



**A review of human identification methods used at Salt River Mortuary, South
Africa**

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Ke rata ho leboha Modimo le Badimo baka. Ke a leboha ka tshohle tseo le nketseditseng tsona.

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Abstract

Identification of deceased individuals is important in medico-legal investigations for many reasons. Unfortunately, many bodies remain unidentified in South Africa. The South African legislation provides a guideline for human identification processes to be followed at forensic mortuaries, particularly surrounding the timeframes of various scientific analyses to be completed. However, it is unknown whether this guidance is followed and if timeframes are met, especially considering the high caseloads and low resources in South Africa. Thus, this study aimed to determine how identification procedures at Salt River Mortuary (SRM) are performed and compared the timeline of identification procedures with South African legislative guidance. During 1 January 2020 - 31 December 2020, 3072 individuals had a suspected identity and 410 had an unknown identity upon admission to SRM. Visual recognition was the most used method of identification (n = 2890/3482, 83.0%), and scientific methods of identification (fingerprints (n = 50), DNA (n = 126), and odontology (n = 1)) were successful in identifying a further 4.99% (n = 174/3482) individuals. Unidentified and unclaimed individuals made up 2.96% (n = 103/3482) and 2.01% (n = 70/3482) of the total caseload, respectively – but scientific analyses were not consistently carried out on these cases. Samples for DNA analysis were typically collected during the autopsy (approximately 3-4 days after death), but fingerprint analysis was not requested within the stipulated timeframe of 7 days. The turnaround times for scientific reports usually took longer than 30 days. Only DNA reports from the private laboratory, Unistel, were received timeously, however, resultant DNA profiles were not uploaded to the National Forensic DNA Database, thus diminishing their value for identification. These results show that several aspects of the legislation are not always followed, and efforts to address the shortcomings identified in this study are urgently needed to improve identification outcomes.

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Abbreviations

DNA:	Deoxyribonucleic acid
FPS:	Forensic Pathology Services
SA:	South Africa
SAPS:	South African Police Services
SRM:	Salt River Mortuary
USA:	United States of America
NFDD:	National Forensic DNA Database
HANIS:	Home Affairs National Identification System
LCRC:	Local Criminal Record Centre
DHA:	Department of Home Affairs
mtDNA:	mitochondrial DNA
STRs:	Short tandem repeats
FACT:	Forensic Anthropology Cape Town
UHRs:	Unidentified Human Remains
HREC:	Human Research Ethics Committee
FPOs:	Forensic pathology officers
PM:	Post-mortem
N:	Sample size
%:	Percentage
No.:	Number
e.g:	For example

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Chapter 1. Introduction and Literature Review

1.1. Background

A medico-legal investigation is undertaken when a person dies unexpectedly, suddenly, or of unnatural causes [1,2]. According to the South African National Health Act (Act no. 61 of 2003), unnatural death is any death due to the application of force (physical or chemical) on the body, procedure-related deaths, death resulting from acts of commission or omission, and any death which is unexpected and sudden [3]. The purpose of a medico-legal death investigation includes determining the cause of death, determining the time of death, collecting evidence that could aid in legal investigations [1,4,5], and identification of the deceased [2,6–8].

It is important to identify deceased individuals for several reasons, these reasons have been extensively explored and reviewed by others [1,7,9,10]. Briefly, these included social, civil, criminal, ethical, and administrative reasons [1,7,9,10]. Socially, identification is important for the family members and friends of the deceased so that they can mourn and bury the deceased [1,10]. Without identification, it may be challenging to fully investigate crimes or complete civil and administrative tasks such as issuing a death certificate and processing insurance claims, inheritances, and Last Wills [1,10]. Moreover, identification fulfils the final legal and ethical obligation towards the deceased [8], as everyone has a right to a name [11,12].

This chapter will entail a literature review of unidentified human remains, methods and timeframes of identification in medico-legal facilities. Thereafter the South African legislation relating to medico-legal investigation and identification will be discussed. Lastly, the rationale of this study will be provided, followed by the aims and objectives.

1.2. The burden of unidentified human remains (UHRs)

Literature shows that unidentified human remains (UHRs) are a problem globally [1,6,7,9,10,13–18]. However, developed countries such as the USA and European countries

have fewer UHRs compared to developing countries such as South Africa (SA) and India [13]. In a systematic review by Reid *et al.* (2023), it was shown that developed countries have lower numbers of UHRs at admission and the number of UHRs further decreases after identification methods have been implemented [1].

These differences in the number of UHRs exist due to the increased availability of resources, time, and expertise in developed countries compared to developing nations, and as a result of financial resources to support these methods [1]. However, UHRs place significant financial, resource, and infrastructural strain on medico-legal facilities, in both developed and developing countries annually [1,19]. This is because unidentified bodies either must be stored for long periods, or the state is responsible for the cost of burial [19].

People with weaker familial ties such as migrants, homeless, and/or missing persons were shown to be more likely to remain unidentified [1]. Males of working age (on average 30-50 years) often represent most of the UHRs [1,6,13,16,20–22]. This is possibly due to the pursuit of employment opportunities in urban areas away from their more rural hometown, thus not having strong social ties and not having anyone to identify them when they die [17].

1.3. Methods of Identification in Medico-legal Investigations

For the identification process to be efficient, feasible, and accurate, the method of identification must be chosen based on the circumstances of each case [8]. Most commonly, visual recognition is initially performed where possible. However, for bodies that are physically compromised, or in instances where no known next-of-kin is contactable to identify the body, scientific methods are then needed [8]. Scientific methods of identification include DNA analysis, forensic odontology, forensic anthropology, radiology, facial reconstruction, and fingerprint analysis [23]. Secondary identifiers such as external characteristics (e.g. tattoos, scars, marks), the presence of certain medical devices, and personal belongings of the deceased (e.g. documents, jewellery, and clothing) may be used to support identification methods too [7,8,24].

1.3.1. Visual recognition

Visual recognition is the most widely used method of identification due to its efficiency and practicality [9,14]. Visual recognition entails the next-of-kin viewing the body and confirming the identity of the deceased individual. However, it is sometimes not accepted as an absolute method of identification, because there is a risk of misidentification and errors due to emotional distress of the next-of-kin [15,16].

Although visual recognition is time efficient, studies show that there may be delays in performing visual recognition [6,15,16]. Delays in visual identification may occur due to the time taken to locate a suitable person to perform the recognition or the time taken for them to travel to the facility [1]. At the Victorian Institute of Forensic Medicine in Australia the median time it took to finalise visual recognition was 1.5 days [15], whereas it took an average of 16.7 days in France [16]. Empirical data of this nature is lacking for South African mortuaries.

1.3.2. Deoxyribonucleic acid (DNA) analysis

DNA profiling has become the gold standard method of human identification in criminal and disaster settings [25]. Autosomal short tandem repeats (STRs) are used for DNA profiling [26]. STRs are repetitive sequences of 2 to 6 base pairs that are found throughout the genome [27]. They are polymorphic which enables them to be used for human identification purposes [28]. Additionally, mitochondrial DNA sequences (mtDNA), X- and Y-chromosome STRs may be used to assess maternal or paternal relations [29]. The forensic DNA profiles generated using these DNA sequences can be compared directly to ante-mortem reference profiles of the deceased individual or compared to profiles of family members for familial matching [29]. The samples used for DNA profiling may be obtained from multiple biological samples, such as saliva, bone, blood, teeth, semen, skin cells, hair, and nails depending on the state of the body. Blood is preferred, however, in cases of extreme decomposition, and teeth and bones are the only tissues available [29,30].

Cavard *et al.* (2011), found that DNA analysis was the most successful identification method of unknown human remains at the University Hospital R. Poincare in France [16]. However, it also had the highest average time to complete (average of 85.9 days) compared to other methods used [16]. Similarly, Blau *et al.* (2021) reported that DNA analysis took longer to complete (an average of 8 days) compared to other methods [15]. The delays in DNA-based identifications usually occurred when adequate familial reference samples or ante-mortem biological samples from the decedent were not easily available [9]. Furthermore, DNA analysis is also more expensive compared to fingerprinting, and other scientific analyses [9]. Hence, it might be intentionally delayed so the other cost-effective methods can be attempted first.

1.3.3. Fingerprints analysis

Fingerprint analysis is a rapid, inexpensive, and reliable method that analyses specific characteristics between two fingerprints [16,31]. To capture the ridge details for fingerprint analysis, typically black ink is applied onto the fingers of the deceased and then transferred to a fingerprint card [32]. Then the captured fingerprints are searched against a database of fingerprints from known people. In SA, people provide their fingerprints to the Department of Home Affairs (DHA) at the age of 16 years when applying for identity documents and this data is stored in a Home Affairs National Identification System (HANIS) database [14]. When a minimum comparison points match, it can be concluded that the prints positively match the person in interest [16,33].

While fingerprint analysis is more accurate compared to visual identification, it is reliant on the access and availability of ante-mortem fingerprint data [16]. Furthermore, in cases of extreme decomposition, skeletonization, and trauma, post-mortem fingerprints may not be reliably obtained thereby limiting the use of this method [16]. It was shown that fingerprint analysis had the highest success rate (98.9 %) of identified cases admitted to the Human Decedent Identification Unit in Johannesburg [14]. A research study conducted in Australia at the Victorian Institute of Forensic Medicine found that fingerprint analysis was on average, completed within 3.5 days [15], while in France, it was completed within an average of 12.1 days [16].

1.3.4. Forensic odontology

Forensic odontology is a discipline of dentistry that is focused on identifying people by their dental and craniofacial characteristics [34]. It is dependable, affordable, and offers useful information even in low-resource settings [9,34]. However, ante-mortem information is required for dental comparisons, such as radiographs or the dental practitioner's technical notes [15].

Studies by Cattaneo *et al.* (2010) and Mazzarelli *et al.* (2021), showed that forensic odontology was one of the most successful methods of identification in badly preserved bodies [9,10]. The success of forensic odontology in badly preserved bodies can be attributed to the ability of teeth to withstand decomposition and harsh environmental conditions [35]. Forensic odontology was one of the quickest (average of 3.5 days) methods of identification in the study by Blau *et al.* (2021) in Australia [15]. In contrast, according to Cavard *et al.* (2011), this method took a long time to completion (an average of 26.4 days) however, it was also one of the most successful methods used for identification [16].

1.3.5. Forensic anthropology

A primary role of forensic anthropologists in medico-legal investigations is assisting with the recovery and identification of human skeletal remains [36]. To help with identification, forensic anthropologists estimate the biogeographical profile such as age range, biological sex, stature, and biogeographic ancestry of the individual based on the skeletal characteristics [36]. However, the estimation of this biogeographical profile is limited when the skeletal remains are fragmented, damaged, and/or charred [36]. Furthermore, the biogeographical profile may not be adequate to identify an unknown individual without ante-mortem data and/or missing persons file [37].

Cattaneo *et al.* (2010), reported that among the badly preserved human remains, anthropology was one of the most frequently used methods [10]. In Cape Town, it took more than 50 days for cases to be referred to for anthropological analysis at Forensic Anthropology

Cape Town (FACT) by SRM [37]. This delay in consulting forensic anthropologists may lead to further alteration of the remains and the loss of contextual information on the case which might limit the ability of the anthropologists to analyse the remains properly [37].

1.4. The South African legislation relating to medico-legal procedures

Given the knowledge surrounding limitations of the different methods of identification, it is unclear if identification analyses in SA are being requested and if these are being completed timeously in accordance with national legislation. The National Health Act (Act no. 61 of 2003) 'Regulations Regarding the Rendering of Forensic Pathology Services' provides an overview of the procedures of human identification to be followed in SA [3]. Upon admission of the body to a medico-legal facility, a clear facial photograph must be taken.

Hereafter, where possible, identification through visual recognition is to be performed by the next-of-kin who is in possession of their identity documents and the identity documents of the deceased [3]. However, if visual identification is not possible, then scientific methods of identification must be organised by the South African Police Services (SAPS), with support and assistance from the Forensic Pathology Services (FPS) [3]. Typically, the type of analyses performed is at the discretion of the forensic pathologist, owing to the case context and sample availability. After completion of all medico-legal investigations, the body can be released from the facility [19]. In some instances, while an identity may be established, the next-of-kin might not come forward, thus leaving a person identified but unclaimed.

If an individual is unidentified seven days after admission to the forensic facility, samples for scientific analyses must be collected [3,19]. These samples may be submitted to SAPS or private stakeholders for processing [19]. After 30 days, if the body remains unidentified after all the steps for identification have been followed, the body becomes the responsibility of the state, and a pauper burial may be arranged [3]. However, unidentified bodies can be kept at medico-legal facilities for longer time periods before a pauper burial is arranged [19].

1.5. Rationale

Salt River Mortuary (SRM) investigates approximately 3500 unnatural deaths annually and is one of the busiest medico-legal facilities in the Western Cape, South Africa [13,37]. This mortuary is classified as an M6 Academic facility by the Western Cape Government (M6 Facility conducts > 3000 post-mortems per year) and services the West Metropole of the City of Cape Town [38].

A study performed at SRM focused on UHRs from 2010-2017, reported that DNA, forensic anthropology, and odontology analyses for identification purposes were under-utilised [13]. It was also noted that the current standard operating procedure used for identification should be updated to facilitate better collaboration and communication between SAPS, FPS, and external stakeholders such as universities and private service providers [13].

There is limited published research aimed at human identification procedures and the number of unidentified bodies in South Africa [1,13,14,39]. While these research studies [1,13,14,39], do provide valuable insight into the current situation of unidentified bodies in SA, they do not focus on the timeframes in which identification is performed. While studies such as [7,14] provide data about the timeframes of identification methods, it is evident that this empirical data is not only lacking in SA but globally. Therefore, timeline data is very valuable as it will add to the limited literature currently available. Furthermore, this data would allow for comparisons and evaluation of how methods of identification and the timeframes of these methods can be improved [7].

Consequently, this study specifically reviewed the methods of identification, timelines of identification events, and the cases that remain unidentified. Moreover, it was unclear whether the guidance provided in the legislation is plausible for an already overburdened forensic facility such as SRM. Therefore, the timeline data allowed comparisons of the South African legislative timeline guidance with time frames of events at SRM. The findings from this paper were incorporated into practically feasible recommendations, particularly raising awareness to the timeframes in the identification process.

1.6. Aim and Objectives

1.6.1. Aim

This study aimed to determine how identification procedures at Salt River Mortuary were performed and compared the timeline of identification procedures to South African legislative guidance.

1.6.2. Objectives

The aims of this study were achieved through the following objectives.

- Describe the demographics (age and sex) of the population at SRM in 2020.
- Determine the frequency at which different methods of identification were implemented at Salt River Mortuary in 2020.
- Compare the timeline of identification performed at SRM, with that recommended in South African legislation.
- Propose recommendations for a standardised procedure and guidance relating to collection of samples, and overall timeline.

Chapter 2. Methods

2.1. Study design

A review of medico-legal case files from SRM over a twelve-month period: 1 January 2020 – 31 December 2020 was performed. This study was descriptive and retrospective in nature where data was collected from individual case medico-legal documentation. Data from 2020 was examined to ensure that enough time had passed for identification efforts to be undertaken, and results to have been obtained. Furthermore, this study is part of an umbrella project that will be examining several years (HREC REF: 136/2021).

2.2. Approvals

This study received ethical approval from the University of Cape Town's Faculty of Health Sciences Human Research Ethics Committee (HREC), HREC REF: 205/2023 (Appendix A), and formed part of an umbrella study (HREC REF: 136/2021). The access to data from SRMs archives was granted and approved by the Clinical Head of the Division of Forensic Medicine and Toxicology (Appendix B).

2.3. Characteristics of the study population

All case files (n = 3494) for the year 2020 were reviewed, these included records of both identified and unidentified individuals. Two cases were excluded due to no documentation and three cases were excluded due to the remains being from non-human remains. Furthermore, seven cases were excluded because they were labelled as medical waste resulting in a total of 3482 cases for this study.

In this study 'identified' was classified as individuals whose identities were confirmed and the body was released to the next-of-kin. 'Unidentified' was classified as individuals who had no evidence of identity being confirmed during data collection. 'Unclaimed' was classified as individuals who had identity confirmed either from fingerprints or from identity being confirmed by next-of-kin, but the body was not released to the next-of-kin due to reasons such as financial limitations or the next-of-kin not being able to be found.

2.4. Data collection

All data was collated using Microsoft Excel® (version 16, Microsoft Corporation, NM, USA) and managed according to the data management plan (Appendix C). The spreadsheet was password protected and saved onto an encrypted removable hard drive, which was stored securely within the Division of Forensic Medicine and Toxicology, UCT.

The documents that were reviewed were obtained from an online repository of medico-legal documentation called LiveLink. In instances where documents were not available in the online repository, the physical hardcopy files were reviewed where available. Documents that were reviewed included the post-mortem examination reports, copies of ID documents of the deceased and their next of kin, FPS documents such as; FPS001 – Log Incident, FPS002 – Scene Script, FPS005(c) – Affidavit - identification to authorised person (PM), FPS012- Notification to claim & remove body, FPS013 – Acknowledgement of receipt of body and variable documents such as reports and/or affidavits of results for scientific analyses (Appendix D).

The variables collected for this study included demographic information such biological sex and estimated age of the deceased, case details (such alleged manner or cause of death, whether the individual had a suspected identity upon admission or the identity was unknown, admission category, and identification method used) and various date points (including the date of death, date of death declaration, date of admission, date of autopsy, date of removal notice, date of identification and date when samples were collected and reports were received from the different stakeholders). A summary of the documentation and the data variables that were collected are in Appendix D.

2.5. Data analysis

Microsoft Excel (version 16, Microsoft Corporation, NM, USA) was used to analyse the data and perform descriptive statistics (including median, mean, mode, standard deviation, range, and counts/%). No trend analysis was performed as only one year was reviewed.

Age was grouped into these categories, non-viable/stillbirths, neonates (less than or equal to 14 days old), 15 - 365 days, 1 - 9 years, 10 - 19 years, 20 - 29 years, 30 - 39 years, 40 - 49 years, 50 – 59, 60 -79, \geq 80 years, and no data available so that comparisons with other studied could be made.

For identification methods, data in this study was grouped and analysed based on the identity of the individual upon admission. If the individual had a name on the FPS002 – Scene Script, then they were classified as having a suspected identity at admission. However, if on this document, “unknown” was specified then the individual was classified as having an unknown identity at admission.

Regarding the utilisation of scientific methods, positive results were classified as any results from external stakeholders or SAPS reports whereby it was evident or stated that there was a positive match made. When there was no match made, those results were classified under the category of ‘no identification data obtained’. This category of ‘no identification data obtained’ included reports of DNA analysis whereby the profile of the deceased was obtained but there was no other DNA sample for comparison. Successful scientific methods for identification were those whereby the reports had positive results and these results were used to confirm the identity of the deceased.

Data regarding durations between key time points were analysed by first subtracting the date of one event from the date of the other events to obtain the number of days. Then the number of days was summarised using descriptive statistics. The medians were used to make visual diagrams for the timelines for visual identification, scientific methods as well as timelines of events for unclaimed and unidentified individuals. Further descriptive statistics for the timeline data such as the mean, standard deviation and ranges are found in Appendix E.

Chapter 3. Results

3.1. Demographics of the study population

The number of cases included in this study were $n = 3482$ cases for the study period from 1 January 2020 – 31 December 2020. Most individuals admitted to SRM were biologically male ($n = 2768/3482$, 79.49 %), with 0.34 % ($n = 12/3482$) cases being of unknown biological sex. Cases of unknown biological sex were made up of non-viable foetuses ($n = 5$) or body parts ($n = 7$).

The estimated age of decedents admitted to SRM ranged from zero days (non-viable/stillbirths) to 97 years of age (Figure 3.1). Over half of the cases ($n = 2261/3482$; 64.93 %) were in the age group 0 - 49 years.

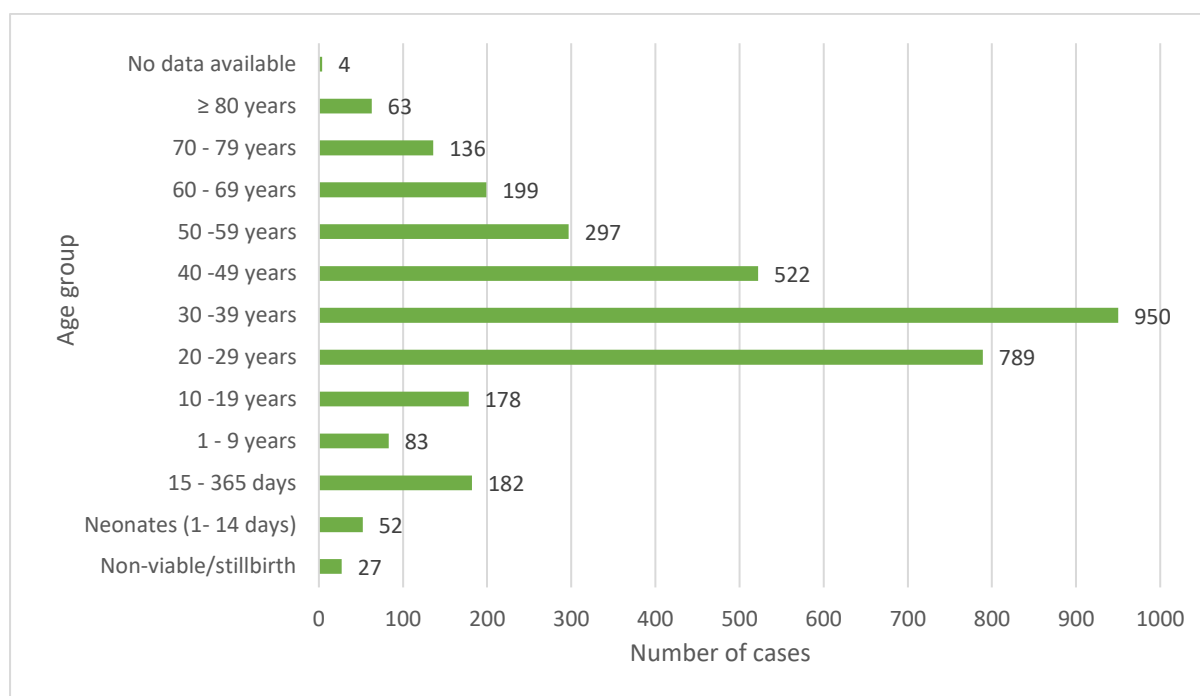


Figure 3.1. Age distribution of cases admitted to Salt River Mortuary in 2020. Neonates are defined as babies less or equal to 14 days old.

3.2. Identification methods used and identity at release

3.2.1. Identification methods used at SRM

In 2020, 88.23 %, ($n = 3072/3482$) had a suspected identity at admission, and 11.77 % ($n = 410/3482$) had an unknown identity upon admission at SRM. Visual recognition ($n = 2890/3482$; 83.0 %) was the most used method of identification. Individuals were visually identified either before autopsy ($n = 1667/2890$; 57.68 %) or after autopsy ($n = 1223/2890$;

42.31 %) (Figure 3.2). Scientific methods for identification were successful in identifying 174 (n = 174/3482; 4.99 %) individuals.

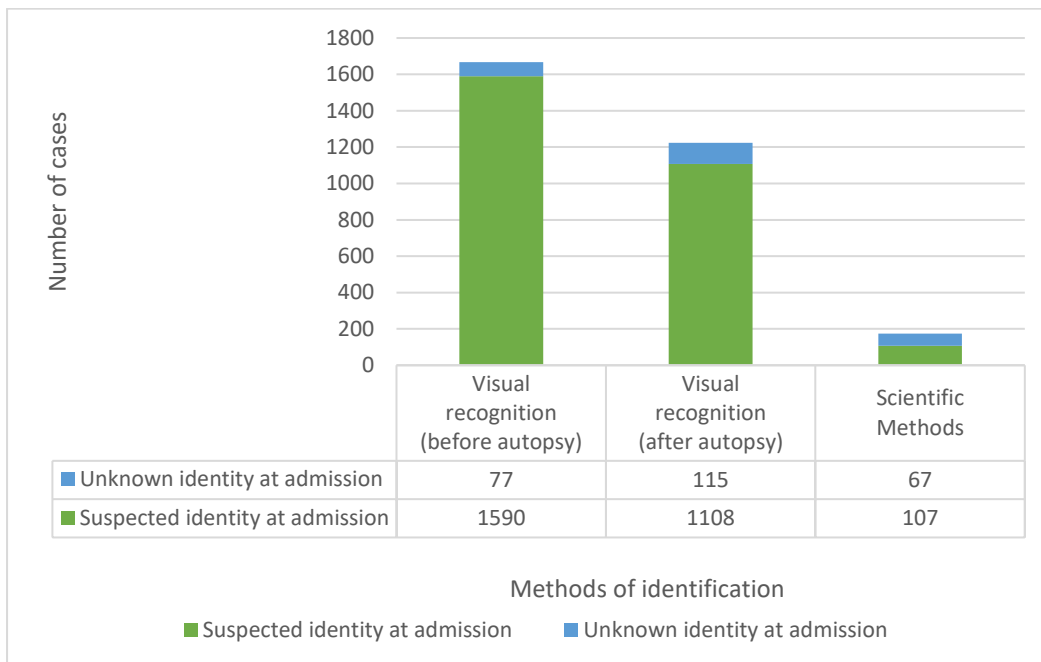


Figure 3.2. Successful Identification methods used at SRM of individuals who were admitted to SRM with a suspected identity and individuals who were admitted with an unknown identity.

3.2.2. Identity at release

After an autopsy and any additional investigations, 3291 (94.51%) cases were identified, 103 (2.96%) were unidentified, 70 (2.01%) were unclaimed and in 18 (0.52%) cases the was no information available due to missing documents. (Figure 3.3).

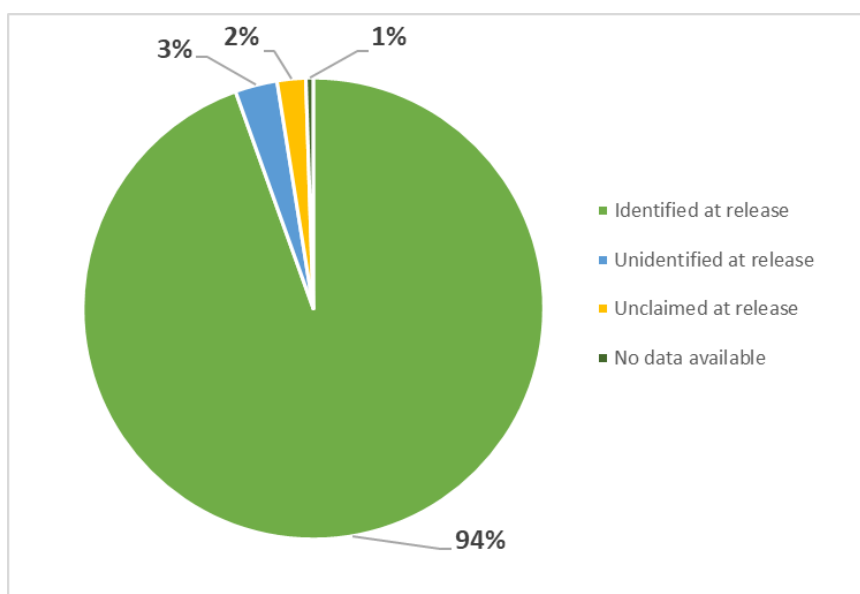


Figure 3.3. Identity at the release of individuals admitted to SRM.

3.2.3. Nature of release

In 2020, most cases admitted to SRM were released to private undertakers. The state arranged pauper burials of 4.88% (n = 170/3482) individuals, these included 100 individuals who were unidentified and 70 who were unclaimed (Figure 3.4).

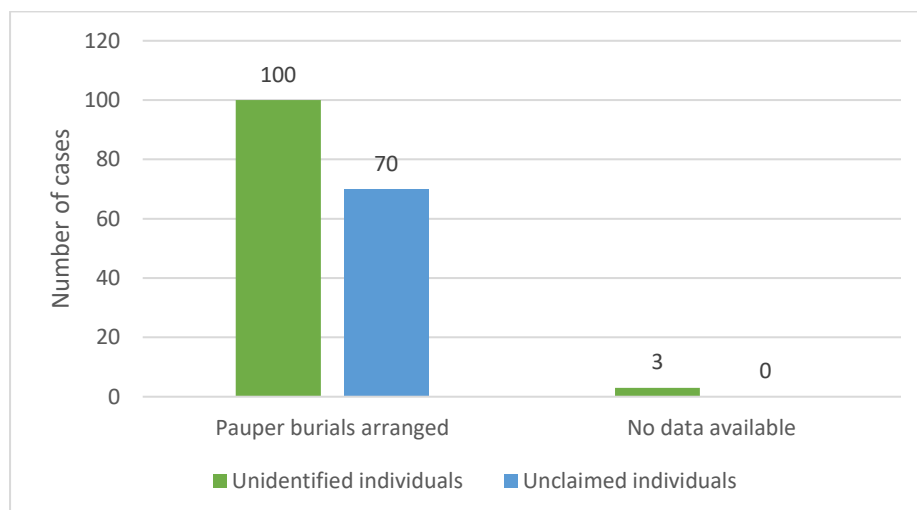


Figure 3.4. Nature of release of individuals who are unidentified and unclaimed.

3.2.4. Utilisation of scientific methods at SRM

In 2020, scientific methods undertaken for identification were fingerprint analysis, DNA analysis, forensic odontology, and forensic anthropology. Table 3.1 shows the utilisation of different scientific methods for identification. For fingerprint analyses, reports were received in all cases where requested (n = 141 cases). Of the fingerprint reports received by SRM, 98 reports were positive results that could lead in positive identification and 43 were reports that did not provide information that could lead in identification. Samples for DNA analyses were collected in 782 cases. Of the total reports received (n = 182) for DNA analysis, 128 were positive results that could lead to positive identification. A total of 54 reports did not provide information that could lead in identification, of these 52 reports were the DNA profiles of only the deceased individuals and 2 reports were the DNA profiles that had failed. Odontology was only requested in one case and was successful in positively identifying the individual who had a suspected identity. Although four cases were referred for anthropological analysis, that did not lead to identification however, an estimated biogeographical profile was established.

Table 3.1. Utilisation of Scientific Methods at SRM in 2020

Method of identification	Admission identity	Samples collected for identification (n)	Reports received (n; % [*])	Positive results: There was a match made by analysis (n; % [^])	No identification data obtained (n; % [#])
Fingerprint analysis	Suspected identity at admission	59	59 (100 %)	44 (74.58 %)	15 (25.42 %)
	Unknown identity at admission	82	82 (100 %)	54 (65.85 %)	28 (34.15 %)
DNA analysis	Suspected identity at admission	467	96 (20.56 %)	80 (83.33 %)	DNA profile of the deceased obtained (15; 15.63 %) and failed DNA profile (1; 1.04 %)
	Unknown identity at admission	315	86 (27.30 %)	48 (55.81 %)	DNA profile of the deceased obtained (37; 43.02 %) and failed DNA profile (1; 1.16 %)
Forensic odontology	Suspected identity at admission	1	1 (100 %)	1 (100 %)	0 (0 %)
	Unknown identity at admission	0	0 (0 %)	0 (0 %)	0 (0 %)
Forensic anthropology	Suspected identity at admission	0	0 (0 %)	0 (0 %)	0 (0 %)
	Unknown identity at admission	4	4 (100 %)	0 (0 %)	4 (100 %)

* percentage calculated as: Reports received/Samples collected for identification*100

[^] percentage calculated as: Positive results: There was a match made by analysis/ Reports received*100

[#] percentage calculated as: No identification data obtained/ Reports received*100

3.2.5. Successful scientific methods in positively identifying individuals

Not all the cases that had positive results of scientific analysis led to successful positive identification of individuals. The number of cases whereby the scientific method was used to successfully help identify the individual is shown in Figure 3.5. DNA had the most cases (n = 126) that successfully led to positive identification.

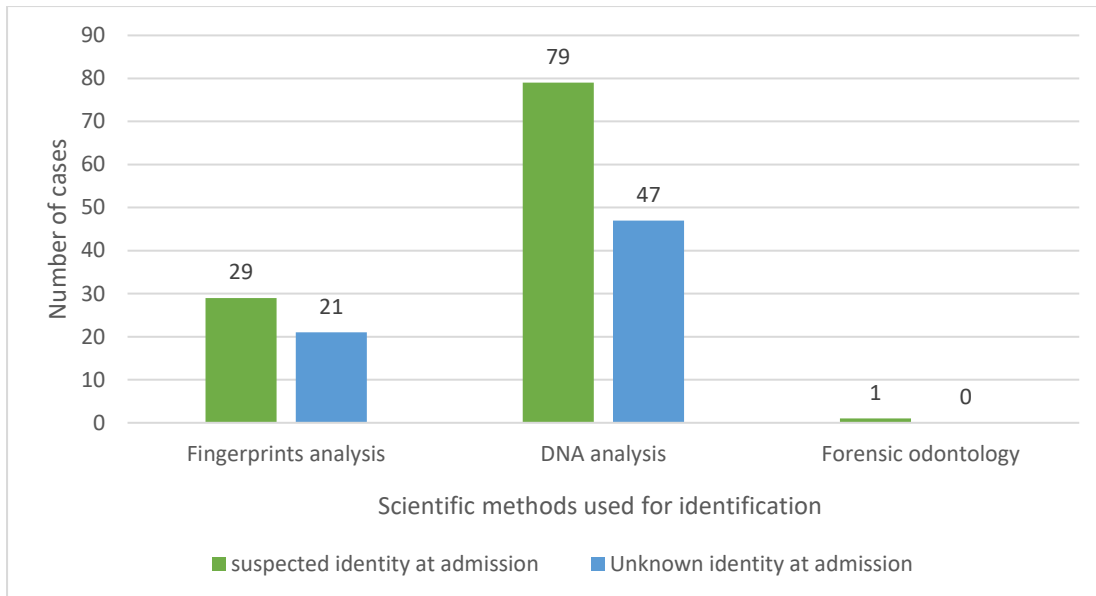


Figure 3.5. The number of cases whereby scientific methods were used for successfully identifying individuals at SRM.

3.3. Timelines of identification at SRM

3.3.1. Timeline of visual identification

For individuals who had a suspected identity at admission, the median number of days for visual recognition to be performed was 1 day (Range: 0 – 10 days, Appendix E, table E.1) and for individuals who had an unknown identity, this was 2 days (Range: 0 – 6 days, Appendix E, table E.1) after the day of admission (Figure 3.6).

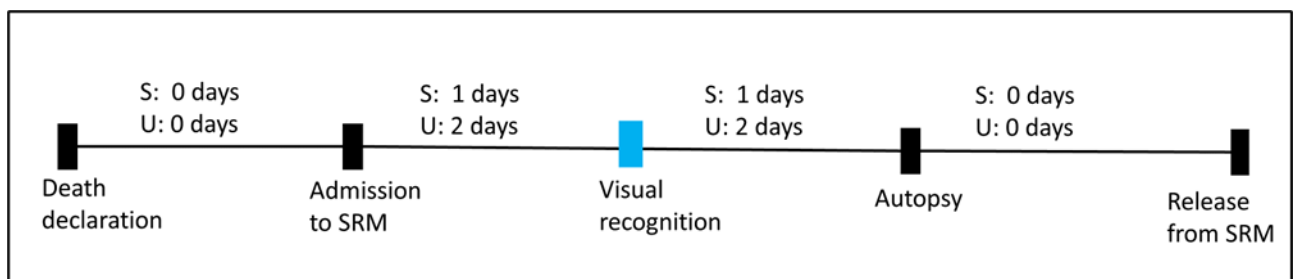


Figure 3.6. Timelines of visual recognition performed before autopsy. S stands for suspected identity at admission and U stands for unknown identity at admission. The values show the median number of days.

Similarly, when identification was performed after autopsy, the median time for visual recognition to be performed was 1 day (Range: 0 – 280 days, Appendix E, table E.2) for individuals who were admitted with a suspected identity. It took a median of 2 days (Range: 0 – 146 days, Appendix E, table E.2) for individuals who had an unknown identity to be visually recognised after autopsy (Figure 3.7).

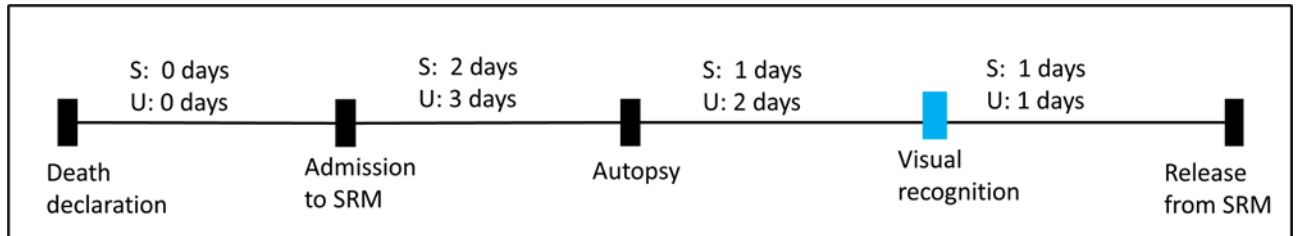


Figure 3.7. Timeline of visual recognition performed after autopsy. S stands for suspected identity at admission and U stands for unknown identity at admission. The values show the median number of days.

3.3.2. Timelines of successful scientific methods

Samples for DNA analyses were frequently collected on the same day of the autopsy (Figure 3.8). The median turnaround time taken to receive results was 7 and 6 days (Ranges: 1 – 146 days and 1 – 88 days, Appendix E, table E.3) for individuals with a suspected identity and unknown identity at admission respectively.

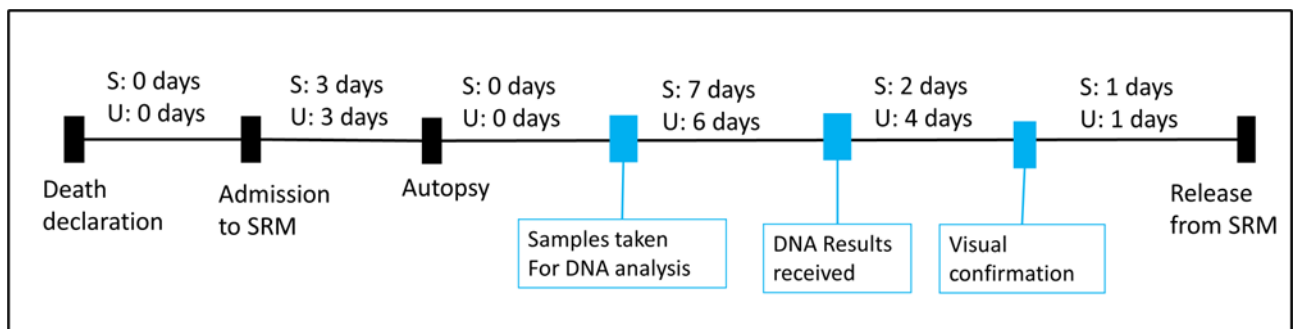


Figure 3.8. Timeline of successful DNA identification. S stands for suspected identity at admission and U stands for unknown identity at admission. The values show the median number of days.

For fingerprints, the median time taken for samples to be collected for analysis was more than 7 days (Figure 3.9). Furthermore, it took a median of 48 days and 31.5 days (Ranges: 2 – 77 days and 1 – 76 days, Appendix E, table E.4) for SRM to receive fingerprint results for individuals with suspected identity and unknown identity at admission respectively.

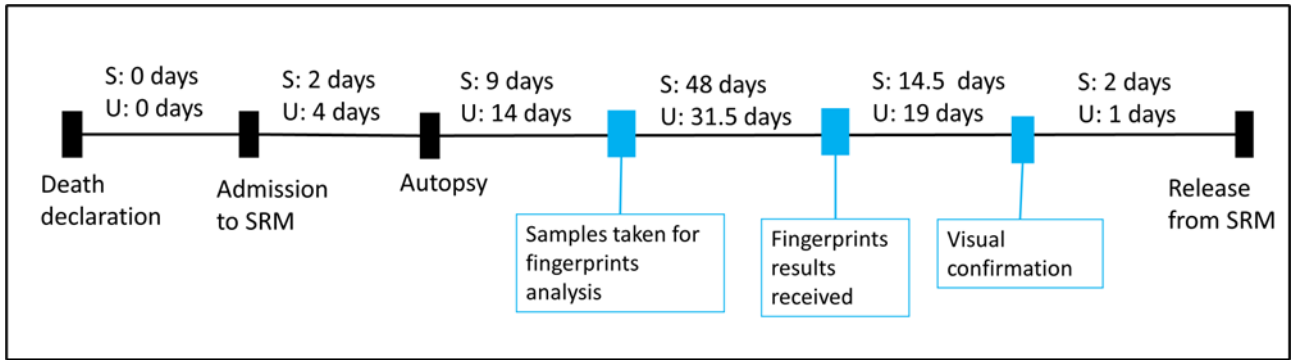


Figure 3.9. Timeline of successful fingerprint identification. S stands for suspected identity at admission and U stands for unknown identity at admission. The values show the median number of days.

It took 7 days and 15 days for forensic odontology samples to be collected and reports to be received, respectively (Figure 3.10).

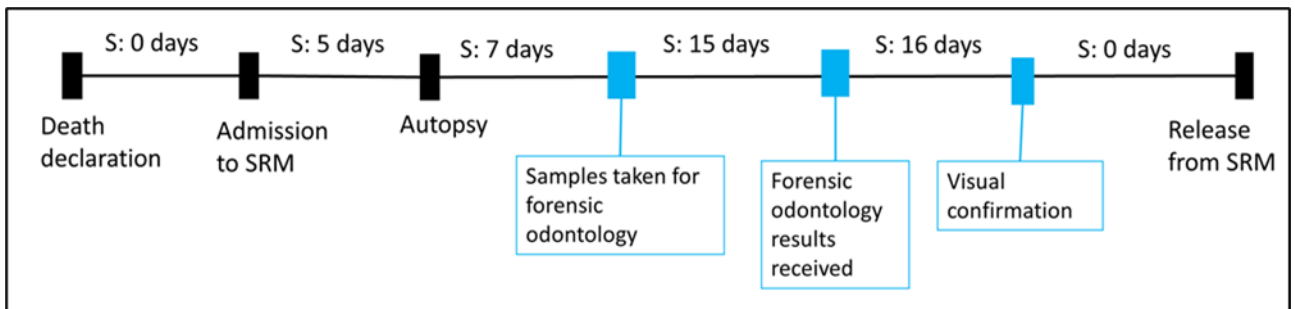


Figure 3.10. Timeline of successful forensic odontology identification. S stands for suspected identity at admission and U stands for unknown identity at admission. The values show the median number of days.

Anthropological analysis did not lead to a positive identification (0% success rate), it took a median of 8 days (Range: 2 – 8 days, Appendix E, table E.6) for the autopsy to be performed from the date of admission for cases whereby anthropology was requested. The remains for anthropological analysis were collected after a median of 5 (Range: 1 – 5 days, Appendix E, table E.6) days after autopsy (Figure 3.11).

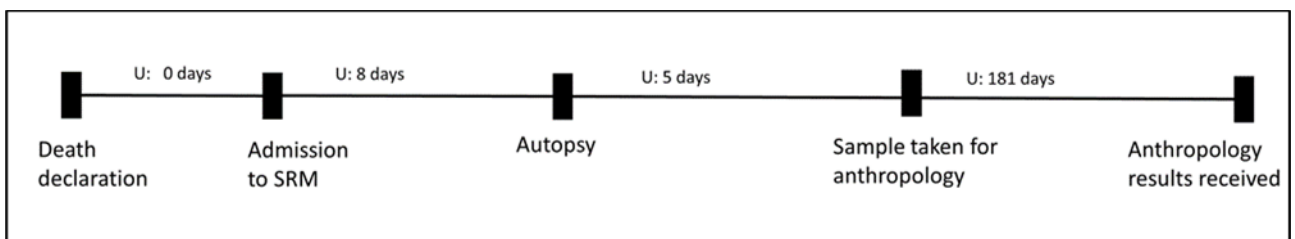


Figure 3.11. Timeline of anthropological analysis. U stands for unknown identity at admission. The values show the median number of days.

3.4. Unclaimed Individuals

3.4.1. Samples collected for scientific analyses from unclaimed individuals

For individuals who were unclaimed, it took a median of 30 days (Ranges: 5 – 103 days for individuals with a suspected identity and 0 – 23 days for individuals with unknown identity) for fingerprint samples to be collected (Table 3.2). DNA samples were frequently collected on the same day as the day of autopsy (Ranges: 0 – 0 days for individuals with a suspected identity and 0 – 45 days for individuals with unknown identity).

Table 3.2. The number of samples and when those samples were collected for unclaimed individuals.

	Total number of cases	Number of fingerprint samples collected	Number of DNA samples collected	Number of samples collected for both DNA and fingerprints	Median (and range) time taken to collect fingerprint samples from the day of autopsy	Median (and range) time taken to collect DNA samples from the day of autopsy
Suspected identity at admission	35	16	7	6	30 days (5 - 103 days)	0 days (0 – 0 days)
Unknown identity at admission	35	33	30	28	23 days (0 – 162 days)	0 days (0 – 45 days)

3.4.2. The timeline events for unidentified individuals

All unclaimed individuals (n = 70) had pauper burials. From the day when autopsies were performed, it took a median of 102 and 156 days (Ranges: 2 – 504 days and 78 – 582 days, appendix E, Table E.7), for those with unknown and suspected identities at admission respectively to be released from SRM (Figure 3.12).

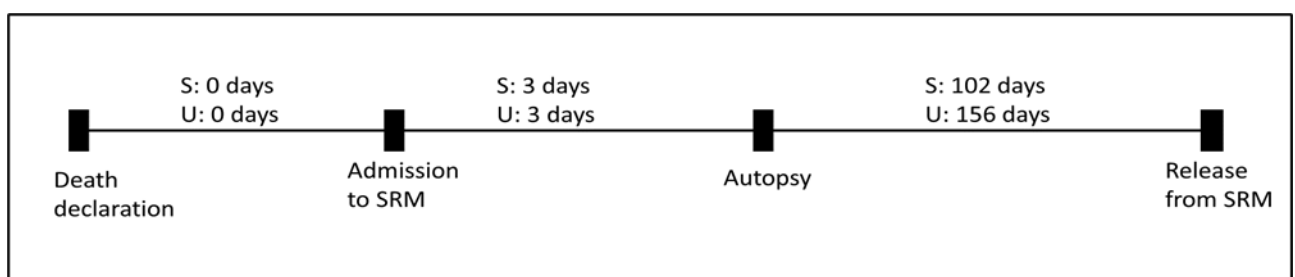


Figure 3. 12. Timeline of events for unclaimed individuals at SRM.

S stands for suspected identity at admission and U stands for unknown identity at admission. The values show the median number of days.

3.5. Unidentified individuals

3.5.1. Samples collected for scientific analyses from unidentified individuals

Samples for fingerprint analysis and DNA analysis for identification were collected in some cases of unidentified individuals, these are shown in Table 3.3. It took a median of 112 days (Ranges: 7 – 226 days) for fingerprint samples to be collected from the date of autopsy for individuals who had a suspected identity at admission. For individuals who had an unknown identity, it took a median of 27 days (Ranges: 0 – 210 days) for fingerprint samples to be collected. DNA samples were usually collected on the same day as the day of autopsy (Ranges: 0 – 209 days for individuals with a suspected identity and 0 – 210 days for individuals with unknown identity).

Table 3.3. The number of samples and when those samples were taken for unidentified individuals.

	Total number of cases	Number of fingerprint samples collected	Number of DNA samples collected	Number of samples collected for both DNA and fingerprints	Median (and range) time taken to collect fingerprint samples from the day of autopsy	Median (and range) time taken to collect DNA samples from the day of autopsy
Suspected identity at admission	23	6	7	2	112 days (7 – 226 days)	0 days (0-209 days)
Unknown identity at admission	80	24	60	22	27 days (0 – 210 days)	0 days (0-210 days)

3.5.2. The timeline events for unidentified individuals

The average number of days between the date of admission and the date of release was more than 250 days (Appendix E, Table E.8) for unidentified individuals. Furthermore, it took more than a median of 241 days (Ranges: 59 – 645 days for individuals with a suspected identity

and 31 – 648 days for individuals with unknown identity, Appendix E, table E.8) from the day of autopsy for these individuals to be released from SRM (Figure 3.13).

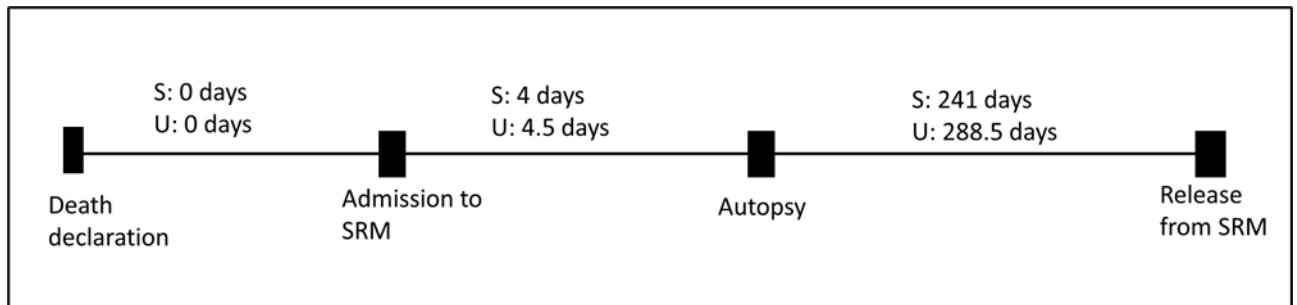


Figure 3. 13. Timeline of events for unidentified individuals at SRM. S stands for suspected identity at admission and U stands for unknown identity at admission. The values show the median number of days.

Chapter 4. Discussion

4.1. Background and Demographics

SRM is one of the busiest mortuaries in the Western Cape province. In 2020, a total caseload of 3492 was experienced at this facility. Other studies [13,40,41] have reported the annual average caseloads experienced at SRM to be more than 3000 cases annually. This study aimed to determine how identification procedures at SRM are performed and compare the timeline of identification with the South African legislation guidance to see if this guidance is feasible for an overburdened facility such as SRM.

During this study period, most cases admitted to SRM were males (79.49%), this was similar to what other studies have found [1,10,13,16,19]. It has been shown that there is a high fatality rate among males in Western Cape which has been linked to a high prevalence of gangsterism and substance abuse [37,42]. In South Africa, violence accounts for more than one-third of all unnatural deaths [43]. Therefore, the high prevalence of violence and injury fatality creates a major strain on the medico-legal system [11,44] that does not have adequate resources, financing or experienced forensic specialists needed to battle large caseloads experienced.[44].

The age distribution of cases also showed a similar trend to what was observed in other studies as well [1,10,13,19], with most of the cases being in the age groups of 20 – 49 years. The reason for observing the majority of cases falling into these two categories (males between the ages of 20 – 49) may be because these are the working-class males who often migrate to cities to seek opportunities and hence have weaker family ties [1].

4.2. Methods used and timelines of identification.

4.2.1. Visual identification

Visual recognition was used in 83.0 % of the cases at SRM. Similar findings were reported by Blau *et al.* (2021) [15]. When visual recognition happens before autopsy, it is performed in a timely manner, usually within a median of two days after admission to SRM. However, it can

take longer for visual recognition to be performed at SRM, therefore autopsies were performed before visual recognition. The time from admission to autopsy can take up to a median of three days, then visual recognition was performed after a median of two days following autopsy (Figure 3.7). Compared to cases that required scientific methods for identification, identification by visual recognition at SRM is frequently completed in a timely manner. Hence visually identified individuals were usually admitted to SRM for shorter periods of time (Appendix E, Table E.1 & E.2) compared to individuals who were identified using scientific methods (Appendix E, Table E.3, E.4 & E.5).

4.2.2. Scientific methods of identification

In this study, it was shown that samples for scientific analyses were collected in $n = 928/3482$ (26.65 %) (Table 3.1). However, there were only 328 (35.34 %; $n = 328/928$) reports received (Table 3.1). Interestingly, reports for fingerprints, odontology, and anthropology were received for all cases where samples were collected, however, DNA reports were received in less than 30 % of cases where the samples were collected. However, since most of the DNA samples were collected when the autopsy was performed, the individuals might have been visually identified after autopsy, therefore DNA analysis was subsequently not necessary as the identity was established. Furthermore, for DNA analysis, the percentage of reports received might be low due to SAPS not issuing reports to the medico-legal facilities unless there is a match made between the profile that was generated using the post-mortem sample and a profile that is already in the National Forensic DNA Database (NFDD).

Despite the number of samples that were collected, there was a small percentage (4.99 %, $n = 174$, Figure 3.2) of individuals who were identified with the help of scientific methods of identification. DNA was the method that was more successful in identifying individuals ($n = 126$) compared to other methods (Figure 3.5). Compared to SRM, DNA was the second most used scientific methods for identification following fingerprints at VIFM [15] and the most used method at the University Hospital R. Poincare in France [16]. Fingerprints had the second highest success rate ($n = 50$) in helping identify individuals from SRM. There were three cases

whereby both DNA and fingerprints were used to help in the identification of the individuals (Figure 3.5).

Samples for DNA were collected in 782 cases in 2020 at SRM. This was more than what other South African studies [13,19] have reported despite them reporting on several years. However, these studies were only investigating UHRs and not the whole population admitted to the medico-legal facility, therefore, more DNA samples could have been collected compared to what was reported. Comparing the number of samples collected for DNA compared to other scientific methods in this study, it is evident that the DNA samples are frequently collected for identification purposes compared to the other methods at SRM (Table 3.1). This finding shows that the utilisation of DNA analysis is increasing at SRM. Reid *et al.* (2020), had previously reported that scientific analyses are being underutilised at SRM [13], this study shows that the use of scientific methods; especially DNA analysis, for identification is improving at SRM.

Most samples where DNA was collected were taken on the same day as the autopsy (Figure 3.8). However, sometimes these samples were collected more than 7 days (up to 134 days) after autopsy (Appendix E, Table E.3). This delay in taking samples for DNA analysis delays the identification process and consequently, it leads to individuals being kept at SRM for longer periods of time. Compared to other methods the average time taken for DNA samples to be collected is within the legislative guidelines of 7 days after admission. With regards to turnaround time to get DNA analysis results, it was shown that DNA is quicker (median of 7 days, Figure 3.8) compared to the other scientific methods. Overall, when DNA was used in this study, it was faster to complete (Figure 3.8) compared to the other scientific methods (Figures 3.9 & 3.10). This finding was interesting as compared to studies by Blau *et al.* (2021) and Cavard *et al.* (2011) DNA was often a method that took longer to complete compared to other methods [13,14].

Additionally, most of the reports for DNA analysis received at SRM were from a private stakeholder, Unistel. This could be the reason for this quick turnaround time as the private

stakeholder might not have a backlog as compared to the government laboratories. However, the resultant DNA profiles from Unistel, are not uploaded to the NFDD. Thus, this limits their value for identification, especially for those individuals whose DNA profiles might be on the NFDD already.

The NFDD is a DNA database that is Governed by the Criminal Law (Forensic Procedures) Amendment Act 37 of 2013) which was passed in 2014 [45]. This Act regulates the conditions in which samples for forensic DNA analysis may be collected and the storage of forensic DNA profiles [45]. While the NFDD mainly has its use in criminal investigation, it is also used to assist with identifying missing and unidentified individuals [45]. DNA profiles from private stakeholders are currently not uploaded to the NFDD. However, it will be beneficial for DNA profiles from private stakeholders to be uploaded to the NFDD to assist in the identification of unidentified individuals. If DNA profiles from private stakeholders are uploaded to the NFDD, this might help fast track the process of identification as it was quicker to get DNA profiles from private stakeholders.

The median time for fingerprint samples to be collected was more than 7 days after admission (Figure 3.9). It also took longer to receive fingerprint analysis results, median of more than 30 days (Figure 3.9) compared to DNA analysis, median of 7 days for DNA (Figure 3.8). The long turnaround in receiving results could possibly be due to the process undertaken for fingerprint analysis. In South Africa, fingerprints are sent to the Local Criminal Record Centre (LCRC) for fingerprint analysis. If a match cannot be found on the LCRC system, the fingerprints are sent to the DHA to assist with identification by searching for a match through the HANIS database [19]. Moreover, the samples for fingerprints were not collected within the timeframes stipulated in the legislation timeframes of 7 days after admission[3]. Due to these delays in collecting samples and receiving results, the individuals were kept at SRM for an average of more than 90 days (Appendix E, Table E.4).

There were cases where a match was made using fingerprints however that did not lead to a positive identity. There were 98 cases of positive results of fingerprint analysis (Table 3.1) however only 50 (51.02 %, n = 50/98) individuals were positively identified with fingerprints (Figure 3.5). Keyes *et al.* (2022) at Human Decedent Identification Unit, in Johannesburg found fingerprint analysis the most successful method, which helped identify 86 UHRs (98.9% of identified UHRs) [14]. It was noted that the Human Decedent Identification Unit employs other methods for collecting fingerprints such as degloving of the skin, photography of desiccated finger pads, and the use of rehydration and tissue filler techniques [14] which might have contributed to the high success rate of fingerprints.

For fingerprint results that did not lead to matches, this could be due to poor fingerprint samples or due to the reference samples not being available. Therefore, to increase the success of fingerprints, good quality fingerprints should be collected, therefore more than one technique of collecting fingerprints might be beneficial. Thus, the standard operating procedures of the Human Decedent Identification Unit [14] should be adopted and implemented at SRM and subsequently at all the FPS facility to increase the chances of identification. The high success rates of fingerprints from [14] and the success rates from this study suggest that fingerprint analysis has the potential to help identify more individuals. However, samples should be collected on time and employing more than one technique for collection where it is possible.

Odontology was used in one case of a person who had a suspected identity at admission. This finding was expected as ante-mortem data for comparison is required [16]. Forensic odontology might have been requested in this case because it was known that the individual has dental records available to compare the post-mortem dental records to. A study by Reid *et al.* (2020), found that no cases from SRM were referred to forensic odontology during a study period of 8 years [11]. Due to the low socioeconomic status of most South African citizens, dental records are typically unavailable [14], making forensic odontology not feasible. Furthermore, there is no practising forensic odontologist in South Africa [14], therefore this could be another reason that odontological analysis are not frequently utilised. Forensic

odontology requires good record keeping of dental records [15,34]. However, oral health and dental care in Africa are not easily accessible [37] and often not prioritised as there are other more significant health issues [34].

Anthropology did not lead to positive identity for cases admitted to SRM in 2020, however, the forensic anthropologist established a biogeographical profile of the individuals which can be used by the police at a later stage for investigative leads and/or even uploaded to missing persons databases [46]. However, when there is no ante-mortem data or a missing person's report then a full biogeographical profile may not aid in the identification of an unidentified individual [37]. In one of these cases, DNA analysis was also requested, and that individual was subsequently identified through DNA analysis. Therefore, this shows that using another method in addition to forensic anthropology may increase the chances of getting a positive identity in the absence of a missing person's report. The median turnaround times to get results for anthropology (Figure 3.11) were the longest compared to the other scientific methods used at SRM. Baliso *et al.* (2019) found that SRM requested anthropological analysis after an average of 50 days after the discovery of the UHR [37]. In 2020, cases were referred to FACT after a median of less than 20 days (Figure 3.11) after admission to SRM. This shows improvement in the time it takes to refer cases to FACT.

The contribution of FACT to the identification are said to be unknown largely due to the large caseloads experienced at SRM, limited government resources and lack of communication[37]. Therefore, FACT rarely hears back from SAPS or FPS on case resolution after the submission of their analysis [37]. In this study, all the cases (n = 4) that were referred to forensic anthropology were referred to FACT. All the cases remained unidentified except for one case whereby DNA analysis aided in identification of the individual. It is still unclear if the unidentified individuals who were referred to FACT had pauper burials arranged or if there are still held at SRM due to unavailable documentation that have these details. Therefore, the contribution of FACT regarding aiding in identification of UHR is still unknown.

4.2.3. Unidentified and unclaimed individuals.

The percentage of unidentified bodies (2.96 %) was found to be lower than what was reported in other studies from SA [13,14,19] and other studies conducted in lower socioeconomic countries [6]. This might have been due to the definition of unidentified and unclaimed bodies used in this study. Reid et al. (2020), defined unidentified individuals as individuals who were not identified within 7 days after admission (Reid). With this definition, some individuals might have been subsequently identified after 7 days. This study showed that some individuals, especially those identified with the help of scientific methods were identified after 7 days (Figures 3.8, 3.9 & 3.10) since it takes time to perform these analyses that aid in identification.

For unclaimed individuals, the local authority arranged a pauper burial, this was arranged after a median of 100 days (Figure 3.12). This was also the case for unidentified individuals where pauper burials were arranged after a median of more than 250 days after autopsy (Figure 3.13). This finding was consistent with a study by Evert (2011), whereby they found that individuals were kept at the medico-legal facility sometimes for more than 6 months [19]. The legislation however states that the pauper burials should be arranged after 30 days if a person remains unidentified and all steps for identification have been followed [3]. However, it was shown that unclaimed and unidentified individuals are kept at medico-legal facilities for more than 30 days on average (Appendix E, Table E.7 & E.8). As a result of these prolonged storage periods and the large number of unidentified and unclaimed individuals, the financial and infrastructural burden experienced by medico-legal facilities increases annually. Furthermore, the unidentified and unclaimed individuals are buried by the state which further increase the financial burden.

4.3. Limitations of this study

The main limitation of this study is that the data that was collected from already existing medico-legal documentation. As such, there was information on documents or documentation that was missing hence some variables could not be recorded. Examples of variables that could not be recorded included the date points of events for example the date of release which is found on the FPS013 – Acknowledgement of receipt of body form. Similarly,

if this form is not available it can be often hard to know whether the individual has been released from SRM or not, unless other additional information or documentation is available.

In this study period (2020), the world experienced a global pandemic that resulted in lockdowns and certain restrictions around South Africa and globally [47]. These lockdowns restricted travel which might have affected the time frames for family members to travel to SRM to identify their next-of-kin. These lockdowns might have also affected the turnaround time of services such as scientific analyses, due to the changes in the workforce such as implementing social distancing [47]. However, this study is part of a larger study that will investigate a longer study period (before and after COVID-19), therefore this data will be beneficial in determining if COVID-19 had an impact on the timeframes for identification.

4.4. Recommendations

Looking at the findings of this study, the turnaround of scientific methods and as well as the time taken before the samples are collected for the scientific methods, it is shown that scientific analyses especially fingerprint analysis take a long to complete. As a result, urgent improvements are needed to ensure that identification happens timeously and within the periods that are recommended by the South African legislation. Therefore, the following are recommended to assist in making changes that would improve the process of identification at SRM.

Firstly, sample collection needs attention to expedite the identification of individuals at SRM. It is recommended that samples for DNA, in the form of bloodspots be collected during autopsy procedures. This study found that most of the DNA samples were taken during autopsies in 2020. Collecting samples during autopsy ensures that DNA samples are collected for most cases where an individual has not yet been identified. If the individual is then identified within 7 days after admission, then the sample can be disposed appropriately. However, if the person remains unidentified after 7 days, the samples could be referred to stakeholders that perform DNA analysis.

Furthermore, it is proposed that forensic DNA profiles from private stakeholders be included to the NFDD. Including these DNA profiles from private stakeholders may improve the likelihood of individuals being identified, particularly if their profiles are already in the NFDD. Furthermore, because obtaining results from private stakeholders is faster (as demonstrated in this study), this may improve the turnaround time for receiving results and the total time for DNA identifications.

It might also be more practical and financially feasible to implement a digital fingerprinting system for all the FPS facilities. The FPS in Gauteng province has implemented a digital fingerprint system to increase the quality of fingerprints collected and the identification of UHRs. This digital fingerprint system employs biometrics technology and has access to the fingerprint databases of DHA, SAPS and, and National Credit Bureau [48]. Through digitalisation, the identities, and the information of UHRs can be found rapidly hence increasing the efficiency of identifications. However, for this digital fingerprinting system to function optimally, the collaboration and communication between FPS, and these different stakeholders (DHA, SAPS, and the National Credit Bureau) need to be improved.

Adopting the Human decedents identification unit model introduced by Keyes *et al.* (2022) [12] in all FPS facilities could also help in improving the identification procedures and the turnaround of identification processes. The Human decedents identification unit has good success rates in aiding with identifications of UHRs [14] This unit was established as a pilot program to assist FPS and SAPS with the identification of UHRs. Cases that were referred to the unit included individuals who were not identified within 7 days after admission or individuals whose fingerprint analysis results were inconclusive [14]. The unit is however staffed with postgraduate students and academic and technical staff from Wits Department of Forensic Medicine and Pathology. Therefore, since SRM is attached to UCT, the postgraduate students and academic staff may assist with the identification procedures. Students who are involved will in turn gain valuable experience and skills that are recognised internationally [37].

Lastly, these recommendations require more funding to be properly implemented. Therefore, more funding should be allocated to medico-legal facilities to ensure that there are enough resources and labour to properly investigate the identity of the deceased. However, other adjustments to the budget allocated to medico-legal facilities can be made. For example, individuals who have not been identified after 30 days may have pauper burials arranged to decrease the amount of time the individuals are stored at medico-legal facilities. This might reduce the costs associated with storing individuals at the facility. Thus, the funds that would have been allocated to storage may be allocated to employing more staff to help in the identification procedures.

4.5. Conclusion

The aim of this study was to determine how identification procedures at SRM were performed and compare the timelines of identification with the South African legislation guidance. In 2020, SRM employed methods of identification such as visual recognition, DNA analysis, fingerprint analysis, forensic odontology, and forensic anthropology. Over 80 % of individuals admitted to SRM were visually identified. Scientific methods of identification assisted in identifying a further 4.99% of individuals admitted to SRM. The timeframes in which these identification methods were performed varied, with visual identifications being completed in a timely manner and forensic anthropology taking the longest time to completion. Furthermore, most samples for fingerprint analysis were not collected within the legislative stipulated time of 7 days after admission. The turnaround taken to receive results also impacted the timeframes taken to complete identification, as analysis sometimes took more than a median 30 days (this was especially true for fingerprint analysis and forensic anthropology). The delay in collecting samples and the long turnaround time to receive results from different stakeholders resulted in individuals being kept at SRM for extended periods. As a result, the financial strain and strain on the infrastructure especially the storage increases annually as more individuals remain unidentified. Therefore, it is recommended that improvements be made to the process of scientific analysis, these include collecting samples during autopsy and referring them to different stakeholders within 7 days if the individual remains unidentified. Changes to the standard operating procedure are also needed, for example introducing digital fingerprinting for faster identification, including forensic DNA profiles to the NFDD as well as adopting the Human Decedent Identification Unit model

introduced by Keyes *et al.* (2022) to assist with identifying UHRs. Lastly, improved collaboration and communication between SRM and different stakeholders is paramount to ensure that identification is efficient and completed with the legislated timeframes.

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Appendices

Appendix A. Letter for ethics approval



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room 45 E-52-E-Floor- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-submissions@uct.ac.za
Website: <https://health.uct.ac.za/home/human-research-ethics>

12 April 2023

HREC REF: 205/2023

Dr L Royle

Division of Forensic Medicine & Toxicology
Falmouth Building-FHS
Email: Laura.royle@uct.ac.za
Student: MKNMOT004@myuct.ac.za

Dear Dr Royle

PROJECT TITLE: A REVIEW OF HUMAN IDENTIFICATION METHODS USED AT SALT RIVER MORTUARY, SOUTH AFRICA: (MPHIL CANDIATE-MS MOTSHIDISI MOKOENA)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 April 2024.

Please submit a progress form, using the standardised Annual Report Form (FHS016) if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Ms Motshidisi Mokoena will also be involved in this study.

Please quote the HREC REF 205/2023 in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

HREC/ref 205.2023

Appendix B. Letter for autopsy database approval



DIRECTORATE: Forensic Pathology Service
ENQUIRIES: Professor L.J. Martin MB BCH WZD Dip For Med SA
 M Med Path (Foren) UCT F C For Path SA
Email: lornaj.martin@uct.ac.za

To whom it may concern,

I, Lorna J. Martin, **do** hereby grant final permission for the following researchers to have access as specified for the research project as stipulated:

Principal Investigator: *A/Prof Laura Heathfield*
Staff number/affiliation: 01426764

Researcher: *Kate Megan Reid (PhD, 2021-2025)*
Student number/staff number/affiliation: RDXKAT001
Project Title: *Forensic Human Identification: what works and where can improvements be made? Meta-analysis of current identification procedures at a forensic mortuary in Cape Town, South Africa*

Researcher: *Sophy Kambovo (MPhil 2022-2023)*
Student number/staff number/affiliation: KMB5OP002
Project Title: *Retrospective analysis of the utilisation of DNA analyses in the identification of human remains at Salt River Mortuary (Cape Town, South Africa)*

Researcher: *Kisharia Dharamdev (MPhil 2023)*
Student number/staff number/affiliation: DHRKIS001
Project Title: *Are Human Identification Methods Effectively Utilised? A retrospective review of unidentified human remains between 2019-2020 at Salt River Mortuary, Cape Town, South Africa*

Researcher: *Motshidi Mokoena (MPhil 2023)*
Student number/staff number/affiliation: MKTMOT004
Project Title: *A review of identification methods used at Salt River Mortuary, South Africa*

Researcher: *Brittany Carstens (Hons 2023)*
Student number/staff number/affiliation: CRSBR1002
Project Title: *Perceptions of forensic human identification: Survey of staff at a forensic facility in Cape Town*

Access to:

✓	<i>Please tick all that apply</i>
	The autopsy allocations
✓	The Office Autopsy Database and related records
	Forensic Pathology Services Laboratory, Salt River for observation and collection of data
	Forensic Pathology Services Laboratory, Salt River for the collection of tissue samples
✓	Forensic Pathology Services Laboratory, Salt River for conducting Interviews
	Forensic Pathology Services Laboratory, Salt River for obtaining informed consent

For the data collection period of **31/03/2021 to 31/12/2025**



Division of Forensic Medicine & Toxicology
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Health

DIRECTORATE: Forensic Pathology Service
ENQUIRIES: Professor IJ Martin MB BCh *WZ* Dip For Med SA
M Med Path (Foren) UCT FC For Path SA
Email: lornaj.martin@uct.ac.za

Approved

Professor Lorna J. Martin (*Signature*)
Head of Division
Division of Forensic Medicine and Toxicology

08/05/2023

Date (*dd/mm/yyyy*)

Ms V Thompson (*Signature*)
Director
Forensic Pathology Service: WCGHW

31/05/2023

Date (*dd/mm/yyyy*)



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A review of human identification methods used at Salt River Mortuary, South Africa - Student Full DMP

1. Project Details

PROJECT NAME - Replicate the title of your project, dissertation or thesis exactly as it appears in your proposal document.

A review of human identification methods used at Salt River Mortuary, South Africa in 2020

PERSONAL DETAILS - Indicate the name(s) and student number(s) of the student(s) who will be involved in this project, dissertation or thesis.

Motshidisi Mokoena (MKNMOT004): MPhil Biomedical Forensic Science Student

SUPERVISOR(S) DETAILS - Indicate who will supervise this project, dissertation or thesis. If you do not yet have a supervisor, leave this section blank.

Supervisor: Mrs Kate Megan Reid (RDXKAT001) Co-supervisor: A/Prof Laura Heathfield (laura.royle@uct.ac.za)

2. Project Summary

RESEARCH SUMMARY - Briefly summarise your study. Include the study's objectives, design, and methods.

Identification of deceased individuals is important in medico-legal investigations for social, ethical, criminal, and administrative reasons. Internationally, visual identification is the commonly used method of identification. However, scientific methods can be used if visual identification is not possible. Despite having different methods of identification available, people remain unidentified, and this might be due to several reasons such as lack of antemortem data, lack of identification documents, lack of resources, etc. The South African legislation gives a guideline of human identification process to be followed; however, it is unclear whether this guidance is plausible for an overburdened forensic facility such as Salt River Mortuary. A study at Salt River Mortuary on unidentified cases from 2010-2017 found 9.2 % of cases were unidentified at the point of admission. Furthermore, it appeared that methods of scientific identification (e.g. DNA, anthropology, and odontology) are under-utilised. While recommended for SOPs to be updated, a comparison to existing legislation was not performed. Aims: To determine how identification procedures at Salt River Mortuary are performed and compare with South African Legislative guidance. Objectives 1. Determine the frequency at which different methods of identification were successfully implemented at Salt River Mortuary in 2020 2. Compare the timeline of successful identification with that recommended in South African legislation 3. Propose recommendations for a standardised procedure and guidance This study is a retrospective review of medico-legal case files at Salt River Mortuary from 1 January 2020 – 31 December 2020. Case details, demographic information, and various date points will be collected to provide context on the identification methods used and to establish a timeline from time of death to release date. All data will be collected and analysed using Microsoft Excel (version 16, Microsoft Corporation, NM, USA), and descriptive statistics will be applied. Where further statistical analysis is required, GraphPad Prism will be used.

3. Description of the Data

DATA REUSE DESCRIPTION - If you re-used data from third-party sources in your study, record pertinent details here such as the source of the data, the extent of the data, usage rights or restrictions pertaining to the data, and how it was incorporated into your study.

- I have used existing data in my study.

This study is a retrospective study, therefore already existing data will be collected. The Data will be collected from Salt River Mortuary medico-legal autopsy records. The data will be collected using Microsoft Excel. It is anticipated that approximately 3500 medico-legal reports will be reviewed. I anticipate the data to be less than 1GB.

DATA DESCRIPTION - Describe the data you have gathered for your study. Briefly describe the nature, scope and scale of the data you have produced.

Already existing data from Salt River Mortuary medico-legal autopsy records will be collected, this will include case details, demographic information and various date points. The data will be collected to provide context on the identification methods used at Salt

River Mortuary and to establish a timeline from date of death to date of release. The data will be collected using Microsoft Excel. It is anticipated that approximately 3500 medico-legal reports will be reviewed. I anticipate the data to be less than 1GB.

4. Formats and Quality Control

QUALITY CONTROL - Describe what measures you took to ensure the data you collected were of high-quality.

All data will be collated into a data validated excel sheet which will prevent entry of typos or erroneous dates. Data will be scrubbed and cleaned following completion to fill in any dates and to double check variables. Another researcher on the study will recollect a subset of cases to ensure that no discrepancies have been completed.

FILE FORMATS - Indicate the formats in which your data will be collected and processed. Clarify whether these formats require specialised proprietary software to access or if they will be produced in or converted to more open, accessible formats for long-term accessibility and preservation. In the case of physical data objects (such as artworks or models) indicate whether these will be digitised or otherwise preserved for accessibility.

The data collected will be collected on Microsoft Excel. The format the data will be collected and processed is CSV format. Documents generated will be in Microsoft Word, or converted to PDF prior to release.

5. Data Management, Documentation and Curation

CURATION (MANAGING AND STORING) DATA - Describe how you organise and manage your data. Specify any file-naming conventions or community data standards you have adopted.

The data collected will be organised and managed on Microsoft Excel spreadsheets. The files will be named according to this convention: YYYYMMDD_File_name_Initials. Supervisor will add details at the end of each title following review of the document.

BACKUP AND STORAGE - Describe how your data is being stored and backed-up. If you are using a data service provider, provide details on for how long they will retain the data.

Data will be collected and stored on the students OneDrive account which is password protected. Data shared with the supervisors and/or collaborators will be through OneDrive or Google Drive. This will ensure that the data files are accessible and secure should the electronic device be damaged or compromised. External hard back ups will occur monthly onto a separate password protected USB device that the student holds in a secure location at the Division of Forensic Medicine and Toxicology, UCT. Passwords will be regularly updated to reduce risk of compromised security. Regular back-up and sharing of the data will be according to the divisional SOP for data sharing, and will be only temporarily stored on the UCT Google Drive.

METADATA STANDARDS AND DATA DOCUMENTATION - Articulate what metadata and documentation you have produced about the data you have generated, collected or re-used.

The completed mini dissertation will include a methods chapter explaining in detail how the data was collected and how the data was analysed. Descriptive statistics will be performed for variables consisting of Demographic information (Biological sex, age) and case details (cause of death, manner of death, identification methods used, sample type obtained, impact of environmental conditions on the remains etc) Microsoft Excel 365, Version 2209 and GraphPad prism, Version 9.5.0 (730).

6. Data Security and Confidentiality of Potentially Disclosive Information

SECURITY - Indicate to what extent your data can be considered sensitive or at-risk. Describe how you will control access to your data. Indicate whether you anticipate a need for encryption or password-controlled access, and if so, how you will enforce that access.

Data that will be collected for this study is sensitive because it is collected from medico-legal autopsy records. The data will be collected only at the UCT campus using a computer which is password protected. The data will be shared only with the supervisors via a Google drive. This drive will only be accessed by the supervisors and the student. The data will also be stored on an external hard drive (USB) that is password protected. This USB will be stored at a secure location within the division.

ETHICS AND PRIVACY - Describe, as per your Ethics Clearance form or other similar documentation, any ethical or privacy issues that your data are subject to (if any). Summarise the main risks to the confidentiality and security of information related

to human participants, the level of risk, and how this risk will be managed. If your project did not require ethical clearance, you may ignore this section.

There are no physical risks involved in this study due to its retrospective nature however, the data collected will be anonymised to insure privacy and confidentiality. Identifying information such as: names of deceased or next-of-kin; addresses and identity numbers will not be recorded. Thus, the risk and vulnerability is considered to be low.

7. Data Sharing and Open Access

DATA OWNERSHIP - If you have used existing datasets, note down any restrictions the data providers have indicated regarding data sharing. Otherwise, leave blank.

- I have used existing data in my study and I have noted down the relevant restrictions as pertains to data sharing(details below).

Data is being collated from existing medico-legal case files. There is no restriction on using this data, provided that is securely and confidentially handled. Raw data sets cannot be published or shared without appropriate agreements in place.

DATA LICENCE - Indicate under which licence you intend to share your research data. If you are not sharing your data, provide the appropriate justification as per the UCT Research Data Management guidelines.

- CC BY

At the conclusion of my study, I will publish my data under a CC BY licence on ZivaHub.

DATA PUBLICATION - Indicate where you intend to publish your research data at the end of your project.

The research data collected in this study cannot be published in its raw form, therefore only de-identified and summarised data may be published. Final dissertation, including anonymised data will be published on the UCT online library.

8. Relevant Institutional or Study Policies

Indicate the relevant departmental, unit, or institutional policies that influence your data management activities.

As I am funded by the NRF, the following policies apply: the UCT Intellectual Property Policy; the UCT Open Access Policy; the UCT Research Data Management Policy; and the NRF Open Access statement.

Appendix D. Summary of Data collection documents and variables

Document Name	Variables collected
FPS001- Log incident	Estimated age
FPS002- Scene script	Estimated age Biological sex Population group Admission category Alleged Manner of death Recovery environment Date of death Date of death declaration Date of admission
Copies of ID documents (deceased and next-of-kin)	Date of birth Date of visual recognition Relationship of the deceased and next-of-kin Documents of ID presented
FPS012- Notification to claim and remove body	Date of removal notice
FPS005(c) – Affidavit- Identification to authorised person (PM)	Date of post-mortem (PM)
PM examination report	Name of the pathologist Date of death Estimated age Biological sex Population group Cause of death category Manner of death Physical condition of the body Date of PM Photographs were taken for ID Secondary identifiers Any/all information on the scientific methods of ID requested
FPS013 – Acknowledgment of receipt	Date of release
Variable documents (depending on availability)	Any information on the method of ID requested and any variable that could be found that was not available on the above documents

Appendix E. Descriptive data for timelines

Table E.1. Descriptive statistics for the timeline data of visual recognition before autopsy

	Date of admission to SRM – Date of death declaration	Date of visual recognition – Date of Admission to SRM	Date of autopsy - Date of visual recognition	Date of release from SRM - Date of autopsy	Date of release from SRM - Date of Admission to SRM
Suspected identity at admission	0.24 ± 0.99 days [0 - 16 days]	1.52 ± 1.44 days [0 - 11 days]	1.95 ± 1.42 days [0 - 10 days]	0.87 ± 3.01 days [0 - 93 days]	4.35 ± 3.60 days [0 – 98 days]
Unknown identity at admission	0.13 ± 0.33 days [0 - 1 days]	2.63 ± 2.73 days [0 - 16 days]	2.23 ± 1.58 days [0 - 6 days]	0.88 ± 3.68 days [0 - 32 days]	5.88 ± 4.36 days [2 - 33 days]

The values show the mean ± standard deviation and the range in square brackets [Range].

Table E.2. Descriptive statistics for the timeline data of visual recognition after autopsy

	Date of admission to SRM – Date of death declaration	Date of autopsy – Date of Admission to SRM	Date of visual recognition - Date of autopsy	Date of release from SRM - Date of visual recognition	Date of release from SRM - Date of Admission to SRM
Suspected identity at admission	0.28 ± 1.48 days [0 - 29 days]	2.59 ± 1.67 days [0 - 17 days]	3.24 ± 14.95 days [0 – 280 days]	1.44 ± 2.46 days [0 - 37 days]	7.28 ± 15.64 days [0 - 290 days]
Unknown identity at admission	0.10 ± 0.31 days [0 - 1 days]	3.23 ± 1.92 days [0 - 10 days]	8.50 ± 19.04 days [0 - 146 days]	1.40 ± 2.03 days [0 – 16 days]	13.39 ± 19.51 days [2 – 154 days]

The values show the mean ± standard deviation and the range in square brackets [Range].

Table E.3. Descriptive statistics for the timeline data of successful DNA identification

	Date of admission to SRM – Date of death declaration	Date of autopsy – Date of Admission to SRM	Date of taking samples - Date of autopsy	Date of receiving results - Date of taking samples	Date of visual confirmation – Date of receiving results	Date of release – Date of visual confirmation	Date of release from SRM - Date of Admission to SRM
Suspected identity at admission	0.14 ± 0.35 days [0 - 1 days]	4.08 ± 3.61 days [1 - 25 days]	4.62 ± 18.31 days [0 - 134 days]	10.77 ± 18.19 days [1- 146 days]	5.41 ± 22.39 days [0 - 182 days]	1.33 ± 1.32 days [0 - 5 days]	32.29 ± 44.29 days [7 - 230 days]
Unknown identity at admission	0.06 ± 0.25 days [0 - 1 days]	4.09 ± 3.28 days [1 - 18 days]	1.43 ± 8.97 days [0 - 56 days]	12.77 ± 19.23 days [1 - 88 days]	4.68 ± 5.83 days [0 – 36 days]	3.40 ± 9.57 days [0 - 62 days]	28.74 ± 38.93 days [9 - 253 days]

The values show the mean ± standard deviation and the range in square brackets [Range].

Table E.4. Descriptive statistics for the timeline data of successful fingerprint identification

	Date of admission to SRM – Date of death declaration	Date of autopsy – Date of Admission to SRM	Date of taking samples - Date of autopsy	Date of receiving results - Date of taking samples	Date of visual confirmation – Date of receiving results	Date of release – Date of visual confirmation	Date of release from SRM - Date of Admission to SRM
Suspected identity at admission	0.14 ± 0.35 days [0 - 1 days]	4.17 ± 4.30 days [1 - 20 days]	27.29 ± 31.72 days [2 - 103 days]	41.00 ± 23.04 days [2- 77 days]	30.19 ± 49.23 days [1 - 183 days]	1.85 ± 1.61 days [0 - 4 days]	90.41 ± 68.94 days [5 - 278 days]
Unknown identity at admission	0.09 ± 0.30 days [0 - 1 days]	4.05 ± 2.44 days [1 - 10 days]	29.53 ± 38.07 days [2 - 137 days]	35.88 ± 19.69 days [1 - 76 days]	30.67 ± 34.75 days [0 – 130 days]	2.00 ± 4.45 days [0 – 20 days]	105.09 ± 68.51 days [19 - 257 days]

The values show the mean ± standard deviation and the range in square brackets [Range].

Table E.5. Descriptive statistics for the timeline data of successful forensic odontology identification

	Date of admission to SRM – Date of death declaration	Date of autopsy – Admission to SRM	Date of taking samples - Date of autopsy	Date of receiving results - Date of taking samples	Date of visual confirmation – Date of receiving results	Date of release – Date of visual confirmation	Date of release from SRM - Date of Admission to SRM (days)
Suspected identity at admission	0 days	5 days	7 days	15 days	16 days	0 days	43 days

The values show the mean ± standard deviation and the range in square brackets [Range].

Table E.6. Descriptive statistics for the timeline data of forensic anthropology analysis

	Date of admission to SRM – Date of death declaration (days)	Date of autopsy – Date of Admission to SRM (days)	Date of taking samples - Date of autopsy (days)	Date of receiving results - Date of taking samples (days)
Unknown identity at admission	0 days	6.00 ± 3.46 days [2 – 8 days]	3.67 ± 2.31 days [1 – 5 days]	214 ± 57.15 days [181 – 280 days]

The values show the mean ± standard deviation and the range in square brackets [Range].

Table E.7. Descriptive statistics for the timeline data of events for unclaimed individuals

	Date of admission to SRM – Date of death declaration (days)	Date of autopsy – Date of Admission to SRM (days)	Date of release from SRM - Date of autopsy (days)	Date of release from SRM - Date of Admission to SRM (days)
Suspected identity at admission	0.74 ± 2.91 days [0 - 16 days]	3.74 ± 3.26 days [0 - 14 days]	133.55 ± 112.23 days [2 - 504 days]	137.10 ± 112.49 days [3 - 506 days]
Unknown identity at admission	0.03 ± 0.17 days [0 - 1 days]	3.46 ± 2.66 days [0 - 15 days]	222.79 ± 144.27 days [78 - 582 days]	222.7 ± 144.27 days [78 - 582 days]

The values show the mean ± standard deviation and the range in square brackets [Range].

Table E.8. Descriptive statistics for the timeline data of events for unidentified individuals

	Date of admission to SRM – Date of death declaration	Date of autopsy – Date of Admission to SRM	Date of release from SRM - Date of autopsy	Date of release from SRM - Date of Admission to SRM
Suspected identity at admission	0.17 ± 0.39 days [0 - 1 days]	5.00 ± 4.18 days [1- 17 days]	257.29 ± 166.94 days [59 - 645 days]	262.07 ± 166.01 days [63 - 645 days]
Unknown identity at admission	0.05 ± 0.22 days [0 - 1 days]	6.39 ± 6.72 days [0 - 31 days]	292.78 ± 166.35 days [31 - 648 days]	299.72 ± 166.17 days [43 - 652 days]

The values show the mean ± standard deviation and the range in square brackets [Range].