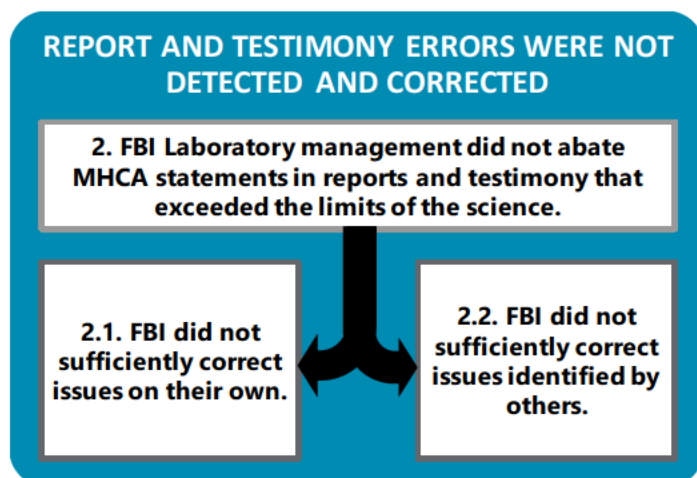


Figure 56. Second level of the CESD associated with “Report and Testimony Errors Were Not Detected and Corrected.”

Given the four Intermediate Causal Events just described (1.1, 1.2, 2.1, and 2.2), there are now four events on the second level of the CESD that lead to the report and testimony error events as shown in Figure 57.

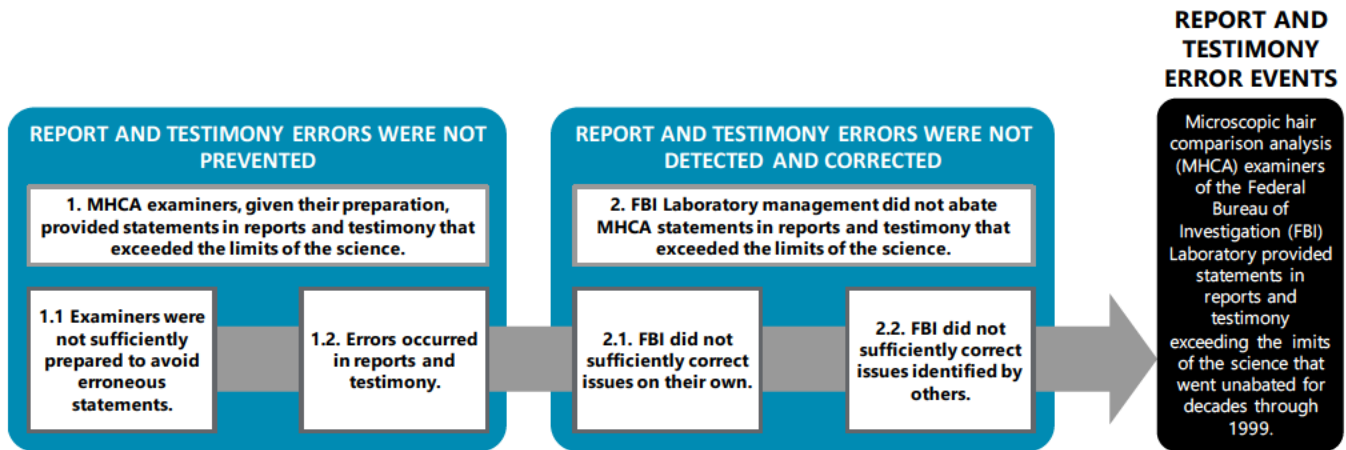


Figure 57. First and second level of the CESD.

Causal Events

After identifying these four Intermediate Causal Events (1.1, 1.2, 2.1, and 2.2), we then sought to identify potential causes for each of them. The following subsections describe each of the 11 Causal Events on the CESD.

Causal Events for Intermediate Causal Event 1.1

When we explored what could have caused Intermediate Causal Event 1.1, *Examiners were not sufficiently prepared to avoid erroneous statements*, we identified three causal events, labeled A, B, and C in Figure 58. At this level of the CESD, the Causal Events are potential causes of Intermediate Causal Event 1.1. In other words, Causal Events A or B or C could have caused Intermediate Causal Event 1.1.

When Causal Event A occurs, it will cause Causal Events B and C to occur. Without sufficient report and testimony guidance (Causal Event A), it is not possible for management to communicate the guidance (Causal Event B) or to ingrain a culture of compliance with the non-existent limits (Causal Event C). However, Causal Events B and C can also occur independently. For example, if sufficiently specific guidance were developed, there could have been issues with communicating and ingraining the guidance.

[A] Causal Event A: *FBI Laboratory management, Hairs and Fibers Unit, and the individual MHCA examiners did not develop sufficiently specific testimony guidance.*

Of note: Sufficiently specific guidance is defined in the *Working Definitions for the Report* section in the front matter of this report.

This causal event addresses the lack of sufficiently specific report and testimony guidance. This causal event does not imply that no guidance existed during the period analyzed, but rather that there was not sufficiently specific guidance for the examiners to consistently avoid making statements exceeding the limits of the science. Causal Event A references three groups, the FBI Laboratory Management, Hairs and Fibers Unit personnel, and the individual MHCA examiners. FBI Laboratory management is specifically used instead of FBI management in general to be clear that the management focus is at the FBI Laboratory level regarding the responsibility to provide sufficiently specific guidance. In addition, the Hairs and Fibers Unit personnel are included as a group who potentially could have provided sufficiently specific report and testimony guidance. Finally, the individual MHCA examiners could have developed sufficiently specific report and testimony guidance. These front-line workers perhaps had the greatest potential to see the need for such guidance, even if they were not the most appropriate group to address the issue.

Typically, in RCA we would assign responsibility for development of written procedures, such as guidance on MHCA testimony, solely to the organization's management. However, given the high level of autonomy granted the MHCA examiners to determine appropriate testimony limits (based on their own comfort level, experience, etc.), we find it reasonable that individual MHCA examiners could have developed and used their own personal guidance. Given this, we include both management and the individual examiners in Causal Event A.

1.1 Examiners were not sufficiently prepared to avoid erroneous statements.

[A]

FBI Laboratory management, Hairs and Fibers Unit, and the individual MHCA examiners did not develop sufficiently specific guidance.

[B]

FBI Laboratory management did not communicate sufficiently specific guidance to the examiners.

[C]

FBI Laboratory management did not ingrain a culture of compliance with sufficiently specific guidance.

Figure 58. Causal events associated with Intermediate Causal Event 1.1.

[B]

Causal Event B: *FBI Laboratory management did not communicate sufficiently specific guidance to the examiners.*

This causal event addresses issues with communication of sufficiently specific report and testimony guidance to the examiners. As was mentioned above, it is not possible to communicate sufficiently specific guidance if it is not developed (Causal Event A occurred). However, even if sufficiently specific report and testimony guidance had been developed (Causal Event A had NOT occurred) specific communication weaknesses could result in Causal Event B. In our analysis, we focused on how the communications process could fail, assuming sufficiently specific guidance existed. We also identified instances where some guidance was provided, and we explored how this guidance was communicated.

[C]

Causal Event C: *FBI Laboratory management did not ingrain a culture of compliance with sufficiently specific guidance.*

This causal event addresses insufficient inculcation of compliance with any report and testimony guidance that was developed (Causal Event A) and communicated (Causal Event B) to the MHCA examiners. It was not possible to ingrain a culture of compliance without these two causal events. However, even if sufficiently specific report and testimony guidance had been developed (Causal Event A did NOT occur) and was sufficiently communicated (Causal Event B did NOT occur), specific cultural weaknesses in the organization could cause issues with ingraining compliance with the guidance. In our analysis, we focused on how the ingraining process could fail assuming sufficiently specific guidance existed and was communicated. We also identified instances where some guidance was provided and communicated, and we explored how this guidance was ingrained.

Causal Events for Intermediate Causal Event 1.2

When we explored what could have caused Intermediate Causal Event 1.2, *Errors occurred in reports and testimony*, we identified four causal events, labeled D, E, F, and G in Figure 59. At this level of the CESD, the causal events are potential causes of Intermediate Causal Event 1.2. In other words, Causal Event D *or* E *or* F *or* G could have caused Intermediate Causal Event 1.2.

These four causal events could occur independently, but they are more likely to occur if Intermediate Causal Event 1.1 has occurred. In other words, if the examiners were not sufficiently prepared (i.e., Event 1.1 occurred), it is more likely that one or more of these four events (i.e., D, E, F, and/or G) would occur. For example, if sufficiently specific report and testimony guidance was not developed (Event A), then examiners were in an *error-likely situation* (as defined in the *Working Definitions for this Report* in the front matter of this report) where it is more likely that MHCA examiners would err when writing reports or testifying. When the examiners were not sufficiently prepared to testify within the limits of the science, it should not be a surprise that they made statements exceeding the limits of the science involving several contributing situations during the period of interest (i.e., Causal Events D, E, F, and G). Even if sufficiently specific guidance was ingrained, given the nature of MHCA testimony, examiners could still make erroneous statements (Causal Events E, F, and G) for a variety of independent reasons.

As a reminder, errors in MHCA examiner statements in their reports and testimony were within the scope of our analysis, but any other errors that may have occurred in performing the MHCA were not within the scope of the analysis.

[D] Causal Event D: *MHCA report and testimony errors were statements consistent with the insufficient guidance.*

This causal event addresses situations where the statements made by the MHCA examiners in reports and testimony were consistent with the guidance they were provided at the time but were subsequently judged as errors by the 2012 Review. In our speed limit analogy from the Preface, in 1985 we posted a speed limit sign that said “Speed Limit 70.” In 2012, we realized the wrong sign had been in place since 1985 and posted a new correct “Speed Limit 60” sign. Then we cited (identify as errors) all the drivers who went faster than 60 mph in 1985 because they were exceeding the updated speed limit.

This causal event also addresses statements made by the examiners in reports and testimony that were not specifically prohibited by the guidance they were provided at the time. Using our speed limit analogy again, we posted a sign saying “Drive Carefully” without specifically stating what the speed limit was. Later, we determine a specific speed limit of 60 mph. Then we cite (identify as errors) all the drivers who drove faster than 60 mph.

1.2 Errors occurred in reports and testimony.

[D]
MHCA report and testimony errors were statements consistent with the insufficient guidance.

[E]
MHCA testimony errors originated from specific case situations.

[F]
MHCA testimony errors originated from situations that occurred during the trial.

[G]
MHCA report and testimony errors originated from an examiner’s individual style.

Figure 59. Causal events associated with Intermediate Causal Event 1.2.

[E] Causal Event E: *MHCA testimony errors originated from specific case situations.*

This causal event addresses case knowledge gained by MHCA examiners that could bias them to provide statements in testimony exceeding the limits of the science. Ideally, the examiner performing the comparison's only knowledge about the case would be limited to the information needed to perform an effective analysis of the evidence submitted. This would limit the potential for specific case information to influence the examiner's testimony.

This causal event also addresses pre-trial situations where the examiner's relationship with court personnel may have affected their statements.

[F] Causal Event F: *MHCA testimony errors originated from situations that occurred during the trial.*

This causal event addresses the times when an examiner's testimony was influenced by situations that occurred during the testimony (e.g., the prosecutor making a statement implying personal identification, and then the examiner affirming). Ideally the examiner would never be placed in a situation where they were not fully prepared. However, given the nature of unscripted live testimony, some residual risk always remains associated with Causal Event F, even if sufficiently specific guidance is provided and ingrained.

[G] Causal Event G: *MHCA report and testimony errors originated from an examiner's individual style.*

This causal event addresses the times when the examiner's testimony was influenced by their particular style during report preparation and the various phases of testimony. Ideally the examiner would rely on report and testimony guidance in providing statements in reports and in court and would not allow their personal style to affect their testimony.

Causal Events for Intermediate Causal Event 2.1

When we explored what could have caused Intermediate Causal Event 2.1, *FBI did not sufficiently correct issues on their own.*, we identified two causal events, labeled H and I in Figure 60. At this level of the CESD, the causal events are potential causes of Intermediate Causal Event 2.1. In other words, Causal Event H *or* I could have caused Intermediate Causal Event 2.1.

Causal Event H could occur independently, but it is more likely to occur if Causal Event A has occurred, because if sufficiently specific report and testimony guidance was not developed, it is unlikely that FBI Laboratory management would detect MHCA examiner errors.

Event I could occur independently, but it is almost certain to occur if Event H has occurred. If FBI Laboratory management did not detect the MHCA examiner errors in reports and testimony, it is very unlikely that they would work to correct those errors.

[H] Causal Event H: *FBI Laboratory management did not sufficiently detect MHCA report and testimony errors.*

This causal event addresses FBI Laboratory management not detecting that there were statements in reports and testimony that exceeded the limits of the science. Ideally FBI Laboratory management, early in the period analyzed, would have detected that MHCA examiners were making statements that exceeded the limits of the science in their reports and during their testimony.

[I] Causal Event I: *FBI Laboratory management did not sufficiently correct MHCA report and testimony errors.*

This causal event addresses not correcting MHCA report and testimony errors once they are identified. Ideally FBI Laboratory management would have addressed the causes of the report and testimony errors so that similar errors would not occur after the corrective actions were implemented. For our analysis of Causal Event I, we are only concerned with its contribution as an independent cause (e.g., the sufficiency of the response to the few instances when they did detect testimony errors).

2.1 FBI did not sufficiently correct issues on their own.

[H]

FBI Laboratory management did not sufficiently detect MHCA report and testimony errors.

[I]

FBI Laboratory management did not sufficiently correct MHCA report and testimony errors.

Figure 60. Causal events associated with Intermediate Causal Event 2.1.

Causal Events for Intermediate Causal Event 2.2

When we explored what could have caused Intermediate Causal Event 2.2, *FBI did not sufficiently correct issues identified by others*, we identified two causal events, labeled J and K in Figure 61. At this level of the CESD, the causal events are potential causes of Intermediate Causal Event 2.2. In other words, Causal Event J *or* K could have caused Intermediate Causal Event 2.2.

Causal Events J and K could occur independently, but are more likely to occur if Intermediate Causal Event A has occurred. If there is insufficiently specific report and testimony guidance, it is less likely that third parties will be able to detect statements that exceed the limits of the science (Causal Event K). It is less likely that the FBI would appropriately respond to third-party input (Causal Event J), without sufficient input from the third parties (Causal Event K), and with no clear criteria to evaluate their input against (Causal Event A).

[J] Causal Event J: *FBI Laboratory management did not appropriately respond to input from third-parties on MHCA testimony errors.*

This Causal Event addresses the FBI's response to the inputs from the third parties. Causal Events J and K are related in that the more receptive the FBI is to third-party input, the less the third parties need to push for change. For our analysis of Causal Event J, we assumed the FBI Laboratory management had some negative third-party input so we are only concerned with its contribution as an independent cause (e.g., how did they respond when they received negative third-party input).

[K] Causal Event K: *External stakeholders did not effectively demand a need for change related to MHCA report and testimony errors.*

This causal event addresses the demands for change related to MHCA report and testimony errors by third parties, or external stakeholders. The external stakeholders mentioned in Causal Event K and shown in Figure 62 include: court personnel; federal and state government entities other than the FBI; the forensic community; legal associations and groups; and media. Each of these groups had a potential role in effectively demanding a need for change related to MHCA report and testimony errors.

2.2 FBI did not sufficiently correct issues identified by others.

[J]

FBI Laboratory management did not appropriately respond to input from third parties on MHCA testimony errors.

[K]

External stakeholders did not effectively demand a need for change related to MHCA report and testimony errors.

Figure 61. Causal events associated with Intermediate Causal Event 2.2.

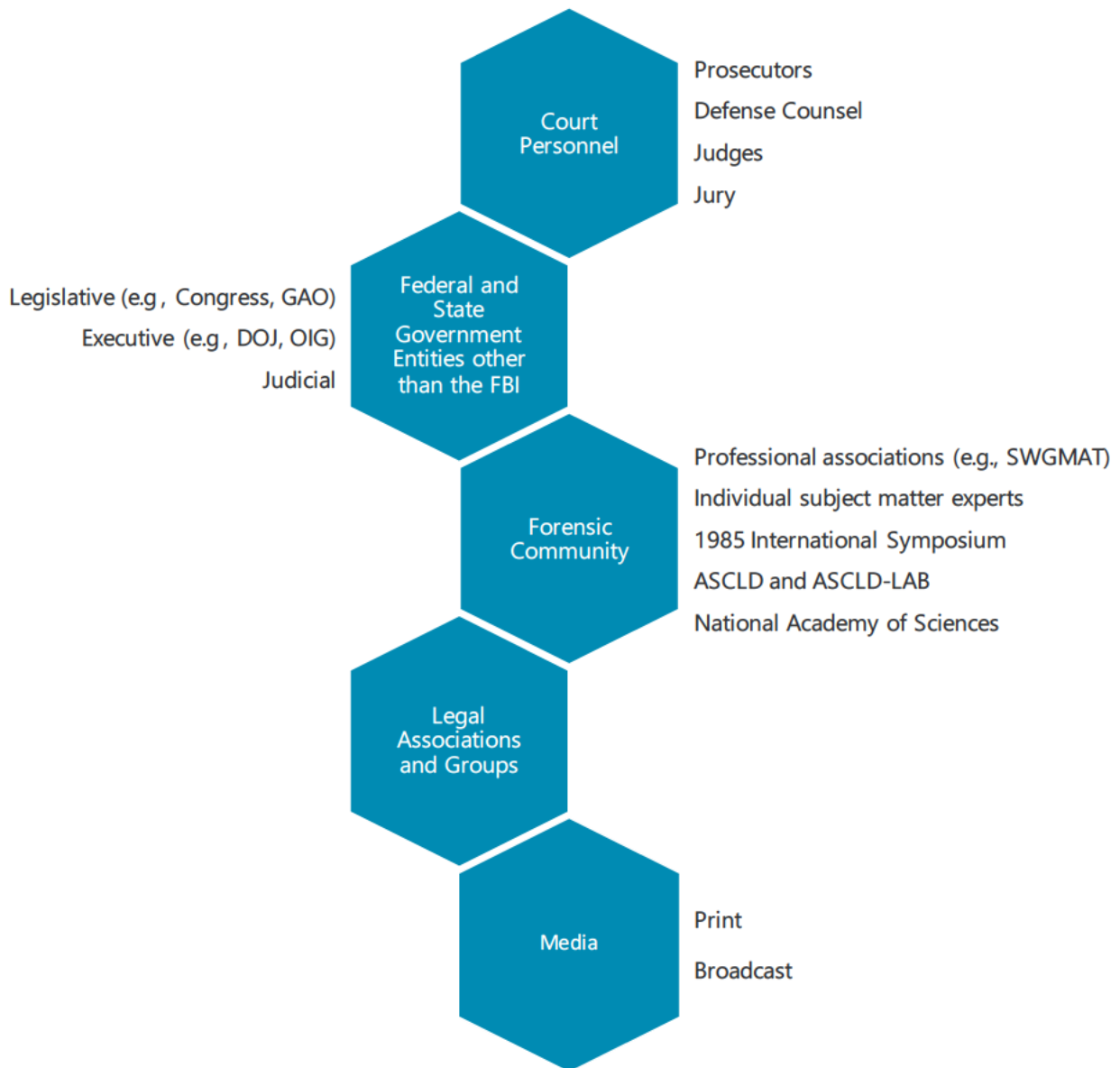


Figure 62. External stakeholders related to Causal Event K.

Transitioning from causal events to root and cultural cause analysis

At the lowest level in the CESD are 11 causal events labeled A through K. Our team determined that these events contributed to the occurrence of the chronic report and testimony errors. The 11 causal events are the starting point for the root cause and cultural analysis. Each causal event is explored in more detail in the next section.

Malicious intent deemed not a contributor

Before proceeding with the details associated with the 11 causal events shown on the CESD, it is valuable to discuss our findings regarding malicious intent as a potential cause of report and testimony errors. We define malicious intent as:

A situation that occurs when an individual provides testimony that exceeds the limits of the science in an effort to convict someone they believe to be innocent.

While we considered this cause, we did not detect any malicious intent with the MHCA examiners, which is why it is not shown on the CESD. Directly below are data supporting and refuting our conclusion.

Conclusion

We did not detect any malicious intent with the MHCA examiners in regard to report and testimony errors.

Data supporting our conclusion that it is very unlikely that MHCA examiners made statements with malicious intent.

Not observed during interviews. Based on interviews, MHCA examiners did not indicate that statements were made in reports or during testimony with malicious intent. Based on interviews, there were numerous examples of MHCA examiners providing statements that exceeded the limits of the science (see Causal Events D, E, F, and G) in an apparent belief that they were appropriately explaining and supporting the conclusions of the analysis.

Overconfidence, but not malicious intent. While confidence is a necessary trait of a successful MHCA examiner that we observed, some individuals were excessive in their confidence; however, we did not connect this to maliciousness.

Data refuting our conclusion that it is very unlikely that MHCA examiners testified with malicious intent.

Third-party accusations of tainted MHCA testimony. Some third parties have expressed opinions that the MHCA examiners in the FBI Laboratory, and in the Hairs and Fibers Unit, intentionally testified inappropriately (though not all issues they raised related to testimony that exceeded the limits of the science). However, this was not supported by our interviews and the documentation we reviewed (e.g., reports, transcripts, and other documents).

Testimony outside the MHCA examiner's area of expertise. The Office of Inspector General's report identified an instance where a Hairs and Fibers Unit MHCA examiner testified outside his area of expertise (testified as an expert in metallurgy). We understand the MHCA examiners were aware of the

requirement to limit their testimony to their area(s) of expertise. If an MHCA examiner was willing to testify outside their area of expertise, this was a possible indicator of a willingness to have testified inappropriately in other ways.

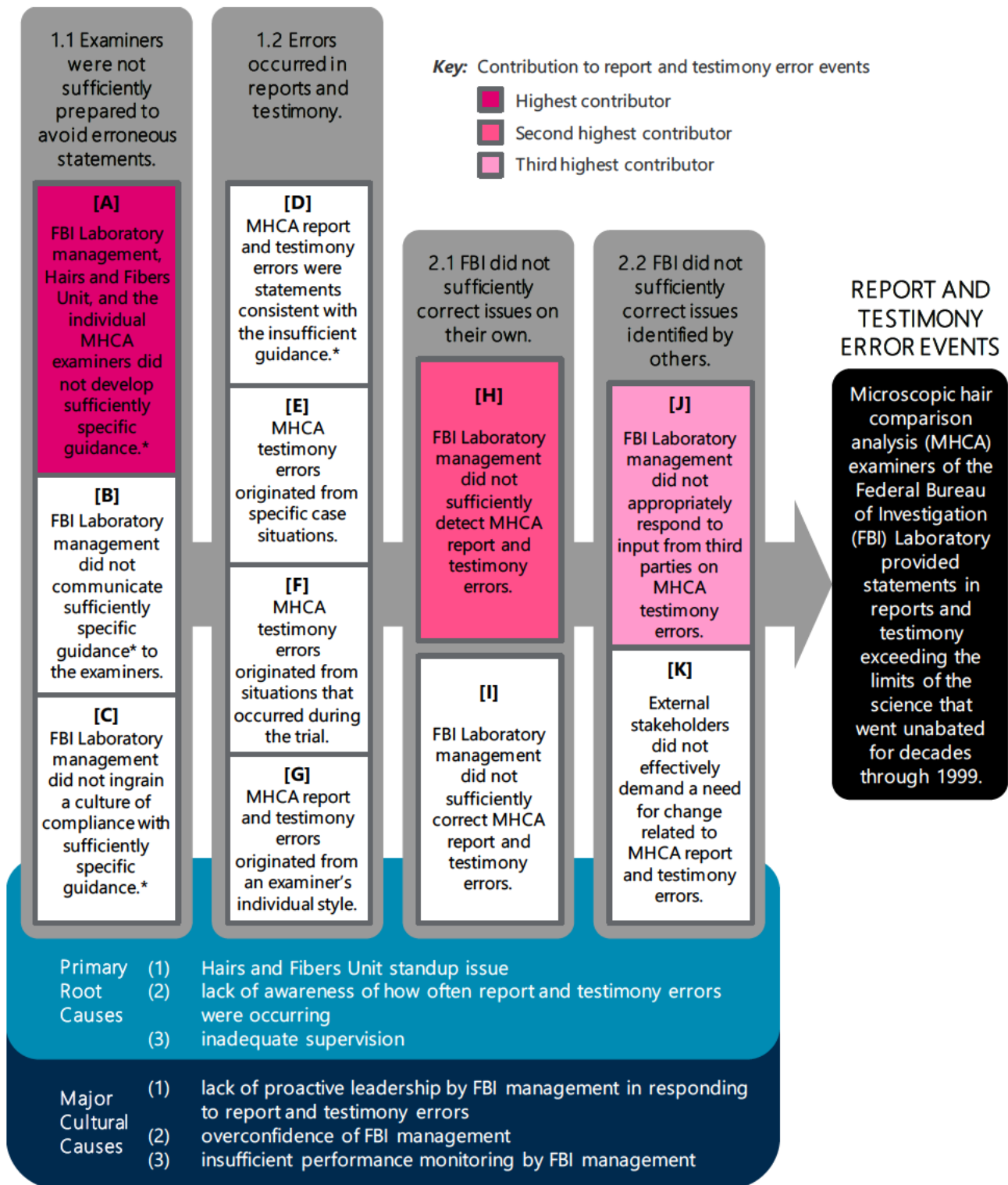
5.4 ROOT AND CULTURAL CAUSES FOR EACH CAUSAL EVENT

The 11 causal events characterized in the previous section of this report provide an understanding of the sequence of events that led to the MHCA report and testimony errors. Our team used long-standing root and cultural cause analysis tools and techniques to provide a concise, transparent, and defensible analysis. The knowledge collected by our analysis team provided input into the results in this section.

This report section is divided into 11 subsections corresponding to the 11 causal events (A through K) shown previously in Figure 63.

Each subsection provides:

- An introduction with a summary description of the causal event (detailed descriptions of each causal event are included in the CESD and Section 5.3).
- Conclusions and their significance which appear in a call-out box with statements detailing the extent of the contribution of the causal event (i.e., did this causal event contribute to the occurrence of almost all the MHCA report and testimony errors or only a few occurrences?).
- Supporting and refuting information for the causal event's occurrence and contribution.
- Management system weaknesses (root causes) that allowed that causal event to exist, described in Section 4.6, and the mapping of these root causes to the categories of the Root Cause Map™, described in Appendix C, and
- Organizational, social, and behavioral issues that allowed the environment to exist (cultural causes) as described in Section 4.7 and the mapping of these cultural causes to the categories described in Appendix D.

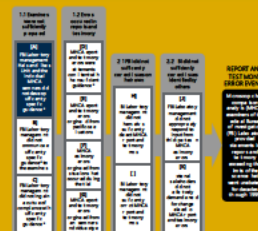


*This guidance is specifically limited to assisting MHCA examiners in avoiding report and testimony errors as defined by the 2012 FBI MHCA Review.

Figure 63. CESD showing causal events leading to MHCA report and testimony errors.

A. FBI Laboratory management, Hairs and Fibers Unit, and the individual MHCA examiners did not develop sufficiently specific guidance.

Highest contributor to the errors



This causal event references FBI Laboratory management, Hairs and Fibers Unit, and the individual MHCA examiners.

Sufficiently specific guidance would provide instructions for MHCA reports and testimony and enable an MHCA examiner to consistently write reports and testify without introducing MHCA report or testimony errors. Sufficiently specific guidance is defined in the *Working definitions for this report* section in the front material of this report.

Conclusion and Significance – Causal Event A

It is very likely that the FBI Laboratory management, Hairs and Fibers Unit, and the individual MHCA examiners did not develop sufficiently specific guidance. It is very likely that this failure to develop sufficiently specific guidance between the 1950s through 1999 contributed to almost all instances of MHCA report and testimony errors.



A. FBI Laboratory management, Hairs and Fibers Unit, and the individual MHCA examiners did not develop sufficiently specific guidance

Data supporting conclusion

Each of the statements and observations that follow supports the conclusion and significance statements for Causal Event A.

Errors were found in almost half of the FBI Laboratory MHCA reports. Almost half of the FBI Laboratory MHCA reports had statements judged to be report errors by the 2012 Review. Almost all report errors (over 98%) described the questioned hair using the phrases consistent with having originated from [individual's name] or consistent with having come from [individual's name] instead of could have come from [individual's name]. (The last phrase was not considered to be an error by the 2012 Review). These statements were consistent with guidance developed between 1982 and 1985 and formally presented at the FBI-hosted

international symposium on MHCA in 1985. We concluded that these report errors occurred, in part, because the FBI Laboratory informally adopted a portion of the guidance developed for the symposium and later identified by the 2012 Review as erroneous. MHCA examiners infrequently made other report errors, such as using phrases like *probably originated from*, *matched the victim*, *likelihood*, and *can be associated with [individual's name]*. Because it was informally adopted (was not documented in a written procedure), the basis for using the six conclusions developed by the *Report Writing, Conclusion, and Court Testimony* subcommittee (see Section 4.3) was not retained over time. See Section 2.1 for a description of the three error types used by the 2012 Review and Section 4.3 for additional details on report errors.

Errors were found in most MHCA examiner trial transcripts, for most years in the period analyzed, and for most MHCA examiners who testified. The 2012 Review team determined that about 90% of the 484 transcripts used in this study contained at least one error. Of the MHCA examiners who testified, 26 of the 28 had errors in their transcripts. The review also determined that on average there were about six errors per transcript. For example, some transcripts contained statements that could imply MHCA is a method for individualization or that MHCA has a low error rate (see Section 4.5 for our analysis of errors in the transcripts).

Examiners did not have sufficiently specific guidance. Interviewees indicated that they did not have explicit guidance regarding what they could and could not state in reports or testimony to remain within the limits of the science. Although MHCA guidance improved during the study period (1950s through 1999), even in 1999, formal MHCA guidance was minimal (see the Procedures summary in Section 4.6, *Analysis of Management Systems*, for a summary of the guidance that was in place during the period analyzed). In the absence of adequate organizational guidance, the individual MHCA examiners did not develop appropriate guidelines on their own to write reports and to testify within the limits of the science. Based on our experience, this seemed an unlikely path to success. Based on interviews, the examiners believed they had received adequate guidance from FBI Laboratory management and were appropriately prepared to write reports and to testify within the limits of the science. While the MHCA examiners thought they had sufficiently specific guidance at the time, based on the current understanding of the limits of the science, the guidance they had during the analysis period was not sufficient.

No document from the period analyzed, such as a procedure, provided sufficient MHCA report and testimony guidance. Some guidance existed during the period (i.e., the guide on microscopy of hair from 1977⁹⁷ and a memo from 1991⁹⁸), and there were changes in this guidance in response to limited feedback. However, these changes did not result in sufficiently specific guidance being developed because of the following inadequacies:

- **Guidance not formalized.** We found no evidence that the report and testimony guidelines presented by the *Committee on Forensic Hair Comparison, Subcommittee 4, Report Writing, Conclusions, and Court Testimony* at the 1985 International Symposium on Forensic Hair Comparisons (see *Events in the*

97 Hicks, John W. "Microscopy of Hair: A Practical Guide and Manual." Vol. 2, Federal Bureau of Investigation, 1977.

98 "Internal FBI memos to FBI Laboratory Director Hicks." 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

1980s in Section 4.2 for more details on the symposium) were formally adopted by the Hairs and Fibers Unit. Adopting the subcommittee's guidelines would have likely reduced the number of MHCA testimony errors, even though the subcommittee's guidelines were inconsistent with the error types used by the 2012 Review. The subcommittee recommended six possible conclusions, some of which conflict with the error types used in the 2012 Review, and left it to the examiner to determine if probabilities and statistics could be stated or implied.

Regarding reports, it appears that starting in about 1985 many of the FBI Laboratory MHCA examiners wrote reports using the phrase consistent with having originated from [individual's name] or consistent with having coming from [individual's name] instead of "could have come from [individual's name]" which was not determined to be an error by the 2012 Review. MHCA examiners infrequently made other report errors, such as using the word "rare." These statements were consistent with guidance developed between 1982 and 1985 and formally presented at an FBI-hosted international symposium on MHCA in 1985. We concluded that the report errors occurred, in part, based on information in the guidance developed for the symposium. However, such guidance was not formalized at the FBI Laboratory.

- **Guidance not comprehensive.** A 1991 memo indicated that an MHCA examiner overstated his conclusions during testimony and that corrective actions were taken with that individual (see the *Events in the 1990s* in Section 4.2 for more details on this memo). However, the response to this issue was not comprehensive and did not result in sufficiently specific guidance.
- **Guidance not specific and not comprehensive.** A 1997 memo⁹⁹ to the FBI Laboratory provided broad guidance on MHCA testimony limits, and it required that the guidance be included in moot courts (part of initial training for MHCA examiners). It also required improvements in MHCA testimony monitoring and provided specific guidance on how to respond if asked to testify about work performed by others. However, the broad guidance was not comprehensive in that it did not include what MHCA examiners could not say or imply in writing reports or giving testimony regarding the limits of the science.
- **Guidance insufficient.** In March 1997, the first formal FBI Laboratory protocol on MHCA was issued,¹⁰⁰ entitled *Protocol for Forensic Hair Examinations*. The written procedure focused on the process of performing the examination and not on how to testify to the results. The procedure did provide the three conclusions that could be reached from performing microscopic examination of human hairs, but did not provide guidance on how to write the report or to testify about the conclusions. Although we have a limited number of transcripts after 1997, we still concluded that the testimony monitoring program did not provide sufficiently specific guidance regarding MHCA reports and testimony.

Sufficient MHCA guidance was not defined prior to 2000. Sufficient MHCA guidance was not developed during the period analyzed.

99 Lind, Richard T to FBI Laboratory. "Court Testimony and Court Testimony Monitoring Policy." 06 Feb. 1997.

100 "Trace Evidence Unit Procedures Manual." Protocol for Forensic Hair Examinations, SOP/HAIRFIBER, no revision indicated, Mar. 1997, pp. 51-59.

Examiners felt “set up.” Several interviewees commented that it was unfair to apply the standards of 2012 to the period analyzed. They indicated that had they known what the limits were, they would have written reports and testified within those bounds.

It is our understanding that the bounds of the science for MHCA have not changed since the science’s conception,¹⁰¹ and, therefore, the limits applied by the 2012 Review would be appropriate for the period analyzed.

Examiners did not develop guidance. In the absence of organizational guidance, the individual MHCA examiners could have, but did not develop appropriate guidance to testify within the limits of the science. Based on interviews, the MHCA examiners believed they had received adequate guidance and training, particularly through moot courts which they conducted themselves, and there was no need for additional guidance. The ABS Group team concluded that while it is possible for this approach to succeed, it was not plausible that limits developed by the individual examiners would provide an enduring path to success.



A. FBI Laboratory management, Hairs and Fibers Unit, and the individual MHCA examiners did not develop sufficiently specific guidance

Data refuting conclusion

Each of the statements and observations below refutes the conclusion and significance statements regarding Causal Event A.

Some progress in developing sufficient guidance. There were efforts to provide sufficient MHCA testimony guidance for MHCA examiners during the period analyzed (see the previous *Data supporting conclusion* discussion in this section). These efforts were not completely successful, but based on transcript analysis, appear to have reduced the number of instances of testimony errors. However, for report errors, the adoption of the 1985 symposium guidance resulted in most of the report errors (because some of the symposium guidance was judged as an error by the 2012 Review).

Report template. Interviewees indicated, and a review of available reports verified, that their report template contained a statement that MHCA could not be used as a means of individualization. This provided some guidance that may have been adopted by MHCA examiners during testimony, but it was not sufficient.

Statements that MHCA could not be used for individualization in MHCA testimony. Many transcripts included a statement similar to: “*I cannot, by doing a hair comparison, identify someone to the exclusion of all other people on earth.*” This statement was NOT judged to be an error by the 2012 Review. However, some of these same transcripts contained statements that implied or stated that the methodology can be used to

¹⁰¹ The relevant issue here is that the size of the pool of people who could be included as a possible source of a specific hair is unknown and no advances had been made by 2012 to delineate the size of the potential pool. In addition, the FBI stated in 2004 that “The FBI Laboratory does not use the mathematical calculations of other researchers nor does it support the feasibility of establishing a numerical probability of a hair match.”

associate a hair(s) to a particular individual. These statements about the limitations of MHCA may have partially mitigated the testimony errors.



A. FBI Laboratory management, Hairs and Fibers Unit, and the individual MHCA examiners did not develop sufficiently specific guidance

Root cause analysis

The root causes identified in this section characterize the management system weaknesses that created an environment where sufficient testimony guidance was not developed.

Sufficiently specific guidance for MHCA testimony did not exist. Sufficiently specific guidance for MHCA reports and testimony was not in place during the period analyzed, even after the FBI Laboratory was accredited in the late 1990s. (Procedure Issue – 122)

Observation: As a result, sufficiently specific guidance for MHCA testimony was not provided to the examiners during the period analyzed.

There was no formal standup of the Hairs and Fibers Unit organization. There was no identified formal standup of the Hairs and Fibers Unit during its evolution from 1 person to more than 20 personnel. Consistent with others in this field at the time, a lack of intentional unit design and corresponding governance structure at the FBI Laboratory led to a missed opportunity to understand the unit's vision, mission, goals, objectives, and the risks to achieve these. Our team found that FBI Laboratory management did not consider what the goals of the Unit were and how they may fail to achieve those goals. In addition, our team found that FBI Laboratory management did not understand or recognize the significance of the risks associated with testimony that exceeded the limits of the science. Consistent with others in this field at the time, a lack of designing the MHCA testimony process at the FBI Laboratory led to a missed opportunity to understand and recognize the significance of the risks associated with MHCA testimony. (Design Issue - 18)

Observation: A formal standup of the Unit would have likely resulted in more formality, including the development of standards, policies, and administrative controls that may have resulted in better guidance and fewer errors in MHCA reports and testimony.

The FBI did not identify MHCA statements that exceeded the limits of the science by MHCA examiners as a significant risk for the organization.

No formal assessment was performed to determine how often MHCA report and testimony errors were occurring. The FBI did not routinely perform a formal assessment of the Hairs and Fibers Unit tasks to identify the potential for MHCA reports and testimony to include statements exceeding the limits of the science. (Hazard/Defect Identification and Analysis Issue – 94 [Proactive Risk Analysis Issue – 104])

Observation: Had the potential report and testimony statements exceeding the limits of the science been formally assessed, it is more likely that this would have been identified as a significant issue.

No procedure for assessment of how often MHCA report and testimony errors were occurring. The Hairs and Fibers Unit did not have a procedure for performing assessments of risks. (Procedure Issue – 122)

Observation: Using such a procedure may have prompted implementation of an initial or a periodic formal assessment of how often MHCA report and testimony errors were occurring.

Lack of appropriate personnel involved in assessment of how often MHCA report and testimony errors were occurring. Had the Unit performed a formal assessment of how often MHCA report and testimony errors were occurring, they may not have involved the appropriate personnel in the assessment, such as subject matter experts in statistics, legal aspects, and quality assurance related to MHCA testimony. The ABS Group team concluded this based on comments from the interviewees on their valuation of input from non-MHCA subject matter experts. Note that during his presentation entitled “The Future of Forensic Hair Comparison” at the 1985 symposium, Barry Gaudette commented that: “Future research aimed at improving report writing and court testimony in forensic hair comparison would likely be fruitful. Such research could take the form of assessing the impact of various statements and phrases on lay audiences.” (Supervision Issue – 185)

Observation: As a result, some of the potential for reports and testimony containing statements exceeding the limits of the science may not have been identified. Assessments of this type are usually more successful when a multidisciplinary team is used.



A. FBI Laboratory management, Hairs and Fibers Unit, and the individual MHCA examiners did not develop sufficiently specific guidance

Cultural analysis

This section describes the organizational culture, social, and behavioral issues that contributed to management system weaknesses that led to the lack of sufficient testimony guidance being developed.

No sense of vulnerability. FBI Hairs and Fibers Unit management was overconfident in that testimony was assumed to be within the limits of the science, until proven otherwise. (Sense of Vulnerability – 5)

Observation: As a result, there were insufficient drivers to perform assessments of the potential for reports and testimony containing statements exceeding the limits of the science.

Lack of deference to appropriate expertise. Subject matter experts at the FBI who were knowledgeable in legal issues (e.g., FBI Office of the General Counsel) were not involved in determining MHCA report and testimony limits. Also, subject matter experts in statistics, human bias, and jury interpretation of MHCA testimony were not involved in determining the related report and testimony limits. Based on interviews, some personnel within the Hairs and Fibers Unit believed external personnel did not have as much exposure to MHCA reports and testimony as the examiners and that their support would not be helpful. Also, it was perceived that if they did bring in external expertise they would make it more difficult for the MHCA examiners to perform their jobs with little to no perceived benefits. As a result, we concluded that it

was unlikely that subject matter experts in statistics and legal issues would have been involved in developing testimony limits. (Defer to Expertise – 7)

Observation: As a result, experts with appropriate backgrounds did not critically examine existing informal limits on MHCA testimony or participate in development of sufficiently specific guidance.

Informal management systems. The Hairs and Fibers Unit culture was such that staff tended to rely heavily on the expertise of the MHCA examiners and informal management systems. Laboratory culture did not include documentation of MHCA examiner activities unless it was required and needed to support MHCA testimony. There were few written procedures that addressed the activities of the MHCA examiners. For example, guidance provided in the *Subcommittee on Report Writing, Conclusions, and Court Testimony* report at the 1985 symposium was not incorporated into internal written procedures. In fact, no formal procedures were developed for the Unit until the mid-1990s. (High Standards of Performance – 3 and Empower Individuals – 6)

Observation: As a result, lessons learned associated with MHCA testimony guidance were not formally incorporated in an officially controlled document. This would also make it more difficult for existing and future examiners to benefit from lessons learned.

Disincentive to identify MHCA statement limits. There was an organizational disincentive to identify issues with MHCA statement that exceeded the limits of the science because of the potential impact on past work. In addition, some examiners mentioned during their interviews that Hairs and Fibers Unit management was not receptive to negative feedback on the Unit's operations. (Core Value – 1, High Standards of Performance – 3, Empowerment Individuals – 6)

Observation: As a result, there was disincentive to perform proactive assessment of the potential for reports and testimony containing statements exceeding the limits of the science.

Disincentive to document MHCA testimony limits. There was a disincentive for the organization and MHCA examiners to document sufficient MHCA report and testimony guidance because it would bring increased scrutiny from third parties, which the FBI Laboratory viewed as a negative. ()

Observation: As a result, there was a disincentive to perform proactive assessment of the potential for reports and testimony containing statements exceeding the limits of the science.

Autonomy of MHCA examiners. Autonomy of MHCA examiners in the area of testimony could result in introduction of variation in standards and practices for MHCA testimony between examiners. Without formal, standard guidance, and encouragement by Hairs and Fibers Unit management to use their expertise and judgement, variations in testimony would be expected. For reports, the Unit Chief reviewed all the reports, so autonomy was less of a contributor to the report errors. (Strong Leadership – 2 and High Standards of Performance – 3)

Observation: As a result, each examiner could have had their own standard for testimony that exceeded the limits of the science.

No drive to learn from experience. There were several indications of problems with MHCA examiner testimony during the period analyzed. (We did not identify any negative feedback on the reports.) However, there was no organizational drive to understand the broader underlying issues associated with these

instances. Further exploration into the causes of these issues may have led to development of sufficiently specific guidance for MHCA reports and testimony. This is discussed further in Causal Events H, I, and J. (Questioning/Learning Environment – 9 and Response to Issues and Concerns – 11)

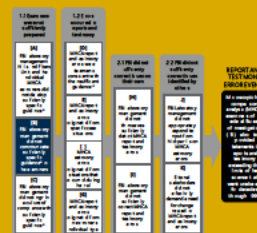
Observation: As a result, there was limited effort expended on learning lessons from issues that were identified and using these lessons to drive continuous improvement in the area of MHCA reports and testimony.

Lack of leadership. Laboratory management did not provide appropriate leadership in identifying the potential for MHCA statements in reports and testimony exceeding the limits of the science, in responding to instances of issues with MHCA testimony, and formalizing the methods used in the FBI Laboratory. (Strong Leadership – 2)

Observation: As a result, there was not a culture in the Unit to proactively and reactively identify the potential for reports and testimony to contain statements exceeding the limits of the science and to address the causes in a fundamental way.

B. FBI Laboratory management did not communicate sufficiently specific guidance to the examiners.

Lower contributor to the errors.



Sufficient MHCA testimony guidance was not communicated to the MHCA examiners because the guidance was not in place through 1999. However, there were improvements made in the testimony guidance throughout the period analyzed. Based on available information, even if sufficiently specific guidance had been developed, it is unlikely that the guidance would have been consistently and effectively communicated to all examiners.

Conclusion and Significance – Causal Event B

Sufficiently specific guidance was not communicated because it did not exist at the time. The limited MHCA report and/or testimony guidance that was in place at the time appears to have been effectively communicated to most MHCA examiners, especially during initial training for new MHCA examiners. Based on available information, even if sufficiently specific guidance had been developed, it is unlikely that the guidance would have been consistently and effectively communicated to all examiners.

- An additional conclusion regarding the capability to communicate sufficiently specific guidance is that continued MHCA training for established MHCA examiners was not required and may have not occurred.



B. FBI Laboratory management did not communicate sufficiently specific MHCA guidance to the examiners

Data Supporting Conclusion

Each of the statements and observations below supports the conclusion and significance statements for Causal Event B.

Guidance not in place to communicate. Sufficient MHCA testimony limits were not communicated to the MHCA examiners because such testimony guidance did not exist through 1999.

FBI Office of the General Counsel personnel not involved in moot courts. Moot courts were a primary method of communicating the appropriate MHCA testimony guidance. Personnel from the FBI Office of the General Counsel who may have been able to provide additional guidance on appropriate testimony were not involved in moot courts. In addition, the presence of FBI Office of the General Counsel personnel may have triggered further documentation of the testimony limits (see Causal Event A).

Former MHCA examiners not kept up to date. Examiners who retired or left the organization did not receive ongoing communication on the current standards for testifying about work performed for the Unit. They were sometimes called to testify months or years after they had left the Hairs and Fibers Unit.



B. FBI Laboratory management did not communicate sufficiently specific guidance to the examiners

Data Refuting Conclusion

Each of the statements and observations below refutes the conclusion and significance statements for Causal Event B.

Symposium guidance communicated. Although there were no documents indicating the report and testimony guidance from the 1985 symposium was communicated to the MHCA examiners, analysis of the reports and transcripts indicates that it was. One of the conclusions that was included in the symposium guidance was the phrase *consistent with having come from [individual's name]*. This phrase was infrequently used prior to the symposium but used at a steadily increasing rate (along with the similar *consistent with having originated from [individual's name]*) following the symposium. In addition, most examiners used this phrase in their reports. This implies that the guidance from the symposium, although not formally adopted by the Hairs and Fibers Unit, was communicated to the MHCA examiners.

Apparent communication. A 1991 memo indicated MHCA examiners should not use phrases like “*perfect match*” or refer to their personal experience to imply a probability that the questioned hairs came from a particular individual in MHCA testimony. MHCA examiners were apparently trained on this issue at the time (based on the 1991 memo). It is unclear if this was incorporated into the training for new MHCA examiners because there was limited documentation of initial and ongoing training related to MHCA

testimony. Analysis of transcript data (see the analysis for Question 5 in Section 4.5) indicates that the use of “perfect match” was essentially eliminated.

Communication recommended. A 1997 memo to the FBI Laboratory required that updated guidance be included in moot court training, an indication that they were aware of the need to communicate changes to MHCA testimony guidance. Again, it is unclear if this was formally incorporated into the training because there was limited documentation of initial and ongoing training.

Communication through training. Based on interviews, the MHCA testimony guidance in place at the time was communicated to the MHCA examiners as part of moot court preparation, presentation, and feedback. Moot courts were apparently led by experienced MHCA examiners, but without formalized MHCA testimony guidance. In addition, documentation in the training manuals describing the content to be communicated during moot courts was very limited.

Communication of policy assumed. A formal policy developed in May 1997 contained guidance on the conclusions that could be reached from MHCA (but not on how these conclusions could be communicated during MHCA testimony). It is unclear how these policies were communicated to the MHCA examiners during initial and ongoing training.



B. FBI Laboratory management did not communicate sufficiently specific guidance to the examiners

Root Cause Analysis

The root causes identified in this section characterize the management system weaknesses that created an environment where sufficiently specific guidance was not communicated to the MHCA examiners.

Training did not contain appropriate content to communicate sufficiently specific guidance. This could not be accomplished until sufficiently specific guidance was developed and approved. (Causal Event A addresses development of sufficiently specific guidance). (Training/Personnel Qualification Issue – 171)

Observation: As a result, sufficient training content did not exist to communicate to MHCA examiners.

Moot courts failed to communicate sufficiently specific guidance because the guidance did not exist. During initial training, the MHCA examiners participated in three moot courts (there was no requirement for moot court after becoming an MHCA examiner). Moot courts provided feedback to the MHCA examiners on the appropriateness of their testimony; however, the guidance was not sufficiently specific on whether their testimony was within the limits of the science as defined by the 2012 Review. This could not be accomplished until sufficiently specific guidance was developed (Causal Event A addresses development sufficiently specific guidance). In addition, moot court requirements were vague regarding performance expectations and appropriate testimonial statements. (Training/Personnel Qualification Issue – 171)

Observation: As a result, it is unlikely the MHCA examiners would have been provided with sufficiently specific guidance from experienced examiners participating in moot courts.

Moot courts for MHCA examiners did not involve attorneys. Attorneys were not requested to participate in moot courts for MHCA examiners (they did participate in the moot courts for DNA). In the absence of formalized guidance, the involvement of attorneys in moot courts may have resulted in recognition of the need for sufficiently specific guidance for MHCA testimony. If formalized guidance had been in place, participation by attorneys would have helped in clarifying the guidance. (Training/Personnel Qualification Issue – 171)

Observation: Had attorneys been involved in moot courts, they may have identified the need for sufficiently specific guidance for MHCA statements to be within the limits of the science.

Initial training was insufficiently structured. Interviewees indicated that initial training was a key method for learning how to appropriately communicate the results of the MHCA. Within the training program, reviewing reports written by others was the primary method for understanding how to write reports, while moot court preparation and experience was the primary method for understanding how to testify appropriately. However, no formal training documents from the period analyzed (through 1999) were provided. Although a 53-page guide was developed in 1977 and used in training, we did not consider this to be a formal training document as it related to MHCA testimony because it only contained a single paragraph on testimony). In the absence of any formal written procedure or policy on the topic, this was not sufficient to consistently communicate sufficiently specific guidance (Training/Personnel Qualification Issue – 171)

Observation: As a result, consistent communication of sufficiently specific guidance was less likely to occur during moot courts.

Continuing training on testifying was unstructured or absent. Continuing training could only be effective if sufficiently specific guidance was developed (see Causal Event A). If the sufficiently specific guidance had existed, it was unlikely that the continuing training program would have been effective in communicating the guidance to all MHCA examiners. Continuing training was not identified in the training documentation provided (2006 and 2011 documents). Although no training documents were available for that period, it appears unlikely that continuing training occurred during the period analyzed.¹⁰² No records of continuing training were provided. Accreditation standards at the time did not require routine continuing training. (Note that the accreditation standards did require remedial training when there was a demonstrated need. Also, the MHCA examiners did take proficiency tests, but these were not related to MHCA testimony). Interviewees indicated that ongoing issues were discussed during some unit meetings. (Training/Personnel Qualification Issue – 171)

Observation: As a result of the informal structure for continuing training, some personnel in the unit may not have been formally and consistently trained as MHCA testimony standards evolved.

Returning to testify. MHCA examiners that had retired or taken positions somewhere else in the FBI at the time of MHCA testimony, testified without receiving the latest guidance/clarifications. In addition, long

102 United States Department of Justice/Office of Inspector General. “The FBI Laboratory: An Investigation into Laboratory Practices and Alleged Misconduct in Explosives-Related and Other Cases (April 1997).” *Executive Summary*. April 1997.

periods without testifying could result in a lack of proficiency. There were no requirements to update MHCA examiners under these circumstances. (Training/Personnel Qualification Issue – 171)

Observation: As a result, these MHCA examiners may not have been aware of current guidance.



B. FBI Laboratory management did not communicate sufficiently specific guidance to the examiners

Cultural Analysis

This section describes the organizational culture, social, and behavioral issues that created a culture that contributed to management system weaknesses that led to FBI Laboratory management not communicating sufficient MHCA testimony guidance to the examiners.

Informal management systems. The Hairs and Fibers Unit culture was such that staff tended to rely heavily on informal methods to communicate changes (e.g., informal training and procedures) when communicating changes in MHCA report and testimony guidance to the MHCA examiners after the initial training program. (High Standards of Performance – 3 and Empower Individuals – 6)

Observation: As a result, even if sufficiently specific guidance had been developed, it is unlikely that the guidance would have been consistently and effectively communicated to all examiners.

Reliance on oral communication. There was a preference for relying on the experience of mentors and leaders through oral communication instead of relying on policy and formal protocol. (Empower Individuals – 6 and Communication – 8)

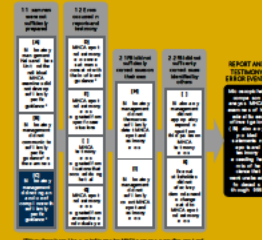
Observation: As a result, even if sufficiently specific guidance had been developed, it is unlikely that the guidance would have been consistently and effectively communicated to all examiners.

Presumption of maintained proficiency. A mindset of “once an expert always an expert” created a culture where individuals within the Hairs and Fibers Unit, especially those who had been there the longest or were perceived to be the most proficient, were assumed to not need any ongoing guidance. In addition, individuals were not seen as vulnerable to error in MHCA testimony after a significant absence from the Hairs and Fibers Unit or long periods when they did not provide MHCA testimony. (Empower Individuals – 6)

Observation: As a result, variation in MHCA testimony could be introduced.

C. FBI Laboratory management did not ingrain a culture of compliance with sufficiently specific guidance.

Lower contributor to the errors.



FBI Laboratory management did not ingrain a culture of compliance with sufficiently specific guidance because the guidance was not in place through 1999. However, there were adjustments made in the guidance throughout the period analyzed. Based on these instances, we concluded that sufficient MHCA testimony guidance would have been sufficiently ingrained had it been developed during the period analyzed and communicated sufficiently.

Conclusion and Significance – Causal Event C

Sufficiently specific guidance was not ingrained in the MHCA examiners because it did not exist at the time. However, the limited MHCA report and testimony guidance that was in place at the time appears to have been largely ingrained, primarily through moot courts.



C. FBI Laboratory management did not ingrain a culture of compliance with sufficiently specific guidance

Data Supporting Conclusion

Each of the statements and observations below supports the conclusion and significance statements for Causal Event C.

Guidance not in place to ingrain. Sufficiently specific guidance was not ingrained into the MHCA examiners because such guidance did not exist prior to 2000.

Management initiative thwarted. Interviewees opined that executive and senior management sometimes tried to institutionalize management systems that were subsequently thwarted by lower level managers and front-line employees who saw no value in the system. They may have complied with the stated requirements, but did not adopt the spirit of the system. For example, accreditation through ASCLD/LAB was viewed by some managers and many of the MHCA examiners as a paperwork exercise that would not improve the quality of the work. It is unknown if the Unit Chief, Training Manager, and mentors would have supported compliance with defined MHCA sufficiently specific guidance if they did not believe they contributed to efficiently and effectively accomplishing the mission.



C. FBI Laboratory management did not ingrain a culture of compliance with sufficiently specific guidance

Data Refuting Conclusion

Each of the statements and observations below refutes the conclusion and significance statements in the call-out box for Causal Event C.

Most reports throughout the period analyzed contained a statement that MHCA could not be used as a means of individualization. Most reports throughout the period analyzed contained a statement similar to: *“It should be noted that hair comparisons are not a means of absolute personal identification.”* This consistency in the reports indicates that this guidance was successfully ingrained.

Testimony transcripts from the MHCA examiner included statements that MHCA could not be used for individualization. Review of the transcripts indicated that MHCA examiners upheld this requirement by:

- Generally, not stating explicitly that MHCA was a means of individualization (which was prohibited)
- Stating, in general (though some transcripts did not contain this statement), that MHCA could not be used as a means of individualization (which they were required to state)

Some transcripts contained analogies and other statements that implied MHCA was a method for individualization, but these statements were not explicitly prohibited by FBI Laboratory management at the time.



C. FBI Laboratory management did not ingrain a culture of compliance with sufficiently specific guidance

Root Cause Analysis

The root causes identified in this section characterize the management system weaknesses that created an environment where FBI Laboratory management did not ingrain a culture of compliance with sufficiently specific guidance.

Management failed to ingrain MHCA sufficiently specific guidance. This could not be accomplished until such guidance was developed (see Causal Event A). (Supervision Issue – 185)

Observation: As a result, sufficient MHCA testimony guidance was not reinforced and ingrained by management.

- **Training was not structured with appropriate content to inculcate (i.e., ingrain) sufficient MHCA testimony guidance.** Training, specifically moot courts were a primary method of ingrain the MHCA testimony limits into the Hairs and Fibers Unit culture. This could not be accomplished until MHCA sufficiently specific guidance was developed (see Causal Event A). (Training/Personnel Qualification Issue – 171)

Observation: As a result, sufficiently specific guidance was not an inherent part of the guidance used by examiners to limit their MHCA testimony.

- **Moot courts failed to inculcate sufficient MHCA testimony guidance.** During initial training, the MHCA examiners participated in three moot courts (there was no requirement for moot courts after initial training). The verbal feedback from the other MHCA examiners during moot courts did not include sufficiently specific guidance to the MHCA examiner. This could not be accomplished until MHCA sufficiently specific guidance was developed (see Causal Event A). In addition, having appropriate personnel involved, such as FBI Office of the General Counsel attorneys, would help to ingrain the use of appropriate MHCA testimony limits. (Training/Personnel Qualification Issue – 171)

Observation: Although moot courts were an excellent method of simulation training for the MHCA examiners in preparation for actual testimony, they did not include guidance on the appropriate limits of the science related to MHCA testimony.



C. FBI Laboratory management did not ingrain a culture of compliance with sufficiently specific guidance

Cultural Analysis

This section describes the organizational culture, social, and behavioral issues that created a culture that contributed to management system weaknesses that led to Laboratory management not ingrain a culture of compliance with FBI-defined MHCA testimony limits.

Autonomy of examiners. In some cases, autonomy of MHCA examiners in the area of MHCA testimony resulted in managers not inculcating sufficient testimony guidance in the examiners. With no formal guidelines, MHCA examiners determined the rules associated with communicating the limits of the science in their own MHCA testimony. In addition, testimony from MHCA examiners was rarely reviewed (see Causal Event H), which further encouraged autonomy in MHCA testimony. In some cases, MHCA examiners believed they were as, or more, experienced than their supervisors. (Empower Individuals – 6)

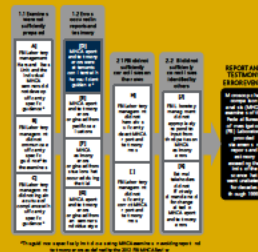
Observation: As a result, MHCA examiners' judgement took priority over their supervisors in determining how examiners delivered their MHCA testimony.

Did not achieve a culture of thoughtful compliance. Regardless of how much guidance was ingrained into the MHCA examiners, they would still face situations where the specific guidance did not adequately address the situation. In these cases, a culture of thoughtful compliance was needed so the examiners could have acted consistently with the intent and within the limitations of the rules and guidance. (High Standards of Performance – 3)

Observation: As a result, the MHCA examiners may not have internalized the intent and limitations of MHCA guidance provided by management.

D. MHCA report and testimony errors were statements consistent with the insufficient testimony guidance.

Lower contributor to the errors.



This causal event addresses the MHCA examiners use of statements in reports and testimony that were consistent with the insufficient guidance. This includes both the use of statements taken directly from the available guidance at the time and the use of statements where no guidance was provided. Issues that arose from the unique circumstances of the individual case are addressed by Causal Event E. Issues that arose during MHCA testimony are addressed by Causal Event F. General issues associated with a specific MHCA examiner are addressed by Causal Event G.

Conclusion and Significance – Causal Event D

It is likely that this event occurred and contributed to unabated MHCA testimony that exceeded the limits of the science. This is because MHCA examiners followed the guidance they were provided regarding statements for MHCA reports and testimony, portions of which were later identified as errors by the 2012 Review.

The significance of this causal event is believed to have increased as elements of guidance for MHCA conclusions from the 1985 symposium hosted by the FBI Laboratory appear to have been used in both report writing and in testimony.



D. MHCA report and testimony errors were statements consistent with the insufficient testimony guidance

Data Supporting Conclusion

Each of the statements and observations below supports the conclusion and significance statements for Causal Event D.

Insufficient guidance. Causal Events A, B, and C conclude that sufficiently specific guidance was not available to the examiners during the period of the analysis, nor was such guidance communicated or ingrained (because it did not exist). The associated MHCA examiner errors include both the use of statements consistent with the available guidance at the time or the use of statements where no guidance was provided. These errors occurred in both reports and testimony.

- **Reports.** Almost half of the FBI Laboratory MHCA reports had statements judged to be errors by the 2012 Review. Almost all report errors (over 98%) described the questioned hair using the phrases consistent with having originated from [individual's name] or consistent with having come from [individual's name] instead of could have come from [individual's name], which the 2012 Review determined was not an error. MHCA examiners infrequently made other report errors. These statements were consistent with guidance developed between 1982 and 1985 and formally presented at an FBI-hosted international symposium on MHCA in 1985. We concluded that the report errors occurred, in part, based on information in the guidance developed for the symposium.
- **Testimony.** As with reports, testimony included the use of statements consistent with guidance presented at an FBI-hosted international symposium on MHCA in 1985. Use of this terminology started in the early 1980s and increased until it peaked in the mid-1990s. Testimony errors also included the use of statements or phrases not addressed by any specific or implied guidance at the time. For example, when speaking to peers, examiners in the FBI Laboratory often referred to an association between the known sample and the questioned sample as a “match.” There was no specific guidance prohibiting the use of this terminology, so “match” was often used by examiners in their testimony.



D. MHCA report and testimony errors were statements consistent with the insufficient testimony guidance

Data Refuting Conclusion

Each of the statements and observations below refutes the conclusion and significance statements for Causal Event D.

A 1991 memo did provide some guidance. A 1991 memo indicated that an MHCA examiner overstated his conclusions during testimony. MHCA examiners were trained (based on the 1991 memo) not to use “perfect match” or refer to their own personal experience to imply a probability that the hairs came from a particular individual in MHCA testimony. Analysis of transcript data (see the analysis for Question 5b in Section 4.5) indicates that: the use of “perfect match” was essentially eliminated and the training may have had an impact on the use of probability statements.

Some guidance appears to have resulted from the O. J. Simpson trial. In 1995, MHCA testimony was provided by an FBI examiner as part of the O. J. Simpson trial. During the testimony, there was an objection regarding the use of the word “match” to describe the link between the known and questioned hair samples, and the judge ruled that the term could not be used by the MHCA examiner.¹⁰³ Following the trial, interviewees indicated that MHCA examiners were directed to stop using “match” and only use the phrase “the microscopic characteristics of the known and questioned hairs were consistent.” Analysis of transcripts (see the analysis for Question 7 in Section 4.5) indicates that the use of “match” apparently decreased after the O.J. Simpson trial.

103 Margolick, David, *Hairs Resembling Simpson's are Identified by an Expert*, The New York Times, July 1, 1995

Some MHCA examiners had few errors in their MHCA reports. The 2012 Review did not identify any errors in about 50% of the reports, including some reports after 1985. While some examiners appeared to have consistently used statements (from 50% to almost 100% of the reports available) conforming to guidance provided in the FBI-hosted international symposium on MHCA in 1985 (which were subsequently labeled errors by the 2012 Review), several MHCA examiners only occasionally used the statements.

During testimony, some MHCA examiners appear to have avoided errors by not saying anything. Numerous instances were observed in testimony where an MHCA examiner was in a situation similar to situations where other MHCA examiners made an error, yet they avoided error by reframing the testimony to avoid the use of any erroneous statements.



D. MHCA report and testimony errors were statements consistent with the insufficient testimony guidance

Root Cause Analysis

Root causes are not provided in this section because Causal Event D appears fully driven by the lack of sufficiently specific guidance. Therefore, the root causes that drove Causal Events A, B, and C are also the drivers for this causal event and are not repeated here.



D. MHCA report and testimony errors were statements consistent with the insufficient testimony guidance

Cultural Analysis

Cultural causes are not provided in this section because Causal Event D appears fully driven by the lack of sufficiently specific guidance. Therefore, the cultural causes that drove Causal Events A, B, and C are also the drivers for this causal event and are not repeated here.

E. MHCA testimony errors originated from specific case situations.

Lower contributor to the errors.

This causal event addresses MHCA examiner activities that occurred prior to testimony, such as evidence collection, evidence processing, interactions with the submitter of the items (i.e., law enforcement personnel). These issues did not arise during each case. Those issues that did occur usually were the result of the unique circumstances of that individual case. Issues that arose during MHCA testimony are addressed by Causal Event F. General issues associated with a specific MHCA examiner are addressed by Causal Event G.

Conclusion and Significance – Causal Event E

It is likely that this event occurred and contributed to unabated MHCA statements in testimony that exceeded the limits of the science as defined by the 2012 Review. This is because MHCA examiners did not have sufficiently specific guidance (Causal Event A) to avoid statements that exceeded the limits of the science in their MHCA testimony. In addition, in some instances, MHCA examiners were exposed to detailed case-specific information that could have influenced the statements used to describe the MHCA association. Exposure to detailed case-specific information occurred infrequently during the early portion of the period analyzed and became less frequent toward the end of the period analyzed.

The significance of this causal event is believed to have been initially small and decreasing throughout the period analyzed. This decrease likely occurred because:

- There was less interaction between the MHCA examiner and field personnel (including law enforcement personnel) as the period analyzed progressed because (1) agent-examiners were largely replaced with non-agent examiners and (2) MHCA examiners performed less evidence collection.
- The single, integrated report produced by one examiner was eliminated later in the period analyzed and replaced with the current system of each examiner producing their own report.



E. MHCA testimony errors originated from specific case situations

Data Supporting Conclusion

Each of the statements and observations below supports the conclusion and significance statements for Causal Event E.

Knowing specifics of the case. Some interviewees stated that they might testify more strongly (e.g., saying that in all probability the questioned hair belonged to the defendant) when they were aware of the details of the case. One of the interviewees specifically stated that in at least one instance, the MHCA examiner's knowledge of other aspects of the case (e.g., circumstances of the crime, presence of suspects at the crime scene, conclusions from other Laboratory examinations) likely influenced their MHCA testimony. Research

into human bias^{104, 105} indicates that the MHCA examiners could have been unconsciously influenced by knowing other factors concerning the case. MHCA examiners could gain additional knowledge of the case in several ways, including:

- **Fibers analysis.** Additional comparisons the MHCA examiner performed, such as also identifying a fiber that was consistent with fibers from an article of the defendant's clothing.
- **Results of analyses from other FBI disciplines.** In their role as primary or coordinating examiner in a case, the MHCA examiners would be knowledgeable of the analysis results from other disciplines in the FBI Laboratory. The primary or coordinating examiner assembled the overall Laboratory report from the dictation of MHCA examiners in other disciplines. In 1999, the practice of the primary or coordinating examiner compiling an integrated report was eliminated and each discipline produced their own report.
- **Evidence collection.** In a few cases, MHCA examiners traveled to the crime scene (or other relevant locations) to support evidence collection. During this process, the MHCA examiner could also have discussions with the law enforcement personnel involved in the case regarding potential suspects, the background of the suspects, and other details of the investigation. During the period analyzed, the occurrence of MHCA examiners performing evidence collection decreased as these responsibilities were largely transferred to other personnel.
- **Interfaces with law enforcement personnel.** Even if the MHCA examiner did not assist with evidence collection, they may have had discussions with the law enforcement personnel associated with the case prior to performing the MHCA or prior to testifying. Some communication with the submitting agency personnel was necessary to perform the MHCA efficiently. This appears to have occurred more often when the MHCA examiner role was staffed with FBI agents with prior field experience. As the agents were replaced with non-agents in the mid- to late 1990s, the frequency and depth of the discussions decreased.
- **Media information and reports.** MHCA examiners could have learned case specifics from media reports. This could have occurred as examiners were reading local newspapers or watching the local television stations while traveling to provide testimony. Some cases received national attention and would have been covered by national publications and broadcasts. Late in the period analyzed, case information may have been available via the Internet.

Connection with the victim. Some interviewees also noted that in a few cases, they connected with the victims of the crime. For example, the victim could be a 7-year-old girl, and the MHCA examiner had a 7-year-old daughter. The case could have also involved a fellow law enforcement officer as a victim. As noted above, research shows that this additional information regarding the case could have unconsciously biased the MHCA examiners.^{106, 107}

104 Ethics in Forensic Science, J.C. Upshaw Downs and Anjali Ranadive Swienton, Elsevier Press, 2012, Chapter 12

105 Cognitive Bias Effects Relevant to Forensic Science Examinations, FSR-G-217, Issue 1, Forensic Science Regulator, 2015

106 Contextual information renders experts vulnerable to making erroneous identifications. Itiel E. Dror, David Charlton, Ailsa E. Peron, Forensic Science International, 6 Jan 2006,

107 Bibliography – Cognitive Bias in Forensic Science at www.forensicsdna.com/assets/bias-bibliography.pdf



E. MHCA testimony errors originated from specific case situations

Data Refuting Conclusion

Each of the statements and observations below refutes the conclusion and significance statements for Causal Event E.

Believed they were not influenced by case specifics. Many of the interviewees did not believe that knowledge of the specifics of a case influenced them in keeping their MHCA testimony within the limits of the science and that in fact it helped them provide better support for the case.



E. MHCA testimony errors originated from specific case situations

Root Cause Analysis

The root causes identified in this section characterize the management system weaknesses that created an environment where MHCA testimony errors originated from specific case situations.

Difficulty handling additional knowledge of the case. Without sufficiently specific guidance on how to address interfaces with the submitters, the interfaces facilitated MHCA examiners providing testimony that exceeded the limits of the science when they had additional knowledge regarding the details of the case. It is possible that this additional knowledge could have influenced the statements used by the MHCA examiner to describe the association. (Human Factors Issue – 146)

Observation: As a result, MHCA examiners may have obtained additional details about the case not required to perform the MHCA that unconsciously influenced their testimony.

Inherent human bias. Individuals with other knowledge of the case can be consciously or unconsciously influenced by this information. (Human Factors Issue – 146)

Observation: As a result, the testimony of the MHCA examiners may have been affected by the additional details of the case, without the examiners' conscious awareness.

Primary examiner role. Prior to 1999, the FBI Laboratory used one of the MHCA examiners to generate a report that included the results of the examinations from all the disciplines that performed analyses. As a result, the primary or coordinating examiner would have detailed knowledge of the results of examinations done by other FBI Laboratory disciplines. (Supervision Issue – 185)

Observation: As a result, MHCA examiners gained additional details about the case as part of performing their normal duties.

Lack of separation of roles. Individuals who went to the crime scene to support collecting evidence were, in some cases, the same individuals who performed the analysis. The examiners became investigators as well as analysts. (Supervision Issue – 185)

Observation: As a result, MHCA examiners who collected and analyzed evidence may have been trying to determine the guilt or innocence of suspects rather than simply providing input for the deciders of fact (jurors/judges) to make that decision.



E. MHCA testimony errors originated from specific case situations

Cultural Analysis

This section describes the organizational culture, social, and behavioral issues that contributed to management system weaknesses that led to MHCA testimony issues originating from specific case situations.

Insufficient guidance. Sufficiently specific guidance was not provided for the MHCA examiner to consistently respond as desired when having information on case-specific situations. (High Standards of Performance – 3 and Empower Individuals – 6)

Observation: As a result, the MHCA examiners had to develop their own guidelines for determining what case information was relevant and necessary to do their work and what was not.

Limited sense of vulnerability. The potential influence of the case-specific information should have been recognized as a potential source of influence. The potential of case-specific information being an influence on MHCA testimony was not recognized, in part, because no formal assessment had been performed regarding how often the influence could create errors. Had a formal assessment been performed, with appropriate personnel involved, including personnel with legal and human factors expertise, it is more likely that this potential influence could have been identified and addressed. (Sense of Vulnerability – 5)

Observation: As a result, no specific guidance or methods were provided for the examiners to deal with this information that could potentially influence their testimony.

Autonomy of MHCA examiners. FBI Laboratory management trusted that the MHCA examiners would testify appropriately because they were highly trained and experienced personnel. However, even under the best conditions, monitoring of personnel performance is essential. The ASCLD/LAB accreditation standards required testimony monitoring,¹⁰⁸ and the Office of Inspector General included this in their investigation.¹⁰⁹ (see Causal Event H). (Continuous Monitoring – 12)

Observation: As a result, when testimony that exceeded the limits of the science occurred, FBI Laboratory management was not very likely to detect it.

108 Given, Jo Ann, Chair, ASCLD-LAB to Dr. Donald M. Kerr, Federal Bureau of Investigation Laboratory. “Accreditation Inspection Report and Accreditation Decision”, July 28, 1998. 42 pages.

109 United States Department of Justice/Office of Inspector General. “The FBI Laboratory: An Investigation into Laboratory Practices and Alleged Misconduct in Explosives-Related and Other Cases (April 1997).” Executive Summary. April 1997.


Conclusion and Significance – Causal Event F

It is likely that this event occurred and contributed to unabated MHCA testimony that exceeded the limits of the science given that MHCA examiners were not prepared to constrain their MHCA testimony to the limits of the science and that MHCA examiners were exposed to MHCA testimony-specific situations.

Based on interviews and transcript reviews, examiners understood the approaches used by prosecutors and were often successful in navigating the situation to avoid testimony errors. However, at times, they gave MHCA testimony that exceeded the limits of the science as a result of these testimony-specific situations.



Each of the statements and observations below supports the conclusion and significance statements for Causal Event F.

 **ABS Group** Root and Cultural Cause Analysis of Report and Testimony Errors by FBI MHCA Examiners

- **Response to questions during direct MHCA testimony or cross examination.** In response to a question from a prosecutor or defense counsel, the MHCA examiner may respond in a way that results in testimony that exceeded the limits of the science. For example:
 - In response to a question about MHCA statistics, the MHCA examiner could state general MHCA statistics or imply statistics from the work the MHCA examiner performed.
 - *Counsel:* Have you ever encountered a situation in your analyses, over the last 6 years, of involving 3,500 to 4,000 people, where the characteristics, the hair characteristics, of any two individuals were the same?
 - *Examiner:* Yes, I have. There have been two cases of which the pubic hairs involved Caucasian individuals in which pubic hairs from two different individuals were so alike that I couldn't tell them apart microscopically. Again, a very rare event. It can happen.
 - *Counsel:* A rare event in your experience.
 - *Examiner:* Absolutely.
 - In response to a question from a prosecutor or defense counsel that contained a statement that exceeded the limits of the science, the MHCA examiner may not clarify the appropriate limits of the science.
 - *Counsel:* Again, just so we are clear, Agent, the hairs that you found in the vehicle -- victim's vehicle, after you did your comparison, what type of match did you find?
 - *Examiner:* Well, I had a single head hair match with [individual], and then I had -- it appears to be four different separate hair matches of [individual]. These were head hair matches.

This was not limited to prosecutors; defense counsels would sometimes phrase questions in this manner.

See the analysis for Question 9 in Section 4.5, *Analysis of transcripts*, for further analysis of testimony errors which were prompted or unprompted.

- **Attorneys pushing for stronger testimony.** Some interviewees noted that some attorneys (mostly prosecutors, but also defense counsel) would push the examiners for stronger testimony to support their case. In most cases, the interviewees indicated that they would not yield to such pressure. They knew what they could and could not say. It is difficult to determine the magnitude of this issue from transcript reviews. The most common situation where this occurred was when an attorney would ask a question that contained an error, and the MHCA examiner would not always address the erroneous statement by the attorney.
 - Example
 - *Counsel:* During the comparison that you have made, although, it is not a definite, and you haven't testified that it was; but during the fourteen (14) years, have any of the comparisons you have made indicated that two (2) people having the same, exactly the same type of hair, at any time during that fourteen (14) years?
 - *Examiner:* I have had on two (2) occasions, hairs that were from different people that exhibited extremely similar characteristics. And that's an extremely small percentage

of all the known samples that I have looked at. But on occasion, hairs from different individuals are found that are very similar.

- **Clarification.** To communicate the results of their analyses and their significance, MHCA examiners may have provided additional testimony that exceeded the limits of the science. Interviews indicated that sometimes they wanted to do this so the jury would understand their testimony.

- Example

Following an objection from the defense counsel regarding the admissibility of the MHCA examiner's testimony on the grounds that simply stating "*could have come from*" did not meet the admissibility standard, the examiner stated "Okay. I can say with reasonable scientific certainty the hair originated from the victim."

- **Response by judges.** Interviewees indicated that, in general, judges were not very effective in limiting MHCA testimony that exceeded the limits of the science. Some examples from transcripts include:

- Example 1

Counsel: Based on your training and experience, are you able to say with confidence that the hairs contained in State's Exhibit 39 came from the same head as the hairs which were submitted to you under the name of [defendant]?

Examiner: I am able to say that based on my experience and the literature available that if [defendant] had nothing to do with this these hairs should not look like his.

Opposing Counsel: I will object, Your Honor. That's a non-responsive answer. That is not the question she asked.

The Court: That is overruled.

- Example 2

Counsel: Well, what would be the -- and I don't know if you could do this -- what would be the chance or percentage that the four hairs on [that item] were someone's other than the defendant's?

Examiner: I --.

Opposing Counsel: Objection.

Counsel: An expert --

The Court: If he can do it, I'll permit him to do it.

Examiner: No, I cannot, your Honor, give a percentage or probability number. That's just beyond the realm of this science.

Counsel: But the only time you found more than one person with a hair was, as you said, for identical twins?

Examiner: In my experience, yeah.

Opposing Counsel: Objection, objection.

Counsel: The same response, he can --

The Court: Yes, I'll permit that.

Examiner: Yeah. In other words, I've had cases in which I've had known hair samples submitted from over 100 people, and I am asked to be able to distinguish between them,

which -- which I have been able to. I mean, some of them at times appear microscopically very similar to each other, but in a side by side comparison, and that's what makes this a unique comparison, we're able to see differences.

- **Inadvertent statements that exceeded the limits of the science.** Regardless of the preparation and MHCA testimony guidance, statements that exceed the limits of the science may still occur occasionally.
 - For example, the MHCA examiner may have made a statement that exceeded the limits of the science and immediately made an effort to correct it. Although this did not occur frequently, there were instances where this did happen.
 - In other cases, the MHCA examiners may have been constrained by the legal restrictions of cross examination or direct inquiry from a judge to frame their response in a manner, that in hindsight may have exceeded the limits of the science.
 - In other cases, MHCA examiners may have determined after testifying that they made statements that exceeded the limits of the science. There was no mechanism in the judicial system for the MHCA examiners to resolve this situation.



F. MHCA testimony errors originated from situations that occurred during the trial

Data Refuting Conclusion

Each of the statements and observations below refutes the conclusion and significance statements for Causal Event F.

Most of the interviewees did not believe that testimony-specific situations influenced them in keeping their MHCA testimony within the limits of the science. Most interviewees believed that the MHCA testimony they had provided was within the limits of the science and that MHCA testimony-specific situations did not cause them to provide testimony that exceeded the limits of the science.



F. MHCA testimony errors originated from situations that occurred during the trial

Root Cause Analysis

The root causes identified in this section characterize the management system weaknesses that created an environment where MHCA testimony errors originated from situations that occurred during the trial.

Difficulty handling testimony-specific situations. Without sufficiently specific guidance, it was more likely that MHCA examiners would drift into MHCA testimony that exceeded the limits of the science when they had to address testimony-specific situations. (Human Factors Issue – 146)

Observation: Without specific guidance and the ingraining of that guidance into the examiners, they were less likely to identify error-likely situations that occurred during testimony and implement effective strategies to respond to these situations.

Lack of formal feedback from MHCA testimony. Following MHCA testimony where unusual situations arose, the MHCA examiners would sometimes have an informal debrief with their Unit Chief and/or other MHCA examiners in the Unit. However, this feedback process was informal and rarely documented or formally communicated to other MHCA examiners. In addition, the lessons learned from this issue were not documented in formal MHCA testimony guidance to capture the lessons learned and facilitate communication to future MHCA examiners. (Procedure Issue – 122)

Observation: As a result, there could have been inconsistent communication of the lessons learned to other examiners. Some MHCA examiners may not have been made aware of the situation and new guidance.



F. MHCA testimony errors originated from situations that occurred during the trial

Cultural Analysis

This section describes the organizational culture, social, and behavioral issues that contributed to the management system weaknesses that led to MHCA testimony issues originating from situations that occurred during the trial.

Insufficient guidance. The guidance was not sufficiently specific for the MHCA examiner to consistently respond as desired when having to address testimony-specific situations. (High Standards of Performance – 3 and Empower Individuals – 6)

Observation: As a result, the MHCA examiners may not have responded as effectively as they could have to these testimony-specific situations.

Informal management systems. There was no formal approach to capturing lessons learned. In general, the Unit avoided documentation of processes, including a formalized lessons-learned process. (Empower Individuals – 6 and Questioning/Learning Environment – 9)

Observation: As a result, lessons learned may not have been as effectively shared across all the personnel providing MHCA testimony.

Overconfidence by Laboratory management. Management was overconfident in the ability of the MHCA examiners to testify within the limits of the science. As a result, the potential influence of the testimony-specific situations on MHCA testimony was not recognized. The risk of testimony-specific situations influencing MHCA testimony was not recognized, in part, because no formal assessment had been performed. (Sense of Vulnerability – 5)

Observation: Had a formal assessment of the potential for MHCA testimony errors been performed, with appropriate personnel involved, it is more likely that these situations could have been identified and addressed.

Autonomy of MHCA examiners. FBI Laboratory management trusted that the MHCA examiners would testify appropriately because they were highly trained and experienced personnel. However, even under the best conditions, monitoring of personnel performance is essential (see Causal Event I). (Strong Leadership – 2 and Continuous Monitoring – 12)

Observation: As a result, it was more difficult for FBI Laboratory management to provide appropriate testimony-specific guidance because they were unaware of the specific issues that arose during MHCA testimony.

G. MHCA report and testimony errors originated from an examiner's individual style.

Lower contributor to the errors.

This causal event addresses issues related to specific examiners.

Conclusion and Significance – Causal Event G

This event very likely occurred and contributed to some instances of the MHCA reports and testimony that exceeded the limits of the science. However, this was not a dominant contributor to the MHCA examiner testimony issues.



G. MHCA report and testimony errors originated from an examiner's individual style

Data Supporting Conclusion

Each of the statements and observations below supports the conclusion and significance statements for Causal Event G.

Interviewees provided some examples of examiner issues:

- **Examiners used their prior reports as a template.** During interviews, MHCA examiners indicated that they would use one report as the template for producing the next report. This could have the effect of inadvertently propagating errors in the reports. It is consistent with the data that show some examiners had few report errors and some had very high numbers of report errors.
- **Examiner overconfidence.** Some MHCA examiners may have had too much confidence in their MHCA results. This could occur when the MHCA examiner “believed” the methodology could, under some circumstances, approach or result in individualization or that the probability of identifying the wrong person was very low. The experience of MHCA examiners in the FBI Laboratory could have been used by the examiners to support such a conclusion.
- **Examiner willing to push the limits.** Some MHCA examiners were willing to push the limits. Interviewees talked about stronger MHCA testimony in some situations (e.g., “when you knew he did it”), but they still believed the MHCA testimony was within the limits of the science.

- Rules did not apply to experienced MHCA examiners.** A key issue to success as an MHCA examiner identified by many interviewees was the examiner's experience. Although there was very limited formal testimony guidance provided to the MHCA examiners, what little guidance provided was sometimes thought by Hairs and Fibers Unit personnel to not apply as rigorously to the experienced/knowledgeable MHCA examiners. Some interviewees said more experienced MHCA examiners could say things less experienced MHCA examiners could not. For example, an inexperienced MHCA examiner might not be able to say that characteristic X of a hair was rare because he or she had not seen enough hairs to make that statement. However, experienced MHCA examiners could because they had the personal experience. Because an MHCA examiner could only testify to what they had done personally, the examiner's experience was a key factor. Discussions at the 1985 International Symposium on Forensic Hair Comparisons state several times that "examiner experience"¹¹⁰ was a primary factor in determining what an examiner could feel comfortable stating during testimony. An example from MHCA examiner testimony (which was not deemed by the 2012 Review to contain an error) included:

Counsel: Uh, and then you say there's a matter of sort of interpretation that comes into play here that's based on the experience of the examiner, which you isolate as the important ...

Examiner: That's correct.

Counsel: ... the most important factor.

Examiner: That's correct.

Counsel: And so he makes a subjective judgement based on his analysis of what he sees.

Examiner: Based on, it's his opinion, that's correct.

Counsel: Oh. And it's subjective.

Examiner: It's, I'm not questioning what you mean by, uh, subjective. Uh ...

Counsel: Well, it, it depends on the examiner.

Examiner: Well ...

Counsel: I mean, he's a, it's a kind of an art.

Examiner: As much as science can, yes.

However, this should not be the case; the limits of the science should be the same for all MHCA examiners.

- Management did not take a strong interest in this issue or management did not notice.** Based on interviews and document reviews, management did not take a strong interest or take a lead in specifying and documenting MHCA sufficiently specific guidance. In addition, the formal MHCA testimony monitoring program was virtually non-existent during most of the period analyzed and what was instituted in the late 1990s was not effective in addressing such testimony that exceeded the limits of the science. This issue ties into the lack of an MHCA testimony monitoring program under the lack of abatement branch of the CESD.

110 Proceedings of the International Symposium on Forensic Hair Comparisons: FBI Academy, Quantico, Virginia, June 25-27, 1985. p. 37, 43, 45, 46, 95, 108, 112, 177, 194, 204, 205

- **Popularity/peer pressure.** A few MHCA examiners indicated that some of the examiners took pride in getting convictions. Although there were no formal rewards in the FBI system for conviction rates or even association rates, some individuals apparently wanted a personal reputation as an MHCA examiner who helped get convictions. The personnel we interviewed did not indicate that this was a strong driver for their performance, but the interviewees indicated that it may have been a driver for a few individuals.
- **Law enforcement approach.** In some cases, the MHCA agent examiners indicated that they performed as investigators, as well as MHCA examiners. In addition to performing the laboratory work, they were assisting in developing inculpatory evidence against an individual for the trial. This appeared to be more of an issue with the agent-examiners and less from the non-agent examiners. In some cases, the agent-examiners were drawn into the specifics of the case (see Causal Event E) and would attempt to integrate their findings with other evidence in the case. The setup of the FBI Laboratory as part of a law enforcement agency could have influenced the MHCA examiners to see themselves as advocates of the prosecutors and not impartial parties. MHCA examiners would regularly meet with the prosecutors prior to providing their MHCA testimony, but would rarely if ever, meet with defense counsel.
- **Effective approaches to communicating with the jury.** During interviews, MHCA examiners expressed how important it was for them to effectively communicate the work they did and the results to the jury. They would find good ways of explaining concepts to the jury, like the face analogy. Lacking any feedback that the analogy was inappropriate (it was usually stated to imply individualization), it often became a standard part of their MHCA testimony. One example:

Examiner: Your face only has a finite number of features, two eyes, two ears, a nose, a mouth, maybe some moles and freckles, but it's how they are distinctly arranged on your spouse or your friend or yourself that allows you to pick that person out. And the same thing with the hair comparison. All hairs is (sic) essentially going to have these different parts. It's how they're distinctly arranged in your hair or your head or pubic hairs that allows the forensic hair examiner to tell your hair apart from someone else's.



G. MHCA report and testimony errors originated from an examiner's individual style

Data Refuting Conclusion

Each of the statements and observations below refutes the conclusion and significance statements for Causal Event G.

Examiner issues were not an influence. Many of the interviewees did not believe that the examiner issues outlined above influenced them in keeping their statements in MHCA reports and testimony within the limits of the science.



G. MHCA report and testimony errors originated from an examiner's individual style

Root Cause Analysis

The root causes identified in this section characterize the management system weaknesses that created an environment where MHCA testimony issues originating due to a specific examiner's individual style occurred.

Difficulty handling specific examiner issues. Without sufficiently specific guidance, it facilitated MHCA examiners providing statements in reports and testimony that exceeded the limits of the science when they had specific examiner issues. (Human Factors Issue – 146)

Observation: As a result, some MHCA examiners may have unintentionally provided testimony that exceeded the limits of the science.

Lack of MHCA testimony monitoring. If the MHCA examiners knew no one would figure out they were providing testimony that exceeded the limits of the science, they could be more likely to provide testimony that exceeded the limits of the science. See Causal Event H for issues related to testimony monitoring. (Supervision Issue – 185)

Observation: With no testimony monitoring in place, it is possible some examiners would have pushed the limits of the science in their testimony from time to time.

Autonomy of MHCA examiners. FBI Laboratory management trusted that the MHCA examiners would testify appropriately because they were highly trained and experienced personnel. However, even under the best conditions, monitoring of personnel performance is essential. See Causal Event H for issues related to testimony monitoring. (Supervision Issue – 185)

Observation: As a result of providing a great deal of MHCA examiner autonomy, it was more difficult for FBI Laboratory management to detect testimony that exceeded the limits of the science.



G. MHCA report and testimony errors originated from an examiner's individual style

Cultural Analysis

This section describes the organizational culture, social, and behavioral issues that contributed to management system weaknesses that led to MHCA testimony issues originating due to a specific examiner's individual style.

Insufficient standards of performance. The standards of performance were not sufficiently specific for the MHCA examiner to consistently respond as desired when specific examiner issues arose. (High Standards of Performance – 3 and Empower Individuals – 6)

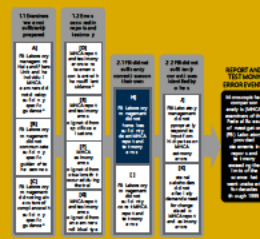
Observation: As a result, there likely were variations in the testimony limits used by each of the MHCA examiners.

Autonomy of the MHCA examiners/insufficient supervision. Even with specific standards of performance, supervision needs to take an active role in ingrain those standards in personnel. The management of the Unit failed to provide sufficient leadership to ingrain adherence to providing MHCA testimony within the limits of the science. Their failure to develop MHCA report and testimony standards and take an interest in monitoring testimony was an underlying contributor to the situation. (Strong Leadership – 2 and Continuous Monitoring – 12)

Observation: As a result, some MHCA examiners may have unintentionally provided testimony that exceeded the limits of the science.

H. FBI Laboratory management did not sufficiently detect MHCA report and testimony errors.

Second highest contributor to the errors.



This causal event addresses the FBI Laboratory’s methods and actions to detect MHCA testimony that exceeded the limits of the science. Once detected, they would need to act to correct the issues identified (see Causal Event I). This causal event does not address detection of MHCA testimony that exceeded the limits of the science by groups outside the FBI. That is addressed by Causal Event K.

Conclusion and Significance – Causal Event H

This event very likely occurred and contributed to most instances of the unabated MHCA report and testimony errors.



H. FBI Laboratory management did not sufficiently detect MHCA report and testimony errors

Data Supporting Conclusion

Each of the statements and observations below supports the conclusion and significance statements for Causal Event H.

Ongoing errors throughout the period. There were ongoing errors throughout the period for which transcripts were available (1971 through 2003). The 2012 Review team determined that approximately 90% of the 484 MHCA examiner trial transcripts from the study period contained at least one error and, on average there were about six errors per transcript. For example, some transcripts contained statements that implied MHCA is a method for individualization (see Section 2.1 for a description of the three error types

used by the 2012 Review). There was an apparent, slight decrease in the number of errors over the period analyzed.

Lack of MHCA sufficiently specific guidance. As described in Causal Event A, sufficiently specific guidance did not exist during the period analyzed. In addition:

- A formal MHCA testimony monitoring program was not created until 1995. However, the monitoring did not ask for feedback on the content of MHCA testimony until it was revised in 1998 and even then, there was no explicit guidance regarding what statements exceeded the limits of the science.
- Interviewees indicated that obtaining transcripts for trials was unusual due to the expense.

Lack of a formal MHCA testimony monitoring program during most of the period analyzed. As described in the *MHCA Timeline* in Section 4.2, a formal testimony monitoring program was not in place for most of the period analyzed. When a program was put in place in the mid- to late-1990s, the program was not effective at identifying testimony that was beyond the limits of the science.

MHCA reports did not generally contain the significance of the findings. The significance of the examiner's findings was generally not included in the FBI Laboratory report, such as the uniqueness of the characteristics of the samples, and it was left to the examiner to convey the significance in court without exceeding the limits of the science. During court testimony in 1979, one of the MHCA examiners indicated that it was the Unit's policy to not include the significance in the reports (although we did not find a written policy on this issue during the period analyzed). This was consistent with the written report guidance in the revised guide published in 2004: "An interpretation of the evidence is saved for testimony that includes an explanation about the basis for examinations." The 1977 version of the guide did not mention including or excluding the interpretation of the evidence.

One exception to the exclusion of significance statements was the use of the phrase *consistent with having originated from [individual's name]* or *consistent with having come from [individual's name]* instead of *could have come from [individual's name]*, which the 2012 Review determined was not an error. Almost all of the report errors contained one of these phrases, which may have been used after about 1985 to indicate a stronger association of the known and questioned hairs. Laboratory management did not provide the MHCA examiners with a written procedure or guideline for testimony that addressed appropriate methods for communicating the significance of their findings within the limits of the science during testimony.

As a result, Hairs and Fibers Unit management could not detect report errors because they used inappropriate guidance during the review and could not detect testimony errors by reviewing the reports because the reports did not contain significance statements typically used in testimony.

Issues identified by third parties. The extent and depth of problems with testimony by Hairs and Fibers Unit MHCA examiners, identified by third parties since the mid-1990s indicates how ineffective the FBI Laboratory's internal approaches to identification of issues was. See the *MHCA Timeline* in Section 4.2 for a discussion of the Office of Inspector General's investigation in the mid-1990s and Causal Event K for discussions of other MHCA testimony issues identified by third parties



H. FBI Laboratory management did not sufficiently detect MHCA report and testimony errors

Data Refuting Conclusion

Each of the statements and observations below refutes the conclusion and significance statements for Causal Event H.

Limited number of issues with MHCA examiner testimony identified internally. There were some instances that came to the attention of the FBI Laboratory management through 1999 (e.g., one or more agents saying “*perfect match*”). For some of these incidents, it is unclear which issues were identified through internal processes and which were identified based on third-party input (see Causal Event K). In the case of the “*perfect match*” complaint, this did result in an internal FBI memo that described limited modifications to MHCA report and testimony guidance.¹¹¹ However, this was not incorporated into formal MHCA report and testimony guidance. At the time this occurred, there was no formal procedure incorporating MHCA report and testimony guidance. Based on interviews, the MHCA examiners did receive infrequent, informal negative feedback from court personnel (e.g., defense counsel and judges). However, the ABS Group team could only identify a very limited number of instances where MHCA report or testimony statements that exceeded the limits of the science were independently identified by Laboratory management during the period analyzed (e.g., the use of “*match*” following the O. J. Simpson trial and potentially the use of “*perfect match*” in another trial).



H. FBI Laboratory management did not sufficiently detect MHCA report and testimony errors

Root Cause Analysis

The root causes identified in this section characterize the management system weaknesses that created an environment where FBI Laboratory management did not sufficiently detect MHCA report or testimony statements that exceeded the limits of the science.

The FBI did not identify MHCA report or testimony statements that exceeded the limits of the science by MHCA examiners as a significant risk for the organization.

- **No formal assessment of how often examiners were making errors.** The FBI did not routinely perform formal assessments in the Hairs and Fibers Unit to identify performance gaps in achieving their mission (e.g., the potential for ongoing instances of MHCA report and testimony statements that exceeded the limits of the science). This lack of formal assessment contributed to a situation where there was a fundamental lack of awareness regarding how often MHCA report and testimony errors were occurring. (Hazard/Defect Identification and Analysis – 94)

111 “Internal FBI memos to FBI Laboratory Director Hicks.” 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

Observation: As a result, they may not have placed a high enough priority on monitoring MHCA examiner statements for potential errors.

- **No procedure for assessing how often examiners were making errors.** The Hairs and Fibers Unit did not have a written procedure for performing assessments of risks which may have prompted implementation of an initial or a periodic formal assessment of how often examiners were making errors. (Procedure Issue – 122)

Observation: With no procedural requirement to perform MHCA report and testimony statement monitoring, it was less likely that it would be performed.

- **Lack of appropriate personnel involved in assessment of how often examiners were making errors.** Had they performed a formal assessment of how often examiners were making errors, it is unlikely they would have had the appropriate personnel involved in the assessment, such as subject matter experts in statistics and legal aspects related to MHCA testimony. The ABS Group team concluded this based on comments from the interviewees on their valuation of input from these subject matter experts. (Supervision Issue – 185)

Observation: As a result, it would be unlikely that FBI Laboratory management would have developed sufficiently specific MHCA report and testimony guidance documentation.

No requirements for sufficiently explicit guidance for MHCA testimony. There were no Laboratory requirements (e.g., policy, standards) to have sufficiently explicit guidance for MHCA report and testimony statements in place. This was true even after the FBI Laboratory was accredited in the late 1990s. (Procedure Issue – 122)

Observation: As a result, it would be difficult to develop a procedure that included the guidance and a testimony monitoring program to detect when MHCA report and testimony statements exceeded the limits of the science.

There was no formal standup of the Hairs and Fibers Unit organization. There was no identified formal standup during the evolution of the Hairs and Fibers Unit from 1 person to over 20 personnel. (Design Issue - 18)

Observation: A formal standup of the Unit would have likely resulted in more formality in standards, policies and administrative controls resulting in a more complete understanding and addressing of the vulnerabilities. This may have resulted in better guidance and fewer errors in report and testimony statements.

Insufficient rewards. Insufficient positive rewards existed for Hairs and Fibers Unit personnel to identify MHCA report and testimony issues. Even if an appropriate definition for MHCA report and testimony statements that exceeded the limits of the science had been identified, it is unlikely MHCA examiners would have reported all MHCA report and testimony issues to management. (Personnel Performance Issue – 207 [Company Issue – 208])

Observation: As a result, some MHCA report and/or testimony issues identified by examiners may not have been communicated to FBI Laboratory management.

No formal report and testimony monitoring program. For most of the period analyzed, there was no formal MHCA report and testimony statement monitoring program making it difficult to detect MHCA

report and testimony statements that exceeded the limits of the science. During the last 4 years of the period analyzed, MHCA testimony monitoring did exist. For 2 years it did not examine the content of the MHCA testimony. When it finally did, starting in 1998, Unit supervision did not have clear guidelines for what constituted MHCA testimony that exceeded the limits of the science. See the *MHCA Timeline* in Section 4.2 for more details on the testimony monitoring program. (Hazard/Defect Identification and Analysis Issue – 94 [Reactive Risk Issue – 110])

Observation: As a result, even when the MHCA testimony content was monitored, there was no structure for establishing that the MHCA report and/or testimony exceeded the limits of the science.

Acceptance issue regarding the potential for MHCA report and testimony errors. The residual risk for MHCA examiners providing report and/or testimony statements that exceeded the limits of the science was believed to have been very low because FBI Laboratory management believed that the MHCA examiners were well qualified, well trained, and appropriately motivated to testify within the limits of the science. They did not see the value in extensive MHCA testimony monitoring because they accepted what they believed to be a low potential for MHCA report and testimony statement errors. (Hazard/Defect Identification and Analysis Issue – 94 [Inspection/Audit/Measurement Issue – 116])

Observation: As a result, management did not place a sufficiently high priority on addressing this issue.



H. FBI Laboratory management did not sufficiently detect MHCA report and testimony errors

Cultural Analysis

This section describes the organizational culture issues, social, and behavioral issues that contributed to management system weaknesses that led to FBI Laboratory management to not sufficiently detecting MHCA report and testimony errors.

Ongoing overconfidence. Laboratory management exhibited ongoing overconfidence regarding how often MHCA report and/or testimony statements exceeded the limits of the science. (Culture Emphasis/Approach – 4 and Sense of Vulnerability – 5)

Observation: As a result, FBI Laboratory management failed to institute a formal MHCA report and testimony performance monitoring program with a focus on the potential for errors in MHCA report and/or testimony statements.

Failure to provide continuous monitoring of performance. For MHCA examiner activities that took place in the FBI Laboratory, continuous monitoring for performance occurred for most of the period analyzed (e.g., report reviews by Unit Chiefs). However, for potential errors in statements in examiner testimony, the monitoring of performance was very limited or ineffective. (Continuous Monitoring – 12)

Observation: As a result, there was minimal opportunity to detect and trend MHCA testimony statements that exceeded the limits of the science.

Failure to establish a questioning/learning environment. Laboratory management failed to ingrain a questioning attitude and a learning environment related to MHCA reports and testimony. Laboratory

management did encourage the exploration of new analysis capabilities, such as DNA analyses. But for MHCA, changes were generally not encouraged. (Questioning/Learning Environment – 9)

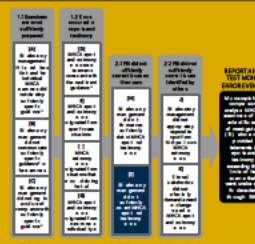
Observation: As a result, MHCA examiners would be unlikely to push management to provide more clearly defined guidance for MHCA reports and testimony.

Leadership. Laboratory management failed to provide effective leadership in identifying potential issues related to MHCA report and testimony statements. (Strong Leadership – 2)

Observation: As a result, FBI Laboratory management did not create a questioning environment that could have led to the understanding for the need for sufficiently specific MHCA report and testimony guidance. A lack of sufficiently specific guidance and lack of a questioning/learning environment made it unlikely that FBI Laboratory management would have detected MHCA report and/or testimony statements that exceeded the limits of the science.

I. FBI Laboratory management did not sufficiently correct MHCA report and testimony errors.

Lower contributor to the errors.



This causal event addresses the FBI response to internally identified issues. Response to issues identified by third parties are addressed by Causal Event J.

Conclusion and Significance – Causal Event I

This event very likely occurred and contributed to most instances of the unabated MHCA report and testimony errors. Because there were few instances where problems were identified internally, there were few opportunities to sufficiently correct MHCA testimony that exceeded the limits of the science.



I. FBI Laboratory management did not sufficiently correct MHCA report and testimony errors

Data Supporting Conclusion

Each of the statements and observations below supports the conclusion and significance statements for Causal Event I.

Limited data were available to assess how the FBI Laboratory management addressed issues that were internally identified. This appears to be the result of a combination of the following factors:

- The general lack of documentation generated at the time by the FBI Laboratory (e.g., formal written procedures were not developed until the mid- to late- 1990s); the limited documentation that has

survived (i.e., most documentation was not retained, such as testimony assessment forms); and the documents that were available to the ABS Group team (e.g., no access to applicable portions of personnel files, such as identification and resolution of MHCA testimony issues).

- The few issues that FBI Laboratory management identified with MHCA testimony independently of third parties.

As a result, the ability to assess the potential efficacy of the FBI Laboratory management's response to these internally generated issues is limited. The ABS Group team used the FBI's response to issues identified by third parties to assess this causal event.

The 2012 Review found errors in approximately 50% of the MHCA examiner reports and in approximately 90% of the MHCA examiner trial transcripts. A prior review by the 2012 Review team of 1,729 reports reviewed when transcripts were not available, determined that 856 or approximately 50% of the transcripts contained an error with most of these reports containing only one error. ABS Group analysis of the over 450 MHCA examiner trial transcripts made available for this study also determined that over 90% of the transcripts contained at least one error and, on average there were about six errors per transcript. For example, some transcripts contained statements that could imply MHCA is a method for individualization (see Section 2 for a description of the three error types used by the 2012 Review).

No holistic approach to providing MHCA report and testimony guidance. There was no clear attempt to create a holistic list of statements that should and should not be provided for MHCA report and testimony, nor was there a clear attempt to include all of the needed expertise to perform this study. For example, subject matter experts at the FBI who were educated and trained in legal issues (e.g., Office of the General Counsel), statistics, human bias, quality assurance, and jury interpretation of MHCA testimony would all be appropriate personnel to be involved in determining MHCA testimony limits.

Narrowly focused corrective actions resulting from internally identified issues. When issues were internally identified (e.g., when MHCA examiners had discussions regarding a challenge by a defense attorney, like when the use of “*match*” was challenged in the O. J. Simpson trial), the resolution was narrowly focused. For example, when the use of “*perfect match*” was prohibited, there was no observed follow-up to identify the criteria needed for exclusion of some phrases.

Formal documentation of testimony guidance decisions was not created. When issues were internally identified, the discussions could result in a consensus that the examiners would use a different approach (e.g., to not use the word “*match*”). However, there was no formal establishment of guidance, individually or collectively, of these decisions.



I. FBI Laboratory management did not sufficiently correct MHCA report and testimony errors

Data Refuting Conclusion

Each of the statements and observations below refutes the conclusion and significance statements for Causal Event I.

Some testimony guidance informally developed. There were some actions taken by FBI Laboratory management that did result in some decrease in specific testimony statements (e.g., use of “match”). However, these were generally the result of issues identified by third parties and not internally. In addition, it appears that reports began some use of the statements proposed by the 1985 symposium. While this use did make conclusion statements more consistent, it also introduced a statement judged by the 2012 Review to be an error.



I. FBI Laboratory management did not sufficiently correct MHCA report and testimony errors.

Root Cause Analysis

The root causes identified in this section characterize the management system weaknesses that created an environment where FBI Laboratory management did not sufficiently correct MHCA report and testimony errors.

Focus on specific issues and not on underlying system causes. FBI Laboratory management was not sufficiently aware of the errors in MHCA reports and testimony. When FBI Laboratory management was aware of an issue, it did not investigate the extent of the issue to determine if it was an isolated issue or the symptom of a broader problem. (Supervision Issue – 185)

Observation: As a result, FBI Laboratory management did not sufficiently understand the scope of the issue so that they could appropriately address the underlying issues leading to the errors in MHCA reports and testimony.

Improper performance not corrected. When performance problems related to MHCA testimony were internally identified (such as the use of the term “match” following the MHCA testimony at the O. J. Simpson trial), the corrective actions were narrowly focused. (Supervision Issue - 185 [Supervision During Work Issue – 192])

Observation: As a result, opportunities to address other causes of MHCA reports and testimony issues were missed.



I. FBI Laboratory management did not sufficiently correct MHCA report and testimony errors

Cultural Analysis

This section describes the organizational culture, social, and behavioral issues that contributed to management system weaknesses that led to FBI Laboratory management not sufficiently correcting MHCA report and testimony errors.

Ongoing overconfidence. FBI Laboratory management had overconfidence regarding how often MHCA report and testimony errors were occurring. (Sense of Vulnerability – 5)

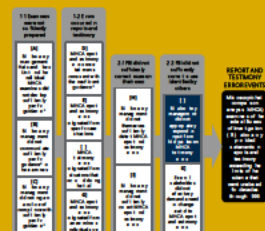
Observation: As a result, FBI Laboratory management did not provide adequate attention to addressing existing and potential issues with MHCA report and testimony statements that exceeded the limits of the science.

MHCA examiner autonomy. The MHCA examiners were provided a high level of autonomy. As a result, FBI Laboratory management did not exercise a high level of control over MHCA examiner testimony. (Strong Leadership – 2 and Continuous Monitoring – 12)

Observation: As a result, even when issues were identified, comprehensive, detailed guidance was not developed that would result in examiner compliance with both the written guidance, as well as, the intent of the written guidance.

J. FBI Laboratory management did not appropriately respond to input from third parties on MHCA testimony errors.

Third highest contributor to the errors.



This causal event addresses how the FBI responded to inputs from third parties (see Causal Event K for third-party inputs). The FBI response to internal issues is addressed by Causal Event I.

Conclusion and Significance – Causal Event J

This causal event very likely occurred and contributed to almost all instances of unabated MHCA testimony.

This causal event addresses the FBI's response to the third-party feedback. This causal event is much more likely if third-party feedback is weak or nonexistent. Nevertheless, in an organization that has a culture of actively seeking and resolving issues, even subtle signals can be sufficient to drive change and, as a result, the burden on third parties to push for change is reduced. The ABS Group team believes there were several strong third-party indicators of MHCA testimony issues during the period analyzed. As a result, the team concluded that, while there certainly could have been additional demands for change from these third parties and those demands could have occurred earlier in the period analyzed, there were sufficient indications of issues raised by third parties. The primary issue was the FBI's response to the identified third-party feedback.



J. FBI Laboratory management did not appropriately respond to input from third parties on MHCA testimony errors

Data Supporting Conclusion

Each of the statements and observations below supports the conclusion and significance statements for Causal Event J.

Errors found in all MHCA examiner trial transcripts, across all years, across all MHCA examiners that testified. The 2012 Review found many errors. A prior review of the 484 MHCA examiner trial transcripts determined that approximately 90% of the transcripts contained at least one error and, on average there were six errors per transcript. For example, some transcripts contained statements that could imply MHCA is a method for individualization (see Section 2 for a description of the three error types used by the ongoing 2012 Review).

Guidance not formalized from results of the FBI-hosted international symposium in 1985. We found no evidence that the report and testimony guidelines presented by the *Committee on Forensic Hair Comparison, Subcommittee 4, Report Writing, Conclusions, and Court Testimony* at the 1985 International Symposium on Forensic Hair Comparisons (see the *MHCA Timeline* in Section 4.2 for more details on the symposium) were formally adopted by the Hairs and Fibers Unit. Adopting the subcommittee's guidelines would have likely reduced the number of MHCA testimony errors, even though the subcommittee's guidelines were inconsistent with the error types used by the 2012 Review. The subcommittee recommended six possible conclusions, some of which conflict with the error types used in the 2012 Review, and left it to the examiner to determine if probabilities and statistics could be stated or implied.

Regarding reports, it does appear that starting in about 1985 many of the FBI Laboratory MHCA examiners wrote reports using the phrases *consistent with having originated from [individual's name]* instead of *could have come from [individual's name]*, which the 2012 Review determined was not an error. MHCA examiners infrequently made other report errors, such as using the word “rare.” These statements were consistent with guidance developed between 1982 and 1985 and formally presented at an FBI-hosted international symposium on MHCA in 1985. We concluded that the report errors occurred, in part, based on information in the guidance developed for the symposium. However, such guidance was not formalized at the FBI Laboratory.

Errors continued after the Office of Inspector General report was issued in 1996. In 1996, the Office of Inspector General Review of the FBI Laboratory was released. It primarily focused on 12 Explosives Unit examiners, but also identified issues with testimony provided by one of the MHCA examiners. Some of the recommendations identified by the Office of Inspector General should have impacted all of the FBI Laboratory units, including the Hairs and Fibers Unit and impacted the testimony of MHCA examiners. Although MHCA testimony errors continued through the end of the period analyzed (1999), it was difficult to assess the impact of the recommendations on the frequency of the errors because of the small number of transcripts available for this period.

Response to observed issues was narrowly focused. There were instances where management took some action regarding MHCA testimony that exceeded the limits of the science identified by third parties.

However, FBI Laboratory management only addressed the specific identified statements and did not pursue identifying underlying issues, including the limits of the science.

- For example, in response to the complaint about using “*perfect match*” in MHCA testimony,¹¹² that term was prohibited. However, there was no observed follow-up to identify the criteria needed for exclusion of some phrases.
- Following the Office of Inspector General report in 1996, the MHCA testimony of other Hairs and Fibers Unit MHCA examiners was not reviewed, even though significant issues were found with a Hairs and Fibers Unit examiner’s testimony. It is unclear why this did not occur.



J. FBI Laboratory management did not appropriately respond to input from third parties on MHCA testimony errors

Data Refuting Conclusion

Each of the statements and observations below refutes the conclusion and significance statements for Causal Event J.

Apparent response. A 1991 memo indicated MHCA examiners should not use phrases like “*perfect match*,” and this appears to have been communicated based on review of transcripts. The origin of this complaint, internal or from a third party, is unknown. However, one source indicated that it was likely from an “outside expert.” Examiners were apparently trained on this issue at the time (based on the 1991 memo). It is unclear if this was incorporated into the training because there was limited documentation of initial and ongoing training. This issue did not result in the review of additional MHCA transcripts to determine the scope of the issue (e.g., were there any other instances of the use of this specific phrase or synonymous phrases).



J. FBI Laboratory management did not appropriately respond to input from third parties on MHCA testimony errors

Root Cause Analysis

The root causes identified in this section characterize the management system weaknesses that created an environment where FBI Laboratory management failed to appropriately respond to input from third parties on MHCA testimony.

The FBI did not identify MHCA testimony statements that exceeded the limits of the science by MHCA examiners as a significant risk for the organization.

- **No formal assessment of how often examiners were making errors.** The FBI did not routinely perform formal assessments in the Hairs and Fibers Unit to identify performance gaps in achieving their mission (e.g., the potential for ongoing instances of MHCA report and testimony statements that exceeded the limits of the science). This lack of formal assessment contributed to a situation where there was a fundamental lack of awareness regarding how often MHCA report and testimony errors were occurring. (Hazard/Defect Identification and Analysis Issue – 94)

112 “Internal FBI memos to FBI Laboratory Director Hicks.” 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

Observation: As a result, FBI Laboratory management may not have placed a sufficiently high priority on understanding issues raised by third-parties associated with MHCA testimony or understood that they could be pointing to more systemic issues.

- **No procedure for assessment of how often examiners were making errors.** The Hairs and Fibers Unit did not have a written procedure for performing an assessment of risks that may have prompted implementation of an initial or a periodic formal assessment of how often examiners were making errors. (Procedure Issue – 122)

Observation: As a result, there was no requirement directing FBI Laboratory management to perform the assessments that could give the needed perspective for considering an issue raised regarding testimony.

- **Lack of appropriate personnel involved in assessment of how often examiners were making errors.** Had they performed a formal assessment of how often examiners were making errors, it is unlikely they would have had the appropriate personnel involved in the assessment, such as subject matter experts in statistics and legal aspects related to MHCA testimony. The ABS Group team concluded this based on comments from the interviewees on their valuation of input from these subject matter experts. (Supervision Issue – 185)

Observation: As a result, FBI Laboratory management did not prioritize monitoring and addressing third-party inputs.

Insufficient methods for soliciting and receiving constructive input from court personnel. For most of the period analyzed, the FBI did not have a formal approach for actively seeking feedback on MHCA testimony. When it did put a formal system in place in 1995, it did not focus on the content of the MHCA testimony. In 1998, the program was modified to address testimony content, but did not specifically focus on identifying MHCA testimony that exceeded the limits of the science. In addition, in January 1998, the program changed its focus to primarily seek input from prosecutors (the “Testimony Monitoring Form” was changed to the “Prosecutorial Evaluation of Examiner Testimony” form). A month later, in February 1998, the program was changed back to seeking input from all court officials and the name of the form was changed accordingly. During interviews, some MHCA examiners indicated they more frequently provided the forms to the prosecutors but also provided the evaluation forms to other court officers (e.g., defense counsel and judges) in some instances. Prosecutors were less likely to identify MHCA testimony that exceeded the limits of the science. There may have been other FBI responses to third-party inputs from court personnel, but we did not see evidence of these efforts. (Procedure Issue – 122)

Observation: As a result, FBI Laboratory management did not actively seek and receive appropriate MHCA testimony feedback.

Records of issues not organized to facilitate identification of trends. Based on interviews, records of third-party feedback (positive and negative) and records of the FBI’s actions taken in response were typically filed in the individual’s personnel file instead of a location that would support a transparent and learning culture. There may have been other FBI responses to third-party inputs, and some of these may have been more effective than those we observed, but we did not see evidence of these other efforts. (Documentation and Records Issue – 58)

Observation: As a result, the FBI Laboratory management's ability to track and trend the issues identified was limited.

Issues identified by third parties analyzed as personnel issues. When issues were analyzed, they were often thought of as personnel issues and not systemic issues. As a result, the corrective actions focused on individual performance issues and not on the broader implications of the issue that might involve other MHCA examiners. There may have been other FBI responses to third-party inputs, and some of these may have been more effective than those ABS Group observed, but the team did not see evidence of these other efforts. (Hazard/Defect Identification and Analysis Issue – 94)

Observation: As a result, FBI Laboratory management's ability to link issues with similar causes and develop overall trending was limited.



J. FBI Laboratory management did not appropriately respond to input from third parties on MHCA testimony errors

Cultural Analysis

This section describes the organizational culture, social, and behavioral issues that contributed to management system weaknesses that led to FBI Laboratory management not appropriately responding to input from third parties on MHCA testimony.

The FBI did not effectively address third-party input. While it is clear that the FBI did not sufficiently address the third-party input, it is difficult to discern whether this was from some level of disinterest in the input, from not understanding the value of the input, or from not understanding how to address it. Some personnel within the Hairs and Fibers Unit indicated that input from these third parties was not needed and not welcome. While generally cooperative, some Hairs and Fibers Unit personnel viewed these third-party investigations as intrusive and unnecessary. (Defer to Expertise – 7)

Observation: As a result, FBI Laboratory management missed opportunities to take advantage of third-party input to recognize and address the MHCA testimony issue.

FBI Laboratory management did not foster a learning environment. When third-party input was received, response to it was narrowly focused on the individuals involved and not viewed as an opportunity to learn beyond the specific issue or allegation. Based on the limited issues that were identified early in the period analyzed and the extensive investigations that occurred in the mid- to late-1990s, the FBI did not embrace these inputs as opportunities to broadly understand and learn about the underlying management issues within the Hairs and Fibers Unit. (Questioning/Learning Environment – 9 and Strong Leadership – 2)

Observation: This narrow focus of response resulted in missing numerous opportunities to identify, address, and prevent future instances of MHCA report and testimony statements that exceeded the limits of the science.

FBI placed higher priority on development of high-quality MHCA examiners with a lower priority on delivery of quality MHCA testimony. Based on interviews and document reviews, the FBI viewed

high-quality MHCA examiners as a key output of the FBI Laboratory and placed a lower priority on delivery of quality MHCA testimony, including MHCA testimony within the limits of the science. For example, there were metrics related to MHCA examiner production but no metrics associated with potential errors in MHCA examiner testimony. (Core Value – 1)

Observation: As a result, FBI Laboratory management did not think of MHCA testimony as a product that required quality control measures.

Personnel outside the FBI Laboratory were not significantly involved in response to third-party issues. Resolution of issues identified by third parties were largely handled within the FBI Laboratory as personnel matters. Other individuals, such as those from the FBI Office of the General Counsel, statisticians, and quality assurance were not involved in the resolution of issues identified by third parties. Based on interviews with MHCA examiners, they were not involved because MHCA personnel anticipated that their participation would only result in additional paperwork with little benefit. (Defer to Expertise – 7)

Observation: As a result, FBI Laboratory management failed to involve appropriate expertise that could have aided in identifying and resolving these issues.

FBI Laboratory management did not foster an environment that encouraged continuous improvement. The FBI Laboratory management did not foster an environment where indications of problems and underlying issues were actively sought and encouraged. (Strong Leadership – 2 and High Standards of Performance – 3)

Observation: As a result, FBI Laboratory management missed opportunities to resolve issues identified by third parties.

K. External stakeholders did not effectively demand a need for change related to MHCA report and testimony errors.

Lower contributor to the errors.



This causal event addressed feedback from third parties that would encourage the FBI to take appropriate actions to address potential MHCA testimony that exceeded the limits of the science. This causal event is connected on the cause and effect tree to the FBI's response to third-party feedback.

Conclusion and Significance – Causal Event K

This event occurred and contributed to instances of unabated MHCA testimony. Third party input was not the focus of this study which instead focused on the management system and culture issues associated with the FBI Laboratory. The FBI Laboratory management's response to third-party concerns is addressed in Causal Event J.



K. External stakeholders did not to effectively demand a need for change related to MHCA report and testimony errors

Data Supporting Conclusion

Each of the statements and observations below supports the conclusion and significance statements for Causal Event K.

Errors were found by the 2012 Review in approximately 50% of the reports reviewed and 90% of all MHCA examiner transcripts reviewed, across all years in the period analyzed, for 31 of the 35 MHCA examiners. Errors were found by the 2012 Review team. The 1,729 reports reviewed when transcripts were not available determined that 856 or approximately 50% of the transcripts contained an error with most of these reports containing only one error. Their review of the 484 MHCA examiner trial transcripts related to the 2012 Review determined that approximately 90% of the transcripts contained at least one error (based on the 2012 Review criteria) and, on average there were six errors per transcript. For example, some transcripts contained statements that could imply MHCA is a method for individualization (see Section 2 for a description of the three error types used by the ongoing 2012 FBI MHCA Review). MHCA examiners were testifying throughout the period analyzed (1950s through 1999), and errors occurred in approximately 90% of the transcripts provided (1971 through 1999).

Note: While not all in the scientific community may agree with the three error types used by the 2012 Review to define the limits of the science for MHCA, our analysis assumed these three error types defined the limits of the science for MHCA. One of the issues identified by our analysis was that there was no clear guidance from the scientific community as to the limits of testimony. There were numerous thoughts and proposals regarding appropriate testimony guidance, but none were adopted as a consensus MHCA-scientific-community standard.

The limited negative feedback from these third-party groups during the period analyzed did not result in the identification of MHCA report and testimony issues until a few individuals that had served lengthy prison sentences were exonerated between 2009 and 2012 in the Washington, D.C., area and their convictions were, in part, impacted by testimony of FBI MHCA examiners.

The remainder of this section on *Data Supporting Conclusion* proved details regarding third-party groups, including:

- Court personnel
- Forensic community
- Federal and state government entities other than the FBI
- Legal association and groups
- Media

Court Personnel

In most cases MHCA examiners were called by the prosecutor (as opposed to the defense counsel) to provide expert witness testimony. However, almost all interviewees indicated that they had testified for the defense on some occasions. Regardless of who calls them to testify, the court system is designed with the expectation that the opposing counsel will act as a safeguard to limit potential MHCA testimony that exceeded the limits of the science. Counsel would be expected to object to any MHCA examiner statements that are not within the limits of the science, and when appropriate, the judge would sustain the objection. However, this safeguard was not always reliable.

Prosecutors

Prosecutors pushed for stronger testimony. Examiners indicated during interviews that prosecutors would sometimes push MHCA examiners for stronger MHCA testimony. In general, MHCA examiners would testify consistent with their own understanding of what they could and could not say. However, the MHCA examiners did not always have an understanding of the testimony that exceeded the limits of the science. For example, some MHCA examiners believed that there were no valid statistics that could be stated to indicate how rare a particular set of characteristics is, but using their own experience to describe the frequency of a particular set of characteristics was acceptable. Interviews and transcript reviews indicated that there were instances where this resulted in MHCA testimony that exceeded the limits of the science.

Prosecutors did not correct MHCA examiner testimony that exceeded the limits of the science.

Examiners indicated that, during individual trials, prosecutors would sometimes fail to identify and correct MHCA examiner testimony that exceeded the limits of the science. Based on interviews, prosecutors did not formally communicate these instances to FBI Laboratory management.

Prosecutors introduced errors. During interviews and transcript reviews, prosecutors frequently asked MHCA examiners questions that led them to appropriately describe the limits of the science. However, prosecutors would sometimes ask questions that could be linked to one of the three 2012 FBI MHCA Review error types, such as asking about statistics or using inappropriate words such as “*matched*,” or implying the questioned hair has been “*uniquely*” associated with an individual. In some cases, the MHCA examiners corrected the inappropriate wording, but in other cases, they did not. For example, a prosecutor asked, “[Special Agent], do you have an opinion based upon a reasonable degree of scientific certainty that the submission from the bed sheet, two ... hairs were the same, and came from the defendant, [defendant]?” And the examiner responded, “Yes. Within a reasonable degree of scientific certainty, that's correct.”

Prosecutors did not provide substantial input to the FBI. In 1995, the FBI Laboratory started a formal testimony monitoring program that solicited feedback from prosecutors on MHCA examiner testimony. The testimony feedback forms were returned to FBI leadership. Although they did provide a formalized avenue of communication, the questions on the feedback form were insufficient in that they did not address the content of the testimony. ABS Group was not provided any examples of negative feedback on MHCA testimony from prosecutors to the FBI.

Defense counsel

Defense counsel had limited knowledge of MHCA. During interviews, MHCA examiners indicated that defense counsels were generally less knowledgeable than prosecutors concerning the limits of the science involving MHCA testimony. A 2009 National Academy of Sciences study indicated that lawyers generally lack the scientific expertise necessary to comprehend and evaluate forensic evidence in an informed manner.

Defense counsel generally did not object to MHCA testimony. In many instances, defense counsel did not object to testimony that exceeded the limits of the science (e.g., use of statistics, individual experience, or implying a statistic). Some interviewees stated that, on a few occasions, defense attorneys would object to certain statements made by the MHCA examiners during testimony; however, the judge would generally ask the MHCA examiner to elaborate and would then allow the MHCA examiner to proceed. Interviewees also stated that few defense counsel objections were sustained. Reviews of transcripts generally confirmed the comments made by the MHCA examiners. In some cases, there was no or limited cross examination or cross examination did not cover significance and limitations of the analysis.

Judges

Judges not effective in supporting defense counsel objections. During interviews, the MHCA examiners indicated that most defense counsel objections were overruled. They stated that, in general, the MHCA examiners could testify how they wanted. Transcript reviews generally support the comments from the MHCA examiners. In some cases, defense counsel objections to MHCA testimony that exceeded the limits of the science were overruled. For example:

Following a discussion regarding the probability that if you “*find two different people with head hair that match*” what is the probability that you would “*expect to take a pubic hair from the same two persons and find that their pubic hairs match.*”

Counsel: Is that even a greater rarity, to have that kind of occurrence?

Examiner: I’ve never had it happen to me, and I work with ten other examiners who do this work full-time, and I’ve never heard anyone mention having such a thing.

Opposing Counsel: Objection, your honor.

The Court: Overruled.

Counsel: Go ahead - - continue.

Examiner: I’ve never had any of those individuals mention such a situation occurring.

The National Academy of Sciences 2009 study indicated that judges had limited effectiveness in limiting MHCA testimony to within the limits of the science. Once the overall methodology (MHCA) was considered admissible, the details of the MHCA testimony provided were not well scrutinized.

Jurors

Jurors not knowledgeable of MHCA testimony limits. In general, jurors would not be expected to independently identify MHCA testimony that exceeded the limits of the science. Expert witnesses are provided at trial to give the jury the ability to evaluate the weight that should be applied to the evidence. During interviews, MHCA examiners indicated they believed that jurors did not have any prior knowledge of MHCA. An important aspect of MHCA testimony, according to the MHCA examiners, is communicating the significance of the findings to the jurors.

No evidence that jurors communicated issues regarding the FBI MHCA examiner testimony. While we recognize that this is an unlikely scenario, we found no evidence that jurors communicated issues regarding the FBI MHCA examiner testimony through the court or directly to the FBI.

Federal and State Government Entities Other than the FBI

Department of Justice, Office of Inspector General report does not identify MHCA testimony that exceeded the limits of the science as an issue. The Office of Inspector General investigation¹¹³ focused on allegations of misconduct by an Explosives Unit examiner. The investigation focused on 12 examiners in the Explosives Unit, but did identify instances of MHCA testimony issues (not testimony beyond the limits of the science, but testimony outside [the agent's] area of expertise) by an MHCA examiner in the Hairs and Fibers Unit.

The investigation by the Office of Inspector General was not expanded to examine the MHCA testimony by other Hairs and Fibers Unit MHCA examiners. In addition, the FBI apparently did not pursue a further review of the Hairs and Fibers Unit MHCA examiner testimony as a result of the Office of Inspector General investigation. See the *MHCA Timeline* in Section 4.2 for additional information on the investigation by the Office of Inspector General.

113 United States Department of Justice/Office of Inspector General. "The FBI Laboratory: An Investigation into Laboratory Practices and Alleged Misconduct in Explosives-Related and Other Cases (April 1997)." *Executive Summary*. April 1997.

Forensic Community

There was input from the forensic science community during the period analyzed (1950s through 1999) that included: (1) information indicating that MHCA examiner testimony during the period analyzed could have exceeded the limits of the science, (2) guidance that was inconsistent with the limits of the science, and (3) guidance that did not address the limits of the science related to MHCA testimony. However, this did not result in appropriate changes within the FBI Laboratory (see Causal Event J). In addition, there were inputs that were provided after the period analyzed (after 1999). Some specific examples of input provided by the Forensic Community include:

Scientific Working Group on Materials Analysis (SWGMAAT)

- **SWGMAAT guidance was not issued until 2005.** SWGMAAT did not provide formal documented guidance during the study period. SWGMAAT was formed under the leadership of the FBI to provide a dialogue for practitioners in each forensic discipline. Membership was from numerous U.S. and foreign laboratories and other interested parties, but leadership was provided primarily by the FBI. The precursor to SWGMAAT, the Technical Working Group on Fibers (TWGFIBE) was formed in 1994. It became the Technical Working Group on Material Analysis (TWGMAAT) in 1996. In 1999, TWGMAAT became the SWGMAAT. SWGMAAT issued their first methodology guidelines, including some MHCA testimony guidance, in 2005. They subsequently released MHCA examiner training guidelines (although the document itself is undated, the latest references therein are from 2005).

Subject Matter Experts

- **Gaudette research sometimes quoted in testimony.** Transcript reviews show that references to the studies performed in the 1970s by Barry Gaudette on the application of statistics to MHCA are sometimes quoted by MHCA examiners. Early in the period being reviewed, statistics are sometimes quoted as valid. Later in the period analyzed, the statistics may have been stated in response to a question, but they were generally discredited by the MHCA examiners (they answered the question, but then they said the statistics were not valid).
- **Limited input on MHCA testimony from other subject matter experts.** Third-party subject matter experts did not provide much guidance on MHCA testimony. A 2013 bibliography on the American Society of Trace Evidence Examiners Web site related to MHCA listed 405 documents. Of these, less than five specifically addressed MHCA testimony issues, while about 5% discussed the potential use of statistics (e.g., when statistics could be valid, attempts to determine frequencies of a hair characteristic). Many of the papers addressed analysis methods or how the characteristics of hair vary based on changes in a variable (e.g., age, sex, disease, treatments).

1985 International Symposium, Hosted by the FBI Laboratory

- **No clear testimony guidance produced.** In regard to testimony, the 1985 symposium did not result in any clear testimony guidance, especially from the discussions that occur at the end of the symposium. A senior FBI MHCA examiner summarized it well at the symposium when he said: “From the nature of the questions and responses it is very apparent that hair identifications or hair comparisons are a very subjective type of analysis. We seem to be struggling with questions like, what really constitutes an adequate sample; what constitutes an adequate questioned specimen; and how significant is a hair comparison?” They also state in relationship to MHCA testimony, that an MHCA examiner’s statements or responses to questions depend

on “what you feel comfortable with.”¹¹⁴ See the *MHCA Timeline* in Section 4.2 for additional information on the 1985 Symposium.

During MHCA testimony, some of the MHCA examiners mentioned attendance or presentations they made at the symposium.

A few of the interviewees mentioned the symposium and that MHCA testimony guidance was discussed. They also mentioned that the FBI did not tailor and formally adopt the guidance discussed at the symposium. MHCA testimony guidance was not documented in any formal quality documents (in procedures, training materials, or quality assurance manual) by the FBI until after 1999.

- **Limits of testimony based on MHCA examiner experience.** Some statements indicated that the limits of MHCA testimony are dependent on the experience of the MHCA examiner. For example, an FBI Agent stated in the conference proceedings.¹¹⁵ “In regard to the uniqueness of Negroid and Mongoloid hairs, it all boils down to how many you look at. The FBI Laboratory is in a unique position because it conducts all the examinations for Washington, D.C. which has a population of approximately 80 percent Negroid, plus we do a number of other cases.” And, “It boils down to the experience of the examiner: the more you look at hairs, the more uniqueness they have.”

Gaudette of the Royal Canadian Mounted Police replied to a question concerning how to use his statistical research.¹¹⁶ “What you can tell them obviously is going to depend on whatever you feel comfortable with yourself. There are a number of ways of getting across the value of hair evidence. Statistical data is only one of those kinds of possibilities.”

Research Laboratories – Universities, National Laboratories

- **Few independent researchers working in the area of MHCA testimony.** Some MHCA examiners mentioned working at universities, but not specifically in the forensic MHCA area. The National Academy of Sciences report indicated that the existing research (as of 2009) at independent research laboratories was limited.

American Society of Crime Laboratory Directors (ASCLD)

- **ASCLD did not provide leadership in identification of MHCA report and testimony errors.** ASCLD is different from ASCLD/LAB. ASCLD is the crime laboratory directors group, while ASCLD/LAB is a laboratory accreditation organization. During interviews, ASCLD was mentioned a couple times in relationship to training programs for other laboratories and how it led to ASCLD/LAB. No mention was made of ASCLD-led efforts to identify problems with MHCA testimony. Transcript reviews identified a few mentions of ASCLD. Most were actually referring to ASCLD/LAB in relation to accreditation. ASCLD did issue numerous position statements. These position papers support improvements in the forensic science areas through activities such as: proficiency testing, ethics standards for MHCA examiners, accreditation for

114 “Proceedings of the International Symposium on Forensic Hair Comparisons: FBI Academy, Quantico, Virginia, June 25-27, 1985.” U.S. Government Printing Office, Proceedings of the International Symposium on Forensic Hair Comparisons: FBI Academy, Quantico, Virginia, June 25-27, 1985, www.ncjrs.gov/pdffiles1/Digitization/116592NCJRS.pdf, p. 209

115 Ibid, p. 112

116 Ibid, p. 201

laboratories and certification of MHCA examiners, standardized methods and procedures, root cause analysis, and bolstering the scientific basis of forensics. While ASCLD certainly provided a method of communications between FBI Laboratory personnel and personnel at the other laboratories, no specific activity they performed resulted in identification of the MHCA testimony issues.

ASCLD/LAB

- **Accreditation did not result in identifying MHCA report and testimony issues.**

Interviewees indicated that accreditation efforts in the mid- to late-1990s improved performance in the Hairs and Fibers Unit. An MHCA testimony monitoring program was created as a result. However, the initial monitoring program started in 1995 did not incorporate input from the FBI or court personnel regarding the content of the MHCA testimony. In 1998, the program was modified to address the content of the testimony, but was not specific to addressing the limits of the science.

Many of the MHCA examiners saw the accreditation process as simply a paperwork effort to satisfy outsiders, and they did not believe it improved the quality of the work. It only made it more difficult and time consuming to get the work done.

In transcripts, the MHCA examiners are infrequently asked about the accreditation status of the FBI Laboratory. The responses varied depending on the timeframe of the question.

Other Forensic Laboratories (federal, state, international, private)

- **Problems at other laboratories generally not identified until after 1999.** Problems with general forensic testimony by examiners at other laboratories occurred during the period analyzed (including examiners at laboratories in Montana, Oklahoma City, St. Paul, Massachusetts, Colorado, Detroit, Philadelphia, and North Carolina); however, most were not publicly identified until after 1999. As a result, knowledge of these issues would not have been available to the FBI Laboratory. In addition, many of these were not related to MHCA testimony.
- **Appropriate testimony guidance was not provided to third parties trained by FBI.** From the limited training data and documentation that was available, it appears that the FBI training to third-parties did not provide sufficient MHCA testimony guidance. The FBI Laboratory personnel provided general training to external law enforcement agencies on MHCA. Based on interviews, Hairs and Fibers Unit personnel were involved in leading two-week training courses on hairs and fibers analysis, mostly for local and state laboratories. The courses were typically held two or three times a year. These courses were abbreviated in nature, and the attendees were not qualified as MHCA examiners by the FBI. As a result, it was less likely that third-party examiners would be able to identify report and testimony statements that exceeded the limits of the science in FBI MHCA examiner statements.

Legal Associations and Groups

Legal community

Victim's rights groups

Media

During the period analyzed, several newspaper articles and books were written that identified various issues with analyses performed by and testimony given by FBI Laboratory examiners, including in some cases, the Hairs and Fibers Unit examiners. Many of these were triggered as a result of the Department of Justice, Office of Inspector General report released in 1996 and the follow-up report in 1997. Because the Office of Inspector General investigation was the result of allegations by an Explosives Unit examiner, the majority of the issues identified were related to the Explosives Unit. However, the testimony of one Hairs and Fibers Unit examiner was scrutinized as part of the Office of Inspector General investigation. This media and Office of Inspector General scrutiny did not result in formalization of FBI MHCA report and testimony guidance.



K. External stakeholders did not effectively demand a need for change related to MHCA report and testimony errors

Data Refuting Conclusion

Each of the statements and observations that follow refutes the conclusion and significance statements for Causal Event K.

There were insufficient inputs from third-parties to demand a need for change related to MHCA report and testimony errors. Although there were numerous third-party inputs as described in the *Data Supporting Conclusion* section for this Causal Event, they were not sufficient to result in a change related to MHCA report and testimony errors within the FBI until after the period analyzed.



K. External stakeholders did not effectively demand a need for change related to MHCA report and testimony errors

Root Cause Analysis

This study focused on the management system issues associated with the FBI Laboratory. As a result, no root causes were identified for this causal event. The FBI Laboratory management's response to third-party concerns is addressed in Causal Event J.



K. External stakeholders did not effectively demand a need for change related to MHCA report and testimony errors

Cultural Analysis

This study focused on the organizational culture within the FBI Laboratory. As a result, no cultural causes were identified for this causal event. The cultural causes associated with the FBI Laboratory's response to these third-party concerns are addressed in Causal Event J.

5.5 CAUSAL EVENT, ROOT CAUSE, AND CULTURAL CAUSE RANKINGS

We used the ranking criteria presented in Section 3.2 to establish rankings for causal events, root causes and cultural causes. The CESD is shown in Figure 64 with the three highest causal events. Also shown in the figure are the three primary root causes and the three major cultural causes.

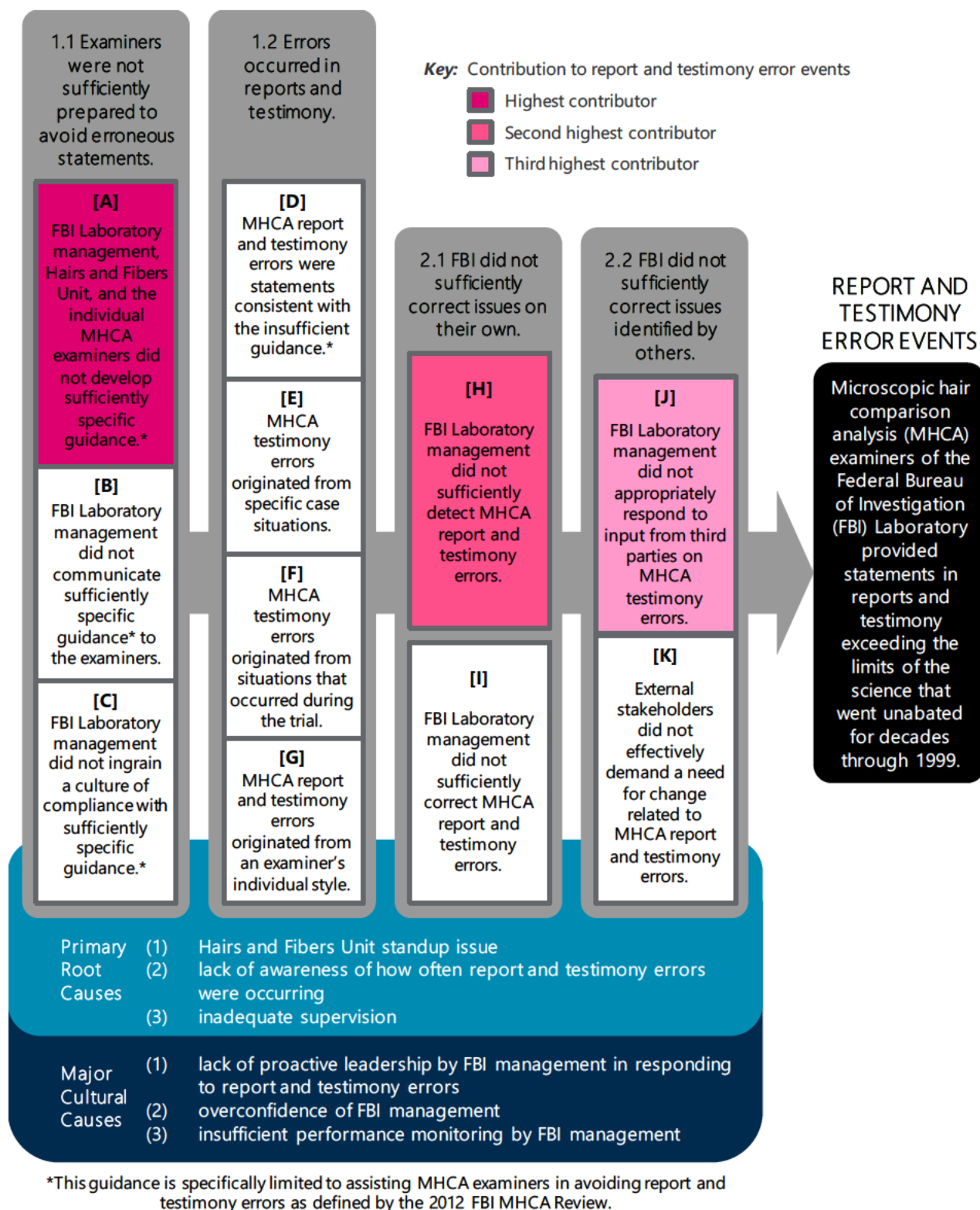
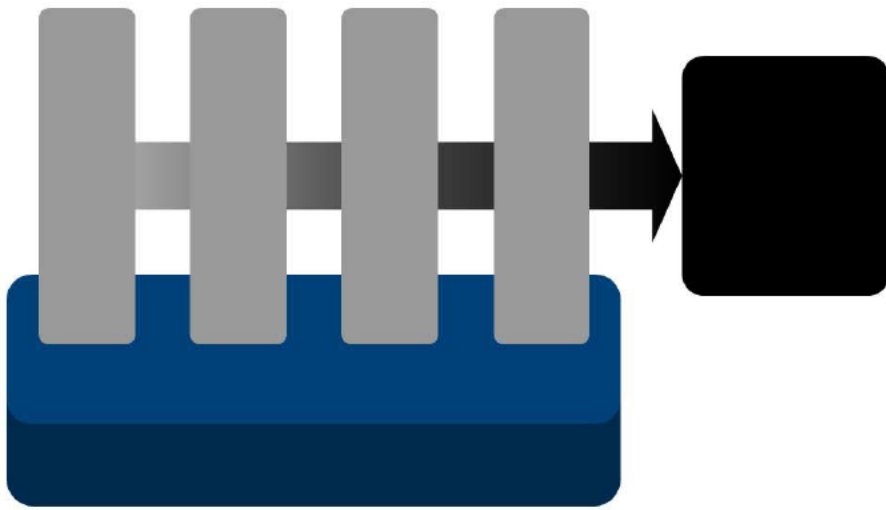


Figure 64. CESD with the three primary root causes and three major cultural causes.



CONCLUSIONS

This section provides the team's conclusions, including the key root and cultural causes driving the ongoing report and testimony errors made by FBI Laboratory MHCA examiners.

6 CONCLUSIONS

The purpose of the study was to answer three basic questions.

The purpose of this study was to answer three basic questions regarding the *report and testimony errors*¹¹⁷ made by FBI Laboratory *MHCA* examiners, as defined in the 2012 Review, from a *root cause* and *cultural cause* perspective. The three questions were:

1. What patterns are evident in the *report and testimony errors*?
2. Why did the *report and testimony errors* occur?
3. Why did the *report and testimony errors* continue for decades?

6.1 WHAT PATTERNS ARE EVIDENT IN THE REPORT AND TESTIMONY ERRORS?

We examined *MHCA* Laboratory *reports and transcripts* to identify patterns in the occurrence of the error types identified by the 2012 Review. Our team further examined the *transcripts* to identify patterns in words/phrases used by the *MHCA* examiners.

Reports

We observed one repetitive error in reports after 1984.

Almost half of the FBI Laboratory *MHCA* *reports* had statements judged to be *errors* by the 2012 Review. Almost all *report errors* (over 98%) described the questioned hair using the phrases “consistent with having originated from [individual’s name]”¹¹⁸ or “consistent with having come from [individual’s name]” instead of “could have come from [individual’s name],” which the 2012 Review determined was not an error. *MHCA* examiners infrequently made other *report errors*, such as using the word “rare.” These statements were consistent with guidance developed between 1982 and 1985 and formally presented at an FBI-hosted international symposium on *MHCA* in 1985. The team concluded that the *report errors* occurred, in part, based on information in the guidance developed for the symposium.

Testimony

Over 90% of the FBI Laboratory *MHCA* *transcripts* reviewed by the 2012 Review associated with *MHCAs* performed through 1999 had statements in testimony judged to be errors by the 2012 Review team. Errors were found in every year for which *transcripts* were reviewed. The 2012 Review found that there were

¹¹⁷ Terms from the *Working Definitions for this Report* are *italicized* when used in this section.

¹¹⁸ All quotes of *MHCA* examiner statements in this report are from *MHCA* reports or testimony unless otherwise noted. Portions of the quotes that were identified by the 2012 Review as report or testimony errors are underlined.

errors in the reports and testimony of nearly 90% of examiners whose work was reviewed. Our team's conclusions were consistent with the 2012 Review that the *testimony errors* were not from a few examiners, but were a systemic issue across most examiners. Similar to the report errors, most errors in testimony were categorized by the 2012 Review as Error Type 2.

Three apparent short-term dips were noted following awareness of testimony issues.

Overall, the *testimony error* rates remained fairly consistent throughout the period analyzed. We noted three apparent variations in the rates:

1. An apparent (not statistically significant) short-term dip in the *testimony error* rate that correlated with a 1985 international *MHCA* symposium hosted by the FBI (contrary to the increase in *report errors* noted above).
2. An apparent short-term dip in *testimony error* rates correlated with counseling of *MHCA examiners* in 1991 in response to a complaint that an examiner had overstated conclusions during a trial. We do not know the origin of the complaint as internal or external. However, one source indicated that it was likely from an "outside expert."
3. An apparent small decrease in *testimony error* rates in the mid-1990s correlated with several changes at the FBI Laboratory. We were not able to conclusively determine what caused the small apparent decrease, but some of the changes that were occurring at the time included (a) ASCLD/LAB accreditation, (b) staffing changes in the *Hairs and Fibers Unit* from FBI agents to non-agents, (c) *Hairs and Fibers Unit* response to the O. J. Simpson trial, and (d) *MHCA examiners* not writing joint *reports* with other disciplines in the FBI Laboratory.

Other observations regarding the *MHCA examiner testimony errors* include:

- Examiner experience appeared to have little impact on testimony error rates, as new *MHCA examiners* and seasoned examiners had essentially the same error rates.
- Based on the ABS Group analysis, about 10% of testimony issues occurred because *MHCA examiners* were asked leading questions that provoked an error. Notably, there were times when the attorneys asked an error-provoking question and the *MHCA examiners* avoided an error in their response.

The errors in transcripts continued throughout the period analyzed at what appears to be a slightly decreasing rate.

Errors in testimony continued throughout the period analyzed at what appears to be a slightly decreasing rate. The FBI Laboratory received limited negative feedback related to MHCA testimony.¹¹⁹ The ABS Group team concluded that FBI leadership took action in addressing such feedback, and noted a corresponding short-term small dip in *testimony error* rates, but was only temporarily successful in correcting that issue. These actions did not result in long-term solutions to the issues identified. This was the result of narrowly addressing the individual concerns and not recognizing the systemic, underlying issues.

The CESD in Figure 65 shows the progression of the 11 *causal events* that led to the *report and testimony error* events on the far-right side of the diagram.

6.2 WHY DID THE REPORT AND TESTIMONY ERRORS OCCUR?

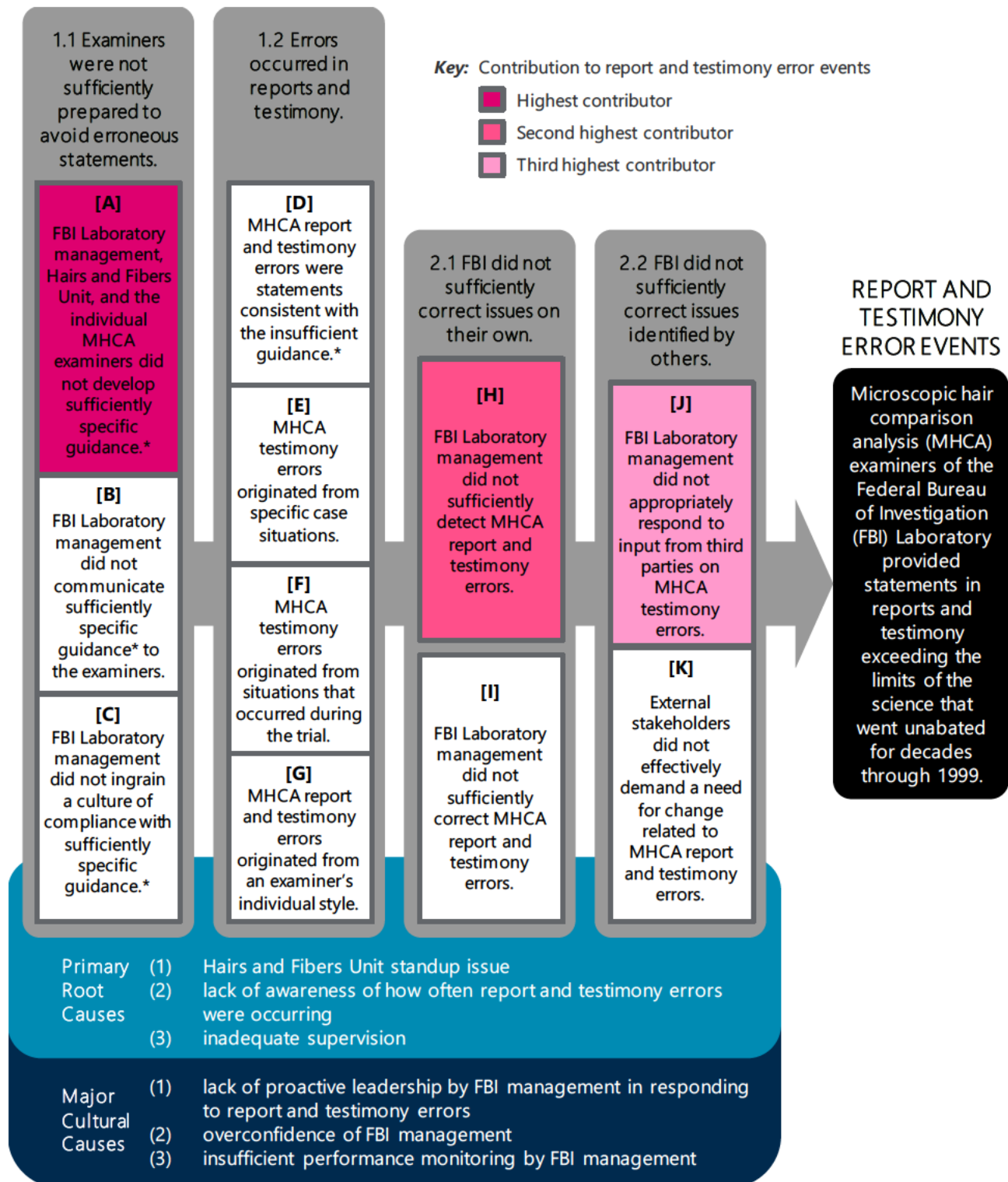
The examiner work environment included several error-likely situations.

The key observation regarding why there were errors in *MHCA examiner's* statements is that when they wrote *reports* and testified, examiners were often in an *error-likely situation*. From the 1950s through 1999, *MHCA examiners* were never provided, nor did they define for themselves, *sufficiently specific guidance* to avoid statements that would exceed the limits of the science. This resulted in an environment where it is not surprising that almost all examiners made numerous errors.

Almost all *MHCA examiners* made some statements containing errors in their *reports* and *transcripts*, with the exception being four who had few *reports* and *transcripts* in the set reviewed by the 2012 Review. The causes described below driving most of the errors were consistent across all *MHCA examiners*, including those with the highest number of errors and the highest error rates.

Based on interviews, examiners believed at the time their statements were within the limits of the science, and many of them still believe that most of the statements later judged to be *report and testimony errors* by the 2012 Review were not really errors. This conclusion regarding the examiners being in an *error-likely situation* is supported by Table 10, which contains additional information on the categories of guidance provided to the examiners during the period analyzed and the relationship of the *report and testimony errors* to these categories of guidance. The guidance was not static over the period analyzed. For example, following the O. J. Simpson trial in the mid-1990s, MHCA examiners were told not to use the word “match.” As a result, “match” moved from the “could state” category to the “cannot state” category.

119 “Internal FBI memos to FBI Laboratory Director Hicks.” 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.



*This guidance is specifically limited to assisting MHCA examiners in avoiding report and testimony errors as defined by the 2012 FBI MHCA Review.

Figure 65. Causal Event Sequence Diagram, the three primary root causes, and the three major cultural causes.

Most report errors fell into either the “could state” or “use your best judgement” categories.

For *reports*, most errors fell into either the “could state” or “use your best judgement” categories. For example, hundreds of *reports* contained statements similar to the questioned hair was “consistent with coming from [individual’s name].” The *reports* containing these statements were reviewed and approved during the period analyzed, but the statement was judged to be erroneous by the 2012 Review.

Most testimony errors fell into either the “could state” or “use your best judgement” categories.

For testimony, most of the errors fell into the “could state” or “use your best judgement” categories. For example, in *transcripts* we observed *MHCA examiner* statements similar to “I have looked at over 10,000 hair samples and so far I have not found two individuals that I couldn’t distinguish one from the other.” Statements like this were judged to be erroneous by the 2012 Review.

There was a mismatch between the guidance provided and the guidance that should have been given.

During our analysis, several interviewees commented that it was unfair to apply the standards of 2012 to the period analyzed. They indicated that had they known what the limits were, they would have testified within those bounds. We understand their comments. Using a highway driving analogy, this is like telling motorists to drive on a road with the posted speed limit sign saying “drive carefully.” Then, later, determining what the appropriate speed limits should have been, posting speed limit signs, and admonishing drivers for speeding 20+ years ago. Their comments reinforce two of our conclusions: (1) that without sufficiently specific guidance we were not surprised to see *report* and *testimony* issues and (2) if the *MHCA examiners* had not been put in this *error-likely situation* (i.e., if they had *sufficiently specific guidance*), they would not have made the majority of the *testimony errors*.

Table 10. Categories of guidance provided to the MHCA examiners during the period analyzed.

Guidance Category	Description of the Category	Comments	Examples
Had to state	Statements that were required to be stated in <i>reports</i> and/or <i>testimony</i> .		For example, the statement: <p><u>"It is pointed out that hair comparisons do not constitute a basis for absolute personal identification."</u>¹²⁰</p> <p>This limiting language was used in almost all reports reviewed. This was NOT judged to be an <i>error</i> by the 2012 Review.</p>
Could state	Statements that could be stated in <i>reports</i> and/or <i>testimony</i> .	Some of the statements in these two categories were determined to be <i>errors</i> by the 2012 Review.	An example of a <i>report error</i> from the could-state category would be: <p><u>"consistent with having come from [individual's name]."</u></p> <p>An example of a <i>testimony error</i> from the could-state category prior to the O.J. Simpson trial (<i>MHCA examiners</i> understood that "match" was allowed in testimony prior to the Simpson trial) was: <p><u>"Well, the head hair that matched with [the defendant] did not match the victim's head hair sample."</u></p></p>
Use your best judgement	Statements where no specific guidance was provided on their use in <i>reports</i> and <i>testimony</i> .	Most of the <i>report errors</i> were of these two categories. Most of the <i>testimony errors</i> were of these two categories.	An example of a <i>testimony error</i> from the use-your-best-judgement category (because there was no specific guidance on the use of "rare") would be: <p><u>"... based on my experience it's extremely rare that I will see hairs from two people that are so alike I can't tell them apart."</u></p>
Cannot state	Statements that were not allowed in <i>reports</i> and <i>testimony</i> .		An example of a <i>testimony error</i> after the O.J. Simpson trial (<i>MHCA examiners</i> were directed by <i>Hairs and Fibers Unit</i> management to not use "match" following the Simpson trial) would be: <p><u>"Well, the head hair that matched with [the defendant] did not match the victim's head hair sample."</u></p> <p>An example of a <i>testimony error</i> in this category after 1991 (a 1991 internal FBI memo stated that "the pitfalls of overstating results were discussed with MHCA examiners,"¹²¹ including the phrase "completely indistinguishable") would be: <p><u>"In other words, it was completely indistinguishable. I could not tell them apart."</u></p></p>

120 All quotes of MHCA examiner statements in this report are from MHCA reports or testimony unless otherwise noted. Portions of the quotes that were identified by the 2012 Review as report or testimony errors are underlined.

121 "Internal FBI memos to FBI Laboratory Director Hicks." 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

Lack of sufficiently specific guidance was a single-point failure.

This fundamental lack of *sufficiently specific guidance* for *reports* and testimony (labeled Causal Event A in Figure 65) was a single point of failure. This compromised the other management systems, inhibiting them from preventing, detecting, and correcting these *report and testimony errors*. For example, the FBI Laboratory management could not communicate sufficient *MHCA* guidance to the examiners (Causal Event B), nor could it ingrain a culture of compliance with *MHCA* testimony guidance (Causal Event C) because such guidance simply did not exist.

Examiners were told to use their best judgement.

Furthermore, when examiners testified, they were often told, in the context of their training, to “use your best judgment.” However, some of these statements were later determined by the 2012 Review to contain errors (Causal Event D). Most importantly, each examiner had their own interpretation of the limits of the science. With no clear boundaries and in using their best judgement, *MHCA examiners’ testimony errors* were also driven by:

- Specific *case* knowledge/situations/information, such as knowing the results of other analyses at the FBI Laboratory also implicated the defendant (Causal Event E)
- Specific situations occurring during trial, such as when an examiner tried to help the jury understand their findings by using an analogy later determined to contain an error (Causal Event F)
- Their own personality and style (Causal Event G)

It was possible for the Causal Events B through G to occur independently, resulting in statements exceeding the limits of the science; however, their occurrence was either guaranteed or greatly increased, given the lack of sufficiently detailed guidance. Not having *sufficiently specific guidance* contributed in some way to almost all of the *report and testimony errors* and is the most important cause of the *errors*. This implies that if the FBI Laboratory, the *Hairs and Fibers Unit*, or *MHCA examiners* had defined *sufficiently specific guidance* then most, if not all, of the *reports* and testimony would have been relatively error free.

The team identified three dominant causal events, three primary root causes, and three major cultural causes that drove the

Based on analysis of the data from interviews, *transcripts*, *reports*, and other documentation, the team concluded:

Testimony and report errors were made by FBI Laboratory *MHCA examiners* throughout the period analyzed.

The top three causal events for these *report and testimony errors* were (1) lack of *sufficiently specific guidance* for *reports* and testimony

occurrence of the MHCA testimony errors.

([A] in Figure 65), (2) lack of internal FBI error-detection [H], and (3) insufficient FBI response to external inputs regarding *MHCA* testimony [J].

The primary *root causes* of these dominant *causal events* were (1) a *Hairs and Fibers Unit* standup issue, (2) lack of awareness of how often *MHCA report and testimony errors* were occurring, and (3) inadequate supervision.

The major *cultural causes* that drove the primary *root causes* were (1) lack of proactive leadership by FBI Laboratory management in responding to report and testimony errors, (2) overconfidence of FBI Laboratory management, and (3) insufficient performance monitoring by FBI Laboratory management.

We structured what we analyzed into 11 causal events falling into 4 categories that sequentially led to the loss event.

Our team concluded that there were 11 *causal events* contributing to one or more of the errors comprising the error events. As illustrated in Figure 65, the 11 *causal events* (labeled A through K) fall into 4 categories (labeled 1.1, 1.2, 2.1, and 2.2) that sequentially led to the error events.

Highest Causal Event Contributor - Causal Event A: FBI Laboratory management, Hairs and Fibers Unit, and the individual MHCA examiners did not develop sufficiently specific guidance.

Regarding the management systems (*root causes*) driving Causal Event A, there was a cascading effect. This involved lacking what was needed from the standup of the *Hairs and Fibers Unit* (Primary Root Cause 1) that contributed to not being effective in the application of other management systems, particularly the lack of awareness of how often *MHCA report and testimony errors* were occurring (Primary Root Cause 2).

Primary Root Cause 1 – Hairs and Fibers Unit standup issue

Hairs and Fibers Unit standup issues began the cascade of management system weaknesses.

The cascade of management system weaknesses that led to the *report and testimony errors* began with deficiencies during the standup of the *Hairs and Fibers Unit*. Our team concluded there was no formal plan and no structured unit standup that identified necessary management systems or experts needed for the Unit's success. Furthermore, we also concluded that formalization of the mission, vision, goals, functions, and identification of stakeholders did not originally occur. The initial formalization or standup of the Unit in

the 1950s and 1960s did not require (1) development of report and testimony guidance or (2) the appropriate subject matter experts (legal, statistical, and quality assurance) to participate in their Unit as stakeholders. Embracing input from the legal experts during the period analyzed would likely have helped the examiners more fully understand the potential for making statements that exceed the limits of the *MHCA* science in legal proceedings and thus the need for more precise guidance. Designing a Unit at standup is a relatively new discipline in the area of organization excellence and was not an industry norm at the time. This *Hairs and Fibers Unit* standup issue negatively and significantly affected other *root causes* and *causal events* that ultimately significantly hampered the Unit's ability to avoid errors in testimony.

Primary Root Cause 2 – Lack of awareness of how often report and testimony errors were occurring

The cascading effect continued. Because there was no formal *Hairs and Fibers Unit* standup, there was no formal plan to proactively identify how often *MHCA report and testimony errors* were occurring. No assessment was performed regarding how often these errors were occurring, so the *Hairs and Fibers Unit* did not fully recognize the risks to the judicial system of erroneous *MHCA report* and testimony statements.

Cultural causes associated with Primary Root Causes 1 and 2

Both Primary Root Cause 1 and Primary Root Cause 2 were driven by lack of proactive leadership by FBI Laboratory management in responding to report and testimony errors (Major Cultural Cause 1) and overconfidence of FBI Laboratory management (Major Cultural Cause 2).

Major Cultural Cause 1 – Lack of proactive leadership by FBI Laboratory management in responding to report and testimony errors

During the period analyzed, FBI Laboratory management did not provide appropriate leadership in (1) identifying how often *MHCA report and testimony errors* were occurring (e.g., by formally establishing criteria for determining errors and monitoring against those criteria), (2) responding to instances of issues with

Lack of proactive leadership by FBI Laboratory management in responding to report and testimony

errors is a major cultural cause.

MHCA testimony (including third-party input), and (3) formalizing the methods used in the FBI Laboratory. As a result, there was not a questioning environment in the *Hairs and Fibers Unit* to support proactive and reactive identification of risks and address them in a fundamental and ongoing way. In addition, FBI Laboratory management did not exercise firm control over *MHCA examiner* testimony, which appears to have led to:

- Each examiner having their own standard for testimony
- Comprehensive, detailed guidance not being developed proactively or even when issues were identified
- Inadequate leadership to ingrain adherence to providing *MHCA* testimony within the limits of the science
- Failure to adequately monitor *MHCA examiner* testimony
- A narrow focus of response to issues identified, which resulted in missing numerous opportunities (including third-party input) to identify, address, and prevent future instances of *MHCA* testimony that exceeded the limits of the science

The ABS Group team concluded that the lack of proactive leadership in providing testimony standards and monitoring *MHCA* testimony occurred because FBI leadership did not consider *report and testimony errors* as highly significant events. Limited negative feedback was received and examiners were retrained, but the training effect soon faded. The Laboratory did not institute FBI Laboratory-wide policy changes to address examiner error issues.

Confidence is a valuable trait, but overconfidence can lead to report and testimony errors.

Major Cultural Cause 2 – Overconfidence of FBI Laboratory management

Confidence is a valuable trait, but overconfidence can lead to significant *report and testimony errors*. Overconfidence can prevent individuals and organizations from being alert to the possibility that something might be amiss. The *Hairs and Fibers Unit* personnel were overly confident because:

- The agent-examiners had done similar moot court training and testimony as fact witnesses
- Attorneys and judges and the *MHCA* community provided little negative feedback regarding the *MHCA* examiners' reports and expert witness testimony
- The *Hairs and Fibers Unit* personnel believed they were the world's leading organization in hair analysis and performing at the highest level

As a result, FBI Laboratory management believed the examiners received adequate training, and thus did not devote adequate attention to addressing existing and potential issues with *MHCA* testimony that exceeded the limits of the science. Specifically, they did not recognize the seriousness of the existing known issues or anticipate other issues.

The ABS Group team concluded that the FBI Laboratory management had an ongoing perception of confidence - everything that could be reasonably done to ensure quality *reports* and testimony had been done. The needed leadership focus on testimony quality did not occur because leadership did not sufficiently perceive or assess the frequency of errors.

6.3 WHY DID THE REPORT AND TESTIMONY ERRORS CONTINUE FOR DECADES?

Errors continued primarily because the errors were not detected and, therefore, not corrected.

Second and Third Highest Causal Event Contributors - Causal Event H: FBI Laboratory management did not sufficiently detect *MHCA report* and testimony errors, and Causal Event J: FBI Laboratory management did not appropriately respond to input from third parties on *MHCA testimony errors*.

No significant abatement occurred because FBI Laboratory management did not (1) sufficiently detect *MHCA report* and testimony statements that exceeded the limits of the science (labeled Causal Event H), nor did they (2) appropriately respond to input from third parties (Causal Event J). Causal Event J is of particular concern because it was the last layer of protection to abate *MHCA report and testimony errors*.

The same management system weaknesses (standup and lack of awareness of the frequency of errors) that contributed to the *Hairs and Fibers Unit's* inability to initially understand that they could be making statements exceeding the limits of the science also clouded their vision such that they did not see and acknowledge the need for systemic change. In addition, weaknesses in supervision contributed to the ineffective abatement (Primary Root Cause 3).

Inadequate supervision was also a root cause of errors continuing for decades.

Primary Root Cause 3 – Inadequate supervision

Had the FBI Laboratory management required a formal assessment of the potential for *testimony errors*, they would have likely required structured and periodic monitoring of *MHCA* testimony during actual trials to ensure the ongoing effectiveness of examiner training. FBI Laboratory management did not sufficiently supervise examiners to detect *testimony errors* that would have prompted action to (1) develop better testimony guidance, (2) ingrain adherence to both the letter and spirit of testimony guidance, (3) involve appropriate personnel in responding to testimony issues, (4) recognize that a particular issue could be symptomatic of a larger problem with testimony, and (5) limit examiners' exposure to specific *case* details and the results of examinations performed by other FBI Laboratory disciplines.

Regarding *reports*, the FBI Laboratory management did not correct the *report errors* during their *report* reviews because they did not have *sufficient specific guidance* defining what was incorrect.

Cultural causes associated with Primary Root Cause 3

Cultural causes associated with the two features of FBI culture previously discussed (lack of leadership and overconfidence) contributed to the inadequate supervision issues discussed above. Insufficient performance monitoring (Major Cultural Cause 3) was an additional significant contributor to Primary Root Cause 3.

Report reviews and testimony monitoring did not identify the errors.

Major Cultural Cause 3 – Insufficient performance monitoring by FBI Laboratory management

Reports

MHCA examiner activities in the FBI Laboratory were generally monitored (e.g., *report* reviews by Unit Chiefs). FBI Laboratory management also reviewed the *reports* but did not correct the *report errors* because they did not use appropriate review standards. Specifically, beginning around 1984, *MHCA reports* began and continued to frequently include a statement identified by the 2012 Review as an error. Almost all the *report errors* can be attributed to that one statement. The statement was consistent with guidance developed between 1982 and 1985 and formally presented by others in the field at an FBI-hosted international symposium on *MHCA* in 1985. The *reports* containing that statement were, at the time, reviewed and approved by *Hairs and Fibers Unit* leadership, but that statement was judged to be erroneous by the 2012 Review.

Testimony

For *MHCA* testimony, examiner testimony was rarely monitored during the period analyzed. Prior to 1995, there was no testimony monitoring program, and the program put in place in 1995 was ineffective in identifying testimony exceeding the limits of the science. As a result, FBI Laboratory management was unlikely to detect *report and testimony errors* and develop better guidance to prevent future errors. The ABS Group team concluded that the limited and ineffective testimony monitoring occurred, in part, because FBI Laboratory management (1) trusted that the *MHCA examiners* would testify appropriately given that they were highly trained and experienced personnel and (2) had a limited understanding of the frequency of *report and testimony errors*.

6.4 OTHER CONTRIBUTORS

Summary of what drove the vast majority of report and testimony errors

MHCA report and testimony errors occurred and continued for decades due to some combination of the 11 *causal events* described in Figure 65. Most importantly, *MHCA examiners* were often in an *error-likely situation* given they did not have *sufficiently specific guidance* to avoid *report and testimony errors* (Causal Event A). Causal Event A was ranked as the highest contributor to the error events. Causal Event H was ranked as the second highest contributor, and Causal Event J was ranked as the third highest contributor. These three highest contributing *causal events* and their primary *root causes* and major *cultural causes* are described above and summarized below. They led to the vast majority of the error events. Specifically, we concluded that had *MHCA examiners* not been in this *error-likely situation*, they would not have made the majority of the errors.

These three casual events, three primary root causes, and three major cultural causes drove the vast majority of report and testimony errors.

Causal Event A: FBI Laboratory management, Hairs and Fibers Unit, and the individual MHCA examiners did not develop sufficiently specific guidance.

Primary Root Cause 1 – *Hairs and Fibers Unit* *standup issue*

Primary Root Cause 2 – Lack of awareness of how often *report and testimony errors* were occurring

Major Cultural Cause 1 – Lack of proactive leadership by FBI in responding to *report and testimony errors*

Major Cultural Cause 2 – Overconfidence of FBI Laboratory management

Causal Event H: FBI Laboratory management did not sufficiently detect MHCA report and testimony errors. – AND - Causal Event J: FBI Laboratory management did not appropriately respond to input from third parties on MHCA testimony errors.

Primary Root Cause 3 – Inadequate supervision

Major Cultural Cause 3 – Insufficient performance monitoring by FBI Laboratory management

Other cultural causes that drove some report and testimony errors

Nine other cultural causes were identified.

The following subsections describe nine additional *cultural causes* and their impacts. Each *cultural cause* contributed to one or more *root cause* categories that drove the occurrence of one or more *causal events*. Unlike the three *cultural causes* described previously, the nine *cultural causes* listed and described below were not major and drove only some *report and testimony errors*.

1. The *Hairs and Fibers Unit* had a culture of limiting the documentation related to *MHCA* examiners.
2. The *Hairs and Fibers Unit* preferred informal communication.
3. The FBI Laboratory did not sufficiently value the accreditation process and standards until late in the period analyzed.
4. There was not a culture of *thoughtful-compliance* related to making *MHCA* report and testimony statements.
5. The *Hairs and Fibers Unit* did not defer to expertise.
6. The *Hairs and Fibers Unit* did not establish a questioning and learning environment.
7. The *Hairs and Fibers Unit* provided too much autonomy to the examiners during testimony.
8. Instead of acting like impartial scientists, the FBI Laboratory culture embraced FBI agent-examiners acting like detectives.
9. FBI leadership was perceived as not welcoming feedback from non-agent examiners when they first joined the FBI Laboratory.

Other Cultural Cause 1 – The Hairs and Fibers Unit had a culture of limiting the documentation related to MHCA examiner activities.

Examiners did not see the value in developing formal written procedures.

Based on information provided during interviews and confirmed by a lack of documentation, we concluded the culture of the *Hairs and Fibers Unit* limited documentation of *MHCA* examiners' activities.

Some examiners expressed that, at the time, it was their perception that it was not the norm in forensics to have written procedures. However, another *MHCA* examiner stated during an interview he was surprised at the lack of documentation and was “shocked at the lack of formality given that this was the FBI.” Some interviewees indicated that, at the time, they did not see the value in developing formal procedures.

When we explored why the Unit limited its documentation, we concluded:

- Some examiners perceived it was the norm not to formalize forensics activities, because of the apprentice model used in training (see Other Cultural Cause 2) produced examiners who were well trained and able to function autonomously.
- Another examiner stated during an interview that he believed the limited documentation was acceptable, because “all they had to do was make a statement as an FBI examiner and that would not be contested.”
- There was a concern that documentation made the *MHCA* examiners more vulnerable to scrutiny during testimony, as written procedures

and documentation of their *case* work would be requested by court attorneys for trial.

In the mid-1990s, the first set of written procedures was created as part of the effort to achieve accreditation as discussed in Other Cultural Cause 3.

Other Cultural Cause 2 – The Hairs and Fibers Unit preferred informal communication.

The Hairs and Fibers Unit relied too much on informal communication.

As discussed, the *Hairs and Fibers Unit* had a culture of limiting the documentation related to *MHCA examiners*. This led to a culture that preferred to use oral communication and other less formal methods to communicate guidance for *reports* and testimony. For example, after two instances of negative feedback, the lessons learned were shared in group meetings and not more formally communicated. In one of these instances, the *Hairs and Fibers Unit* Chief described the corrective actions using words such as “discussed,” “cautioned,” “counseled,” and “instructed.”¹²²

Another example is that testimony guidance was initially provided orally to examiners when they joined the Unit. New *MHCA examiners* were trained through an apprentice model that included strenuous moot courts. After initial training, testimony guidance and updates continued to be shared verbally. As a result, even if sufficient *MHCA* testimony guidance had been developed without a culture of formal communication it is unlikely that the guidance would have been consistently and effectively communicated to all examiners.

Other Cultural Cause 3 – The FBI Laboratory did not sufficiently value the accreditation process and standards until late in the period analyzed.

The FBI did not demonstrate leadership in achieving Laboratory accreditation.

122 “Internal FBI memos to FBI Laboratory Director Hicks.” 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

As leaders in their field, the FBI *MHCA examiners* trained many state, local, and other Laboratory examiners in the science of the *MHCA* process and held an international conference on *MHCA* attended by over 170 scientists from industry, university, and forensic laboratories around the world.¹²³ However, the FBI did not demonstrate leadership in achieving Laboratory accreditation. About 175 other publicly funded crime laboratories were ASCLD/LAB accredited before the FBI Forensics Laboratory.¹²⁴ Some laboratories became accredited in the early 1980s; however, there was not a significant commitment from the FBI Laboratory to achieve accreditation until the mid-1990s, with accreditation occurring in 1998.

One examiner told us during an interview: “Protocols were not written until accreditation.” As the *Hairs and Fibers Unit* grew from a single individual to a group of over 20, the need for formal written procedures increased. Even when written procedures for *Hairs and Fibers Unit* activities were developed, they did not include *sufficiently specific guidance* to enable an *MHCA examiner* to consistently write *reports* and testify without error.

When we explored why this *cultural cause* existed, we concluded:

- As discussed above in Other Cultural Cause 1, the *Hairs and Fibers Unit* had a culture of limiting the documentation related to *MHCA examiners*. This cultural issue led to a hesitation to embrace accreditation, a process requiring extensive documentation of Laboratory activities that was a forensic laboratory standard of care.
- Based on being leaders and innovators in the industry, they did not see value in the accreditation process. As discussed regarding Major Cultural Cause 2, there was an overconfidence of FBI Laboratory management in the capabilities of their management processes and *MHCA examiners*.
- As discussed in Other Cultural Cause 6, the *Hairs and Fibers Unit* did not establish a questioning and learning environment that would have wanted, sought, and welcomed the expertise of others in the form of the standard of care contained in the accreditation standards.

Other Cultural Cause 4 – There was not a culture of thoughtful-compliance related to making MHCA report and testimony statements.

123 “Proceedings of the International Symposium on Forensic Hair Comparisons: FBI Academy, Quantico, Virginia, 25-27 June 1985.” U.S. Government Printing Office, www.ncjrs.gov/pdffiles1/Digitization/116592NCJRS.pdf, page iii.

124 ASCLD Board of Directors, “Board Position Statement: Accreditation,” 20 Aug 2014, www.ascl.org/wp-content/uploads/2014/08/ASCLD-Board-Position-on-Accreditation.pdf.

The Hairs and Fibers Unit did not sufficiently achieve a culture of thoughtful-compliance.

There were occurrences where *MHCA examiners* adhered to the specific requirements, but not the intent behind the requirement. For example, the *MHCA examiners* were trained in 1991 not to say “perfect match” and the data suggest this training worked; however, the examiners kept saying “indistinguishable” and other phrases that strongly indicated the hairs were likely from the same source.

Without exception, we found the *MHCA examiners* interviewed to be respectful of the FBI Laboratory rules. Given a rule, we believe they would have followed it. However, the *Hairs and Fibers Unit* culture did not sufficiently emphasize the importance for understanding why certain decisions were made and why certain rules existed and the nuances therein.

When we sought to understand why this culture existed, we concluded:

- As discussed in Other Cultural Cause 6, the *Hairs and Fibers Unit* did not establish a questioning and learning environment that would have supported *thoughtful-compliance*. The balance in the Unit too heavily leaned to literal compliance versus embracing and encouraging *thoughtful-compliance*.
- Several examiners indicated during interviews that “the FBI operated in a military fashion with a specific chain of command.” The FBI Laboratory is a law enforcement agency and branch of the U.S. Department of Justice. For the agent-examiners, they also had experienced FBI agent training that “operated like a military boot camp.” Based on interviews, this culture may have limited personnel from raising potential problems to managers.

Other Cultural Cause 5 – The Hairs and Fibers Unit did not defer to expertise.

The Hairs and Fibers Unit did not want, seek, or value the expertise of others.

There was no intentional and sustained effort to involve experts (e.g., they were confident in their own expertise) in the interpretation of potentially erroneous statements in *MHCA reports* and testimony. The data we were able to collect on this topic were mainly in regard to involvement of internal FBI legal counsel.

When the FBI Laboratory assigned legal counsel to the FBI Laboratory in the 1990s, the *Hairs and Fibers Unit* did not welcome that person’s help with training (including moot courts) and guidance for writing *reports* and providing testimony.

Based on interviews, most *MHCA examiners* who were in the *Hairs and Fibers Unit* from the 1950s through 1990s believed the FBI lawyer’s input would not be helpful because the lawyers, in general:

- Were not technical experts (an *MHCA examiner* said during an interview that “Lawyers do not know science.”)
- Did not have much exposure to *MHCA* testimony

MHCA examiners in the *Hairs and Fibers Unit* believed they had a good understanding of the legal system in regards to *MHCA* testimony because the Unit had seasoned *MHCA examiners* with a lot of courtroom testimony experience, and they had received substantial positive feedback and minimal negative feedback.

Some *MHCA examiners* believed their ability to effectively communicate their scientific opinion to the jury would be encumbered by guidance from the FBI’s legal counsel. This was expressed during interviews as, “[the FBI lawyers] are trying to put a legal opinion on my scientific conclusion.”

Based on interviews, we concluded that some *MHCA examiners* did not understand how important *MHCA* testimony could be to a trial. For example, one examiner said during an interview, “no one gets convicted just on hair testimony.”

When we sought to understand why this culture existed, why *MHCA examiners* did not seek support from FBI legal counsel, and why there was friction:

- In moot courts, examiners had to pass a role-playing court setup during training where the lawyer was “out to get them tricked” into saying something that may have created a feeling of lawyers as the opposition. One examiner said during an interview that, “in the moot court training, the older examiners would role play the defense attorney, even including some tactics from police tv shows.”
- Based on interviews, when the *MHCA examiners* were in court, the examiners believed that, “we go in to do our job and don’t care about the answer [the results of their *MHCA* analysis] but lawyers just want to twist our words.” This belief was confirmed by many interviewees.
- In addition, an Office of Inspector General inquiry in 1994 through 1995, brought scrutiny to one *MHCA examiner*.¹²⁵ This investigation created friction between lawyers and *MHCA examiners* in the *Hairs and Fibers Unit*. One *MHCA examiner* stated during an interview that during the “DOJ inquiry we all had our rights read to us... look

125 Bromwich, Michael R. “FBI Laboratory: An Investigation into Laboratory Practices and Alleged Misconduct in Explosives Related and Other Cases.” Diane Pub Co, 01 Apr. 1997, books.google.com/books?id=PpjvumZdqo8C&printsec=frontcover#v=onepage&q&f=false.

what happened the last time we got a lawyer involved” and another interviewee stated “they make everything more difficult... we hate them.”

Also, more broadly, the *report* and testimony limits were discussed at the 1985 international symposium,¹²⁶ but there is no evidence in the proceedings that non-forensic experts such as lawyers and statisticians were involved in developing or presenting the *MHCA* limits of the science. This indicates a larger forensic community failure to involve subject matter experts. As a result of not involving experts, there was a lack of understanding of the frequency of *MHCA* *examiners* providing statements that exceeded the limits of the science.

The ABS Group team concluded that this occurred, in part, because of a culture of allowing the skilled and trained examiners (experts in their field) to do their work with a perception that other external input (expertise in other, related fields) would be unhelpful, burdensome, intrusive, and unnecessary.

126 “Proceedings of the International Symposium on Forensic Hair Comparisons: FBI Academy, Quantico, Virginia, June 25-27, 1985.” U.S. Government Printing Office, Proceedings of the International Symposium on Forensic Hair Comparisons: FBI Academy, Quantico, Virginia, June 25-27, 1985, www.ncjrs.gov/pdffiles1/Digitization/116592NCJRS.pdf.

Not creating a questioning and learning environment resulted in missing opportunities to identify, address, and prevent issues.

Other Cultural Cause 6 – The Hairs and Fibers Unit did not establish a questioning and learning environment.

While the FBI Laboratory had a successful learning environment in other areas, such as DNA technology and the process of performing *MHCA*, Laboratory management did not ingrain a questioning attitude and a learning environment related to significance statements in *MHCA* reports and testimony.

Our team’s analysis of *transcript* data shows only short-term dips following learning opportunities with minimal long-term improvement. This indicates that lessons learned were not retained by the Unit. There was insufficient drive to understand the underlying causes of issues related to *MHCA* statements, and we found no evidence of a formal approach to capturing lessons learned.

We understand some lessons learned were discussed verbally in meetings at the time but not captured and integrated into organizational knowledge for retention. Because they did not create and retain lessons learned records, they did not have a central set of records for adverse events that occurred. Based on interviews and response to one complaint,¹²⁷ records of feedback (positive and negative) and records of the FBI’s actions taken in response were typically filed in an individual’s personnel file instead of a location that would support a transparent and learning culture.

As a result, it was more difficult for existing and future examiners to benefit from those lessons learned and to respond as effectively as they could have to testimony-specific situations.

Hairs and Fibers Unit leadership took some action to fix what they saw as the immediate problems as they arose. The short-term benefit was evident in our testimony trending that showed dips in *testimony errors*. But, the Unit leadership did not sufficiently explore the underlying causes or dig deep enough to understand and take action on correcting the management system weaknesses.

The incentives in the *Hairs and Fibers Unit*, sometimes monetary in nature, rewarded efficiency in processing *cases*. There was no positive motivation for *Hairs and Fibers Unit* personnel to take the initiative to recognize and communicate *MHCA* issues to management. This made it less likely that *MHCA* examiners would proactively recognize, report, and resolve *report* and

127 “Internal FBI memos to FBI Laboratory Director Hicks.” 6 Dec. 1991 and 11 Nov. 1991, Subject: Transcript of Testimony, 12-14 Dec. 1989.

testimony problems. It also made it unlikely that *MHCA examiners* would push management to provide more clearly defined guidance for articulating the results of *MHCA* analyses.

Collectively, the failure to establish a learning and questioning environment resulted in missing numerous opportunities to identify, address, and prevent future instances of *MHCA report and testimony errors*.

Other Cultural Cause 7 – The Hairs and Fibers Unit provided too much autonomy to the examiners during testimony.

A few examiners were perceived by other examiners as acting on their own during testimony.

As described regarding Major Cultural Cause 2, the culture of overconfidence of FBI Laboratory management led to the examiners being trusted to testify within the limits of the science. Their testimony was infrequently monitored. This resulted in all examiners having a high degree of autonomy when testifying, which resulted in the following issues:

- A few examiners were perceived by other examiners as acting on their own during testimony – that they could say whatever they wanted. We understand that the FBI Laboratory wanted examiners to represent themselves in *reports* and in court as an FBI Laboratory examiner consistent with the training and guidance they had received. But, based on interviews, some examiners perceived that when they took the stand they were expert witnesses first and FBI employees second, with their opinion based on their analysis, education, and experience. These few individuals were perceived as undisciplined by several interviewees.
- During the period analyzed, former *MHCA examiners* testified after extended absences from the FBI Laboratory, but FBI Laboratory management did not require them to receive updated guidance before providing testimony. In the few instances where the limited testimony guidance had changed, the returning *MHCA examiners* were not informed or trained on the new guidance.

This *cultural cause* was driven by the reluctance of the *MHCA examiners* to discuss with Unit and Laboratory management their perception that a fellow examiner's testimony was inconsistent with their training and guidance. This in turn was an extension of the Other Cultural Cause 6, the *Hairs and Fibers Unit* did not establish a questioning and learning environment and created a situation where *MHCA examiners* did not raise testimony issues to management. In addition, this *cultural cause* was driven by failure (1) of the FBI Laboratory management to recognize examiners' reluctance to speak up and (2) to inculcate the examiners in the FBI's expectations for them.

Other Cultural Cause 8 – Instead of acting like impartial scientists, the FBI Laboratory culture embraced FBI agent-examiners acting like detectives.

There are benefits of having FBI agents in the FBI Laboratory, but management did not control the down side of that approach.

There were many benefits of having FBI agents in the FBI Laboratory, but management did not control the down side of that approach. For many decades, only FBI agent-examiners were allowed to work in the FBI Laboratory. The FBI agent-examiner role was not just to provide the analysis results, but also to assist in integrating those results with other information about the *case* to help draw conclusions. Many agent-examiners were pulled from the field to work in the FBI Laboratory because they had a science-related background. In the mid-1990s, non-agents were admitted to the *Hairs and Fibers Unit*.

Statements made, or the significance of the statements, in testimony by some examiners were influenced by the following factors:

- The examiner knew other FBI Laboratory results (e.g., the Firearms/Tool marks Unit had made a match to the suspect) and that boosted confidence in their own *MHCA* match.
- The examiner learned about the background of the suspect and knew, in some instances, that the suspect had an extensive criminal history.
- The examiner knew unnecessary information about the *case*.
- Some examiners were familiar with the judges and prosecutors in their *cases*. Assignment of *cases* was generally based on workload, but at times, *cases* were assigned based on examiner preference.

When we explored how this culture began, we learned:

- The FBI desired the *MHCA examiners* to perform in a “competent and impartial manner.”¹²⁸
- FBI agents typically spent some part of their career before working at the FBI Laboratory as a field-agent where they were trained as law enforcement agents, and they were also trained and testified as fact-witnesses. As one examiner told us during an interview that, “Agents were part of a fraternity, chasing criminals... They followed direction. They approached *cases* like agents.”

128 “Trace Evidence Unit Physical Scientist-Forensic Examiner Training Manual.” Training Program-Physical Scientist-Forensic Examiner Trace Evidence Unit, TRAINING MANUALS/PHYS SCIENTIST-FORENSIC EXAM TRNG MAN 1, Revision 1, 12 December 2006, pp. 1-76.

- Even when they entered the FBI Laboratory, FBI agent-examiners retained their agent identity first and foremost. Being an agent-examiner brought social and financial perks like prestige, higher pay, and the ability to carry a gun every day.
- An example of this role duality (between agent and examiner) is that at some point the *MHCA* examiners started supporting the crime-scene investigators with evidence collection. In some *cases*, based on interviews and *transcript* data, examiners collected hair from the crime scene, completed the *MHCA*, then testified on the results in the trial.

These circumstances could have led to mischaracterization and overemphasis of their own results during testimony; however, notably these issues did not lead to the predominance of the *report and testimony errors*. Our team concluded that the FBI agent-examiners gained *case-specific* information because they acted more like detectives building a *case* than impartial scientists reporting facts.

This cultural issue began with the nature of the standup of the FBI Laboratory and continued because the FBI Laboratory management failed to compensate for the down side associated with staffing the FBI Laboratory with FBI agent-examiners.

Other Cultural Cause 9 – FBI leadership was perceived as not welcoming feedback from non-agent examiners when they first joined the FBI Laboratory.

Some non-agent examiners believed FBI leadership did not welcome their feedback when they first joined the FBI Laboratory.

Negative feedback, especially from non-agent examiners when they first entered the FBI Laboratory, was not well received by management. The non-agent examiners brought a fresh perspective to Laboratory activities that we suspect (but could not formally conclude from the anecdotal evidence) may have been threatening to the existing *MHCA* examiners and other agent-Laboratory leadership.

One examiner said leadership went so far as reprimanding them for communicating a process deficiency. There are no data to suggest that this was more than a short-term issue during the transition from solely agent-examiners. This issue left some non-agent examiners believing leadership did not want feedback and led to missed opportunities to identify, respond, and prevent issues.

We concluded this *cultural cause* stems from Other Cultural Cause 5, the *Hairs and Fibers Unit* did not defer to expertise, and that FBI Laboratory management was not open to criticism from these perceived outsiders. This

hindered the FBI Laboratory's ability to detect and correct the issues occurring.

Of note: External stakeholders did not effectively demand a need for change related to MHCA report and testimony errors.

There was not a timely demand for change from external stakeholders.

The ABS Group team also observed that the FBI Laboratory management is a crucial component, but not the only component in the overall judicial system that included the defense attorney, the judge, and the prosecutor. Specifically, for the feedback system to work as intended, feedback from these judicial system elements ideally would provide timely indication of performance gaps in an examiner's testimony.

However, during the period analyzed, this feedback was infrequent and was not persistent or forceful. In addition, there was limited or no effective input from other groups with influence (e.g., *MHCA* community and broader pattern recognition community) or oversight responsibility (e.g., Office of Inspector General, GAO, OGC). The negative feedback that occurred was addressed by the FBI Laboratory management as isolated events with insufficient recognition and correction of the larger system deficiencies.

CONFIDENCE IN OUR RESULTS AND CONCLUSIONS

If we interviewed more people or reviewed more documentation, we expect it would not substantially alter our results and conclusions.

After a year of analysis, the ABS Group team gained an understanding of the examiner's role at the FBI Laboratory, their management system, and their work culture. The insights from interviews were organized and categorized alongside open source information and FBI-provided documentation using the structured methods discussed in this report. Our team reached a level of consistency in data and analysis such that if we interviewed more people or reviewed more documentation, we expect it would not substantially alter our results and conclusions.



EPILOGUE

This section provides an updated MHCA status in the FBI Laboratory since the period analyzed.

7 EPILOGUE

Today the FBI Laboratory has enhanced technological abilities that it uses to provide scientific analysis of crime scene evidence. Law enforcement and crime scene investigators continue to find hair at crime scenes and desire to know how that hair compares to their suspects or victims. The FBI continues to use MHCA as a technique to perform visual analysis of the hairs. Now, MHCA is routinely used in conjunction with DNA testing. MHCA examiners continue to be requested by prosecutors and defense attorneys to testify on the results of their MHCA findings. FBI employees trained in MHCA continue to testify, providing expert opinion on hair found at crime scenes as they relate to the case.

The analysis of human hair remains relatively unchanged since its introduction into the scientific community decades ago. However, changes have been made on understanding the limitations of hair comparison and the ability to articulate those limitations to a jury, and those limitations are reflected in current practices.



APPENDICES

These appendices provide information that helps to understand the work we performed. The information includes sources we reviewed, additional detailed analyses on trending of transcripts, and details on the RCA and CCA methodologies used in the analysis.

APPENDIX A: SOURCES

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APPENDIX B: TRENDING OF WORD OR PHRASE USAGE

This appendix contains data on the words and phrases used by MHCA examiners during trial that were, at least in one instance, marked as an error by the 2012 FBI MHCA Review. These data are used in Section 4.5 as the basis for the analysis.

Why is our analysis structure different from the 2012 FBI MHCA Review? To gain insight for this root cause and cultural cause analysis, our team analyzed the transcript data by words and phrases instead of by the three error types defined by the 2012 FBI MHCA Review. Trending the usage of specific words and phrases in the transcripts (instead of by Error Type 1, 2, and 3) allowed us to understand (1) how the use of particular words or phrases changed during the period analyzed and (2) which events in the timeline may have influenced MHCA examiner reports and testimony. Section 4.5 uses the base data contained in this appendix to answer a set of questions about the potential impact of events and changes in the Hairs and Fibers Unit during the period analyzed.

Trending was performed for the following 16 words and phrases:

1. Completely indistinguishable
2. Consistent with
3. Exact
4. Face analogy
5. Indistinguishable
6. Individualization
7. Match
8. Perfect match
9. Probability/Statistics
10. Rare
11. Same
12. Scientific certainty
13. Seldom
14. Stronger/Confident
15. Unique
16. Unusual

How were these data analyzed? The techniques, data available, limitations of the data, and technical decisions made to complete this analysis are provided in *Methodology* and *Analysis* (Sections 3 and 4, respectively).

Why are there differences between the results of this analysis and the results of the 2012 Review? The words and phrases listed above were marked at least once as an error by the 2012 Review. However, because of differences in the methods used by the 2012 Review and our analysis, the words and phrases listed above may not have always been identified by the 2012 Review as errors.

Why do the charts in this appendix range from 1979 through 1999 when there are more transcripts in earlier and later years? For trending analysis, we required there to be at least five transcripts across consecutive years. Figure 66 shows the total number of transcripts available for each year. 1979 is the first year from which at least 5 transcripts were available, and 1999 is the last consecutive year where at least 5 transcripts were available.

Why does each chart in this appendix have a dashed line across the graph? Each graph includes a dashed line that is a linear trend line generated using the trend line feature in Excel. These trend lines are helpful in judging whether the general trend appears to have increased or decreased.

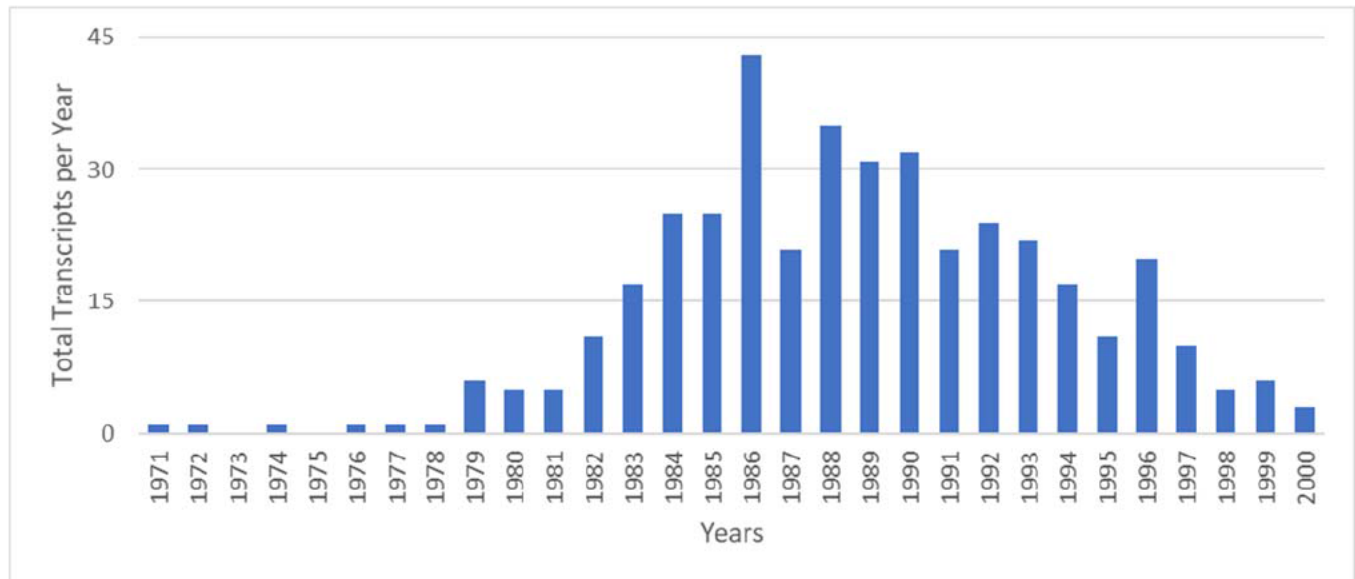


Figure 66. Total number of available transcripts of MHCA examiner testimony, by year.

What is shown in the graphs in each of the 16 sections below? The graphs associated with the analysis of each word or phrase show the average number of times a specific word or phrase, like “match,” was used during each year across all examiners. There are two graphs in each section resulting from the two different ways the data were normalized. The first graph shows the annual trend of the average uses of the word or phrase per transcript and the second graph show the annual trend of the average uses of the word or phrase per transcript page.

Example of the method used to normalize data for the first graph in each section below:

The first graph for each word or phrase shows data normalized by transcript. For example, Figure 67, illustrates the availability of 5 transcripts during a 1-year period. In searching for the word “XYZ,” two instances were found where the word “XYZ” was used in a manner similar to what the 2012 Review deemed an error. There were 2 uses of the word “XYZ,” which when divided by 5 total transcripts give an average of 0.4 uses per transcript for this particular year.



Figure 67. Example of normalization by the number of transcripts.

Example of the method used to normalize data for the second graph in each section below:

The second graph for each word or phrase shows data normalized by transcript page. For example, Figure 68, illustrates the availability of 5 transcripts during a 1-year period with a total of 1,079 transcript pages of MHCA examiner-related testimony. In searching for the word “XYZ,” two instances were found where the word “XYZ” was used in a manner similar to what the 2012 Review deemed an error. There were two uses of the word “XYZ,” which when divided by 1,079 total transcript pages give an average of 0.0019 uses per transcript page for this year.

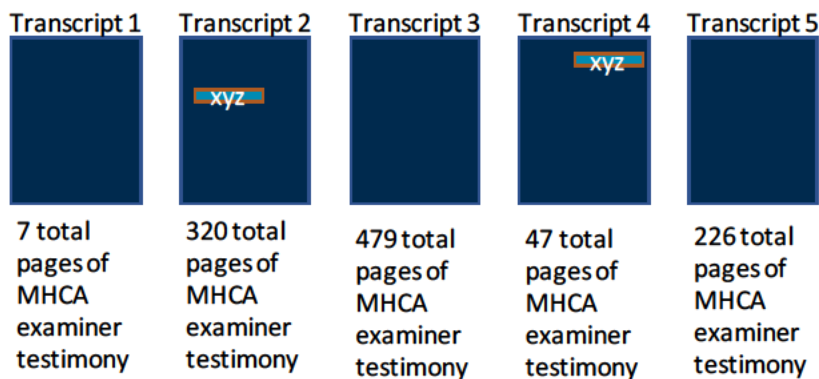


Figure 68. Example of normalization by the number of transcript pages.

What were the 16 words/phrases used as search terms?

The following table lists the search terms used to provide the graphical trends in this appendix.

Table 11. Words and phrases used in MHCA testimony analysis.

Word or Phrase	Example Search Terms
Completely indistinguishable	Completely indistinguishable
Consistent with	Consistent with coming from [individual's name], having come from [individual's name], originating from [individual's name], having originated from [individual's name], [individual's name], is consistent with being a contributor, [individual's name] is consistent with being a source
Exact	Exact, exactly, just like
Face analogy	Analogy, face, eye
Indistinguishable	Indistinguishable, identical
Individualization	Individualization, individualize, individualized, degree of individuality
Match	Match, matches, matched, matching, match up
Perfect match	Perfect match, perfectly matched, matches the known hairs perfectly, match perfectly, matches perfectly, matched perfectly, perfectly matches, perfectly matching, matching perfectly
Probability/statistic	Probable, probably, statistic, out of, one in, one of, study, never, always, remote, often, percent, likely, unlikely, infrequent, infrequently
Rare	Rare, rarely
Same	Same
Scientific certainty	Scientific certainty, exact science
Seldom	Seldom
Stronger/confident	Strong, stronger, confidence, confident, degree of certainty, significant
Unique	Unique, uniquely, uniqueness
Unusual	Unusual, not usual, unusually, not usually

Completely indistinguishable

A phrase used by one MHCA examiner during testimony was “completely indistinguishable.” Some uses of this word were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Examiner: I compared the pubic hair to the hairs of [defendant]. They were -- they microscopically matched. They were completely indistinguishable from [defendant]’s hairs and either originated from him, or if they didn’t, it would have to be another person of the same race with pubic hairs exactly like [defendant]’s, and if that third person does exist, then they would have to be in a position where their hairs could also be put on this particular jacket.

Our team searched for the phrase “completely indistinguishable” in various forms listed in Table 11. Figure 77 and Figure 78 show the trends of “completely indistinguishable” in testimony associated with exceeding the limits of the science from 1979 to 1999.

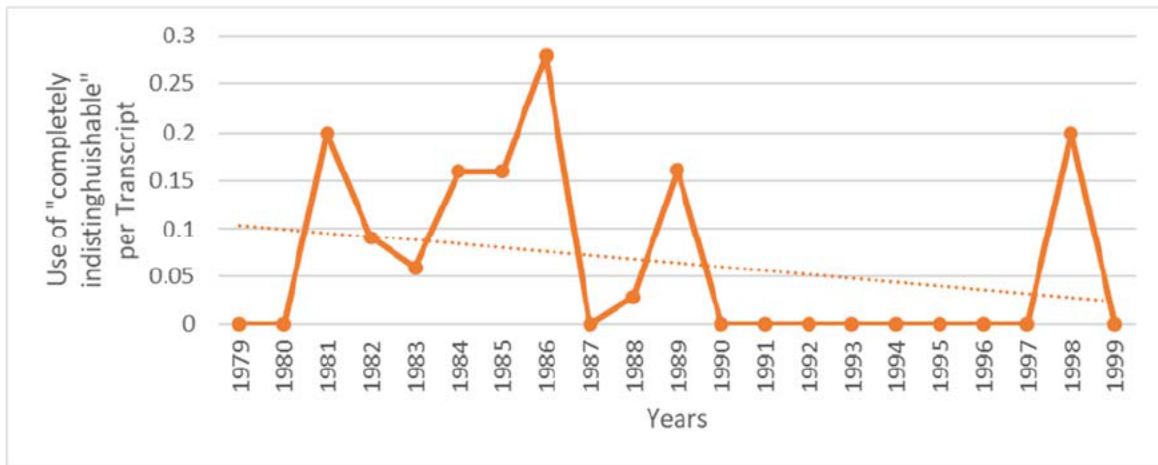


Figure 69. Use of "completely indistinguishable" per transcript by year (1979-1999).

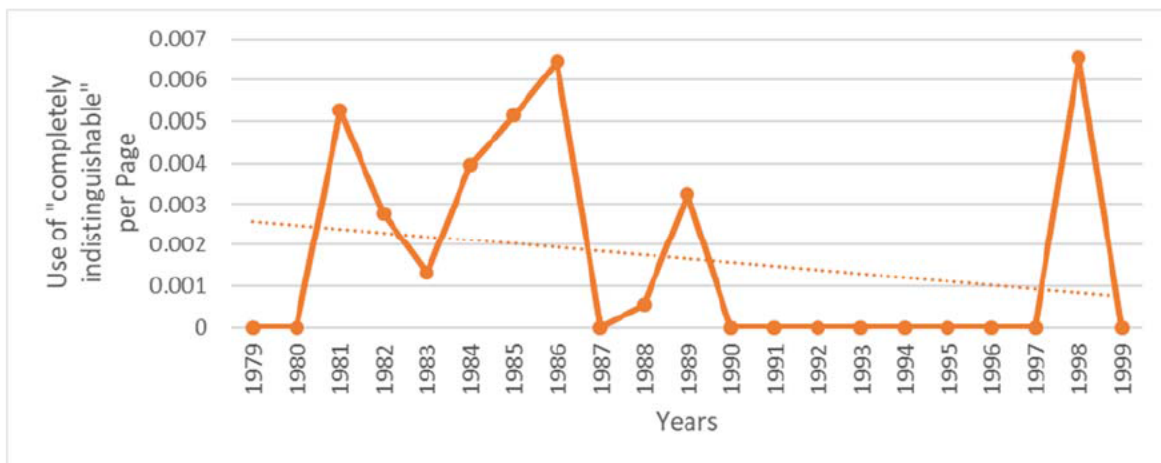


Figure 70. Use of "completely indistinguishable" per transcript page by year (1979-1999).

Consistent with

A common phrase used by some MHCA examiners during testimony was “consistent with.” Some uses of this phrase were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Counsel: What is the best conclusion that you can come to?

Examiner: When every characteristics (sic) in the questioned hair is present in the known sample and there are no significant differences, I conclude that those hairs exhibit the same microscopic characteristics as the known sampling and are consistent with having come from that individual, the same individual that the known sample came from.

Our team searched for the phrase “consistent with” in various forms listed in Table 11. Figure 71 and Figure 72 show the trends of “consistent with” in testimony associated with exceeding the limits of the science from 1979 to 1999.

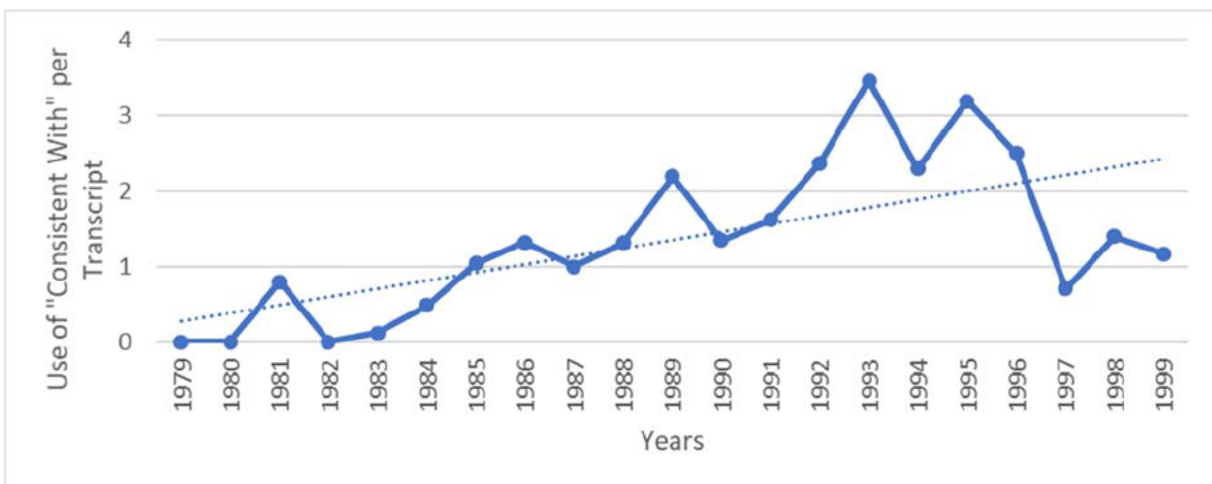


Figure 71. Use of “consistent with” per transcript by year for all MHCA examiners (1979-1999).

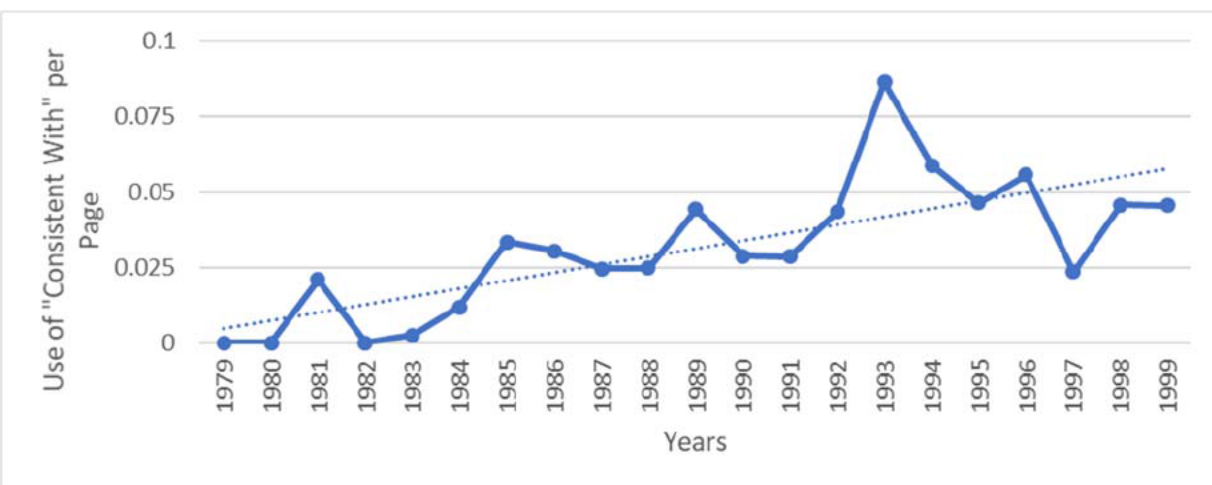


Figure 72. Use of “consistent with” per transcript page by year for all MHCA examiners (1979-1999).

Exact

A common word used by some MHCA examiners during testimony was “exact.” Some uses of this word were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Examiner: ...but someone else would had to have exactly the same microscopical characteristics in their hairs and had the opportunity to deposit those hairs at the crime scene at the time the crime occurred. You know, statistically I think you can probably work that out.

Our team searched for the word “exact” in various forms listed in Table 11. Figure 73 and Figure 74 show the trends of “exact” in testimony associated with exceeding the limits of the science from 1979 to 1999.

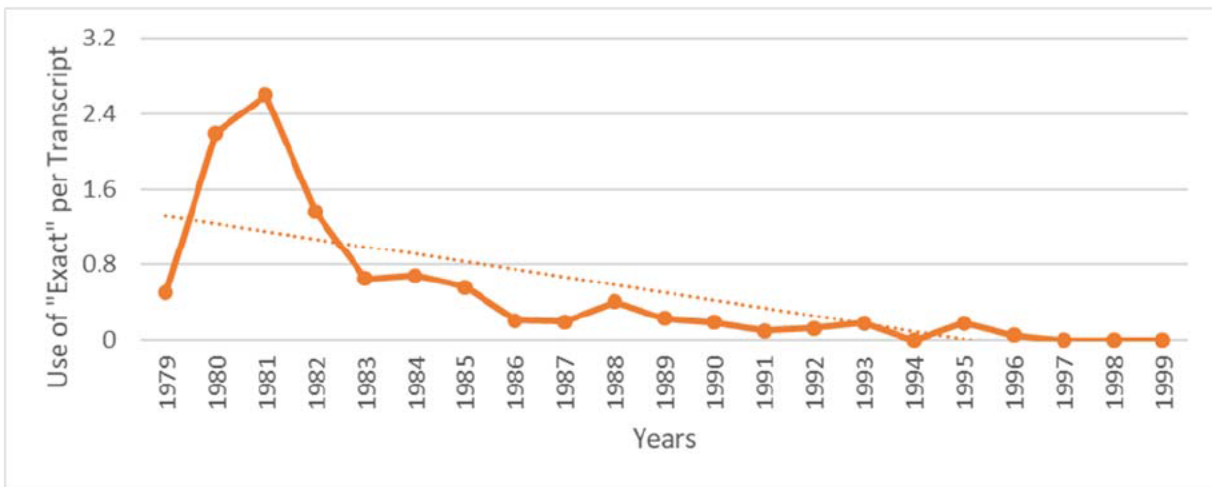


Figure 73. Use of “exact” per transcript by year for all MHCA examiners (1979-1999).

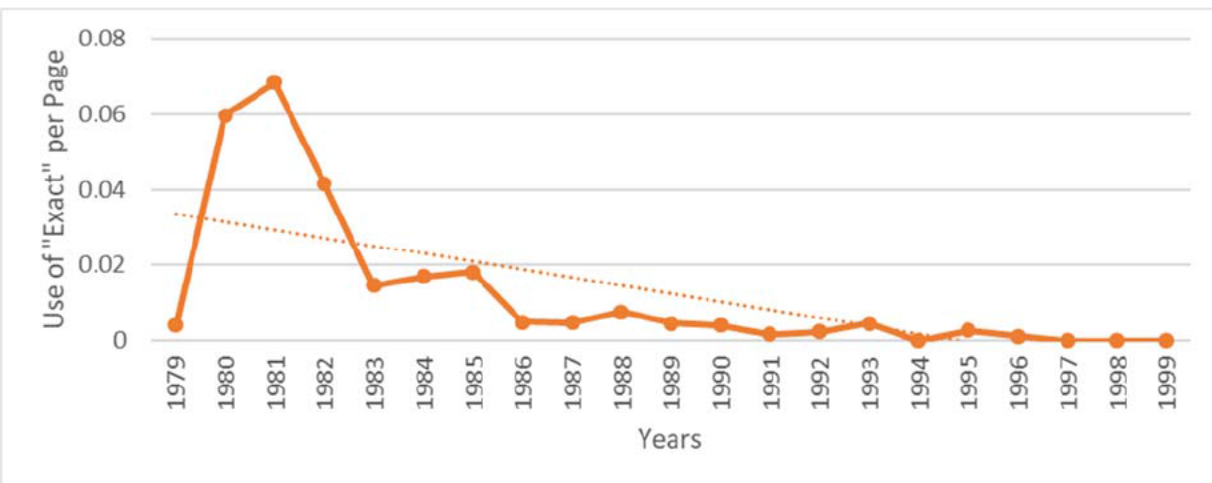


Figure 74. Use of “exact” per transcript page by year for all MHCA examiners (1979-1999).

Face analogy

The face analogy was commonly used by some MHCA examiners during testimony to describe the variation in the arrangement of microscopic characteristics of hair. Some uses of this phrase were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Examiner: Your face only has a finite number of features, two eyes, two ears, a nose, a mouth, maybe some moles and freckles, but it's how they are distinctly arranged on your spouse or your friend or yourself that allows you to pick that person out. And the same thing with the hair comparison. All hairs (sic) is essentially going to have these different parts. It's how they're distinctly arranged in your hair or your head or pubic hairs that allows the forensic hair examiner to tell your hair apart from someone else's.

Our team searched for words and phrases indicative of the face analogy listed in Table 11. Figure 75 and Figure 76 show the trends of words and phrases indicative of the face analogy in testimony associated with exceeding the limits of the science from 1979 to 1999.

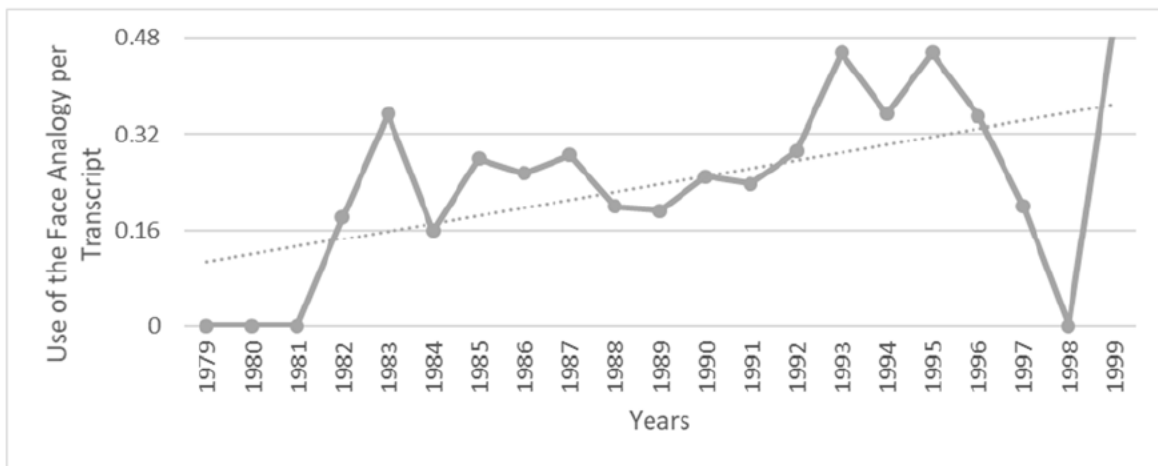


Figure 75. Use of the face analogy per transcript by year for all MHCA examiners (1979-1999).

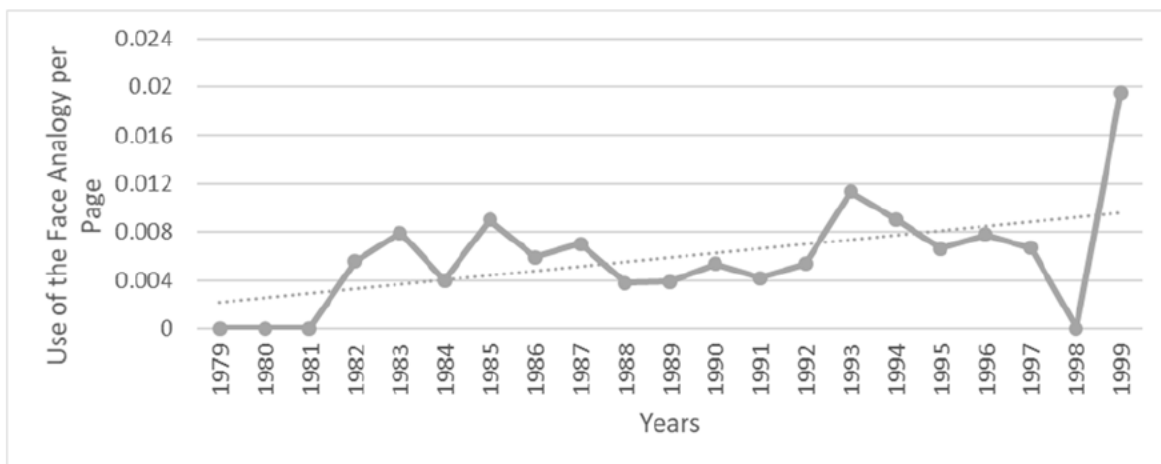


Figure 76. Use of the face analogy per transcript page by year for all MHCA examiners (1979-1999).

Indistinguishable

A common word used by some MHCA examiners during testimony was “indistinguishable.” Some uses of this word were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Examiner: Again, they were indistinguishable from [the defendant] and either originated from him or, to have come from anybody else, again, it would have to be a person of the same race with exactly the same characteristics.

Our team searched for the word “indistinguishable” in various forms listed in Table 11. Figure 77 and Figure 78 show the trends of “indistinguishable” in testimony associated with exceeding the limits of the science from 1979 to 1999.

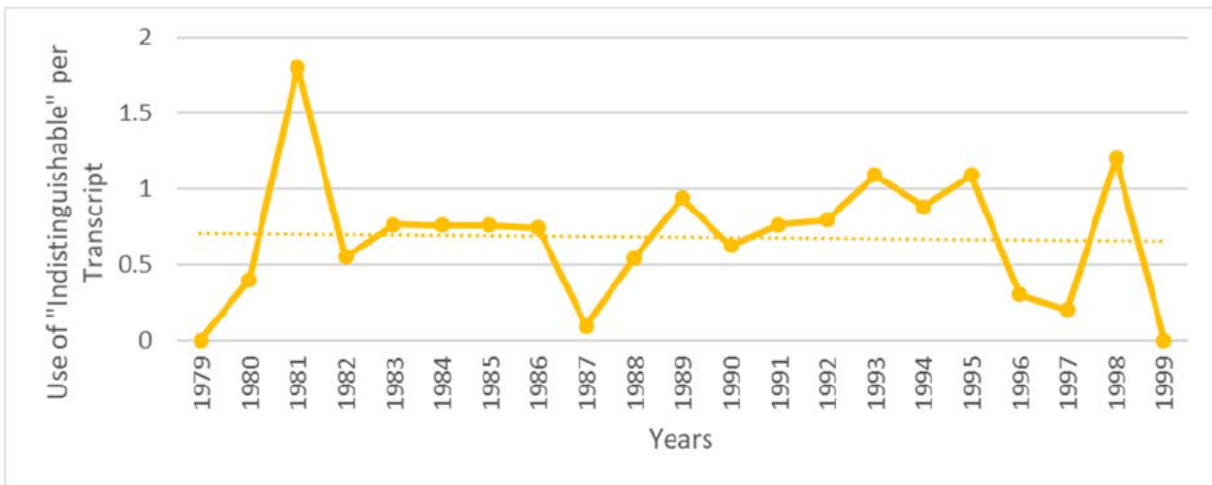


Figure 77. Use of "indistinguishable" per transcript by year for all MHCA examiners (1979-1999).

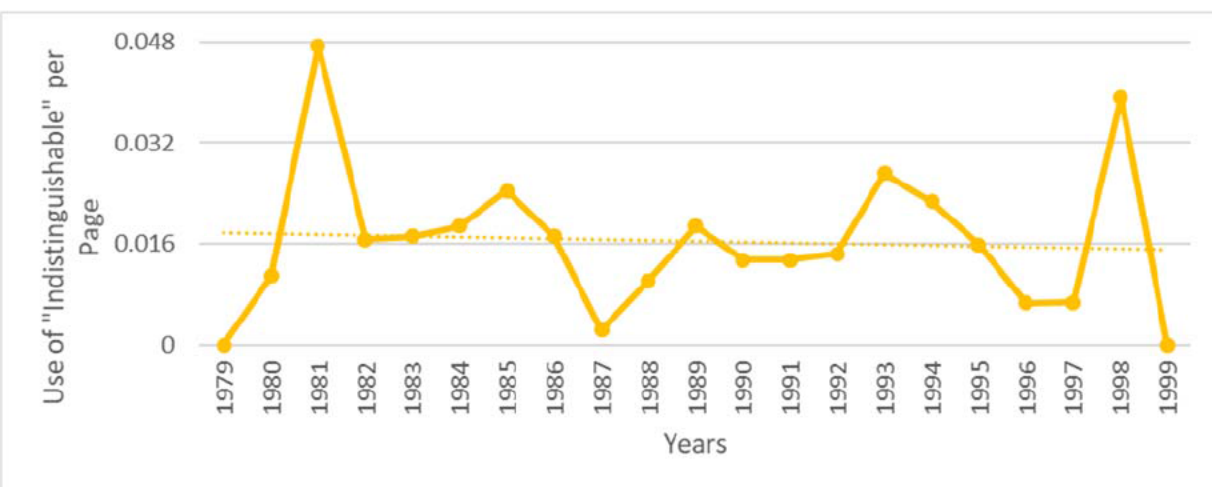


Figure 78. Use of "indistinguishable" per transcript page by year for all MHCA examiners (1979-1999).

Individualization

When an MHCA examiner used words and phrases that indicated or implied MHCA could be used to identify the individual who was the source of the hair (e.g., individualization) in a transcript, it was determined to be an error. One example follows:

Examiner: There is, in my opinion, a relative high degree of individuality in hair comparisons.

Our team searched for words and phrases indicating or implying individualization as described in Table 11. Figure 79 and Figure 80 show the trends of words and phrases indicating or implying individualization in testimony associated with exceeding the limits of the science from 1979 to 1999.

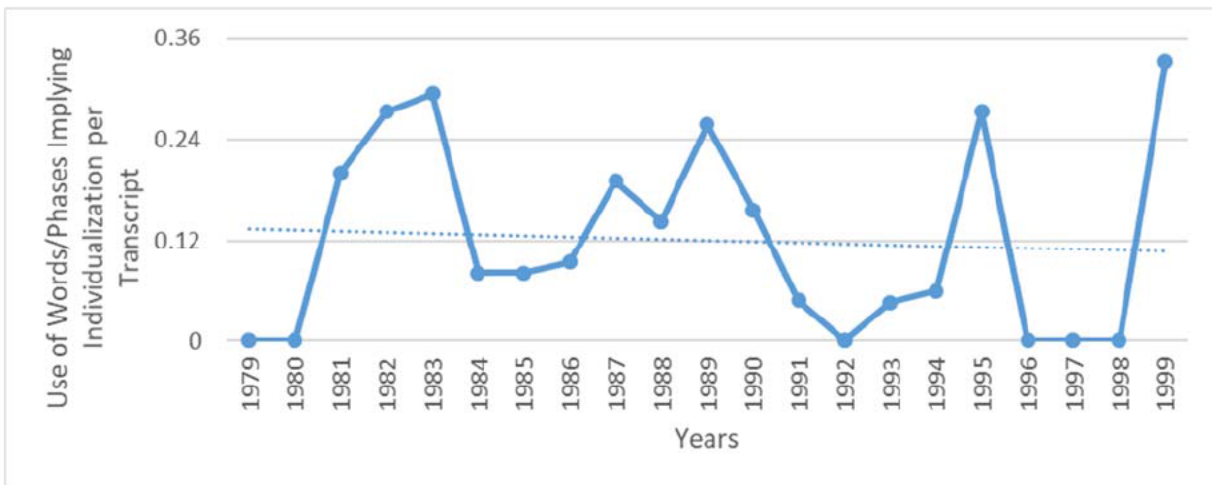


Figure 79. Use of words/phrases implying individualization per transcript by year for all MHCA examiners (1979-1999).

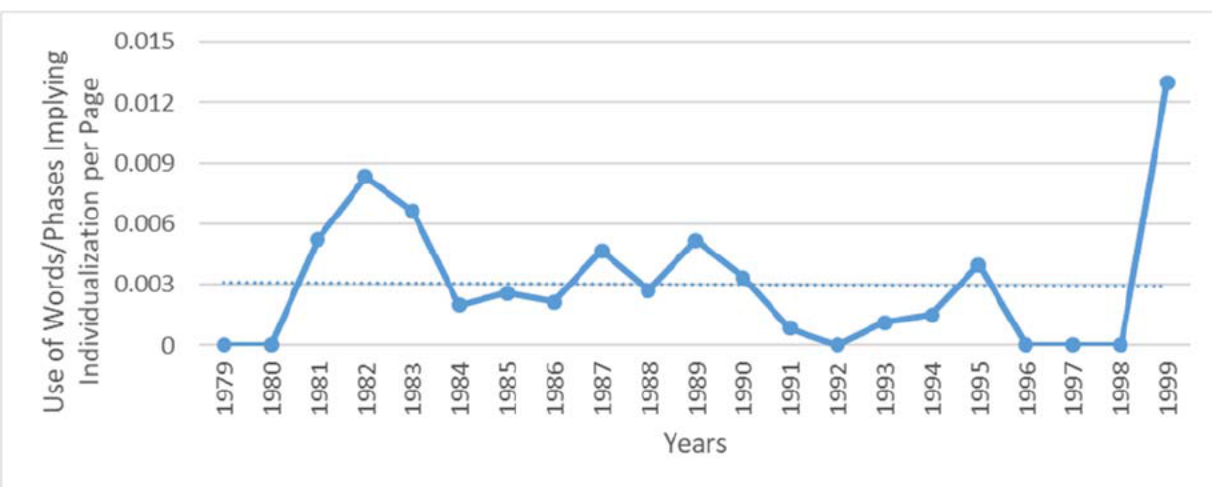


Figure 80. Use of words/phrases implying individualization per transcript page by year for all MHCA examiners (1979-1999).

Match

A common word used by some MHCA examiners during testimony was “match.” Some uses of this word were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Examiner: Well, I had a single head hair match with the [Defendant 1], and then I had - - it appears to be four different separate matches of the [Defendant 2]. These were head hair matches.

Our team searched for the word “match” in various forms listed in Table 11. Figure 81 and Figure 82 show the trends of “match” in testimony associated with exceeding the limits of the science from 1979 to 1999.

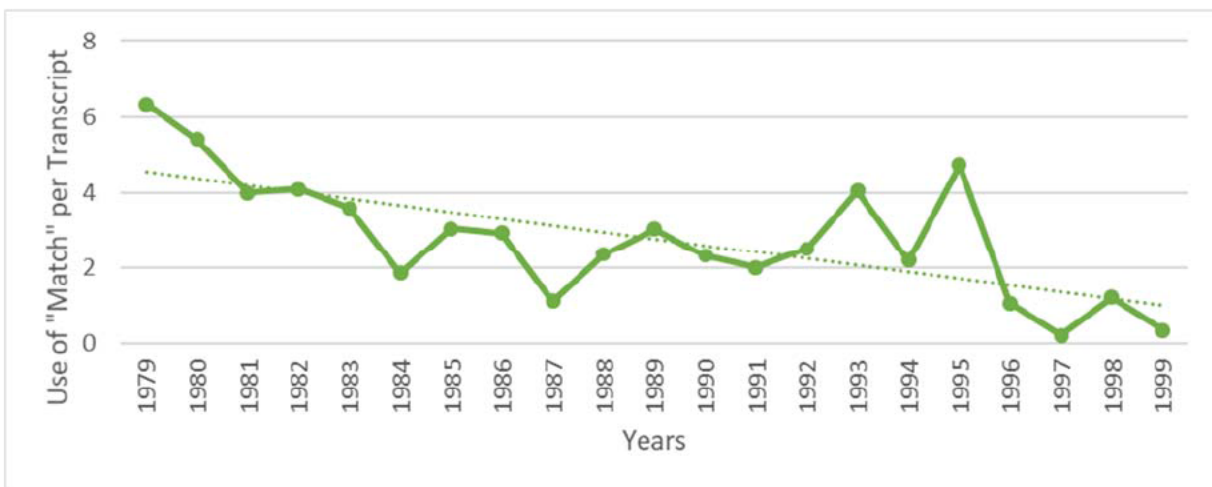


Figure 81. Use of “match” per transcript by year for all MHCA examiners (1979-1999).

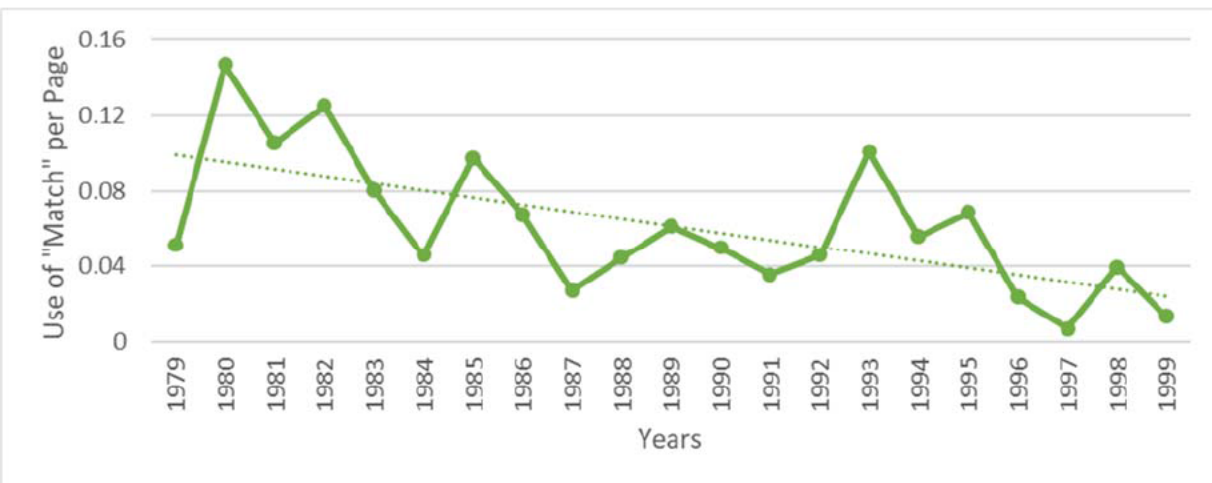


Figure 82. Use of “match” per transcript page by year for all MHCA examiners (1979-1999).

Perfect match

A common phrase used by some MHCA examiners during testimony was “perfect match.” Some uses of this phrase were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Examiner: It did not match any of the others, but it was a perfect match to [named individual’s] hair.

Our team searched for the phrase “perfect match” in various forms listed in Table 11. Figure 83 and Figure 84 show the trends of “perfect match” in testimony associated with exceeding the limits of the science from 1979 to 1999.

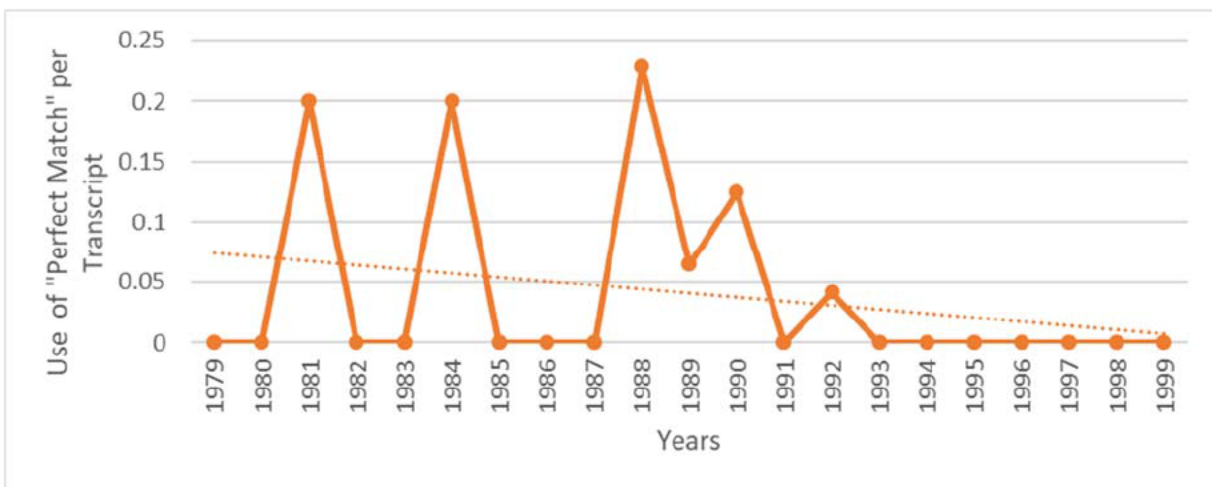


Figure 83. Use of “perfect match” per transcript by year for all MHCA examiners (1979-1999).

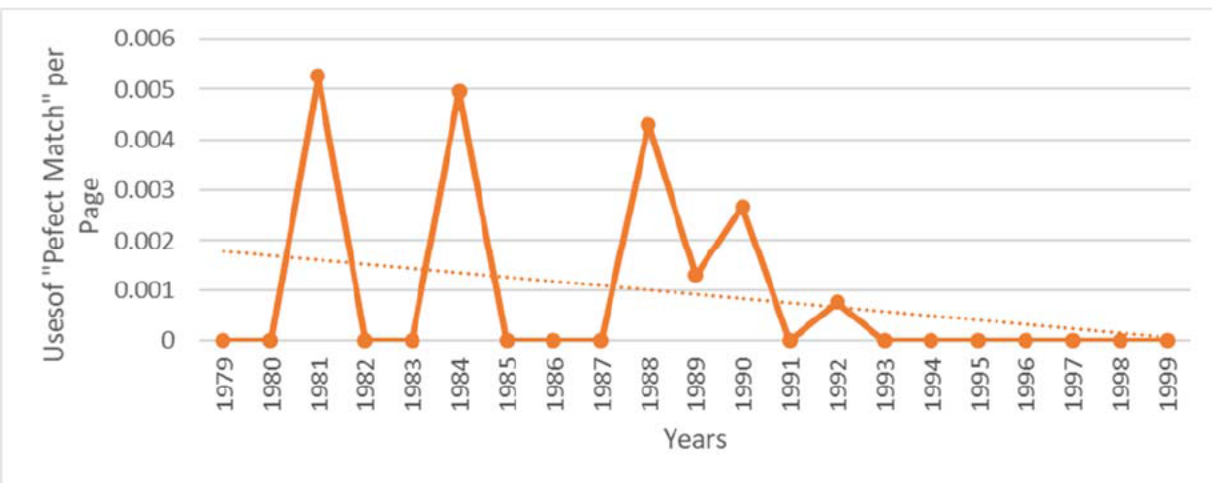


Figure 84. Use of “perfect match” per transcript page by year for all MHCA examiners (1979-1999).

Probability/Statistics

When an MHCA examiner used words and phrases that implied an MHCA-related probability in a transcript, it was determined to be an error. One example follows:

Examiner: As I stated I can't make a positive, absolute identification, but it would be unlikely that if that hair matches [the defendant] in these microscopic characteristics, it would be unlikely that it came from someone else.

Our team searched for words and phrases indicating or implying a probability as described in Table 11. Figure 85 and Figure 86 show the trends of words and phrases indicating or implying a probability in testimony associated with exceeding the limits of the science from 1979 to 1999.

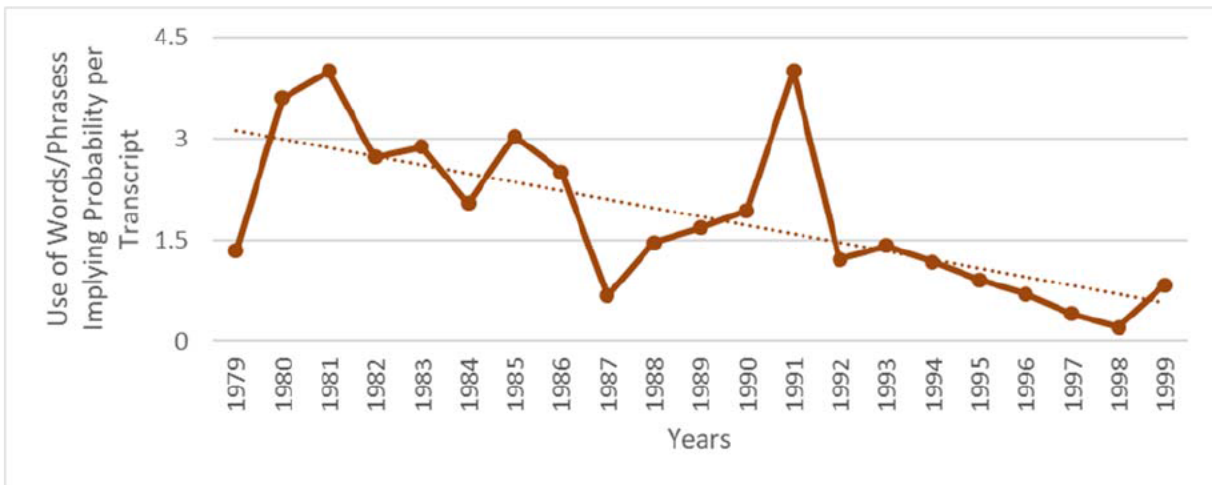


Figure 85. Use of words/phrases implying a probability per transcript by year for all MHCA examiners (1979-1999).

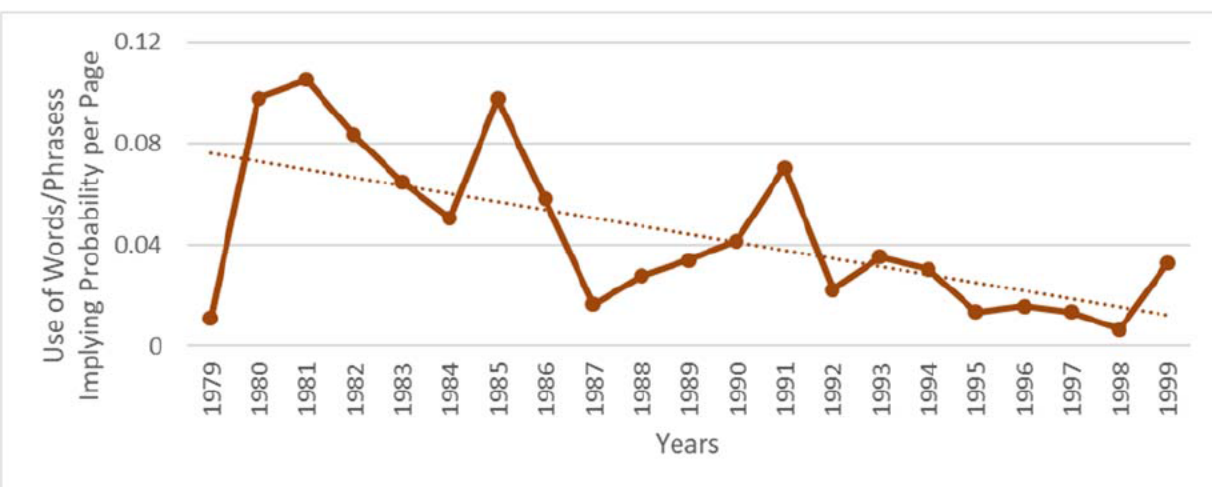


Figure 86. Use of words/phrases implying a probability per transcript page by year for all MHCA examiners (1979-1999).

Rare

A common word used by some MHCA examiners during testimony was “rare.” Some uses of this word were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Examiner: I told you that it was a very, very rare event such that a situation is encountered when you can't tell hairs apart, but it has happened on rare instances.

Our team searched for the word “rare” in various forms listed in Table 11. Figure 87 and Figure 88 show the trends of “rare” in testimony associated with exceeding the limits of the science from 1979 to 1999.

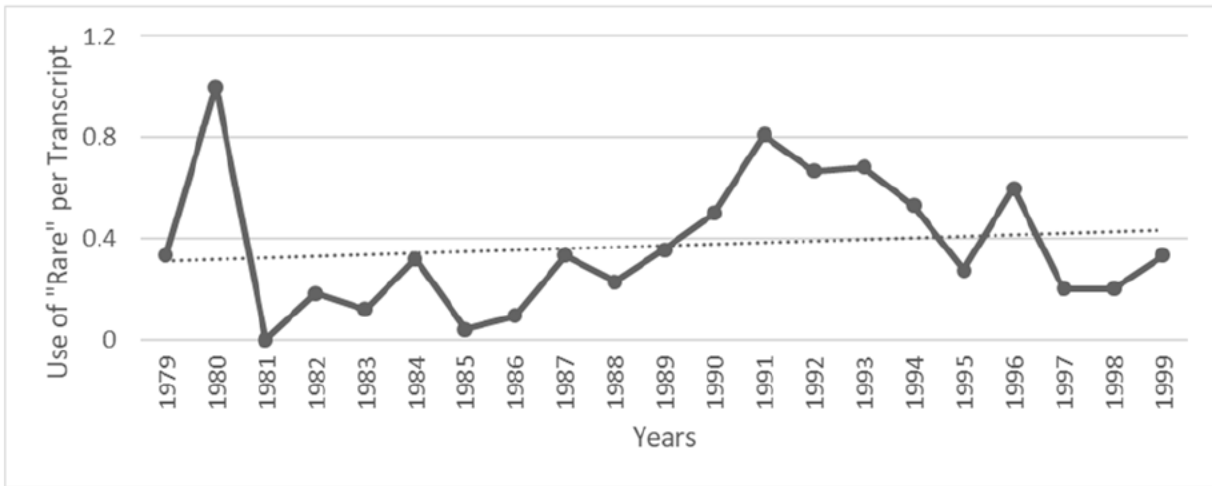


Figure 87. Use of "rare" per transcript by year for all MHCA examiners (1979-1999).

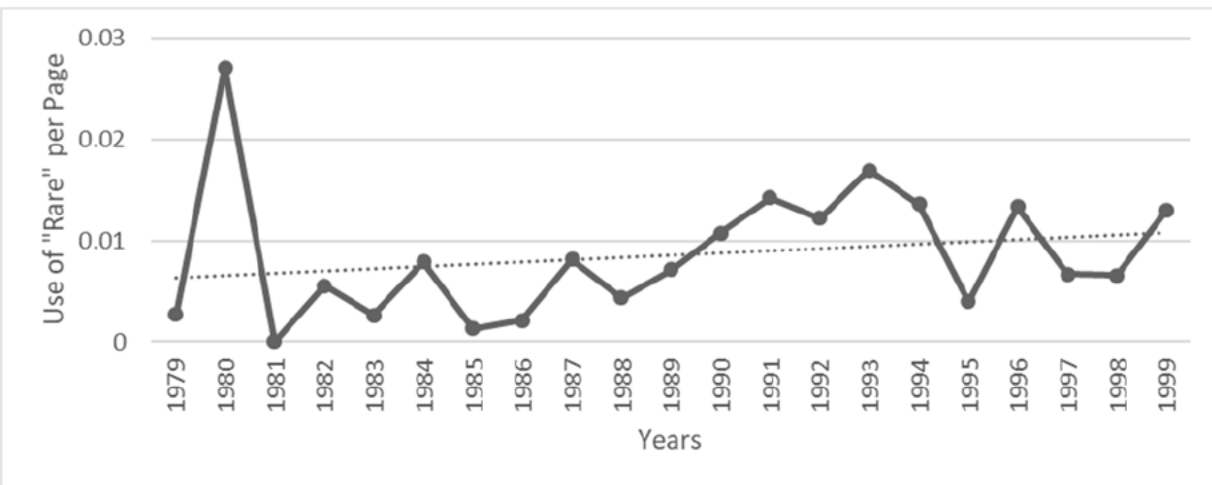


Figure 88. Use of "rare" per transcript page by year for all MHCA examiners (1979-1999).

Same

A common word used by some MHCA examiners during testimony was “same.” Some uses of this word were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Examiner: We can compare hairs from -- a questioned hair with a known hair sample from an individual to tell if the hair is microscopically the same and if it's consistent with coming from that individual.

Our team searched for the word “same” in various forms listed in Table 11. Figure 89 and Figure 90 show the trends of “same” in testimony associated with exceeding the limits of the science from 1979 to 1999.

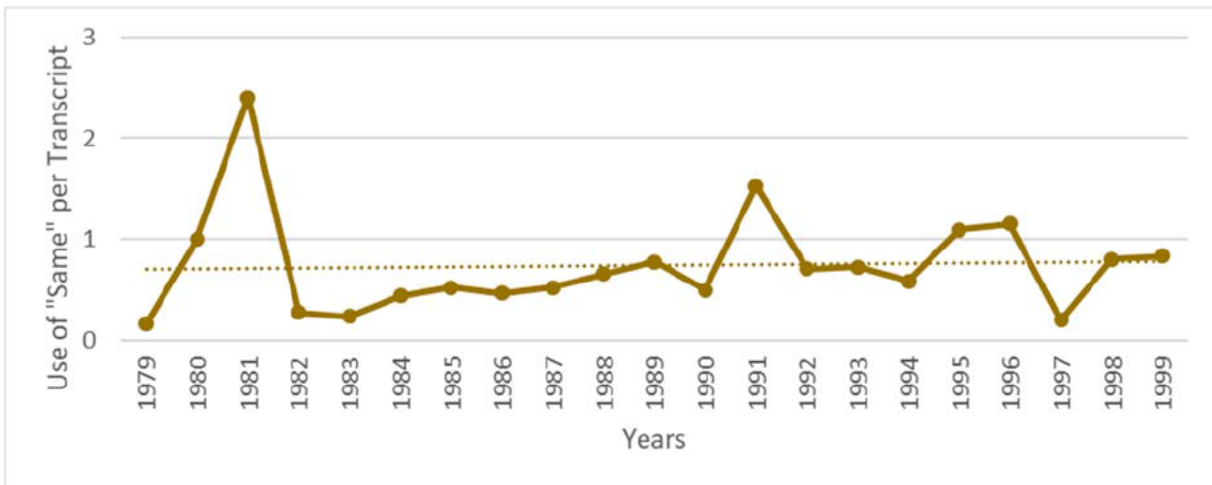


Figure 89. Use of "same" per transcript by year for all MHCA examiners (1979-1999).

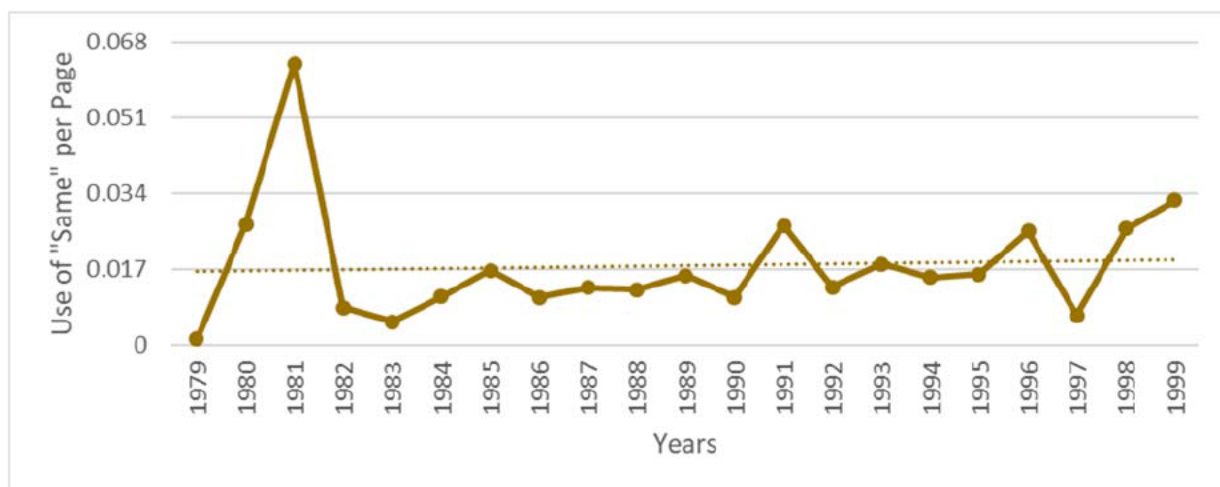


Figure 90. Use of "same" per transcript page by year for all MHCA examiners (1979-1999).

Scientific certainty

A common phrase used by some MHCA examiners during testimony was “scientific certainty.” Some uses of this phrase were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Examiner: I can say with reasonable scientific certainty the hair originated from the victim.

Our team searched for the phrase “scientific certainty” in various forms listed in Table 11. Figure 91 and Figure 92 show the trends of “scientific certainty” in testimony associated with exceeding the limits of the science from 1979 to 1999.

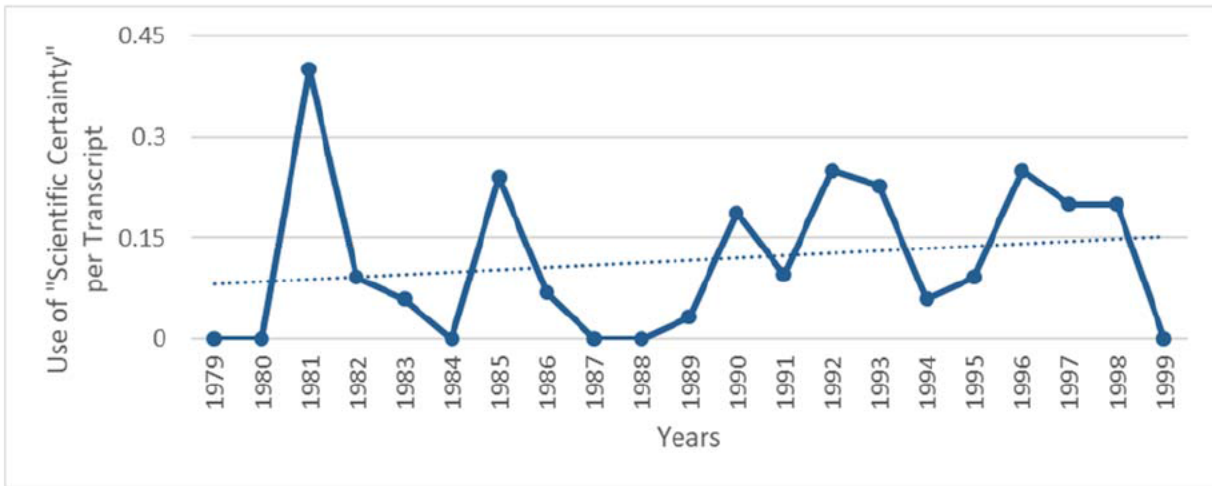


Figure 91. Use of "scientific certainty" per transcript by year for all MHCA examiners (1979-1999).

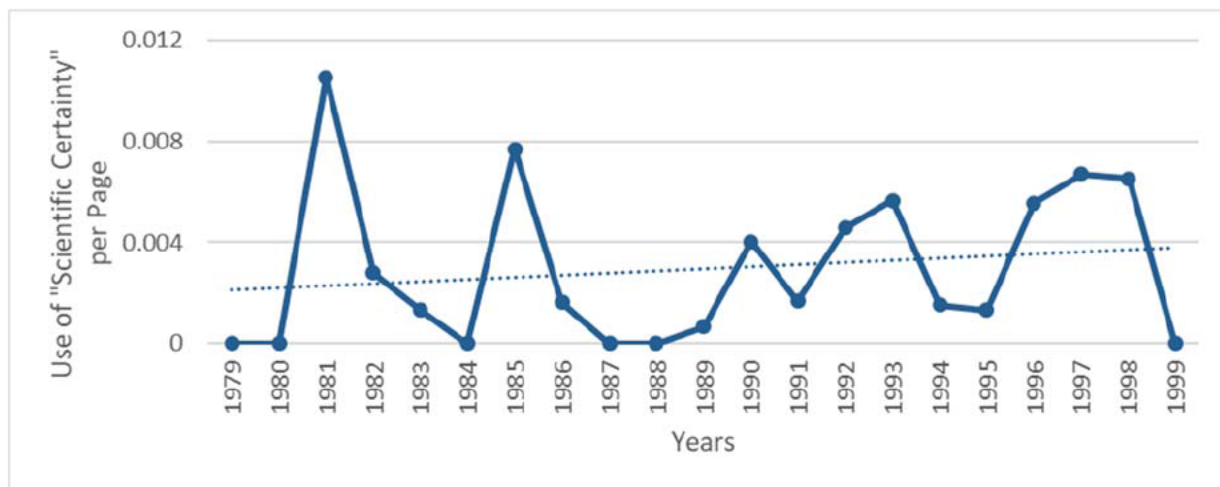


Figure 92. Use of "scientific certainty" per transcript page by year for all MHCA examiners (1979-1999).

Seldom

A word used by some MHCA examiners during testimony was “seldom.” Some uses of this word were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Examiner: Now, all the characteristics that I’m talking about are fairly unique and individualized to you and to you only. However, they’re not absolute. It’s not like a fingerprint. I can’t absolutely say that a hair came from a particular individual. When I take all these characteristics and the arrangement of the characteristics, I can make a decision as to whether or not a hair could have come from an individual.

Counsel: And in your experience as an analyst in the FBI Laboratory, have you often found hairs from different people that have the same characteristics?

Examiner: Not often, but I have seen it happen, but very, very seldom does it happen.”

Our team searched for the word “seldom” in various forms listed in Table 11. No trend of seldom in testimony exceeding the limits of the science was identified, as the word was only found three times (once each in 1985, 1988, and 1999) in testimony associated with exceeding the limits of the science. Because no trend was identified for the phrase “seldom”, we do not provide graphs for uses per transcript by year or uses per transcript page by year.

Stronger/Confident

Common words used by some MHCA examiners during testimony were “stronger” and “confident.” Some uses of these words were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Examiner: “And to find these hairs and these fibers on his clothing and in that location is indicative of an association, of a strong association. And in my expert opinion, that indicates that he was in the house.”

Attorney: That he was in the house?

Examiner: Yes.

Our team searched for the words “stronger” and “confident” as well as similar words listed in Table 11. Figure 93 and Figure 94 show the trends of words like “stronger” and “confident” in testimony associated with exceeding the limits of the science from 1979 to 1999.

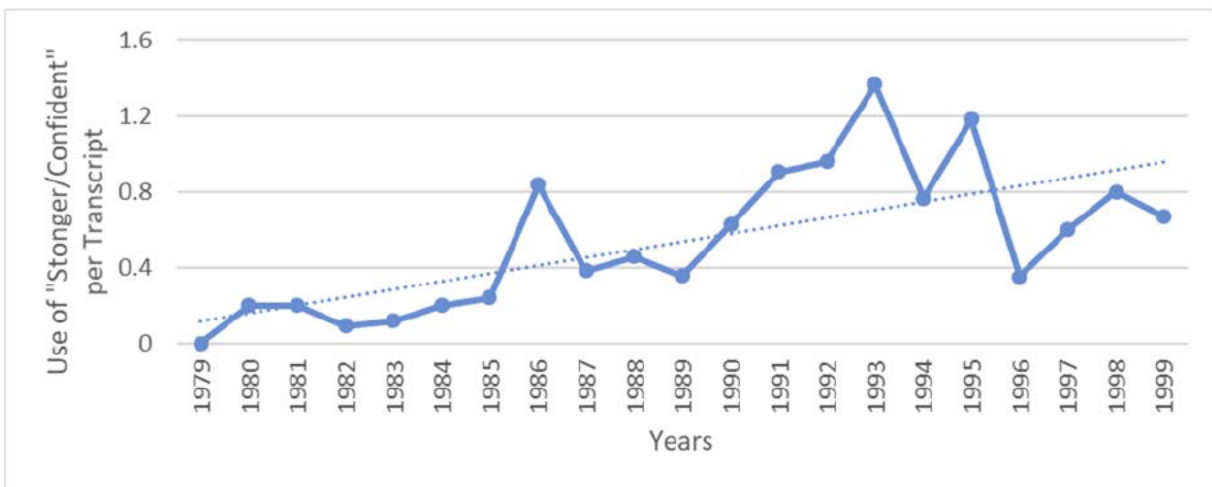


Figure 93. Use of "stronger/confident" per transcript by year for all MHCA examiners (1979-1999).

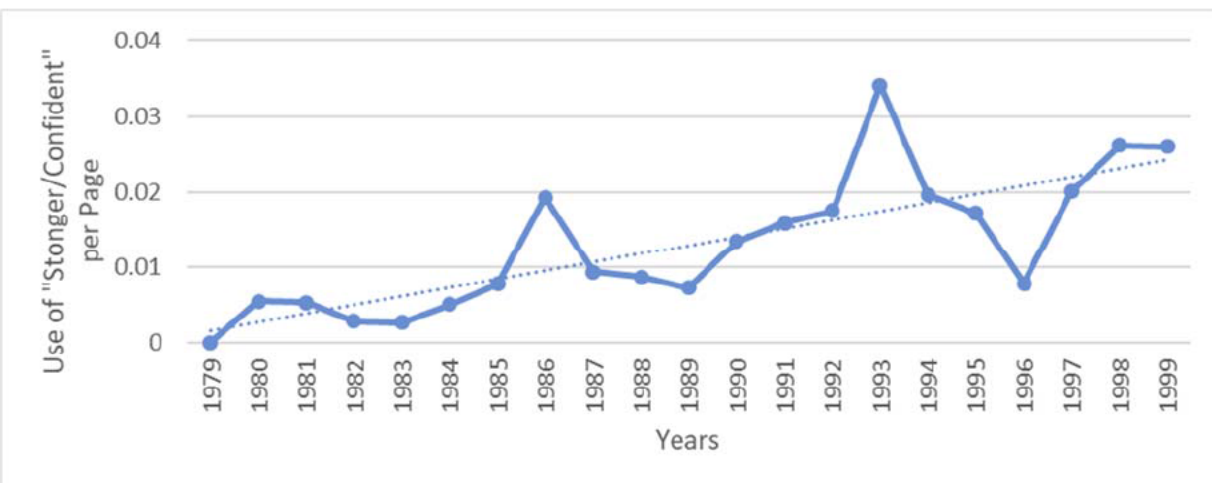


Figure 94. Use of "stronger/confident" per transcript page by year for all MHCA examiners (1979-1999).

Unique

A common word used by some MHCA examiners during testimony was “unique.” Some uses of this word were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Examiner: “When you look at all of these characteristics together in a single person's hair, it tends to give that person's hair a certain uniqueness. Now, this uniqueness is what we base our examination on.”

Our team searched for the word “unique” in various forms listed in Table 11. Figure 95 and Figure 96 show the trends of “unique” in testimony associated with exceeding the limits of the science from 1979 to 1999.

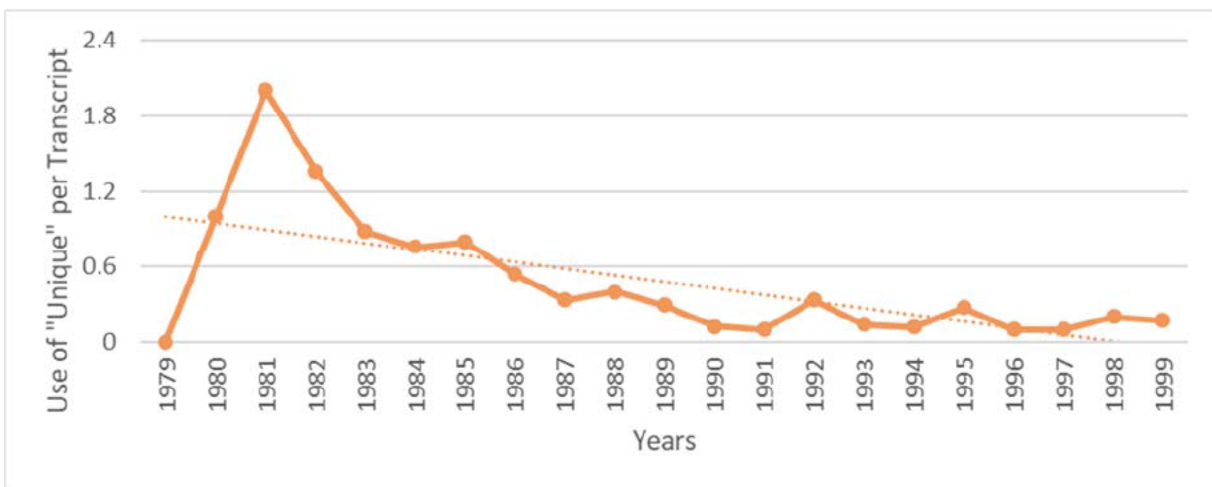


Figure 95. Use of "unique" per transcript by year for all MHCA examiners (1979-1999).

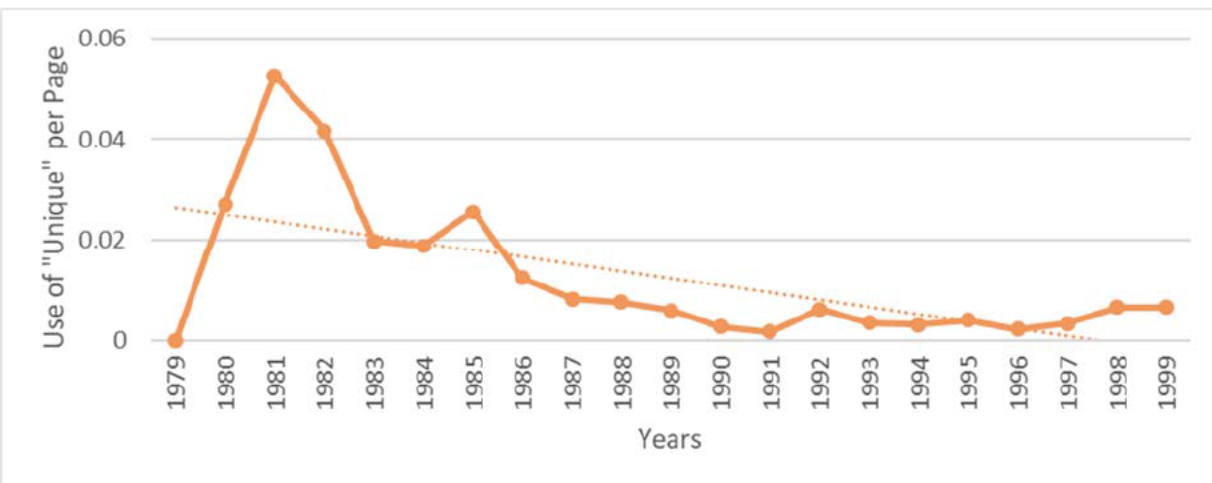


Figure 96. Use of "unique" per transcript page by year for all MHCA examiners (1979-1999).

Unusual

A common word used by some MHCA examiners during testimony was “unusual.” Some uses of this word were determined to be an error by the 2012 FBI MHCA Review. One example follows:

Examiner: The only thing that I can tell you is that in the cases that I've worked where we had known hair samples from two or more different people, it's very, very unusual that those hairs are so near alike that we can't tell them apart.

Our team reviewed the word “unusual” and its various forms listed in Table 11. Figure 97 and Figure 98 show the trends of “unusual” in testimony associated with exceeding the limits of the science from 1979 to 1999.

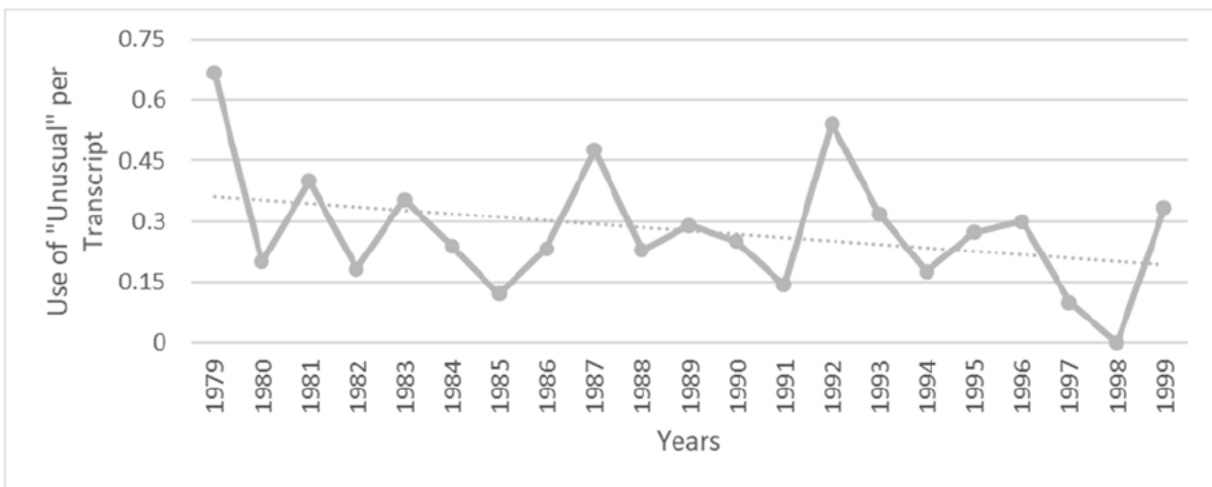


Figure 97. Use of "unusual" per transcript by year for all MHCA examiners (1979-1999).

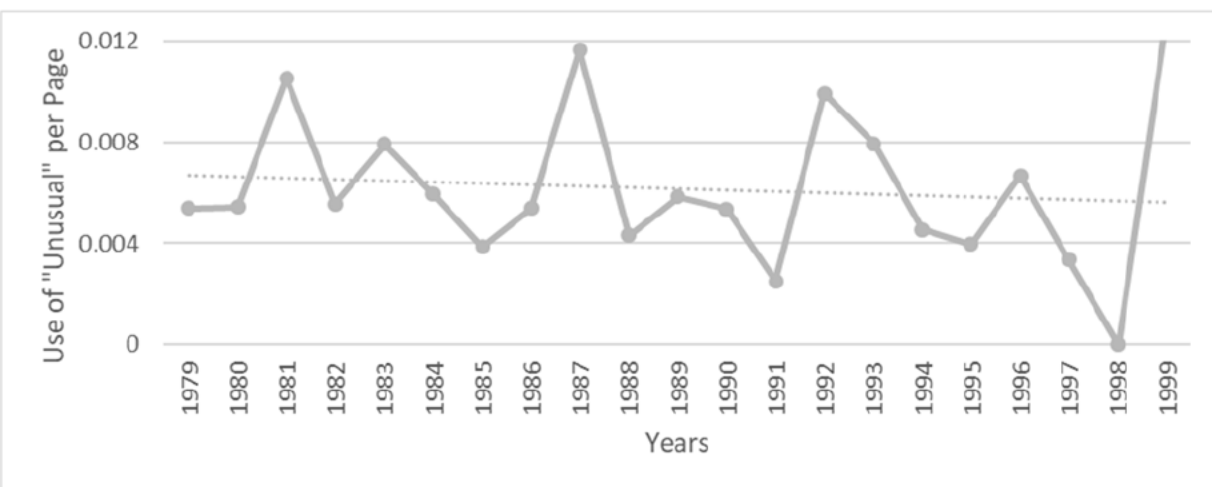


Figure 98. Use of "unusual" per transcript page by year for all MHCA examiners (1979-1999).

APPENDIX C: METHODOLOGY – ROOT CAUSE ANALYSIS, INCLUDING USE OF THE ROOT CAUSE MAP™

ROOT CAUSE ANALYSIS

Root cause analysis (RCA) is a process designed for use in investigating and categorizing the underlying causes of events with safety, health, environmental, quality, reliability, production, and other impacts. “Event” refers to an unplanned sequence of actions and conditions that actually resulted in, or could have reasonably resulted in, undesirable consequences, including accidents, losses, and near misses.

RCA is a systematic approach that guides investigators to look deeply into management systems and work processes for the underlying causes of an event or series of events. Figure 99 shows potential levels of analyses. At the top, equipment performance gaps and front-line personnel performance gaps are analyzed. Performance gaps are differences between desired and actual performance of equipment or personnel. Further down in the triangle are more fundamental causes and aspects of organizations, including controls for tasks and processes. The bottom two areas of the triangle are where an organization’s management systems and culture can be analyzed. Analyzing *why* in those areas increases understanding about how the organization functions, which encourages the development of corrective and preventive actions that are more fundamental in nature and broader in scope. Thus, deep analysis of an event or series of events leads to fundamental changes that allow problems to be solved once (at its “root”) and prevent future manifestations of the same issue.

Simply stated, RCA is a tool designed to help identify not only *what* and *how* an event occurred, but also *why* it happened. Only when investigators can determine *why* an event occurred will they be able to specify corrective measures that prevent similar future events.

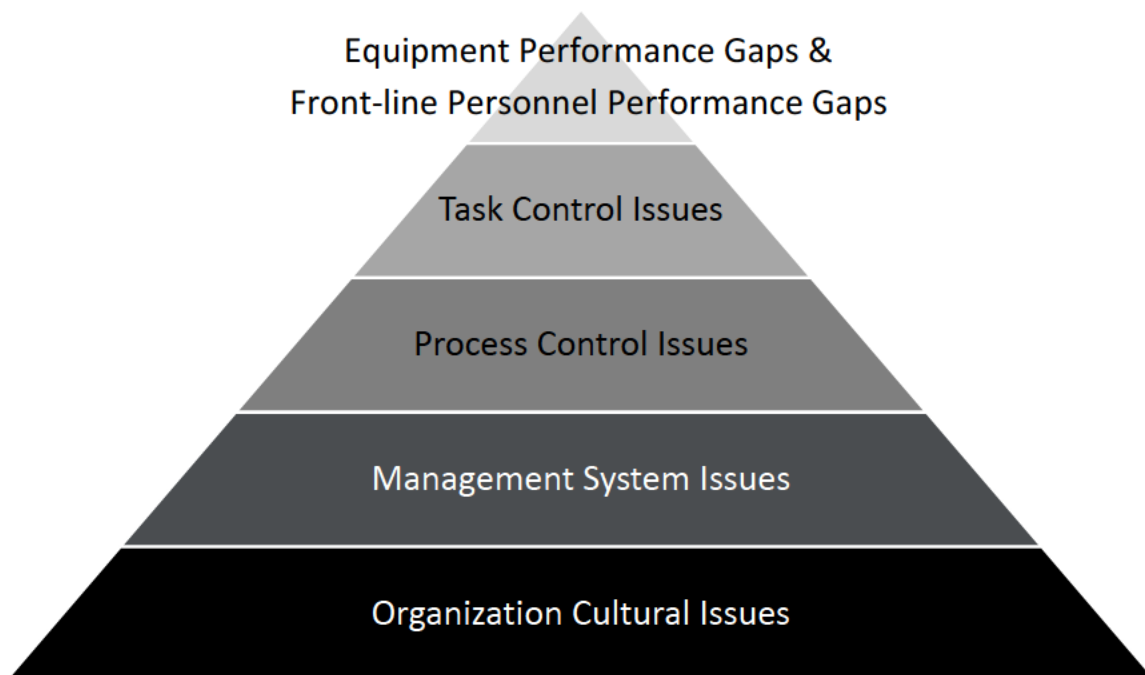


Figure 99. Task triangle showing possible depths of analyses.

Identifying root and cultural causes is the key to preventing recurrences. An added benefit of an effective RCA and cultural cause analysis (CCA) is that, over time, the root and cultural causes identified across the population of occurrences can be used to target major opportunities for improvement. If, for example, the RCA points to inspection/audit/measurement issues and the CCA points to a cultural deficiency in timely response to issues and concerns, then resources can be focused on strengthening of this management system and strides can be made to affect the cultural issue. Trending of root and cultural causes allows for development of systematic improvements and assessment of the impact of corrective programs. CCA is discussed in more depth in Appendix D.

Using the Root Cause Map™ shown in this appendix assists in brainstorming, identifying, and trending root causes. The map has many items that are generically referred to as nodes. The Root Cause Map™ legend shows the level of analysis indicated by each node shape. More information on using the Root Cause Map™ and the ABS Group Seeking Out the Underlying Root Causes of Events™ (SOURCE™) methodology can be found in the Root Cause Analysis Handbook: *A Guide to Efficient and Effective Incident Investigations* or on the ABS Group website in the Knowledge Center where there are free downloadable resources.

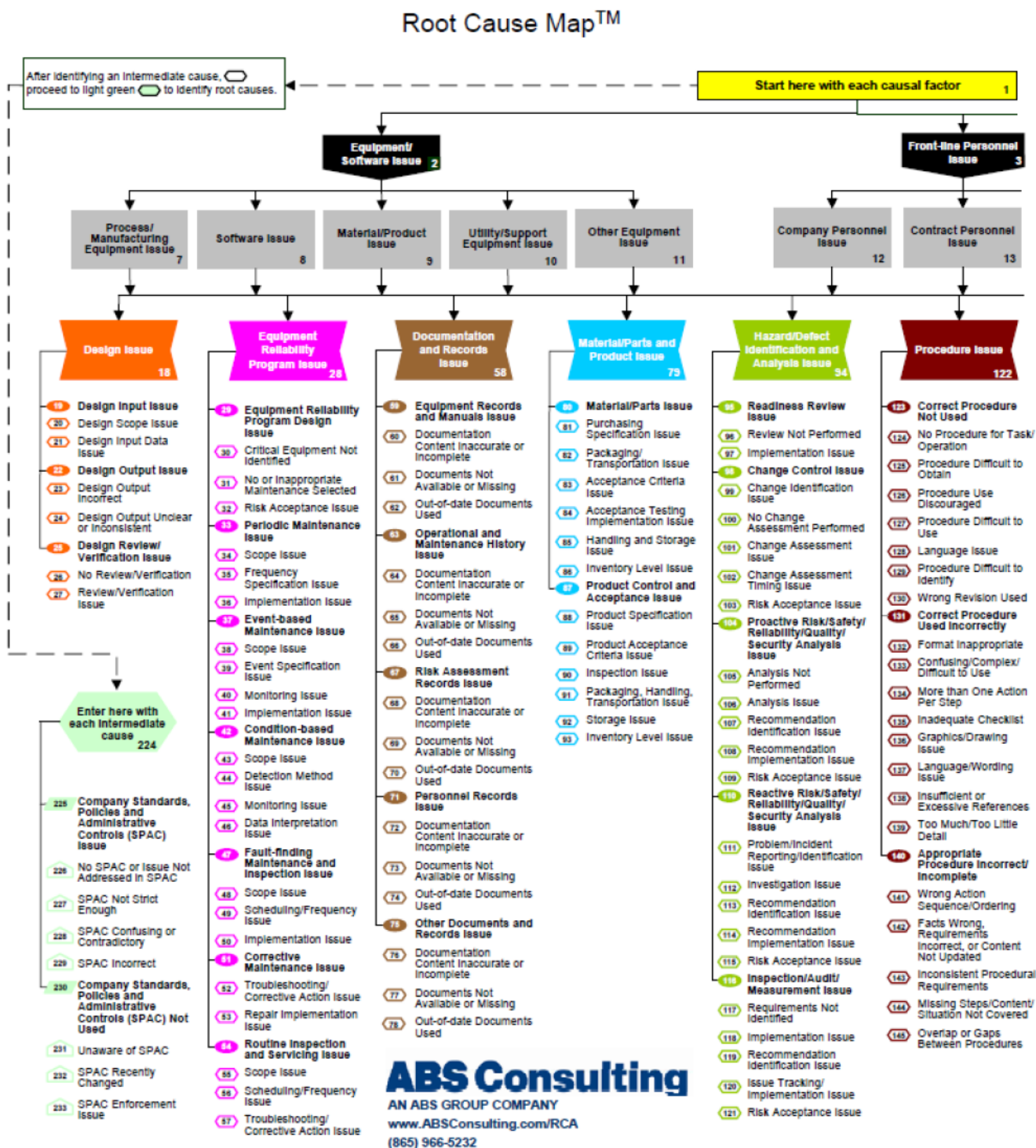


Figure 100. Root Cause Map™ (page 1 of 2)

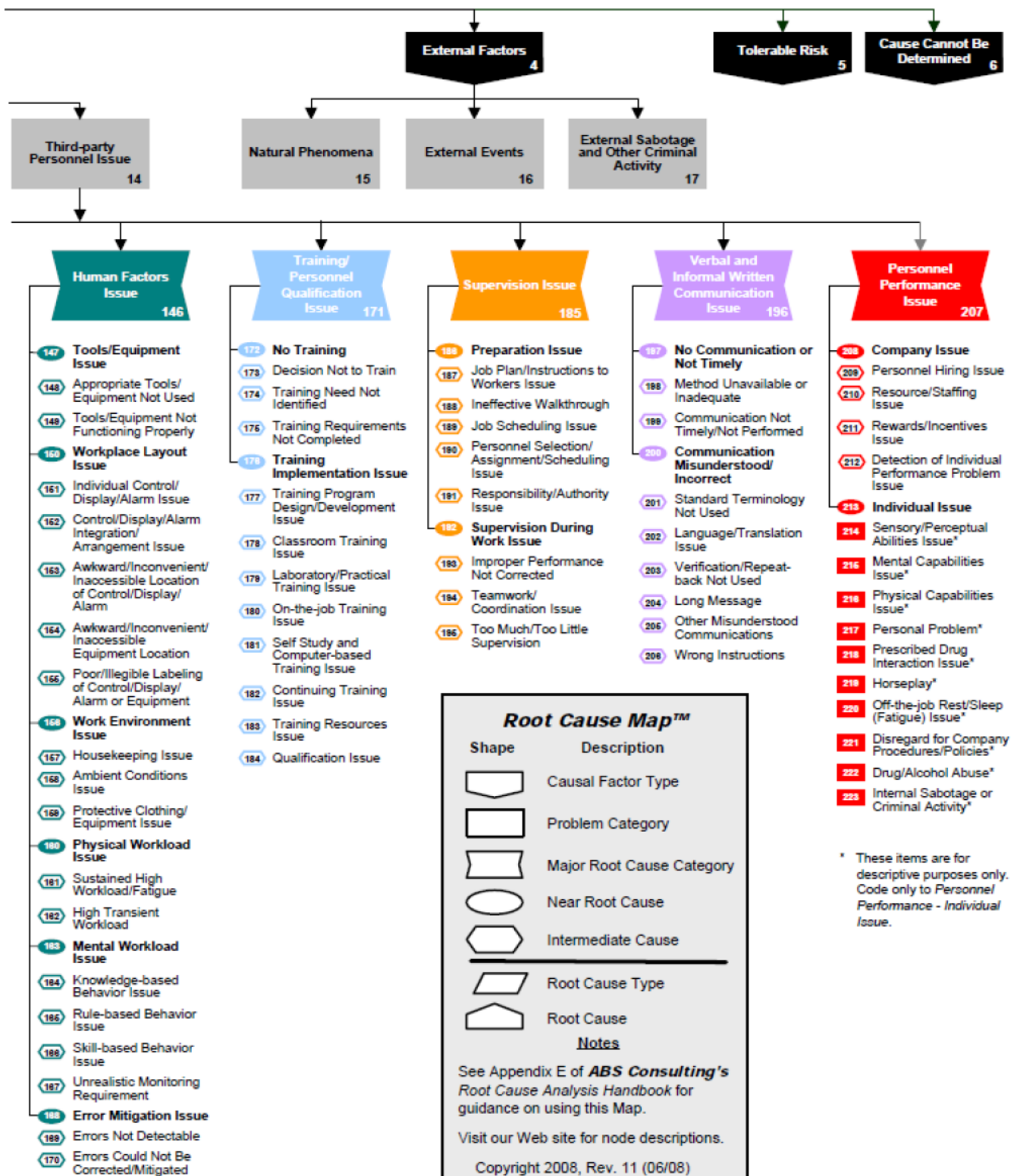


Figure 101. Root Cause Map™ (page 2 of 2)

APPENDIX D: METHODOLOGY – CULTURAL CAUSE ANALYSIS™, INCLUDING USE OF THE CULTURAL CAUSE ANALYSIS METHODOLOGY™

CULTURAL CAUSE ANALYSIS METHODOLOGY™

After an accident, near miss, or series of incidents, learning organizations strive to assess not only “what” happened or “how” it happened, but “why” it happened. Organizations assess “why” at a variety of levels, with the deepest, most comprehensive assessment being at the cultural level. Cultural Cause Analysis Methodology™ (CCAM), an analysis method developed by ABS Group, is a structured approach to assess the cultural deficiencies that create an environment allowing management system weaknesses to exist. The culture of specific individuals, as well as the culture of the organization, create the foundation that either supports or prevents attaining organizational goals. For this analysis of the FBI Laboratory, the culture was defined as:

The set of values and behaviors that determine the evaluation criteria for the organization’s management systems and the activities performed to achieve high performance against the evaluation criteria.

ABS Group developed CCAM to provide a systematic and structured approach to evaluate cultural deficiencies that led to an event or series of events. “Event” refers to an unplanned sequence of actions and conditions that actually resulted in, or could have reasonably resulted in, undesirable consequences, including accidents, losses, and near misses. This methodology can be used for both reactive and proactive assessments of culture. CCAM evaluates 12 essential features an organization should have to support sustained achievement of organizational goals and mission.

The following 12 essential features of the ABS Group CCAM were tailored to support this cultural cause analysis for the FBI Laboratory. To assess cultural deficiencies (performance gaps) in this report, our team first had to define, for each of the 12 essential features, the desired culture at the FBI Laboratory. These 12 essential features describe the desired state for the organization’s culture and are not intended to portray assessment of the actual state at the FBI Laboratory. The 12 essential features were:

1. Core values
2. Strong leadership
3. High standards of performance
4. Culture emphasis/approach
5. Sense of vulnerability
6. Empower individual
7. Defer to expertise
8. Communication
9. Questioning/learning environment
10. Mutual trust
11. Response to issues and concerns
12. Continuous monitoring

ESSENTIAL FEATURE 1: CORE VALUES

The **desired** culture would have established core values. The organization and individuals within the organization would evaluate their performance against these core values. This would be reflected in exceptional quality in all aspects of the job, including: diligent evidence management; consistent and accurate analysis; thorough, accurate, and timely Laboratory notes; comprehensive reports that accurately and clearly reflect the analyses undertaken and conclusions; and, when required, clear, accurate, and defensible testimony. A deeply ingrained sense of these values would exist at all levels of the organization. In an exceptionally sound culture, this would be promoted to an ethical imperative. Individuals would have an awareness of their responsibilities to self, coworkers, the FBI, other law enforcement agencies, and society with respect to their performance. Each person would feel not only accountable for his or her actions but also for the actions of others. This would lead to strong individual and group intolerance for violations of performance norms.

Attributes and characteristics of the desired culture with established core values are:

- **Ingrained compliant and ethical behavior.** A deeply ingrained sense of consistent, accurate, and ethical behavior would be present at all levels of the organization.
- **Aware of responsibility.** Awareness of responsibility to self, coworkers, agency, and society.
- **Violations would not be accepted.** Individual and group intolerance of those in violation of the norms.
- **Core values would be established.** Core values would be established and communicated regularly throughout the organization.
- **Actions would support core values.** Demonstrating core values would be evidenced by visible actions in support of the core values.
- **Recognize behavior consistent with core values.** Workforce actions that demonstrate adherence to established core values would be celebrated.

ESSENTIAL FEATURE 2: STRONG LEADERSHIP

The **desired** culture would have strong leadership, demonstrating and encouraging actions consistent with the core values from Essential Feature 1. Managers would be educated in the basic concepts and dynamics of a strong, positive culture, and they would be aware of their roles in fostering such a culture. Visible, active, and consistent support for programs and objectives would exist at all levels of organizational management. Visionary and inspiring managers would be committed to doing what is right and would demonstrate their values through their communications, actions, priorities, and provision of resources. Performance reviews of leaders and promotions into leadership positions would reflect the core values of the organization and address the individual's commitment towards performance improvement.

Attributes and characteristics of the desired culture with strong leadership are:

- **Visible management support.** There would be visible, active, and consistent support for programs (including improvement opportunities) from all levels of company management through communications, actions, priorities, provision of resources, etc.
- **Management would be committed to do what is right.** Members of the management team would be committed to doing what is right as defined by the core values of the organization and would demonstrate their values through their decisions and actions.
- **Management would set performance goals.** Members of the management team would have foresight on how to achieve quality performance goals and would be capable of inspiring others to follow their lead.
- **Drive for strong leadership characteristics.** Openness, honesty, and firmness would be qualities of the management team.
- **Managers would be flexible.** Managers would be alert and responsive to modifying strategies to meet goals.
- **A high level of quality behavior would be expected at all levels.** The concept of accurate, high-quality, ethical behavior would be understood and adopted at all levels of the organization.
- **Defined responsibilities.** Organizational responsibilities would be clearly defined.
- **Assessment of quality and ethical performance would be included in annual objectives.** Quality and ethical performance would be included in annual objectives for unit leadership positions.

ESSENTIAL FEATURE 3: HIGH STANDARDS OF PERFORMANCE

The **desired** culture would establish and enforce high standards of performance. High standards of performance expected of all personnel would be established and reinforced at both the individual and organizational levels. Where circumstances warrant, standards would be modified through a structured process, but “normalization of deviance” (i.e., gradual erosion of standards due to increased tolerance of nonconformities) would not be accepted. There would be zero tolerance for willful violations of standards, rules, or procedures.

Attributes and characteristics of the desired culture with established and enforced high standards of performance are:

- **High standards would be established.** The organization would establish high standards of performance at both the individual and organizational levels.
- **Management expectations would be communicated.** Management would clearly and frequently communicate expectations of full conformance to Laboratory standards to all levels of the organization.
- **Performance measures/controls would be in place.** Controls would be established to reinforce high standards of performance. These controls would include the revision of the standards when circumstances warrant it.
- **Emphasis to avoid normalization of deviance.** Open and specific emphasis would be in place to counteract erosion of standards and demonstrate intolerance for nonconformities.
- **Emphasis on personal accountability.** Personal accountability would be promoted throughout the organization.
- **Positive and negative consequences would be understood.** The benefits of compliance to standards for the individual, as well as the organization, would be communicated. Also, the consequences associated with noncompliance to standards would be communicated, as appropriate.
- **Pay-at-risk in place.** A pay-at-risk system would be established to incentivize exemplary performance.

ESSENTIAL FEATURE 4: CULTURE EMPHASIS/APPROACH

The **desired** culture would document the culture emphasis and approach. Culture is the output of thousands of individual management and employee actions (and inactions) that create the foundation for future individual attitudes and behaviors. Therefore, it is important for an organization to record the salient features of significant, complex activities that the organization wants to be consistently effective over the lifetime of the organization. Thus, strong management would document key principles or activities that support or maintain its culture.

Attributes and characteristics of the desired culture with a culture emphasis/approach are:

- **Cultural framework would exist.** The framework of well-conceived and designed management systems would promote culture as a key element in the organization.
- **Institutional memory would be established.** A systematic, documented institutional memory would be established to record lessons learned from previous experiences.
- **Established vision statement.** A vision statement for culture would be established and communicated.
- **Culture maintenance and improvement activities would be included in annual objectives.** Cultural maintenance and improvement activities would be included in annual objectives for Laboratory leadership.
- **Accountabilities would be established.** Clearly documented accountabilities would be established.
- **Cultural issues would be included in performance evaluations.** Performance and culture would be a part of the performance evaluation for every worker, supervisor, and manager.
- **Approach would be documented.** The approach that the Laboratory takes to evaluate and nurture a strong, positive culture would be documented.
- **Culture would be periodically evaluated.** Periodic culture evaluations would be instituted using, at least in part, assessors from outside of Laboratory.
- **Culture would be included in periodic audits.** Culture would be highlighted as an evaluation area in audits, incident investigations, etc.

ESSENTIAL FEATURE 5: SENSE OF VULNERABILITY

The **desired** culture would maintain a sense of vulnerability. The organization would maintain high awareness of potential pressures and influences, both internal and external, that could threaten individual and organizational core values. Consequences of yielding to these pressures would be well understood by all. There would be constant vigilance for indications of system weaknesses that might foreshadow more significant breaches of protocol. The organization would strive to avoid the complacency that might be stimulated by past performance or undesirable precedent. Where uncertainty exists, the burden of proof would be placed on demonstrating that an activity or condition meets established requirements rather than assuming that an action or condition is acceptable until proven to be unacceptable.

Attributes and characteristics of the desired culture with a sense of vulnerability are:

- **Importance of compliant and ethical behavior would be understood.** All levels of the organization would be highly aware of the importance of accurate results and ethical behavior and the potential consequences that may result when deviating from these standards. Personnel would always be vigilant for indications of weaknesses in the system that might be considered warnings of more significant issues.
- **Efforts would be in place to avoid complacency.** There would be constant efforts to avoid the complacency that past success and positive feedback might create.
- **Not overly dependent on management systems.** High-quality Laboratory results would not be excessively dependent on management systems. The organization would be aware of the need for resilience, and whenever reasonable, multiple lines of defense would be implemented.
- **Proper assignment of burden of proof.** The organization would always place the burden of proof on determining that processes and activities are acceptable rather than unacceptable.

ESSENTIAL FEATURE 6: EMPOWER INDIVIDUALS

The **desired** culture would empower individuals to successfully fulfill their responsibilities. The organization would provide clear delegation of, and accountability for, all job-related responsibilities. Accordingly, employees would be provided requisite authority and resources to allow success in their assigned roles. Adequate and current training and procedures would be among the resources provided to employees. Personnel would accept and fulfill their individual responsibilities. Management would expect and encourage the sharing of concerns by all members of the organization.

Attributes and characteristics of the desired culture that empower individuals to successfully fulfill their responsibilities are:

- **Employees would accept authority and responsibility.** Every employee would accept the authority and responsibility to terminate a task or activity if the employee believes the activity may violate internal or external standards of ethics or performance.
- **Managers would accept and support individuals with concerns.** Leaders and managers would fully support individuals who raise legitimate issues of concern, even if the employee is mistaken in their assessment.
- **Clear delegation of responsibility.** There would be a clear delegation of, and accountability for, personnel responsibilities.
- **Resources would be provided.** Sufficient authority and resources would be provided for individuals and groups to carry out their responsibilities. Accurate and current procedures and a well-designed and functioning training program would be among the resources provided.
- **Effective system would be in place.** There would be an effective system in place to communicate expectations by training employees on Laboratory policies and procedures.
- **Personnel would accept/fulfill responsibility.** Personnel would accept and fulfill their responsibilities.
- **Accountabilities would be defined.** Accountability (who is responsible for what) would be clearly defined for all activities.
- **Failures would be investigated.** Any failures to meet expectations would be investigated and system causes would be addressed, where relevant.
- **Learning from others.** A system would be in place where employees can learn best practices from others in the organization and from outside the organization.
- **Procedures would include best practices.** Laboratory best practices would be codified into written operating procedures.

ESSENTIAL FEATURE 7: DEFER TO EXPERTISE

The **desired** culture would defer to expertise. The organization would place high value on the training and development of individuals and groups. The authority for key technical decisions would naturally migrate to the proper people based upon their knowledge and expertise, rather than their rank or position. Subject matter experts would have a substantive role in the resolution of technical issues. Expertise would be sought out wherever it resides and would be sometimes found in unexpected places. There would be an imperative within the organization to maintain the “critical mass” of expertise required for proper Laboratory operations.

Attributes and characteristics of the desired culture that defer to expertise are:

- **Authority would reside with experts.** Authority for key decisions would reside with the person(s) who has the most knowledge of and experience with the topic, rather than automatically flowing to management or others with high rank or position in the organization.
- **Experts would be included in decisions.** Competent authorities would have a key role in the deliberation of important issues.
- **Expert input would be sought out.** Subject matter expert input would be sought out and integral to the decision-making process.
- **Risk-free environment.** A risk-free environment would be provided for subject matter experts to speak out on issues without fear of adverse consequences.
- **Sufficient expertise.** The organization would maintain a sufficient level of expertise.
- **Experts would be identified.** The technical experts would be identified within the organization and outside the organization who can be called upon to promptly resolve issues as they arise.
- **Gaps in expertise would be identified.** Management would be aware of gaps in technical expertise and actions would be taken to fill those gaps.
- **Succession plan would exist.** Leadership would have a succession plan to address known loss of personnel through attrition, as well as, contingencies for unexpected changes in staffing.
- **Competency matrix.** A training competency matrix would be developed for all levels of the organization.
- **Necessary disciplines would be identified.** The necessary technical disciplines that need to participate in specific activities (e.g., changes to laboratory procedures) would be defined to help ensure their involvement.

ESSENTIAL FEATURE 8: COMMUNICATION

The **desired** culture would ensure open and effective communication. Healthy communications channels would exist both vertically and horizontally within the organization. Vertical communications would go both ways; managers would listen as well as speak. Horizontal communications would ensure information needed for proper laboratory operations are appropriately disseminated. Communications channels would be monitored for their effectiveness, and necessary “repairs” would be implemented. Redundant and/or nontraditional communications channels would exist where necessary to provide adequate communications (e.g., avoiding overuse of emails). There would be a strong emphasis on promptly observing and reporting nonstandard conditions for timely detection of “weak signals” that might foretell issues in the laboratory.

Attributes and characteristics of the desired culture that ensure open and effective communication are:

- **Open communication channels.** Healthy communication channels would exist both vertically and horizontally within the organization.
- **Two-way communication.** Verbal communications would be two ways; managers would listen as well as speak.
- **Adequate horizontal communication.** Horizontal communications would ensure that necessary information is shared among workers.
- **Communication channels would be monitored.** Communication channels would be monitored so that corrective actions could be implemented where needed. In particular, email-based communication would be reviewed to help ensure that the intended messages are actually received.
- **Nontraditional communication.** Redundant or nontraditional communication channels would be available where needed.
- **Unusual conditions would be reported.** Nonstandard conditions would be reported quickly so that significant issues are avoided.
- **Managers would not be shielded.** Managers would not be shielded from bad news and would welcome the opportunity to solve the issue at its inception.
- **Anonymous communication channels would be available.** A mechanism would be in place for anonymous input to management so that those fearful of reprisal would have an alternate communication pathway.
- **Workforce opinions would be solicited.** Workforce opinions on organizational performance issues would be formally solicited on a frequent basis.
- **Feedback would be provided.** An employee suggestion/feedback program would be implemented and used by employees.
- **Periodic surveys would be employed.** Periodic employee opinion/attitude surveys would be used to identify any concerns not making their way through normal channels.
- **Ethics-related communications would be published.** Culture- and ethics-related messages from laboratory managers would be included in periodic newsletters or other communications.

ESSENTIAL FEATURE 9: QUESTIONING/LEARNING ENVIRONMENT

The **desired** culture would have an established questioning/learning environment. There would be an organizational imperative for continuous performance improvement. This would be implemented through various means, including (1) appropriate and timely culture assessments, (2) prompt and thorough investigations of laboratory incidents, (3) looking beyond the laboratory or agency for applicable learnings, and (4) sharing and applying learnings throughout the organization, as appropriate. The organization would recognize that significant events in laboratory operations are typically complex in causation and rare in frequency. Consequently, overly simple solutions would be avoided when addressing complex issues. For example, the response to systemic errors in analysis and reporting would take a more strategic approach when warranted (e.g., revising the training and qualification program).

Attributes and characteristics of the desired culture with an established questioning and learning environment are:

- **Continuous improvement.** Activities would be in place to enhance the continuous performance improvement culture (e.g., appropriate and timely assessments, thorough and timely investigation of incidents, actively searching for applicable internal and external learning opportunities).
- **Knowledge of incidents would be shared.** Significant incidents from similar laboratories would be shared.
- **Safe reporting environment.** A safe reporting environment would be established. If necessary, an anonymous reporting system would be created.
- **Lessons learned would be communicated.** Lessons learned from recent incidents would be identified and communicated throughout the organization and appropriate actions taken as a result.
- **Lessons from external laboratories would be communicated.** Lessons from external laboratory incidents would be communicated throughout the organization and appropriate actions taken as a result.
- **Over-simplified solutions would be avoided.** The organization would understand that simple solutions may not be possible for complex problems.
- **Established questioning environment.** An environment would be established and a policy from top management would be communicated to all levels of the organization that it is acceptable and encouraged for people to appropriately question decisions, policy, issues, and organizational priorities.

ESSENTIAL FEATURE 10: MUTUAL TRUST

The **desired** culture would foster mutual trust. Employees would trust managers to “do the right thing” in support of laboratory operations. Managers would trust employees to shoulder their share of responsibility for performance and to report potential problems and concerns. Peers would trust the motivations and behaviors of each other. Employees would have confidence that a fair and just system exists where honest errors could be reported without fear of reprisals. Organizational performance, communications, and behaviors would be such that the testimony from laboratory personnel could be trusted as sound and reliable input to the criminal justice process. Even though there would be mutual trust, personnel would be willing to constructively challenge and accept people evaluating or checking their performance of critical tasks and activities. Investigations into issues would focus on solving the problem rather than assigning blame. A progressive disciplinary policy would exist and be consistently applied to address such non-conformities.

Attributes and characteristics of the desired culture that foster mutual trust are:

- **Proper response to acceptable and unacceptable behavior.** Management response to acceptable and unacceptable performance would be timely, consistent, and fair.
- **Employees would trust managers.** Employees would trust managers to do the right thing.
- **Managers would trust employees.** Managers would trust employees to (1) do the right thing, (2) to accept responsibility for performance, and (3) promptly report potential problems and concerns.
- **Peers would trust each other.** Peers would trust the motivations and behaviors of each other.
- **Fair system.** Employees and contractors would believe that a fair and just system exists in which honest errors could be reported without fear of reprisal.
- **Outside groups would trust results.** Other organizations, groups, and individuals trust the organization to provide accurate and defensible results.
- **Employees would welcome observation.** Employees and contractors at all levels would be willing to accept others observing and commenting on their performance.
- **Blame would be avoided in investigations.** Investigations would focus on solving problems rather than assigning blame.
- **Progressive discipline policy would be in place.** A progressive discipline policy would be in place, and would be consistently applied to implement a policy of zero tolerance for willful violations of standards, rules, or procedures.
- **Employees would be trained on progressive discipline.** Employees would be trained on the progressive discipline policy.

ESSENTIAL FEATURES 11: RESPONSE TO ISSUES AND CONCERNS

The **desired** culture would provide timely response to laboratory issues and concerns. The organization would recognize that there is often only a brief period between the recognition of a potential problem and the problem occurring. Priority would be placed on the timely communication and response to learning from RCA, CCA, incident investigations, audits, etc. Mismatches between practices and procedures (or standards) would be resolved in a timely manner to prevent normalization of deviance. The organization would put an emphasis on the timely reporting and resolution of employee concerns.

Attributes and characteristics of the desired culture that provide timely response to issues and concerns are:

- **System would be in place to resolve employee concerns.** A system would be in place to help ensure managers and supervisors resolve employee concerns and suggestions in a credible, timely manner.
- **Expectation for timely communications.** The importance of and expectations for timely, effective communication throughout the chain of command would be clearly communicated (including response time to employee questions, concerns, or suggestions).
- **Lessons learned would be acted on.** Lessons learned from RCA, CCA, audits, and investigations would be acted upon in a timely manner.
- **Mismatch between practice and procedure would be resolved.** The organization would emphasize the timely resolution of mismatches between practices and procedures to prevent normalization of deviance.
- **Action tracking system would be established.** A unified action item tracking system would be developed and effectively used to help ensure full and timely completion of action items.
- **System to extend completion dates.** A performance standard on action item completion (e.g., deadlines, backlog) would be developed. The standard would include requirements for extending estimated completion dates.
- **Responsibility and completion date would be assigned.** Action items would be assigned to a specific individual with an estimated completion date.
- **Tracking system backlog would be kept within acceptable parameters.** A system would be in place to provide the needed resources to reduce the action item backlog, if needed. The status of the backlog would be periodically communicated to the employees.

ESSENTIAL FEATURE 12: CONTINUOUS MONITORING

The **desired** culture would provide continuous performance monitoring. The organization would maintain a healthy curiosity, perhaps anxiety, with respect to “How are we doing?” Relevant, clear metrics would exist to address both leading and lagging indicators. Metrics would be tracked, trended, and acted upon. There would be a high “sensitivity to operations,” that includes close, frequent contact to monitor performance and conditions within process operations, management systems, and interpersonal issues that could have a bearing on performance.

Attributes and characteristics of the desired culture that provide continuous monitoring of performance are:

- **Performance metrics would be established.** Performance metrics (leading and lagging) would be established and the results would be communicated.
- **Management system reviews would be conducted.** Regular management system reviews would be conducted.
- **Continuous improvement would be a core value.** The management would have (re)established continuous improvement as a core value of the organization and implemented a campaign to communicate it to all levels of the organization.
- **Metrics would be included in annual objectives.** Performance metrics would be included in annual objectives for all personnel.
- **Employee input would be solicited for metrics.** Employee input would be solicited and included in the development of performance metrics.
- **Improvement objectives would be included in job descriptions.** Improvement activities and/or objectives would be included in job descriptions or personnel performance plans and addressed in periodic performance reviews.