

Forensic science in Seychelles: An example of a micro-jurisdiction forensic delivery system



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ARTICLE INFO

Article history:

Received 5 February 2021

Accepted 5 February 2021

Available online 16 February 2021

Keywords:

Forensic science

Service delivery

Policy

Legislation

Governance

Seychelles

ABSTRACT

Forensic science has become an indispensable tool for even the smallest of jurisdictions. However, micro-jurisdictions often face significant challenges with respect to resource availability, administration and local governance. This paper examines the forensic service provision in Seychelles as an example of a micro-jurisdiction forensic delivery system. The impact of limited resources and remote access to consumables or services have prompted the prospective shift to localise commonly utilised forensic services. The potential for a solid foundation for a sustainable forensic service is examined in relation to jurisdictions with more advanced forensic service delivery. Reforms of the legal framework, administration, and governance structures are some of the key underpinnings for an effective forensic delivery system built on a culture of transparent science that promotes justice and creates public confidence.

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1. Introduction

Forensic science plays a central role in the modern justice system. It has the potential to support investigation and prosecution of crime, and equally protect the innocent from wrongful prosecution. Recent years have seen an increasing reliance on forensic science in criminal investigations, propelled by the rapid advancement of science and technology. This is evident with the increasing utilisation of DNA and digital evidence as a key policing strategy by law enforcement around the world [1,2]. The modern capabilities of such technology have made forensic science an indispensable tool for even the smallest of jurisdictions. An example of this can be seen in the Seychelles; a geographically remote micro-jurisdiction where significant investments are being made into enhancing forensic science service provision [3].

Seychelles is an island nation spanning an archipelago of 115 islands in the western Indian Ocean, north of Madagascar, and about 1600 km off the east coast of mainland Africa (Fig. 1). The islands are divided into two geographical regions - inner and outer islands. The former are mostly granitic with a central range and narrow coastal

line, while the latter consist of flat coralline islands. Seychelles is a sovereign democratic republic governed by a president, cabinet of ministers, and National Assembly [4]. The country is geopolitically part of Africa and is the smallest African state with a population of 98,462 as of June 2020 [5]. Seychelles is divided into 26 administrative regions, with 23 on the main island of Mahe, two on the second largest island (Praslin), and the last encompassing the remaining inner and outer islands. Tourism is the main economic activity and although Seychelles has one of the highest GDP per capita in Africa (USD \$1.74 billion in 2019) [6], the economy is very fragile due to limited resources and a lack of economic diversity. The significant decrease in tourism due to the COVID-19 pandemic is a concrete example, resulting in an economic loss of 18.6% in the third quarter of 2020 compared to similar period in 2019 [5].

Given the reliance on the tourism industry (accounting for 65.8% of total GDP in 2019), common offences such as housebreaking and theft constitute a major impediment to economic growth and prosperity of the Seychelles [7]. Illicit drugs are a prominent threat and the root cause of many of the social issues in the country, including related volume crimes. Transnational crimes such as human trafficking, piracy, credit card fraud using skimming devices, and illegal fishing are also notable threats. As a result of the substantial socio-economic impact of crime on the fragile economy, there is an increasing emphasis on forensic science to counter criminal threats [8], however, development and access to forensic services remains a challenge.

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Fig. 1. Map illustrating the location of the Republic of Seychelles.

The increasing demand for forensic services, albeit with the limited resources of forensic delivery systems, is commonly echoed [9,10] across the sector. The challenge is how to effectively 'do more with less' [11] without compromising quality. In response, the landscape of forensic science service provision is changing. Benchmarking to monitor performance and quality, and sharing of information within the forensic industry to identify best practices are being embraced [11,12]. For example, in 2019 a total of 178 laboratories participated in Project FORESIGHT - a benchmarking initiative created in 2008 to harness best practices through the engagement of the international forensic management community. From an economic viewpoint, commercialisation of the market has become more tangible based on its proposed cost effectiveness [13]. This has resulted in some jurisdictions, notably the United Kingdom (UK), electing to privatise forensic services. The general aim is to manage forensic service delivery from a business perspective, ensuring the effective use of public funds while safeguarding scientific validity and reliability in the administration of justice. Whilst these parallels exist across jurisdictions, the limited local access to consumables and maintenance services in micro-jurisdictions such as Seychelles present unique challenges to maintaining a sustainable forensic service.

Here we examine forensic service provision in Seychelles as an example of a micro-jurisdiction forensic delivery system. It sets the context by outlining the historical development of forensic science in Seychelles before discussing key underpinnings of the forensic delivery system: the legislative framework, forensic science provision, quality assurance and governance structures. These are discussed against the backdrop of jurisdictions with more advanced forensic service delivery systems. This paper aims to share information on the status and development of forensic science in Seychelles and underline some of the primary considerations for other micro-jurisdictions seeking to reform forensic service provision.

2. Historical synopsis of forensic science development in the Seychelles

Like many other countries, the establishment of forensic science institutions in Seychelles originated within the police domain. The

Fingerprint Bureau, officially known as the Scientific Support & Criminal Records Bureau (SS&CRB) was established in 1968 by a group of Seychellois police officers trained in the UK on crime scene processing and fingermark detection [14] (Fig. 2). In 1969, the first example of fingermark evidence was tendered before the criminal court of Seychelles in a burglary case. The guilty verdict was appealed on the grounds of the witness not being qualified as a fingermark expert; however, the appeal was quashed before the Criminal Appeal Court of the UK in 1978 [14]. This landmark case established fingermarks as a primary forensic discipline locally delivered in Seychelles.

The use of fingermark evidence became a core function in criminal investigations, coupled with traditional policing techniques of partnering with the public for information and conducting interviews. Occasional pathology services were sought from the Ministry of Health, whilst specialised services such as DNA, toxicology and ballistic examinations in serious crime cases were outsourced to overseas laboratories [15]. This setup within a small, remote, and relatively peaceful country led to a conservative development of other forensic disciplines besides fingermarks. With the emergence of heroin to the shores of Seychelles in the early 1990s, the lack of other forensic services became evident with gaps in the investigation of illicit drug cases [15]. These growing concerns led to the development of a small controlled substance laboratory amalgamated with the SS&CRB in 1992 [15]. In the absence of locally qualified personnel, the laboratory was reliant on retired foreign experts from the UK and Mauritius.

Although reform has been slow, post-2010 saw several new additions to the forensic service provision, catalysed by the recruitment of a small cohort of returning science graduates. In 2013, the SS&CRB procured an automated fingerprint identification system (AFIS) [16] and in 2015 the digital forensic laboratory was commissioned [17], both under the framework of the Interpol capacity building initiative for Eastern African countries funded by the European Union. Between 2017 and 2019, major analytical equipment including a gas chromatograph-mass spectrometer and video spectral comparator were procured under a grant from the Indian Government [18]. In 2016, an independent consultancy from the UK (Cellmark Forensic Services) conducted a needs assessment study for DNA services in Seychelles under a joint collaboration between Interpol and the Seychelles Police [3]. The project culminated in a blueprint for a modern forensic laboratory facility, which when completed will comprise major services including DNA, toxicology and a controlled substance laboratory. This increased capacity in forensic science is seen as a major boost in the fight against crime in Seychelles [19].

Viewed in its present state, forensic science in Seychelles is still in the early stages of development. Based on the assessment conducted by Cellmark Forensic Services, it is presently the policy of the Seychelles Government to see the creation of a modern forensic laboratory [20] which is expected to materialise over the course of five years. It follows that future development and its relative success therefore reside in present-day planning. This includes legal reforms, strategic planning and management of the forensic services, training of staff, development of quality assurance programs, and enhancement of governance structures.

3. Legal framework in Seychelles in relation to forensic science

The legal system in Seychelles is described as a 'mixed jurisdiction' influenced by the successive colonisation by France and Britain. The Civil Code of Seychelles is essentially a direct English translation of the French Civil Code, whereas the criminal law is based on English common law [21]. The relatively new Constitution

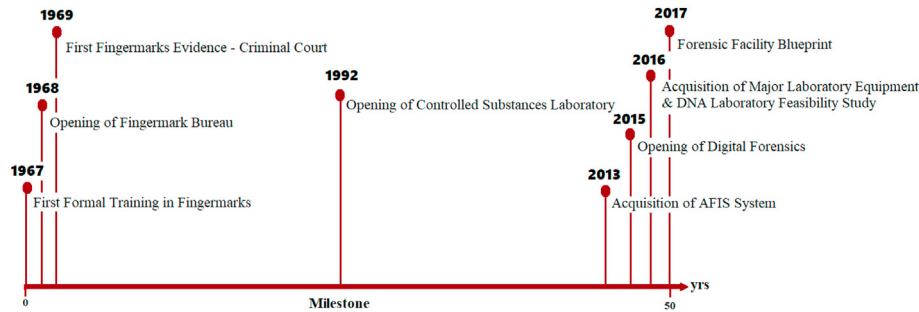


Fig. 2. Timeline of the development milestones of forensic science in the Seychelles.

of the Third Republic of Seychelles adopted in 1993 provides the mandate and scope of police powers to perform criminal casework. One of the functions of the police as stated under Article 161(b) of the Constitution [4] is “to prevent and detect crime in Seychelles and over any other area over which the Republic has proclaimed its jurisdiction”. This in principle carved out the powers of law enforcement to secure crime scenes and gather evidence, which is set out under the legislative mandate of the Police Force Act [22], Article 6 of which states “The Force shall be employed in Seychelles for the maintenance of law and order, the preservation of peace, the prevention and detection of crime, and the apprehension of offenders”.

The Charter of Fundamental Human Rights and Freedoms under Chapter 3 of the Constitution [4] attempts to balance the power vested in law enforcement with the fundamental rights of individuals under investigation and/or prosecution. For example, Articles 18, 19, and 20; the right to liberty (condition and procedure for arrest and detention), right to a fair trial (disclosure of evidence and right to cross-examine experts and/or have experts to testify on their behalf), and the right to privacy (search warrants) respectively; are some of the principal safeguards with regards to criminal investigation. These safeguards have been adopted in procedural law by many countries [23] and provide the balance between law enforcement needs and the values of human rights.

The legal framework in place governs many aspects of a forensic service delivery system from crime scene to court. It typically governs crime scene powers, investigation processes, as well as the handling, testing, admissibility, and disposal of evidence. It can also relate to provisions to establish and regulate the use of forensic laboratories and information databases [24]. The potential of national fingerprint and DNA databases to yield positive outcomes for criminal justice has led law enforcement agencies around the world to establish national databases as a key policing strategy, including micro-jurisdictions such as Seychelles. An Interpol Global DNA profiling survey conducted in 2019 reported that 89 member countries use DNA profiling in police investigations, 70 have a national DNA database, whilst a further 6 (including Seychelles) planned to introduce DNA databases [2]. However, the adoption of these scientific techniques must be accompanied by a comprehensive legislative framework to guide their use. For example, Mauritius enacted the DNA Identification Act [25] in 2009 and Australia enacted the Crimes (Forensic Procedure) Act 2000 [26] to provide the legal framework for DNA use. Currently, the Seychelles Police rely on the broad legislative framework of the Criminal Procedure Code [27] for the collecting of forensic samples. The Criminal Procedure Code does not comprehensively deal with issues such as the establishment of DNA or fingerprint databases, use, storage, and destruction of bodily fluid samples and profiles. The potential for legislative gaps calls for comprehensive reform of the forensic legislation.

Legislative reform should also consider the growing public debate on protecting the civil liberties and rights of individuals’

privacy [28]. In 2012, a total of 1,766,000 DNA profiles and 1,672,000 fingerprint records were deleted from the UK database as a result of the Protection of Freedoms Act [29], aimed at redressing the balance between the State’s duty to protect the public and an individual’s right to privacy. In this context, any proposed legislative framework must take into consideration the legislative developments in other jurisdictions, be adaptable to reflect the fast-paced changes in science and technology, and be based on a broad consultation to gain public confidence.

4. Characteristics of forensic science provision in Seychelles

The organisational structure of the forensic system is influenced by the legal and economic environment, political will [30], and traditions in individual jurisdictions. For historic reasons, most forensic services are state-owned and administratively situated in the police organisation or the judiciary, staffed by sworn officers and/or civilians [31]. In Seychelles, the SS&CRB operating under the aegis of the Seychelles Police Department is responsible for forensic service provision across the jurisdiction. The centralised service comprising four units; crime scene and photography, forensic laboratory services, digital forensics, and AFIS & criminal records unit; is based on the main island of Mahe. The main customers are the Criminal Investigation Division (CID), the Anti-Narcotic Bureau, and the nine main police stations (Fig. 3) spread across the three main islands (Mahe, Praslin, and La Digue). Occasional requests are also received from the Anti-Corruption Commission and the judiciary.

Whilst Seychelles is small in terms of land area (455 km²), the spread of islands across the vast Exclusive Economic Zone (1.3 million km²) [32] is comparable to larger jurisdictions but with contrasting resources capacity. Given the limited resources, the single and centralised structure of forensic services is seen to be efficient compared to the multiple forensic services seen within larger jurisdictions. It also provides a favourable environment for implementation of national standards compared to the latter, which is prone to “fragmentation” as underlined by the 2009 National Academy of Sciences (NAS) report [9]. However, a centralised service poses a risk to business continuity due to external factors such as major disasters [33] or monopolisation of the service by the prosecution [34], limiting access to the defence.

As of December 2020, the SS&CRB has a staff strength of 29 sworn personnel spread across the different units and is based on a generalist system requiring multi-tasked staffing to provide management flexibility. With limited skilled personnel in the jurisdiction, the recruitment of foreign experts in the past was not uncommon. Over the last ten years, through the support of the Government Scholarship Scheme, the recruitment of returning science graduates has closed the gap, providing an increasingly local team of professionals. The imminent development of the forensic facility calls for a larger pool of local scientists to be trained

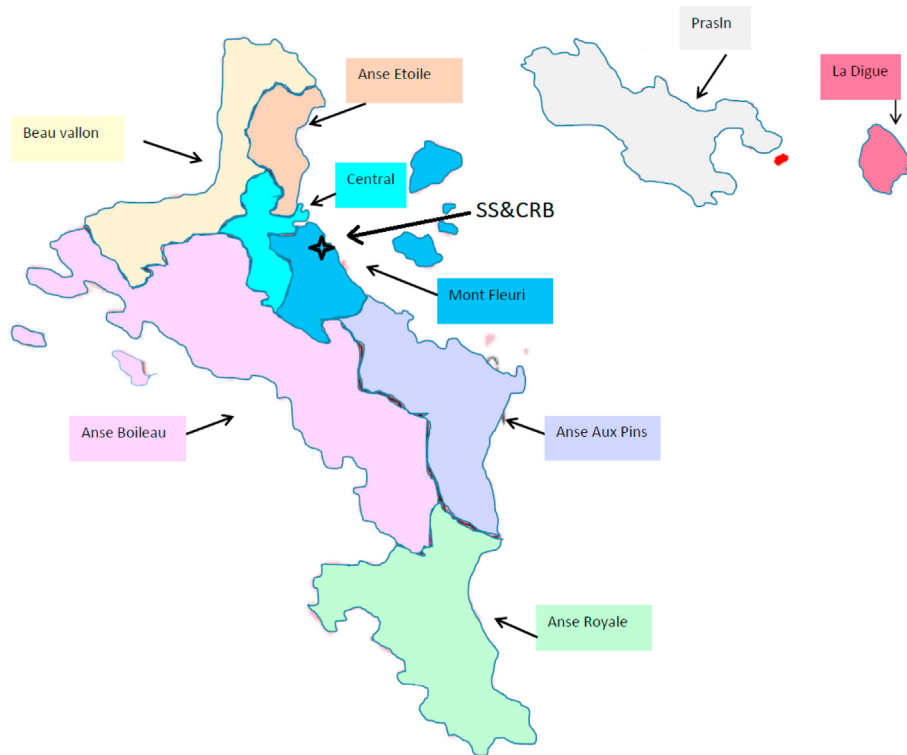


Fig. 3. Location of SS&CRB and 9 main police stations.

in various disciplines such as DNA, toxicology, illicit drugs, and questioned documents. This will enable staffing of the proposed operational laboratory, resorting to foreign technical assistance and outsourcing only when needed. However it must be emphasised that the ability to access foreign technical support is vital, particularly in the early stages of operation. To embark on such an ambitious project, the Seychelles Police may need to consider civilianisation for part of the forensic services, namely the laboratory section, to appeal to skilled professionals. Once considered as a cost-effective policing measure [35], civilianisation is now viewed more in the light of performance and quality benefits [36,37]. However, civilianisation does have its own challenges. For example, a study on the civilianisation of the Canadian Police [38] found that acceptance of civilians in a police service organisation culture was a major impediment leading to low morale and turnover of staff. These are aspects that must be addressed from an early stage to ensure smooth integration.

4.1. Challenges to forensic service development

With the increasing demands of forensic services and economic downturns, there has been a shift of forensic services within the public realm to the private sector [13]. These can be limited to specialised services or an almost fully privatised approach, such as in England and Wales [39]. Based on the economics of scale, privatisation of the forensic service in Seychelles is not viable, hence any development of services has to be government-led. These services are provided through a mixture of in-house facilities, bilateral cooperation and, more recently, foreign commercial partnership.

The geographically remote location of Seychelles brings several challenges to both insourcing and overseas outsourcing of services. Local access to forensic consumables and maintenance services is almost non-existent, whilst importation leads to high freight costs

and shipment times. The disruptions in supply is fairly common, an issue recently reported by larger jurisdictions due to the impact of the COVID-19 pandemic [40,41]. To ensure service continuity several strategies have been adopted, such as maintaining a stock level of 1.5 years subject to budget capacity and consumable shelf-life, and communal consumable sharing initiative with local public health laboratories. Maintenance services originally from South Africa are now being procured in the neighbouring country of Mauritius, reducing the travel time for technicians by 4 h, and more recently establishing remote user access to instrumentation through a secured virtual private network (VPN) for troubleshooting purposes.

On a face-value and economic perspective, the overseas outsourcing of forensic services seems a logical approach for a micro-jurisdiction with limited resources, particularly with the view that the challenges facing forensic science require substantial investment [33]. However, outsourcing carries the added cost of accommodation and flight for SS&CRB officers to submit samples to overseas laboratories in person. The reluctance to adopt the alternative (courier by post) stems from the need to maintain chain of custody, which according to common practice of the judiciary requires samples to be delivered and collected in person, and for expert witnesses to testify in person. Consequently, the cost is triplicated when applied to the collection of samples from overseas laboratory and testimony of foreign expert witnesses before the court of Seychelles.

The turnaround time and access to foreign government experts also cannot be guaranteed due to the demands of the overseas government forensic institutions, such as the backlog of cases. Hence, predicaments with turnaround time and availability of foreign government experts are commonplace. In the case of *Azemia v Republic* (SCA 14/2012, SCCA 35/2014) [42], the Court of Appeal acquitted the appellant of murder charges partly on the basis that DNA evidence from the DNA report in absentia of the

DNA expert was considered unsafe. In another case in 2015, an unidentified skull found in the northern district of Mahe and associated with the disappearance of several persons during the one-party state era received high media coverage [43,44]. Delay in DNA results caused public scrutiny of the objectivity of the results, prompting the Seychelles Police to make several media releases.

These limitations and public scrutiny have been partly responsible for the rationale for the Seychelles Police Department to shift towards foreign commercial partnerships and explore the feasibility of localising some of the more commonly used forensic services. In 2016, the toxicological services were chiefly being procured from a private internationally accredited testing laboratory in Mauritius, decreasing the turnaround time from over nine months to less than one month. During the same year, an assessment of the forensic capability within the Seychelles Police Force was undertaken by Cellmark Forensic Services, following a request by the Seychelles Police to the Counter Terrorism and Maritime Security Directorate of the Interpol Regional Bureau for Eastern Africa [3]. The outcome of this assessment culminated in the project to design, build and equip a forensic facility including a DNA laboratory with the capability to meet a projected 200 cases per year at an estimated cost of USD \$1.9 million [8]. This project is expected to materialise in the next five years, subject to the logistical and economic impact of the COVID-19 pandemic.

4.2. Funding and management

Increasing the capacity of forensic science services requires important investment in personnel, infrastructure, and consumables. This is illustrated by the projection of an 86% increase in the current goods and services cost for the first year of operation of the facility, decreasing to an expected 56% the following year [8,45]. In the context of small jurisdictions, it is paramount that the scarcity of resources is managed effectively to provide maximum societal impact [46,47] on the investment. Introducing solutions that can improve efficiency and gauging their effectiveness is an essential aspect to ensure an economically sustainable forensic service. For example, a laboratory information management system (LIMS) can automate part of the workflow and positively impact quality and cost [11,48]. Many of the solutions being adopted today are hallmarks from decades-old challenges faced by forensic science laboratories around the world. Forensic services under current development can take benefits from these examples, with customisation where necessary to meet individual jurisdictional needs.

Despite the possibilities, it is important to recognise that the potential benefits of science or new technology are not automatic, as it has been shown [48] that there is historical disparity between the potential of forensic science and its actual use. Hence, the rationale of economic choices must be based on quality information and validation [13]. The ability to benchmark the forensic service is thus essential to ensure effective and efficient use of science and technology to fulfill its purpose [12]. In this context, we refer to benchmarking as the sharing and comparison of standardised information to measure products, services, and processes between institutions across a particular industry [49]. This allows for identification and adoption of best practices across the industry while determining key performance indicators (KPIs) to objectively measure quality and performance progress [12,50].

Project FORESIGHT is now the standard for benchmarking of forensic service provision. With the engagement of 178 laboratories globally, Project FORESIGHT provides a platform for the forensic service management community to share operational data using standardised terminology that can be analysed to improve laboratory performance. At this crossroads in Seychelle's forensic science

development, engagement with Project FORESIGHT is a golden opportunity to capture and utilise the knowledge gained from other jurisdictions. With over 10 years of industry data, it is an invaluable resource for small jurisdictions looking to manage scarcity of resources for sustainable forensic service development. The identification and use of appropriate KPIs would be in line with the full adoption of Performance Based Budgeting (PBB) and Performance Monitoring and Evaluation (PM&E) by the Government of Seychelles in 2016 [51]. Additionally, the measurement of the return on investment can align the optimal use of resources to synergise with societal objectives [50]. Overall, these metrics would assist micro-jurisdiction forensic services with evidence-based arguments for competing public funds with other institutions [12] and as a feedback loop for continuous improvement opportunities [52].

4.3. Quality assurance and governance structures

There is an increased emphasis worldwide on quality assurance and standardisation across the forensic industry [53,54], to build a culture of transparent science that promotes justice [55] and creates public confidence. In this regard, a key element of the Seychelles Police forensic facility project is the staff training and in-country consultancy to support the attainment of ISO9001 and ISO17025 accreditation [8]. Implementation of a quality assurance program and relevant standards should take into context emerging trends and tools such as blind proficiency testing [56], quantifying and reporting error rates [57], certification of staff, and providing public access to the information for scrutiny. To achieve this goal whilst considering the limited resources available for training and research in Seychelles, strong collaboration is needed with national, regional, and international organisations and forensic laboratories. A cost-benefit analysis model of the scientific and economical challenges of quality assurance [33] suggests that the solution partly relies on stronger international collaboration, in which existing forensic networks or international police organisations could play a pivotal role. On a national front, collaboration with laboratories from the Ministry of Health, the Seychelles Bureau of Standards, and the National Institute of Science and Technology (NIST) can help shape a national accreditation program, national education and training programs, and national research programs.

One of the strategic goals of the SS&CRB within the strategic framework for 2019–2021 [58] is to enhance governance structures for scientific validity and the provision of quality services. SS&CRB falls under the Criminal Investigation Wing within the Seychelles Police, alongside the Criminal Investigation Division (CID), a primary customer of the forensic service. Viewed in its current position as a forensic service within the police organisational structure, this may be seen as a potential conflict of interest, particularly with reference to accreditation standards [59]. Hence, a reform involving the position held by the forensic service within the police structure, with a focus on independent reporting, can provide a better outlook on the scientific validity, independence and impartiality of the forensic service. Another option is a forensic service independent of the police, analogous to that which exists in the neighbouring island state of Mauritius. The Mauritius Forensic Science Laboratory was established in the 1950s [60], and although initially operating under the police, in 1997 it became an autonomous body under the aegis of the Prime Minister's Office, Home Affairs Division. These options must be carefully assessed within the context of the particular jurisdiction. Nonetheless, it must be emphasised that the primary focus of scientific validity is not the nature of the host organisation but the responsibility and accountability of the laboratory staff and management [31].

Independent forensic science governance structures are regarded as a key element for transparency, impartiality, and validity in forensic science services [9,10]. Characteristic features of governance structures are administrative independence and a regulatory body. For example, the Scotland Police Authority (SPA) [61] is a body independent of the police, which is responsible for the management and delivery of forensic provision in Scotland. In England and Wales, the scientific quality and standards associated with a commercialised forensic service provider model are regulated by the Forensic Science Regulator [62]. Another example is the Houston Forensic Science Center (HFSC) [63] governed by a nine-member board of directors. The HFSC board and the SPA's forensic services committee are open to the public and meeting minutes are posted on their respective websites for scrutiny. In Seychelles, the the Police Commissioner and Deputy Commissioner's office, provides policy guidance and oversight. Another mechanism of policy guidance and oversight is through stakeholder meetings between the judiciary and law enforcement. To enhance scientific integrity, good governance and best practices in line with international standards, the establishment of an independent technical advisory committee is recommended. This committee can provide oversight, facilitate the development of a regulatory framework for forensic activities and spearhead reforms to that promote an open and transparent culture for forensic science in Seychelles.

5. Conclusion

The challenges faced by micro-jurisdictions in delivering forensic science is illustrated by Seychelles, which is shifting from a modest approach of outsourcing to investment into localising commonly utilised forensic services. Jurisdictions currently developing their forensic delivery service have the advantage of utilising the knowledge gained by other jurisdictions to build on a solid foundation. This can be achieved through sharing of innovative best practices such as Project FORESIGHT and introducing solutions to improve efficiency.

The adoption of new technology to enhance the forensic capability of the Seychelles Police necessitates accompanied legal reforms to reflect the changes in forensic provision and address potential ethical issues concerning individual rights and privacy. Additionally, a competent and dedicated workforce is an essential prerequisite for providing a high-quality forensic service. Implementation of a training regime, recruitment initiatives and retention strategies such as civilianisation of laboratory staffing may be necessary to appeal to skilled professionals.

A reform of the position of the forensic service in the police organisation, and the setup of an independent technical advisory committee to provide oversight and facilitate development of regulatory framework of forensic activities, can provide a better outlook on the scientific validity, independence, and impartiality of the forensic service in Seychelles.

CRediT authorship contribution statement

Jemmy T. Bouzin: Conceptualization, Writing - original draft, Writing - review & editing. **Georgina Sauzier:** Conceptualization, Supervision, Writing - review & editing. **Simon W. Lewis:** Conceptualization, Project administration, Supervision, Writing - review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

JTB is supported by a postgraduate scholarship from the Government of Seychelles. We would like to thank Ted Barbe (Seychelles Police), Anna Heavey (PathWest Forensic Biology and Curtin University) and Talia Newland (Curtin University) for their feedback on drafts of this paper. The views and opinions expressed in this paper are those of the authors and do not necessarily reflect the official policy or position of the Seychelles Police.

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