

Influence of CSI Effect, Daubert Ruling, and NAS Report on Forensic Science

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Abstract

The national media and fictional television shows have elevated the field of forensic science to having near supernatural qualities, while sensationalizing the wrongdoings of individual forensic scientists. The purpose of this study was to determine if the CSI Effect, the Daubert Ruling, and a National Academy of Sciences report on the status of forensic science in the United States affect the practice of forensic science. This quantitative study used a survey format to evaluate how forensic practitioners and administrators, belonging to the American Society of Crime Laboratory Directors (ASCLD), perceive the influence of these factors in the field of forensic science and the criminal justice system in general. A combination of descriptive statistics, inferential statistics, and cross tabular analysis were used in conjunction with Cronbach's alpha test, Mauchly's test, Wilcoxon signed rank test, and ANOVA to analyze the results of the survey. The results (N=124) indicated that members of ASCLD believe the operation of the crime laboratory, the analysis of evidence within the forensic science community, the testimony of expert witnesses at trial, and the future of the forensic science community are influenced by the CSI Effect, Daubert Ruling, and NAS Report. However, few administrators have implemented policies, procedures, or training programs that address these factors.

Keywords: CSI effect, crime laboratory, Daubert Ruling, NAS Report, expert testimony, forensic science

Introduction

The purpose of this study was to determine if the CSI Effect, the Daubert Ruling, and the National Academy of Sciences (NAS) report on the status of forensic science in the United States. The "Daubert Ruling" by the U.S. Supreme Court has changed the method by which the admissibility of expert testimony and scientific analysis is judged by the court (Daubert v. Merrell Dow Pharmaceuticals, 1993). The ruling stressed the trial judge's role as the gatekeeper for the admissibility of scientific evidence and adds specific guidelines for judges to follow when acting in this role. Secondly, the proliferation of fictional forensic science based television shows has created a phenomenon known as the CSI Effect, as a result of popular television shows. Among other factors, it is thought that the CSI Effect can lead to an unrealistic expectation of forensic evidence in criminal trials (Schweitzer & Saks, 2007; Thomas, 2005).

The National Academy of Sciences published a report entitled "Strengthening forensic science in the United States; a path forward" (NAS Report, 2009; Mays, 2009; Forensic, 2009). The report outlines some of the perceived weaknesses in the field, factors that have created those weaknesses, and possible methods for strengthening the field. Many practitioners, supervisors, and members of the academic community have referenced the Daubert Ruling, CSI Effect, and NAS Report as influences that play a role in governing crime laboratory practices and expert witness testimony.

This study differs from those of the past, since it focuses on how the Daubert Ruling, CSI Effect, and NAS Report are perceived by forensic scientists. Regardless of how judges and juries view the Daubert Ruling, forensic scientists must abide by it. Despite how juries or attorneys view evidence in comparison to fictional television shows, forensic scientists are forced to compare their work to that of fictional crime scene investigators. Lawmakers, administrators, and the forensic science community are still debating the merits of findings and determining which to apply to the practices already in place. Some professional organizations have responded to the NAS Report in whole or in part, but there is no consensus in these responses.

Literature Review

Many factors that affect the application of forensic science and expert witness testimony. Chiefly, the CSI Effect, the Daubert Ruling, ethics, and leadership were examined to better shape the research tool utilized in this study. As seen ahead, there have been many studies conducted to improve forensic science and its application in the courtroom. However, none of these studies accurately reflects how the issues influence the practices of crime laboratories or the perceptions of individual forensic scientists. Typically, these studies focus on the reaction of judges and jurors to forensic science, and ignore forensic scientists and crime laboratory administrators.

Defining the CSI Effect

Although there is much speculation regarding the influence of CSI-type television shows, most sources define the CSI Effect similarly as an unrealistic expectation placed on forensic science that is based on misinformation presented in the hit fictional television show, *CSI: Crime Scene Investigation* (CSI), and the many spinoffs that have followed (Mann, 2006; Thomas, 2005). Once this evidence is not as plentiful or conclusive as what they have witnessed on television, jurors often find that prosecutors have not met their burden of proof and acquit the defendant. Although studies differ in their findings and the true existence of a CSI Effect is debatable, the general definition provided above is the premise with which most researchers begin their analysis (Brickell, 2008; Shelton, Kim, and Barak, 2006; Shelton, D.E., Kim, Y.S., and Barak, G., 2009; Stephens, S.L.; Ungvarsky, E. J., 2006.) None of these studies focus on examining if a real or perceived CSI Effect influences the practices of crime laboratories or individual forensic scientists.

Cole and Dioso-Villa (2007), utilizing various media reports and scholarly articles, find that variations of the CSI Effect exist among many actors within the criminal justice system. For example, they discuss the defendant's effect, or "reverse CSI," where defense attorneys and defense advocates assert that television shows like *CSI* portray a positive view of forensic science and elevates forensic science practitioners to near mythical status (Cole and Dioso-Villa, 2007). Ultimately, they state that defense attorneys argue that the CSI Effect empowers jurors to put too much weight on forensic science and its "infallibility," leading to convictions where acquittals would have otherwise occurred. Opponents of this view believe that forensic science and its practitioners can never live up to this mythical status, allowing defense attorneys to challenge experts based on these unrealistic expectations.

Tyler (2006) looked at the CSI Effect as a part of the influence of the mass media on an individual's ability to make decisions based on sound facts and principles. Tyler reviewed a series of studies of juror behavior to look at the psychological perspective of these individuals, finding that individuals have difficulty distinguishing between various forms of media.

Tyler (2006) supplements the definition for the CSI Effect by examining how television shows like *CSI* influence jurors through several secondary effects. First, Tyler suggests that *CSI* simplifies the complicated world of crime and, unlike real crime, provides closure to its audience by having the case solved and justice delivered at the end of each episode. To reach this same type of closure, jurors may be more likely to vote for a guilty verdict. Second, Tyler (2006) argues that the probative value of forensic evidence may be exaggerated by the mythical status of its practitioners. Thus, the juror looks at the outlandish methods depicted on *CSI* and believes that all forensic science is infallible and has a far greater probative value than what can possibly be delivered by any scientific field.

Most significantly, Tyler (2006) points to the fact that most episodes end as the investigation comes to a close and rarely show the trial. For this reason, Tyler speculates that jurors may see the trial as an afterthought to the process and may have a preconceived notion that the defendant is guilty. This aspect of the CSI Effect is unique because it is driven by the format of the show and not the myths presented in the script.

The Daubert Ruling

The Daubert Ruling gives trial judge's discretion in determining the admissibility of scientific evidence and provides a set of guidelines that judges may choose to use. In 1993, the Supreme Court chose the Daubert case to finally address the issue of reliability (*Frye vs. United States, 1923*) versus relevance (Rule 702, Federal Rules of Evidence, 1975) in evaluating expert witness testimony. This ruling stemmed from a lower court decision excluding expert witness testimony offered by the plaintiffs to show that animal studies revealed that a specific drug, Bendectin caused birth defects in children, when taken by the mother during the first trimester of pregnancy. The defendants utilized an epidemiologist who reviewed the testing of 130,000 patients in eight different studies. He found that Bendectin did not cause birth defects in humans. The judge excluded the expert testimony of the plaintiffs and ruled in favor of the defendants who filed a summary judgment. The lower court excluded the testimony on the basis of the Frye standard. This decision was appealed and found its way to the Supreme Court (*Daubert v. Merrell Dow Pharmaceuticals, 1993*).

Justice Blackmun delivered the opinion of the court, including a four-prong guideline that is to govern the acceptance of expert witness testimony, merging the theories of reliability and relevance set forth in Frye and Rule 702. To clearly evaluate the nature of the decision it must be quoted directly. They include asking four questions of a theory or technique, (1) can it be tested, (2) has it been subjected to peer review and publication, (3) is there a known or potential error rate, and (4) has it gained general acceptance in its field. In delivering these guidelines, the Supreme Court established a method by which lower courts were to consider the admissibility of expert witness testimony.

When comparing the influence of the Daubert Ruling and the CSI Effect, one may speculate that crime laboratory administrators would say that the Daubert Ruling plays a greater role on the analysis of evidence as the Daubert Ruling created concreate case law that plays a vital role in evaluating scientific evidence and its admissibility into court, through expert witness testimony. In addition to this ruling at the federal level, over forty states have adopted similar rulings at the state level. In fact, these states are commonly referred to as "Daubert States" as it relates to the admissibility of expert testimony (Hernandez, 2013). Following the guidelines established by the United States Supreme Court, a trial judge has the discretion to admit or exclude scientific evidence based several factors (*Daubert v. Merrell Dow Pharmaceuticals, 1993*).

Since the 1993 decision was delivered, both the legal and forensic science communities have struggled to interpret these guidelines and apply them to the legal systems in which they operate. The remaining portion of this study will focus on how these two crucial communities of the criminal justice system are adapting to casework in a post-Daubert world.

Expert Witness Testimony: Boundaries Limiting s Effectiveness

For every field that yields experts, most often a professional organization governs their behavior. These organizations establish guidelines that create standard methodologies and practices for deriving analytical opinions as well as ethics codes by which their members must abide. Mario (2002) reviewed the codes of ethics of fourteen different forensic professional organizations, finding although they varied in specificity and content, all required the members to act ethically or be punished (e.g. expulsion, censorship). These professional organizations have established ethical guidelines for their members to remain fair and impartial regardless of the case.

Additionally, many experts operate within the boundaries of a crime laboratory, an auxiliary defining factor. The American Society of Crime Laboratory Directors (ASCLD), the largest crime laboratory accrediting body in the United States, reviews the procedures and practices of crime laboratories, ensuring compliance. ASCLD accreditation places a strong emphasis on ethical policies and procedures, with the expectation of administrations first and foremost to bear the burden of ethics (ASCLD Code of Ethics, 2005), demonstrating how ethics, morality, and integrity start with the top levels of an administration and trickle down. Considering the Daubert standard, it is important for experts to closely adhere to the guidelines established by their professional organization and, when applicable, the crime laboratory they in which they work.

The guidelines established by Daubert attempt to limit the effect of bias and incompetence on the proffer of scientific evidence. Experts may not always realize their own bias when conducting analysis. Dror and Charlton (2006) presented a study that examined if bias plays a role in the conclusions reached by latent print examiners.

Latent print examiners were given latent prints to examine, which included individualizations (matches) and exclusions (non-matches). The same prints were resubmitted to the examiners, but on the second submittal, biasing information was given to the examiners. The conclusions reached were surprising, as two-thirds of the experts had inconsistent findings.

Furthermore, a premise of our legal system is that a trial is the search for the truth in the interest of justice (Huang, 2000). Although the expert witness swears to tell the “whole truth,” the legal system often makes this ideal impossible. Gutheil, Hauser, White, Spruiell, and Strasburger (2003) analyze this statement and try to establish what “truth” is actually provided to the triers of fact by presenting legal reasons that the concept of the “whole truth” is an ideal that is rarely achieved. Gutheil, et al. (2003) demonstrated that there is a balance between truth and admissibility, and that experts may be testifying to what they believe to be true instead of what actually is the truth. The authors also discuss how justice does not always equal truth and that our system is set up to deliver justice first and foremost.

Gutheil and colleagues (2003) recommend several ways for the expert to preserve the truth whenever possible, including that the expert’s testimony must be data driven and that there is a duty to deliver that data in an unbiased manner. Limiting one’s testimony to only one possible theory further prevents the testimony from being completely truthful.

The Daubert ruling focuses on the concept of admissibility. As discussed by Gutheil and colleagues (2003), the guidelines of Daubert are created to limit what the trier of fact hears at trial. Although this limitation was created to ensure that only relevant and reliable expert testimony is presented at trial, this limitation keeps the “whole” truth from being heard. As the gatekeeper, the judge has an enormous responsibility to aid in the preservation of the truth, so that just verdicts are rendered.

The Daubert Ruling’s Effect on the Triers of Fact

To grasp the actual effect of the Daubert ruling one must consider how it is applied by the triers of fact. Judges must correctly apply the Daubert standard, focusing on both the letter and spirit of the case law developed. Juries, for their part, must be able to comprehend the expert testimony that is deemed admissible by the judge. This section will evaluate the abilities of both the judge and jury.

The top four problems cited by federal judges Dobbin et al. (2007) were:

1. Experts abandon objectivity and become advocates for the side that hired them
2. Excessive expense of party-hired experts
3. Expert testimony appears to be of questionable validity or reliability
4. Conflict among experts that defies reasoned assessment

The survey of state trial judges revealed similar results when asked the problems they most frequently encountered. The top four problems cited by these judges were:

1. Extensive disagreement among experts
2. Experts abandon objectivity and become advocates for the side that hired them
3. Excessive expense of party-hired experts
4. Delay in trial schedule caused by unavailability of experts

These are the same factors that should be considered in a Daubert hearing. If pretrial Daubert hearings were utilized more frequently, some of these issues may be eliminated at trial. However, with judges seeming to allow increasing amounts of scientific and expert testimony to be heard in the courtroom, a greater burden is being placed on juries to comprehend expert evidence and to distinguish between true and junk science.

Vidmar (2005) asked trial judges if they agreed with the verdicts rendered by juries in their courts. He found that the trial judge would have rendered the same verdict as the jury over 80% of the time and that the complexity of evidence offered in the case did not alter the level agreement. Based on research and data collection Vidmar (2005) rendered two significant conclusions. First, juries have a clear understanding of the adversarial court system that governs both criminal and civil trials. Second, the verdicts rendered indicate that most juries are capable of evaluating expert testimony, use that as expert testimony in conjunction with other evidence presented at trial, and deliver consistent verdicts.

Current Study

Published research on the CSI Effect, Daubert Ruling and NAS Report does not clearly examine the factors affecting the application of forensic science and expert witness testimony. Although previous research suggests that there is a CSI Effect, landmark United States Supreme Court rulings, and recent critiques of forensic science have a significant influence on public perception, existing research is limited by not sufficiently examining how actual forensic scientists and crime laboratory administrators interpret these factors.

To understand how these factors influence the application of forensic science in the criminal justice system, a better understanding must be developed of how forensic scientists and crime laboratory administrators perceive the influence of the media, the Court, and recent critiques. If it can be demonstrated that forensic practitioners are reacting to and changing their practices based on this perception, then proving its actual existence is secondary. This study explores how the Daubert Ruling, CSI Effect, and NAS Report have influenced the practice of forensic science as practitioners analyze, report, and testify to their findings.

Target Population

The survey was distributed to members of the American Society of Crime Laboratory Directors (ASCLD), a professional organization comprised of 600 members, including crime laboratory directors, supervisors, and practitioners. Because their mission is clear and directly concerned with standardized and effective forensic analysis, this organization has the best population from which to obtain the information needed in this study.

This population is comprised of members from numerous specialties within forensic science, including forensic biology, forensic chemistry, forensic identification and other sub-specialties. For this reason, the survey included members of many forensic science disciplines as well as analysts, mid-level supervisors, and crime laboratory directors, broadening its scope.

Descriptive Statistics

Data were collected for 124 participants of varying age and regional demographics. The largest groups of participants were aged from 40 – 49 (N=38, 31%) and 50 – 59 (N=44, 36%). A large group of the participants were workers in the forensic science field for over 25 years (N=49, 40%). Over half of the participants had a graduate degree (N=71, 57%). Large groups of participants worked in a laboratory in either state (N=49, 40%) or local (N=57, 46%) jurisdiction. Half of the participants indicated their position as crime laboratory director (N=62, 50%). Twenty-nine percent of participants reported their current state uses the Daubert standard (N = 36), while 20% reported use of the Frye standard (N = 25). Thirty-three percent reported use of a combination of the two in their state (N = 40). Table 1 below presents frequencies and percentages for sample demographics.

Research Question One

What influence does the Daubert Ruling, the CSI Effect, the NAS Report, or all three have on the operation of the crime laboratory?

To examine research question one, first descriptive statistics were calculated to describe opinions on the Daubert ruling versus the CSI effect on operation of the crime laboratory. Frequencies and percentages were calculated for survey questions 10, 12, and 13 and are presented in Table 2.¹ Survey question 10 asked, “Which of the following has had the greatest impact on the overall practice of forensic science?” The most common response was the CSI effect (N = 54, 47%). Survey question 12 asked, “Which of the following has had the greatest impact on expert witness testimony?” The highest group of responses was for the CSI effect (N = 51, 45%). Survey question 13 asked, “Which of the following has had the greatest impact on the interaction between forensic scientists and law enforcement?” A majority of the participants indicated the CSI effect (N = 81, 72%).

To further evaluate research question one, a one within analysis of variance (ANOVA) was conducted to determine statistically significant differences between CSI specific, Daubert ruling specific, and NAS report specific Likert type responses pertaining to impact on operation of the crime laboratory. Prior to analysis, the assumptions of a one within ANOVA were assessed. To assess for normality, three Kolmogorov Smirnov (KS) tests were conducted and the Daubert specific scale ($p = .001$) violated the assumption.

¹ Note: For all three questions, response options were: CSI effect, Daubert ruling. Both have an equal effect, and neither has an effect. See Table 1.

However, the F statistic is quite robust to violations of normality, and these violations should not dramatically shift results (Stevens, 2009). Sphericity was assessed using Mauchly's test and the assumption was not met ($p < .001$), requiring use of the Greenhouse-Geisser degrees of freedom to examine statistical significance.

Results of the one within ANOVA did not indicate statistically significant differences in the three scores ($F(1.58, 164.69) = 0.23, p .743$) and no further examination was conducted. Because no differences were found, the null hypothesis, there is no statistically significant difference in the effect of the Daubert ruling, the CSI effect, and or the NAS report on operation of the crime laboratory, could not be rejected.

Research Question Two

What influence does the Daubert Ruling, the CSI Effect, the NAS Report, or all three have on the analysis of evidence within the forensic science community?

To examine research question two, first descriptive statistics were collected to describe opinions on the Daubert ruling versus the CSI effect on analysis of evidence within the forensic science community. Survey question 11 asked, "Which of the following has had the greatest impact on the analysis of evidence?" Options included the CSI effect, the Daubert ruling, both, or neither. Thirty-five percent of participants responded that the CSI effect had the greatest impact on analysis of evidence ($n = 40$). Twenty-nine percent of participants responded that the Daubert ruling had the greatest impact ($n = 33$), while 19% ($n = 22$) responded both had an equal effect, and 17% responded that neither had any effect at all ($n = 19$).

Results of the Wilcoxon signed rank test indicated significant differences in the two scores ($Z = -7.50, p < .001$) and the null hypothesis could be rejected in favor of the alternative. Means were further evaluated to further examine differences. The CSI specific question had a mean response of 3.60 and the NAS specific questions had a mean value of 2.83. Higher means indicated a greater impact, suggesting that the CSI effect had a significantly greater impact on the analysis of evidence within the forensic science community than did the NAS report.

Additionally, question 21 responses were compared directly to question 44 responses via a Wilcoxon Signed Rank test. Results of the Wilcoxon signed rank test indicated significant differences in the two scores ($Z = -3.76, p < .001$) and the null hypothesis could be rejected in favor of the alternative. Means were further evaluated to further examine differences. The CSI specific question had a mean response of 3.60 and the NAS specific questions had a mean value of 3.10. Higher means indicated a greater impact, suggesting that the CSI effect had a significantly greater impact on the analysis of evidence within the forensic science community than did the NAS report.

Research Question Three

What influence does the Daubert Ruling, the CSI Effect, the NAS Report, or all three have on the testimony of expert witnesses at trial?

To assess research question three, first descriptive statistics were conducted to describe opinions on the Daubert ruling versus the CSI effect on testimony of expert witnesses. Frequencies and percentages were calculated for survey questions 12, 14, and 15. Survey question 12 asked, "Which of the following has had the greatest impact on expert witness testimony?" Options included the CSI effect, the Daubert ruling, both, or neither. The most common response was the CSI effect, at 45% ($n = 51$). Nearly equal participants indicated the Daubert ruling (52, 25%) as did those who indicated both have an equal effect (30, 26%). Five participants indicated neither had an effect (4%). Survey question 14 asked, "Which of the following has had the greatest impact on the interaction between forensic scientists and prosecuting attorneys?"

As before, options included the CSI effect, the Daubert ruling, both, or neither. The majority indicated the CSI effect (61, 54%), while 26% indicated both had an equal effect ($n = 29$). Thirteen percent indicated the Daubert ruling ($n = 15$), and seven percent indicated neither had any effect ($n = 8$). Survey question 15 asked, "Which of the following has had the greatest impact on the interaction between forensic scientists and defense attorneys?" Options again included the CSI effect, the Daubert ruling, both, or neither. The most common response was the CSI effect, at 36% ($n = 41$), followed by both (34, 30%), followed by the Daubert ruling (27, 24%), and finally, the least indicated response was "neither" with a 10% response rate ($n = 11$). Frequencies and percentages for these responses are presented below in Table 1, below.

Question	n	%
Which of the following has had the greatest impact on expert witness testimony?		
CSI effect	51	45
Daubert ruling	28	25
Both have had an equal effect	30	26
Neither has had an effect	5	4
Which of the following has had the greatest impact on the interaction between forensic scientists and prosecuting attorneys?		
CSI effect	61	54
Daubert ruling	15	13
Both have had an equal effect	29	26
Neither has had an effect	8	7
Which of the following has had the greatest impact on the interaction between forensic scientists and defense attorneys?		
CSI effect	41	36
Daubert ruling	27	24
Both have had an equal effect	34	30
Neither has had an effect	11	10

Table 1 — Frequencies and Percentages for Responses to Survey Questions 12, 14, and 15. *Note.* Due to rounding error, some percentages may not sum to 100%.

To further evaluate research question three, a one within analysis of variance (ANOVA) was conducted to determine statistically significant differences from CSI specific, Daubert ruling specific, and NAS report specific Likert type responses pertaining to impact on testimony of expert witnesses at trial. Prior to analysis, the assumptions of a one within ANOVA were assessed. To assess for normality, three Kolmogorov Smirnov (KS) tests were conducted and the CSI specific responses violated the assumption ($p < .001$). However, the F statistic is quite robust to violations of normality, and these violations should not dramatically shift results (Stevens, 2009). Sphericity was assessed using Mauchly's test and the assumption was not met ($p < .001$), requiring use of the Greenhouse-Geisser degrees of freedom to examine statistical significance.

Results of the one within ANOVA indicated significant differences in the CSI, Daubert, and NAS scores ($F(1.50, 154.36) = 4.19, p = .027$) and further pairwise comparison was conducted. The difference between CSI specific responses and Daubert specific responses was statistically significant ($p = .001$), with higher mean scores in the Daubert specific responses. Higher scores indicate a greater impact, and it could be inferred that the Daubert ruling had a greater impact on the testimony of expert witnesses at trial than the CSI effect, and the null hypothesis could be rejected. No other pairwise comparisons were significant.

Research Question Four

In the future will the Daubert Ruling, the CSI Effect, or the NAS Report have the greatest impact on the forensic science community?

To examine research question four, a Friedman analysis of variance (ANOVA) was conducted to determine if statistically significant differences exist between responses to survey questions 23, 34, and 43. Survey question 23 gathered Likert-type responses to the level of agreement that the CSI effect will have a significant impact in the future. Survey question 34 gathered responses to the Daubert ruling's future impact, and survey question 43 gathered these responses for the NAS report. Because the Friedman ANOVA is a non-parametric analysis, it intrinsically overcomes the main assumptions of variance tests, and no assumptions had to be assessed.

Results of the Friedman ANOVA indicated statistically significant differences in the three responses ($\chi^2(2) = 36.41, p < .001$) and the null hypothesis could be rejected in favor of the alternative. Wilcoxon signed rank tests were then conducted to determine pairwise differences where they exist.

Results of the Wilcoxon signed rank tests indicated significant differences between each pair of responses. The pairwise comparison of the Daubert ruling responses with the CSI effect responses indicated CSI responses were significantly higher than Daubert responses ($p = .043$). The pairwise comparison of the NAS report responses with the CSI effect responses indicated CSI responses were significantly higher than NAS responses ($p < .001$). The pairwise comparison of the NAS report responses with the Daubert ruling responses indicated NAS responses were significantly higher than Daubert responses ($p < .001$). The resulting order of future impact from highest future impact to lowest was CSI effect, the Daubert ruling, and finally the NAS report. Results of the Wilcoxon signed rank tests are presented below in Table 2.

Source	Z	p	Mean difference*
CSI [†] vs. Daubert	-2.02	.043	0.26
Daubert [†] vs. NAS	-4.31	.001	0.46
CSI [†] vs. NAS	-5.32	.001	0.72

Note. *Mean differences expressed in absolute values, [†] indicates the higher of the two values.

Table 2 — Wilcoxon Signed Rank Tests for CSI vs. NAS vs. Daubert Impact on the Future

Three Kruskal Wallis tests were also conducted to assess differences in how likely the Daubert Ruling, the CSI Effect and the NAS Report had on the future of the forensic science community by specialty. For the purposes of this analysis, controlled substance analysis and toxicology analysis were grouped in one specialty (34). Biology included DNA analysis, screening, and serology (32). Physical evidence analysis included firearm and tool mark examination, latent print analysis, footwear and tire track analysis, and questioned document analysis (27). The group labeled as other included, trace evidence analysis, crime scene (investigation and processing), and other (31). The results of all three Kruskal Wallis tests were not significant, $p > .050$ for all three, suggesting there were no differences in how likely the Daubert Ruling, the CSI Effect and the NAS Report had on the future of the forensic science community by specialty. Results of the Kruskal Wallis tests are presented in Table 3, seen below.

Future impact	Controlled substance/toxicology mean rank	Biology mean rank	Physical mean rank	Other mean rank	χ^2 (3)	p
CSI effect	55.32	60.07	62.31	46.61	4.36	.225
Daubert ruling	50.13	59.98	47.27	58.43	4.06	.255
NAS report	50.08	51.88	57.53	52.23	1.19	.756

Table 3 — Results for Kruskal Wallis Tests for Future Impact by Specialty

In addition, 12 Spearman correlations were conducted to assess the relationship between the likelihood the Daubert Ruling, the CSI Effect and the NAS Report had on the future of the forensic science community and the ordinal demographics (years in the field, years as a supervisor, age, and education). Results of all of the Spearman correlations returned non-significant results ($p > .050$ for all correlations). Results of the correlations are presented in Table 4, below.

Demographic	CSI effect	Daubert ruling	NAS report
Years in field	.10	-.04	.02
Years supervisor	.04	-.08	-.01
Age	.07	-.04	.07
Education	-.09	-.01	-.16

Note. * $p < .05$. ** $p < .01$.

Table 4 — Spearman Correlations between Future Impact and Ordinal Demographics

Summary of Results

Of the four research questions analyzed in this survey, three allowed for the hypothesis to be supported. There were statistically significant differences in the effect the Daubert Ruling, the CSI Effect, and/or the NAS Report had on the analysis of evidence within the forensic science community, the testimony of expert witnesses at trial, and their future impact on the forensic science community as a whole.

The first question examined, “What influence does the Daubert Ruling, the CSI Effect, and/or the NAS Report have on the operation of the crime laboratory,” supported the null hypothesis and it was determined that there is no statistically significant difference in the effect of the Daubert Ruling, the CSI effect, or the NAS Report on operation of the crime laboratory.

Expert Testimony and Analysis of Evidence within the Forensic Science Community

The CSI Effect, Daubert Ruling, and NAS Report were examined to weight if respondents felt if any influence of these factors had a negative effect on expert witness testimony. Questions 17, 24, and 35 were Likert scale questions and stated, “X (The CSI Effect the Daubert Ruling, or NAS Report, respectively) has had a negative effect on expert witness testimony.” Possible answers included, strongly agree, agree, neutral, disagree, and strongly disagree. The statistical results of this analysis were not as strong as the above comparison.

The only statistically significant finding of this analysis was that respondents viewed that the CSI Effect had a more negative influence on expert testimony than the Daubert Ruling. This finding is consistent with the direct comparison of the CSI Effect and the Daubert Ruling examined above. As depicted below in Table 6, 40% of respondents either agreed or strongly agreed that the CSI Effect has had a negative effect on expert witness testimony, while only 10% of respondents agreed or strongly agreed that the Daubert Ruling has had a negative effect on expert witness testimony. No other comparisons were significant and the majority of respondents either agreed, were neutral, or disagreed with the negative influence of any of the factors, with few having formed a strong opinion either way. See Table 4 for detail.

Scale	CSI effect	Daubert Ruling	NAS Report
Strongly Agree	4.50%	1.87%	6.73%
Agree	36.04%	8.41%	28.85%
Neutral	27.03%	26.17%	18.27%
Disagree	30.63%	55.14%	42.31%
Strongly Disagree	1.80%	8.41%	3.85%

*X equals the CSI Effect, the Daubert Ruling, or NAS Report, respectively

Table 5 — Direct comparison of “X* has had a negative effect on expert witness testimony”

Impact on the Forensic Science Community

In examining Research Question 4, survey questions were dedicated to the impact of these factors on the practice of forensic science for years to come. As these questions dealt with the future, these findings may shed some light on how members of ASCLD view the longevity of the CSI Effect, the Daubert Ruling, and the NAS Report. Unlike research questions 2 and 3, the results of this question show that the NAS Report will have the strongest influence; however, a majority of respondents agreed that all three will play a significant role in shaping forensic science in the future.

Respondents felt strongly that the NAS Report will have a significant impact on forensic science, as a whole. Eighty-three percent of respondents agreed or strongly agreed that the NAS Report will have a significant impact on the practice of forensic science for years to come, with 26% of those strongly agreeing (see Table 7). This is consistent with a concern in the field and a reaction to the NAS Report, including the creation of National Commission of Forensic Science (Edwards, 2014). In conjunction with the Department of Justice, who will focus on broad policies, the National Institute of Science and Technology (2014) responded to the declared need for standardization by focusing on the practice of forensic science and its individual disciplines. To accomplish this goal National Institute of Science and Technology (NIST) has established the Organization of Scientific Area Committees (OSAC) and the Forensic Science Standards Board (FSSB), which will be subdivided by scientific area and discipline specific subcommittees (Stolorow, 2014).

Although the NAS Report had the great percentage of respondents (83%) who agreed or strongly agreed, the second highest majority was recorded with the Daubert Ruling (63%; see Table 7). This demonstrates that it too will be a part of laboratory management in the future. The combined effect of the Daubert ruling and the Supreme Court’s rulings in *General Electric Company v. Joiner* (1997) and *Kumho Tire Company v. Carmichael* (1999), commonly referred to as the Daubert Trilogy, has established strong guidelines for the admissibility of scientific evidence and has led to greater scrutiny by trial judges.

This scrutiny and framework force forensic scientists and crime laboratory administrators to ensure that the policies and procedures meet or exceed the expectations of the court. As the Court rules on additional cases, the Daubert Ruling will evolve and continue to influence actions with crime laboratories. Additionally, Faigman's (2013) review of the influence of the Daubert Ruling on its twentieth anniversary demonstrates clearly that the Daubert Ruling is still a driving force within the criminal justice system and will be for years to come. This provides a sound explanation of why a majority of respondents believe the same.

Lastly, a smaller majority of respondents (54%) believed that the CSI Effect will have a significant impact on the practice of forensic science for years to come (see Table 7). With a response smaller than both the Daubert Ruling and the NAS Report, this may indicate that ASCLD members believe that the influence of the CSI Effect may taper off in the future, while the influence of the Daubert Ruling and NAS Report will remain strong. However, it remains remarkable that a majority of respondents believe that the unproven concept of the CSI Effect will have an impact for years to come. This indicates that the CSI Effect will have a guiding force in the long-term planning within crime laboratories. As budgets, future policies, and thoughts of expansion, enter the minds of administrators, the CSI Effect will, at a minimum, continue to hover in the background. Table 6, below provides comparison.

Scale	CSI effect	Daubert Ruling	NAS Report
Strongly Agree	8.11%	4.67%	25.71%
Agree	45.95%	57.94%	57.14%
Neutral	23.42%	28.04%	12.38%
Disagree	15.32%	8.41%	4.76%
Strongly Disagree	7.21%	0.93%	0.00%

*X equals the CSI Effect, the Daubert Ruling, or NAS Report, respectively

Table 6 — Direct Comparison of “X* will have a significant impact on the practice of forensic science for years to come.”

Operation of the Crime Laboratory

Of the research questions examined, only research question 1 (*What influence does the Daubert Ruling, the CSI Effect, the NAS Report, or all three have on the operation of the crime Laboratory?*) revealed an overall null hypothesis. However, a further examination of the survey questions utilized in rendering this conclusion yields more specific results. Several direct comparison and Likert scale questions were utilized and combined to assess the operation of a crime laboratory in general. A review of the results clearly demonstrates that all three factors, Daubert Ruling, the CSI Effect, and/or the NAS Report, have an influence on the operation of the crime laboratory.

Because the interaction between crime laboratories and other members of the criminal justice system has an impact on the overall operation, a direct comparison was made between the impact of the Daubert Ruling and CSI Effect on the interaction between forensic scientists and law enforcement. Here, there was a substantial and notable disparity. Seventy-two percent responded that the CSI Effect had a greater influence and 6% responded that it had an equivalent impact as the Daubert Ruling. This may be due to a combination of the police chief's, weak prosecutors' and victim's effects (Dioso-Villa, 2014). Since law enforcement officers must answer to the victims they encounter and the prosecutors trying their cases, the perceived need for forensic evidence would alter their interaction with laboratory personnel. Additionally, the police chief's effect permeates all levels of law enforcement, as they combat against criminal, seemingly being educated by fictional crime shows.

Contrary to what may be expected from the responses, when asked about the future impact on forensic science, respondents were not as uniform in their opinions with regards to training. As seen in Table 7 below, many respondents either disagreed or strongly disagreed that the CSI Effect (55.56%), Daubert Ruling (42.06%), NAS Report (49.52%) has changed training programs. Since training programs are the backbone of most crime laboratories and set the foundation for future analysts, it seems that these factors should be addressed during this critical period of an individual's career.

Scale	CSI effect	Daubert Ruling	NAS Report
Strongly Agree	.90%	.93%	4.76%
Agree	23.42%	33.64%	24.76%
Neutral	17.12%	23.36%	20.95%
Disagree	36.04%	32.71%	41.90%
Strongly Disagree	22.52%	9.35%	7.62%

*X equals the CSI Effect, the Daubert Ruling, or NAS Report, respectively

Table 7 — Direct Comparison of “X* has forced the institution in which I work/supervise to alter its training practices.”

In addition to training programs, the impact of the CSI Effect, Daubert Ruling, and the NAS Report were examined with respect to their influence on the policy and procedures. Once again, respondents were not as uniform in their opinions with regards to policy and procedure changes. As seen in Table 9, many respondents either disagreed or strongly disagreed that the CSI Effect (59.63%), Daubert Ruling (49.53%), NAS Report (44.77%) have changed their policies and procedures. Based on their responses to other survey questions, this too goes against what is expected.

Typically, accredited laboratories must have document reviews every year. These document reviews should include topics influencing forensic science. Since a majority of respondents believed the CSI Effect (54.06%), the Daubert Ruling (62.61%), and the NAS Report (82.85%) will have a significant impact on the practice of forensic science for years to come, administrators must begin to incorporate policies and procedures addressing these factors. The alternative is to allow these factors to have an informal or uncontrolled influence on the practices of one’s laboratory. If practitioners within a laboratory are not trained to address these issues during analysis or in court and no policies exist to govern their response, individuals will vary in their approach. This can lead to unregulated outcome that will be difficult to manage.

Scale	CSI effect	Daubert Ruling	NAS Report
Strongly Agree	.92%	.93%	5.71%
Agree	19.27%	23.64%	29.52%
Neutral	20.18%	26.17%	20.00%
Disagree	38.53%	41.12%	38.10%
Strongly Disagree	21.10%	8.41%	6.67%

*X equals the CSI Effect, the Daubert Ruling, or NAS Report, respectively

Table 8 — Direct Comparison of “X* has forced the institution in which I work/supervise to alter its policies and procedures.”

The CSI Effect

As previously addressed and discussed by Cole and Dioso-Villa (Cole and Dioso-Villa, 2007; Dioso-Villa 2014), the weak prosecutor’s effect focuses on how the CSI Effect has changed the actions of prosecutors. These actions include asking that unnecessary testing be conducted by the laboratory to make the case look more like CSI. Absent any empirical data of its actual influence on juries, weak prosecutors believe that the jury needs forensic evidence to convict a defendant. This has influenced DNA testing, creating or expanding backlogs in many crime laboratories (Pratt et al., 2006).

Because of the weak prosecutor effect and the “need” for DNA evidence in court, sexual assault kit backlogs grow, while trivial testing is conducted. This is one of the impacts associated with the CSI effect, as misguided attorneys request analysis that is not truly necessary to convict a defendant (Cooley, 2007).

Another source for artificial backlogs is symbolic evidence collection, where law enforcement personnel, such as detectives or crime scene technicians, collect samples merely to seem responsive to the victim and to portray the image that they care about the case. This clearly mirrors the Victim’s Effect discussed by Dioso-Villa (2014) where victims desire to have everything tested in their cases to help catch the criminal. Even though detectives and technicians may know that there is no evidentiary value to what is being collected, it is done merely to appease the victim and artificially inflates backlogs.

The Daubert Ruling

The Daubert Trilogy has established strong guidelines for the admissibility of scientific evidence and has led to greater scrutiny by trial judges. Forensic scientists and crime laboratory administrators should enact policies and procedures that meet or exceed the expectations of the court. As the Court rules on additional cases, the Daubert Ruling will evolve and continue to influence actions with crime laboratories. However, if no policies or training programs are in place, laboratory personnel will be ill prepared to face these challenges in court and may ultimately harm their chosen discipline or the entire forensic science community.

The research conducted in this study clearly demonstrates that crime laboratory administrators believe that the Daubert Ruling will continue to play an active presence in forensic science. In fact, 62.61% of respondents stated that the Daubert Ruling will have an effect of forensic science for years to come. Additionally, only one third of respondents have altered their training programs based on the Daubert Ruling. The lack of policy, procedures, and training programs updates will have a negative effect on expert witness testimony and could have permanent consequences for the various fields of forensic science.

Based on the response to updating policies and training programs with regard to the Daubert Ruling, it would appear that crime laboratory administrators are lagging behind on including legal updates within their programs. In an effort to keep up-to-date with legal matters that effect the crime laboratory, administrators should have a method for learning of and addressing these issues before they negatively impact services. There are several ways to accomplish this task. One method would be to reach out to their local prosecutors and receive updates and training through their continuing legal education requirements. Another method would be to work with local law enforcement to receive and review legislative updates. In either case, training and education are key, followed by implementing what is learned. Updating policies, procedures, and training programs to address the Daubert Ruling and various other legal requirements will lead to positive social change, by ensuring that forensic science remains an accurate and useful entity within the criminal justice system.

The NAS Report

It is imperative for crime laboratory administrators to view the findings of the NAS Report, especially those that have gained traction, and implement changes to their policies, procedures, and training programs.

82.85% of respondents stated that the NAS Report will have an effect of forensic science for years to come. This was the highest percentage of all three factors studied, with over a quarter of respondents strongly agreeing. Additionally, less than one third of respondents have altered their training programs based on the report. This lack of updating the policy, procedures, and training programs in response to the NAS Report, published in 2009, further demonstrates a slow reaction time to a major development in forensic science. A further look into how respondents answered more specific questions may shed light on to this disparity.

47% of respondents felt that the crime laboratories should be removed from law enforcement entities. Respondents were fairly equally divided. Here, 37% disagreed or strongly disagreed, while 16% were neutral.

399 crime laboratories are accredited currently by the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB), the largest accrediting agency (Accredited Laboratory Index, August 2014). Also, Forensic Quality Services (FQS) accredits over 50 laboratories (FQS, 2014). Some smaller laboratories remain unaccredited and independent analysts are not affiliated with accredited laboratories. Although accreditation is voluntary in the majority of jurisdictions, most laboratories choose to go through the process. This may explain why there was sharp division when asked if a national commission should make accreditation mandatory (Figure 8). Respondents were fairly equally divided. Here, 32% disagreed or strongly disagreed, while 28% were neutral, while 49% either agreed or strongly agreed.

Recommendations for Future Study

Beyond ASCLAD, another professional organization to consider surveying include the American Academy of Forensic Sciences (AAFS), would include a broad base of respondents, including the various sections within the organization. These sections include Anthropology, Criminalistics, Digital and Multimedia Sciences, Engineering Sciences, Odontology, Pathology/Biology, Psychiatry and Behavioral Sciences, Toxicology, Jurisprudence, and a General section.

Conclusion

It was determined that members of ASCLD believe the operation of the crime laboratory, the analysis of evidence within the forensic science community, the testimony of expert witnesses at trial, and the future of the forensic science community as a whole are influenced by these factors. Although they believe these factors play a role in the use of forensic science within the criminal justice system, few have implemented policies, procedures, or training programs to address these issues.

Crime laboratory administrators must begin to address the CSI Effect, Daubert Ruling, and NAS Report as they would any other issue they face. Research on the CSI Effect should be presented to trainees, and administrators should weigh the influence of the CSI Effect on their policy decisions, relative to the Daubert Ruling and NAS Report. Case law surrounding the Daubert ruling should be included within training programs and new court decisions presented at laboratory meetings. The NAS Report and its recommendations should be discussed and concrete changes implemented. The alternative to creating policies and training programs that address these issues is to allow these factors to influence each analyst individually with no guidance or direction. This is a recipe for disaster within the crime laboratory and the forensic science community.

Accreditation requires that crime laboratories have clear policies for both the managerial and technical aspects of the laboratory, and clearly defines these requirements; however, it does not mandate that laboratory directors address these factors specifically (ISO/IEC 17025:5.2.1, 2005). By acting as leaders and insisting that forensic science remains an accurate and beneficial entity within the criminal justice system, laboratory administrators will encourage positive social change. To improve the use of forensic science, limit the time and money wasted on unnecessary testing, and increase the effectiveness of expert witnesses at trial, crime laboratory administrators must begin to address the CSI Effect, Daubert Ruling, and NAS Report within their policies, procedures, or training programs.

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