Pak. j. life soc. Sci. (2024), 22(2):15485-15492 E-ISSN: 2221-7630;P-ISSN: 1727-4915

Pakistan Journal of Life and Social Sciences
www.pjlss.edu.pk

https://doi.org/10.57239/PJLSS-2024-22.2.001123

RESEARCH ARTICLE

The Impact on the Reporting of Forensic Findings in Criminal Proceedings

Kate Simon[1], Joe H Smith[2*]

[1]Forensic Science Laboratory, South African Police Service
[2]Forensic and Criminal Investigation Science, College of Law: School of Criminal Justice, Department Police Practice

ARTICLE INFO

Received: Sep 17, 2024

Accepted: Nov 23, 2024

Keywords

DNA
Fingerprints
Firearms
Forensic evidence
Forensic science
Uniqueness of the evidence

***Corresponding Author:**

38761556@mylife.unisa.ac.za

ABSTRACT

Forensic science techniques are frequently employed in criminal trials to identify perpetrators, and the judiciary find this evidence highly persuasive. The predominant practice in some branches of forensic science employs analytical methods reliant on human perception and interpretive methods grounded in subjective judgement. The methods lack transparency and are prone to cognitive bias; interpretations frequently exhibit logical flaws, and forensic evaluation systems often lack empirical validation. However, it's crucial to recognize that some convictions, often based on a single piece of forensic evidence such as fingerprint analysis or firearms identification, are incorrect due to overstated claims of uniqueness and no other supporting evidence. Recent reports confirm the critical role of forensic pattern-matching methods but highlight flaws such as overstating the uniqueness of the evidence, insufficient scientific validation, coincidental results, and human errors. Therefore, to ensure justice, courts should exercise caution and demand strong corroboration with other evidence, providing reassurance to all involved. This study examines and explores what impact forensic findings have and how the judiciary views the accuracy of various forensic techniques and the role of human judgment in their application.

INTRODUCTION

Forensic evidence has revolutionized criminal investigation. However, it represents only a single facet of the broader evidentiary landscape and seldom provides unequivocal conclusions (Taylor et al., 2024). In criminal investigations, comparative forensic sciences are frequently employed to identify perpetrators. For instance, DNA trace or fingerprints collected at crime scenes are compared to known samples to assess whether they originate from the same individual. Historically, the validity and reliability of these forensic techniques were seldom questioned, leading courts to permit examiners to assert that two prints or samples "match" to the exclusion of all others, despite a lack of empirical evidence supporting such definitive conclusions (Ribeiro et al., 2019; Skene 2018). Forensic evidence may corroborate or refute a theory in court; but, it cannot independently establish that a crime occurred. This is due to the circumstantial nature of forensic evidence, which does not directly link a person to a crime (Meintjes-Van der Walt and Dhliwayo 2021).

The strength of the evidence is communicated by forensic practitioners to the judicial officers. In forensic science, evaluating the strength of evidence involves two key processes: **analysis**, which entails extracting information from relevant items (the trace evidence), and **interpretation,** which involves drawing inferences about the significance of the information obtained during the analysis (Morrison 2022). Examples of items of interest include: DNA trace collected from the crime scene and buccal sample taken a known individual.

In many forensic science disciplines, analysis often relies on human perception, and interpretation depends on subjective judgment. Even when instrumental measurements are used, interpretations frequently involve subjective assessments, such as visually examining graphical data (Morrison 2022). These subjective methods lack transparency and are vulnerable to cognitive biases (Borkar 2023; Curley et al., 2020). Moreover, even when statistical models are employed for interpretation, logical flaws can

occur, and forensic evaluation systems—comprising both analysis and interpretation methods—are frequently inadequately empirically validated (Du 2017; Morrison 2022; Thompson and Newman 2015).

Recent studies indicate that many individuals perceive forensic evidence as relatively inaccurate and heavily influenced by human judgment (Ling et al., 2021; Ribeiro et al., 2019). In 2009 the U.S. National Academy of Sciences (NAS) issued a report criticizing the state of forensic science (National Academy of Sciences,2009). The report stated that, except for nuclear DNA analysis, no forensic method had been rigorously proven to consistently and accurately link evidence to a specific individual or source. It recommended conducting research to establish the reliability and limitations of each forensic technique, noting a lack of such studies in most disciplines (National Academy of Sciences, 2009). In 2016, the U.S. President's Council of Advisors on Science and Technology (PCAST) released a report questioning the scientific validity and reliability of various feature-comparison methods and offered recommendations to strengthen forensic science and promote rigor.

Problem statement

Forensic evidence plays a crucial role in criminal proceedings by determining guilt or innocence. Concerns have arisen about the accuracy and reporting of this evidence in criminal casework. Documented instances exist in which forensic practitioners have exaggerated findings or offered testimony outside their area of expertise, resulting in possible miscarriages of justice.

Research question for the study

The study is guided by the following question:

1) What impact does the reporting of forensic evidence have on the judicial process in criminal casework?

METHODOLOGY

The research involves describing and defining the issue and presenting various opinions on it. This study employs a qualitative methodology, utilizing a narrative review approach to critically assess and synthesize existing research on the presentation of forensic findings in court. By conducting a meta-synthesis, the study integrates findings from multiple qualitative studies to develop a comprehensive understanding of how forensic evidence is reported during legal proceedings. (Darvishpour et al., 2014; Leary and Walker 2018). It is an approach that is used to synthesize research findings of previous studies on the impact on the reporting of forensic findings in criminal proceedings. The approach was used to identify the relationship, contradictions, gaps, and inconsistencies from these studies to create new knowledge which in this case, the impact of the reporting of forensic findings in criminal proceedings in the development of the preservice teachers' profession (Darvishpour et al. 2014; Walsh and Downe 2005).

Bibliographic search focus: The bibliographic search was executed in Google Scholar, PubMed and Scopus repositories from 2014 to end of November 2024, to include relevant literature.

Inclusion and Exclusion Criteria: Inclusion criteria encompassed studies without temporal limitations that contained search terms related to the reporting of forensic findings in criminal proceeding sin the title or abstract, with full-text articles published in English. Studies that employed a search strategy and opinion were included.

Screening and Quality Assessment: one researcher conducted the screening of all titles and abstracts, while a second researcher oversaw and screened the full texts for relevance to the study's objectives. This collaborative approach ensured that all perspectives were considered in the quality assessment and data extraction, making the process more inclusive.

RESULTS AND DISCUSSION

The justice system depends significantly on forensic expert evidence to adjudicate serious criminal cases. The analysis, interpretation, and review of forensic trace necessitate a rigorous application of contemporary scientific theories, statistical methodologies, and specialised knowledge. The use of forensic evidence to implicate or exonerate individuals in serious criminal cases requires high levels of precision and meticulous attention to detail (Martin 2023; Morgan 2023; Olaborede and Meintjes-Van der Walt 2020).

Wrongful convictions, often caused by misidentification, flawed evidence, prosecutorial misconduct, and inadequate defence, are a significant issue (Bonventre, 2021; Morgan 2023; Visser and Scholtz 2023).

While adversarial safeguards like cross-examination and professional expertise aim to reduce these risks, research suggests they may not be as effective as we hope in ensuring accurate fact-finding in criminal trials (Visser and Scholtz 2024). In South Africa, the absence of formal mechanisms to track or investigate instances of false convictions is a stark reality (Visser and Scholtz 2023).

The high crime rate and pervasive violence in South Africa often shape public impressions, potentially leading professionals to avoid disclosing inconclusive results. The assumption of guilt before proving a suspect's culpability beyond a reasonable doubt might undermine the fundamental tenet of fair justice. Consequently, unlawful convictions in South Africa are mostly unacknowledged, usually overlooked, and often refuted (Olaborede and Meintjes-van Der Walt 2020).

Studies indicate that extraneous contextual, cognitive, and motivational elements can influence forensic scientists' judgments and decisions (Borkar 2023; Kaye 2022; *Mattijssen 2020; Smith & Horne 2023;* Visser and Scholtz 2024;*)*. Forensic practitioners need to implement risk mitigating measures to address the factors including the quality and clarity of forensic evidence, the context of case information, and the subjective interpretation of forensic analysis and reporting might affect prejudice.

In specific forensic fields, the need for scientific validation has never been more urgent. Scientific assessments have demonstrated an absence of factual backing for expert claims, resulting in substantial modifications. Entire subfields, such as bullet lead analysis, have been abandoned after decades of usage in criminal convictions due to discreditation (Koehler 2023; *Sauerwein et al.,* 2023). Disciplines such as fire and arson investigation have transitioned from discredited concepts to more scientifically valid methodologies (Koehler 2023; *Sauerwein et al.,* 2023). Methods like microscopic hair analysis have undergone heightened examination, leading to diminished credibility and a retreat from exaggerated assertions (Koehler 2023; *Sauerwein et al.,* 2023). Notwithstanding these advancements, many domains, particularly bite mark recognition, have continued to be employed despite adverse scientific evaluations (*Sauerwein et al.,* 2023).

Concerns have long been raised that expert witnesses may skew their conclusions and evidence to benefit the side that has retained them, whether deliberately or inadvertently (Svider 2021; Visser and Scholtz 2024; Waite et al., 2021). This phenomenon, termed "adversarial bias," indicates that specialists may conform their expectations and conclusions to the interests of the hiring entity.

The primary concern with the formal interpretation framework lies in the disparity between the enquiries posed by the court and the determinations made by the forensic scientist (Maitre 2017). The forensic practitioner examines the origin of the forensic trace, while court interrogations mostly focus on the subsequent interpretation of activities before, occurring during, and following the event. Nonetheless, the courts focus on this source information as the forensic practitioner is unable to provide insights on the activity and should not attempt to speculate on this.

Individualisation

In forensic science, source attribution refers to the process of determining the origin of a particular piece of evidence, such as DNA, fingerprints, or digital data, and linking it to a specific individual, object, or location. This individualised match determination claims that a trace item exclusively corresponds to a known sample from an individual, indicating it must have originated from that specific source (Leonetti 2024). Individualization has long been a cornerstone of forensic science, with forensic practitioners performing individualizations in the majority of their casework. The individualisation fallacy denotes the incorrect claim that a defendant is the exclusive possible source of a forensic trace sample, asserted with complete certainty. This claim is often accompanied by claims of a zero percent error rate.

This individualisation fallacy fails to acknowledge the inherent limitations of forensic science, as it is scientifically unsound to assert with 100% certainty that a specific individual is the sole source of a forensic trace sample. These assertions neglect the potential for coincidental matches or analytical errors, underscoring the need for a critical and analytical approach in forensic analysis, keeping the audience engaged and active in their work. While some instances of this hyperbolic assertion persist, many forensic professional associations now advise their members against making such definitive statements, recognizing the inherent uncertainties in forensic analyses.

In court proceedings, forensic practitioners are frequently questioned about the manner in which forensic evidence was deposited at a crime scene. Forensic practitioners frequently draw erroneous conclusions during their oral testimony. Claims like "In my experience, the large amount of trace DNA deposited is

more consistent with direct transfer," "It is attributable to a biological fluid," or "The data supports this conclusion" may lack adequate scientific support or exaggerate the evidence. It is imperative that these experts refrain from offering opinions on such matters, as doing so may exceed the bounds of their expertise and the available evidence. Speculative statements regarding the likelihood of when or how a forensic trace was deposited, or attributing it to a specific individual with certainty, should be avoided to maintain the integrity and objectivity of forensic testimony.

Use of Statistical Models

Statistical fallacies in forensic science adversely affect the legal system, including the provision of statistics lacking empirical support, the individualisation fallacy, the prosecutor's fallacy, and the defence attorney's fallacy (Dror and Scurich 2020; Kilberger 2023; Koehler et al., 2023). There are several instances of reporting of forensic evidence where the judgement indicated either contained a statistical fallacy or was utilised or interpreted by the presenting party (e.g., in closing arguments) in a way that demonstrated a flaw in statistical thinking (Leonetti 2024). These statistical fallacies present a substantial threat to justice, as flawed statistical testimony in forensic science is pivotal in the wrongful conviction of innocent defendants.

All forensic tests, including DNA analysis, are susceptible to laboratory errors and expert misinterpretations. Contrary to the common belief in the objectivity of expert testimony, certain aspects of scientific evidence rely on subjective interpretation. This inherent potential for error, coupled with logical missteps like the transposed conditional fallacy, has significantly contributed to wrongful convictions

Prosecutor Fallacy

The prosecutor's fallacy arises when the likelihood of a random match is incorrectly interpreted as the probability that the defendant is the origin of the evidence. For instance, if the likelihood of an innocent individual matching the DNA sample from a crime scene is one in ten thousand, the prosecutor mistakenly infers that the probability of the defendant's innocence, given a DNA match, is likewise one in ten thousand. This misinterpretation may result in wrongful convictions by exaggerating the significance of the evidence.

Defence Attorney Fallacy

The defence attorney's fallacy arises when it is contended that a DNA match is insignificant unless it exclusively identifies the defendant or a very limited group. This reasoning overlooks the cumulative weight of evidence, potentially leading to the dismissal of pertinent forensic findings. The defence attorney's fallacy arises when a minimal probability of the person of interest (POI) being the source is misinterpreted, taking into account the population size and the random match probability (RMP). An RMP of 1 in 1 million suggests that, within a population of 100 million, one would anticipate identifying approximately 100 individuals whose genotype corresponds with the evidence profile. The fallacy is in the reasoning that DNA evidence is insignificant solely due to the theoretical possibility of 100 other individuals possessing the same profile. A profile that reduces the pool of potential sources from 100 million to approximately 100 is highly significant and pertinent to the investigation.

Transparency

Transparency is essential for an equitable criminal justice system and a fundamental characteristic of rigorous scientific practice. The capacity of defence attorneys to assess, investigate, present, and challenge forensic evidence is contingent upon the prompt disclosure of information regarding the examination, the conclusions of forensic science practitioners, and the facility involved. Recommendations encompass transparency, ethical standards, disclosure obligations, access to research, and minimum disclosure criteria.

Quality Assurance

Quality management systems and accreditation processes are often advocated as efficient self-regulation mechanisms within the forensic sciences (Smith and Horne 2024a), This strategy is susceptible to selective application, as not all practitioners or laboratories adhere to uniform criteria.

Despite rigorous efforts to secure accreditation, numerous anomalies remain unaddressed in the field, undermining the credibility and reliability of forensic evidence in judicial settings. To address these

limitations, forensic sciences should extend beyond self-regulation and implement oversight from statutory authorities via authoritative regulatory enforcement procedures (Smith and Horne 2024b).

Challenges in Court Cases

Forensic reporting issues and inconsistent admissibility standards in courts pose significant challenges in presenting and interpreting scientific trace evidence (Olckers 2013, Smith and Horne 2024a, Smith and Horne, 2024b; Visser and Scholtz 2024). Notable Southern African cases, including *Bokolo v. State*, *S v Maqhina*, *Tshantsani v S*, *S v Van der Vyver*, and *State v Rapogadie,* have highlighted issues with the reported forensic evidence during court proceedings. Olckers (2013) identifies common problems in court cases involving forensic evidence, such as unvalidated DNA testing methods, contradictory witness statements during cross-examination, and the poor quality of DNA evidence and its presentation. Concerns also arise regarding expert witness bias favouring the prosecution, underscoring the necessity for ethical testimony and authentic DNA evidence in Southern African courts. Implementing appropriate systems to address these challenges is essential for upholding the credibility and reliability of forensic science in the pursuit of justice (Smith and Horne 2024b; Visser and Scholtz 2024).

Potential Risks of Convictions based on a Single Piece of Forensic Evidence

Forensic scientists have historically claimed the absolute reliability of their disciplines, frequently rejecting the notion of potential errors. Both the National Academy of Sciences (NAS) in 2009 and the President's Council of Advisors on Science and Technology (PCAST) in 2016 have contested these claims, asserting that assertions of 100% certainty lack scientific validation. The NAS report assessed 14 forensic disciplines, including biological evidence, emphasising the necessity for a more rigorous evaluation of forensic methodologies.

Deficiencies exist in forensic pattern-matching methods, which are connected to the wrongful conviction of an innocent individual based solely on a single piece of forensic evidence (Mnookin 2018, Olaborede and Meintjes-van der Walt 2020). Despite inherent flaws, certain courts continue to accept forensic expert testimony derived from pattern-matching methods as scientific evidence. Wrongful conviction of an innocent person, based on a single piece of evidence, poses serious risks to the victim and society. It affects fundamental rights like life, liberty, and human dignity. Convicted individuals face challenges, court delays, and costs of appeals and legal remedies. The real perpetrator of the crime remains within society, and the state faces high costs.

Despite flaws in forensic pattern-matching methods, some courts still admit such testimony as scientific evidence. The necessity for caution is further underscored by the state's occasional inability to present tangible evidence that should have been accessible Olaborede and Meintjes-van Der Walt, 2020).Therefore, the court must encourage the state to provide additional material evidence, if available, to corroborate the circumstantial evidence (ie forensic evidence) in order to reinforce their argument(s).

CONCLUSION

Misinterpretations and fallacies in forensic evidence are caused by erroneous inferences, inaccurate conclusions and reporting forensic findings. These issues stem from bias, inadequate application of scientific principles and a lack of understanding of forensic evidence's limitations and assumptions. The forensic practitioner's role is crucial in providing a reliable forensic service and evidence in criminal casework

South Africa's elevated crime rate and widespread violence frequently influence public perceptions, which may compel experts to refrain from presenting inconclusive findings. The presumption of guilt prior to the establishment of a suspect's culpability beyond a reasonable doubt can compromise the foundational principle of equitable justice. As a result, wrongful convictions in South Africa are predominantly unrecognised, frequently neglected, and often denied.

ACKNOWLEDGEMENTS

None

Informed Consent

This study is a literature review, hence there is no informed consent authors had to obtain before collecting data for this study.

CONFLICT OF INTEREST

Authors have no conflict of interest in this study.

Authorship contribution statement:

KS: Conceptualization, Design, Methodology, Implementation, Writing- original draft. **JHS:** Methodology-screened the full texts for relevance to the study's objectives. Writing- review and editing.

REFERENCES

Bokolo vS (2013) ZASCA 115. https://www.saflii.org/za/cases/ZASCA/2013/115.html

Bonventre, C.L. (2021). Wrongful convictions and forensic science. *Wiley Interdisciplinary Reviews: Forensic Science*, *3*(4), p.e1406. https://doi.org/10.1002/wfs2.1406

Borkar, A. (2023). Cognitive Bias in Forensic Science. *Journal of Law Science*, *5*(2), pp.59-64. www.iocscience.org/ejournal/index.php/JLS

Curley, L.J., Munro, J., Lages, M., MacLean, R. & Murray, J. (2020). Assessing cognitive bias in forensic decisions: a review and outlook. *Journal of Forensic Sciences*, *65*(2), pp.354-360. https://doi.org/10.1111/1556-4029.14220

Darvishpour, A., Joolaee, S. and Cheraghi, M.A., 2014. A meta-synthesis study of literature review and systematic review published in nurse prescribing. *Medical journal of the Islamic Republic of Iran*, *28*, p.77. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4219909/

Dror, I.E. & Hampikian, G. (2011). Subjectivity and bias in forensic DNA mixture interpretation. *Science & Justice*, *51*(4), pp.204-208. https://doi.org/10.1016/j.scijus.2011.08.004

Dror, I.E. &Scurich, N. (2020). (Mis) use of scientific measurements in forensic science. *Forensic Science International: Synergy*, *2*, pp.333-338. https://doi.org/10.1016/j.fsisyn.2020.08.006

Du, M. (2017). Analysis of errors in forensic science. *Journal of Forensic Science and Medicine*, *3*(3), pp.139-143. https://doi.org/10.4103/jfsm.jfsm_8_17

Kaye D. H., et al. (2022) Toolmark-Comparison Testimony: A Report to the Texas Forensic Science Commission. https://dx.doi.org/10.2139/ssrn.4108012

Kilberger, K.B. (2023). Something Doesn't Add up: Solving DNA Forensic Science Statistical Fallacies in Trial Testimony. *Vanderbilt Journal of Entertainment and Technology Law*, *25*, p.181. https://scholarship.law.vanderbilt.edu/jetlaw/vol25/iss1/4

Kloosterman, A., Sjerps, M. and Quak, A., 2014. Error rates in forensic DNA analysis: Definition, numbers, impact and communication. *Forensic science international: Genetics*, *12*, pp.77-85. https://doi.org/10.1016/j.fsigen.2014.04.014

Koehler, J.J., Mnookin, J.L., & Saks, M.J. (2023). The scientific reinvention of forensic science. *Proceedings of the National Academy of Sciences*, *120*(41), p.e2301840120. https://doi.org/10.1073/pnas.2301840120

Leary, H. and Walker, A., 2018. Meta-analysis and meta-synthesis methodologies: Rigorously piecing together research. *TechTrends*, *62*(5), pp.525-534. http://dx.doi.org/10.1007/s11528-018-0312-7

Leonetti, C. (2024). Ensuring the reliability of evidence in the New Zealand criminal courts: The admissibility of forensic science. *Common Law World Review*, p.14737795241237799. https://doi.org/10.1177/14737795241237799

Ling, S., Kaplan, J., & Berryessa, C.M. (2021). The importance of forensic evidence for decisions on criminal guilt. *Science & justice*, *61*(2), pp.142-149. https://doi.org/10.1016/j.scijus.2020.11.004

Maitre, M., Kirkbride, K.P., Horder, M., Roux, C. and Beavis, A. (2017). Current perspectives in the interpretation of gunshot residues in forensic science: a review. *Forensic science international*, *270*, pp.1-11. https://doi.org/10.1016/j.forsciint.2016.09.003

Martin, B. (2023). Litigating Innocence: Why Systemic Reforms Are Needed to Exonerate, Pro Se Individuals. *Law & Ineq.*, *41*, p.117. https://doi.org/10.24926/25730037.682

Mattijssen E. J. A. T., Witteman C. L. M., Berger C. E. H., Stoel R. D. (2020). Cognitive biases in the peer review of bullet and cartridge case comparison casework: A field study. Sci. Justice 60, 337–346 https://doi.org/10.1016/j.scijus.2020.01.005

Meintjes-Van der Walt, L. and Dhliwayo, P., 2021. DNA Evidence as the Basis for Conviction. *Potchefstroom Electronic Law Journal/Potchefstroomse Elektroniese Regsblad*, *24*(1). https://doi.org/10.17159/1727-3781/2021/v24i0a8537

Mnookin, J.L. 2018. The uncertain future of forensic science. *Daedalus*, *147*(4), pp.99-118. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3300354

Morgan, J. (2023). Wrongful convictions and claims of false or misleading forensic evidence. *Journal of forensic sciences*, *68*(3), pp.908-961. https://doi.org/10.1111/1556-4029.15233

Morrison, G.S. (2022). Advancing a paradigm shift in evaluation of forensic evidence: The rise of forensic data science. *Forensic Science International: Synergy*, *5*, p.100270. https://doi.org/10.1016/j.fsisyn.2022.100270

National Research Council, Division on Engineering, Physical Sciences, Committee on Applied, Theoretical Statistics, Policy, Global Affairs, Committee on Science, Law and Committee on Identifying the Needs of the Forensic Sciences Community. (2009). *Strengthening forensic science in the United States: a path forward*. National Academies Press. https://doi.org/10.17226/12589

Olaborede, A. and Meintjes-Van der Walt, L. (2020). The dangers of convictions based on a single piece of forensic evidence. *Potchefstroom Electronic Law Journal/Potchefstroomse Elektroniese Regsblad*, *23*(1). http://dx.doi.org/10.17159/1727-3781/2020/v23i0a6169

Olckers A (2013) DNA evidence in South: Lessons learned to date. Forensic Science International: Genetics Supplement Series. 4(1): e160 – e161. https://doi.org/10.1016/j.fsigss.2013.10.083

President's Council of Advisors on Science and Technology, Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods (the PCAST report). https://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/pcastforensicscienceportfinal.pdf.

Ribeiro, G., Tangen, J.M., & McKimmie, B.M. (2019). Beliefs about error rates and human judgment in forensic science. *Forensic science international*, *297*, pp.138-147. https://doi.org/10.1016/j.forsciint.2019.01.034

S v Maqhina. (2001) 1 SACR 241 (T). https://collections.concourt.org.za/handle/20.500.12144/15675

Skene, J.H. (2018). Up to the courts: Managing forensic testimony with limited scientific validity. *Judicature*, *102*, p.39. https://judicature.duke.edu/wp-content/uploads/2019/12/JUDICATURE102.1-SKENE-1.pdf

Smith, J.H. & Horne, J.S. 2023. Die belangrikheid van gehaltebestuurstelsels in forensiese DNS-toetslaboratoria in Suid-Afrika. *Litnet Akademies:'n Joernaal vir die Geesteswetenskappe, Natuurwetenskappe, Regte en Godsdienswetenskappe*, 20(3):491-522. https://doi.org/10.56273/1995-5928/2023/j20n3b12

Smith, J.H. and Horne, J.S. (2024). Quality management system in forensic science: An African perspective. *Forensic Science International: Synergy*, *8*, p.100476. https://doi.org/10.1016/j.fsisyn.2024.100476

Smith, J.H. & Horne, J.S. (2024). Regulating forensic science practice in Southern Africa. *Journal of Forensic Science & Criminal Investigation*, 18(3): 555987. https://juniperpublishers.com/jfsci/pdf/JFSCI.MS.ID.555987.pdf

Tshantsani v S (CS225/20114) (2016) ZAECGHC 3. https://www.saflii.org/za/cases/ZAECGHC/2016/3.html

S v Van der Vyver (SS190/06) (2007) ZAWCHC 69. https://www.saflii.org/za/cases/ZAWCHC/2007/69.html

State v Rapogadie v S (36/2010) [2012] ZAWCHC 15 https://www.saflii.org/za/cases/ZAWCHC/2012/15.html

Sauerwein K., Butler J. M., Reczek K. K., Reed C. (2023). Bitemark analysis: A NIST scientific foundation review. https://nvlpubs.nist.gov/nistpubs/ir/2023/NIST.IR.8352.pdf.

Svider, P.F. (2021). Expert Witness Testimony. In Eloy JA, PE Svider, S Baredes, SP Kelly (Eds.). *Litigation in Otolaryngology: Minimizing Liability and Preventing Adverse Outcomes* Springer, New York, USA, pp.179-184. DOI: 10.1007/978-3-030-64418-5_19

Thompson, W.C., & Newman, E.J. (2015). Lay understanding of forensic statistics: Evaluation of random match probabilities, likelihood ratios, and verbal equivalents. *Law and human behavior*, *39*(4), p.332. https://doi.org/10.1037/lhb0000134

Taylor, M., Romsos, E., Ballantyne, K., Boswell, D.M., & Busey, T. (2024). Forensic DNA Interpretation and Human Factors: Improving the Practice Through a Systems Approach. https://www.nist.gov/publications/forensic-dna-interpretation-and-human-factors-improving-practice-through-systems

Visser, J.M. & Scholtz, D. (2023). Warnings from the West: Identification and Expert Evidence as Causes of Wrongful Convictions and the Implications for South Africa (Part 1). *African Journal of International and Comparative Law*, 31(4):536-55. https://doi.org/10.3366/ajicl.2023.0465

Visser, J.M. and Scholtz, D., 2024. Warnings from the West: Identification and Expert Evidence as Causes of Wrongful Convictions and the Implications for South Africa (Part 2). *African Journal of International and Comparative Law*, *32*(4), pp.523-542. https://doi.org/10.3366/ajicl.2024.0503

Waite, S., Scott, J., Kolla, S. & Bruno, M.A. (2021). The role of the expert witness in radiology: challenges and strategies for overcoming them. *Journal of the American College of Radiology*, *18*(2), pp.318-323. https://doi.org/10.1016/j.jacr.2020.06.007