CRITICAL ANALYSIS OF DEOXYRIBONUCLEIC ACID EVIDENCE DURING RAPE INVESTIGATION IN THE SELECTED LOCAL MUNICIPALITIES OF NORTHERN CAPE PROVINCE, SOUTH AFRICA

BY

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DECLARATION

I, JOSEPH WANDA ZONDI, Student number 44820666, declare that the Thesis titled **CRITICAL ANALYSIS OF DEOXYRIBONUCLEIC ACID EVIDENCE DURING RAPE INVESTIGATION IN THE SELECTED LOCAL MUNICIPALITIES OF NORTHERN CAPE PROVINCE, SOUTH AFRICA** is my own work, only submitted to the University of South Africa (UNISA) and that I have acknowledged all the sources used and quotations included in this thesis by means of a complete reference.

March 2024

Signature **Date:**

ACKNOWLEDGEMENTS

- I would like to pledge my deepest gratitude to all individuals who made contribution to the success of this study. From such a perspective, I would like to bow down and thank the Almighty for granting me wisdom and stamina to run this race until the end. I also express special thanks to my ancestors, ooGaba, oNgqosini, abantu baMlombo, oCihoshe, oNozinga, oThithiba oMjobi, ndithi ukwanda kwaliwa ngumthakathi. In addition, I am indebted to you, my supervisor Professor D.Q. Mabunda for your belief in me, and your unconditional backing throughout this journey; I am yet to meet a patient man like you. Many thanks to you, Sir. We started this journey as a supervisor and a student, but we became family, thank you, Sir. I wish you an unlimited blessings and prosperity.
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- Finally, I would like to let everyone know that this study is my third published work on online platforms, following my first book entitled: *No Easy Battle: How I overcame extreme obstacles to achieve my dream*, published in 2020 and my Master of Arts: Criminal Justice Dissertation published in 2021 on *'an assessment of methods applied to gather exhibits of Deoxyribonucleic Acid (DNA) value in rape cases: a case study of Galeshewe.'*

DEDICATIONS

- I would like to dedicate this work to every Black child, regardless of their circumstances and conditions, still wake up and strive for a better tomorrow, hoping that their stories will change for the better. I am dedicating it to those that odds are against them but still believe in the beauty and the realisation of their dreams.
- To the ones who have had a million reasons to throw in the towel but never did. This work is dedicated to them that give their best but not getting results; the ones that always work harder than an average man in the room hoping that one day they will achieve with their dreams.
- My message is that, please stretch your hand a little more, your dream realisation is closer than you may realise, and I pray that the Lord Almighty visit you and let you collide with your breakthrough so that His name and His name alone may be glorified.

ABSTRACT

Forensic evidence such as DNA has become a crucial tool in criminal investigation, particularly in rape cases. The analysis of DNA evidence can provide important information that can help identify a suspect, link a suspect to a crime scene or victim, and exonerate innocent individuals who may have been wrongly accused. Therefore, the aim of this study was to critically analyse (DNA) evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa. Moreover, the objectives of this study were four-fold, designed as follows: 1) To assess the use of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa; 2) To detail selected sources of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa; 3) To maintain chain of custody for rape DNA evidence in the selected Local Municipalities of Northern Cape Province, South Africa; 4) To develop a conceptual model for preserving DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.

The qualitative research approach was adopted. It was supported by phenomenological research design. Five police stations formed part of this study, namely: Kimberley Police Station, Jan Kempdorp Police Station, Galeshewe Police Station, Roodepan Police Station and Pampierstad Police Station, under the Sol Plaatje and Phokwane Local Municipalities respectively. This study used the non-probability: Purposive sampling to select the following subjects from its population: Twenty-Five Northern Cape SAPS investigators (Sample 'A'), five participants, including three South African Police Service Forensic Specialists (SAPS FS) from the Forensic Science Laboratory [SAPS FSL], situated in Arcadia (Sample 'B') and two DNA specialists from the Council for Scientific and Industrial Research (CSIR), based in Pretoria, and 25 community members from the Northern Cape Province (Sample 'C'). For data collection, unstructured Key Informant Interviews (KIIs) were employed for 'sample 'A' and 'B' and Focus Group Discussions (FGDs), involving 25 community members, were used for sample 'C'. Furthermore, simple observation schedule was also inducted to observe reactions of sample 'A' and 'C' through employment of non-participative observation schedule, as some significant information stemmed from outside the parameters of the conducted KIIs and FGDs, together with the documentary studies. The inductive Textual Content Analysis (TCA) was adopted to analyse the collected data. This study established that the shared sentiment by the DNA analysts, SAPS FSL and SAPS LCRC were common on the significance of DNA analysis during rape investigations, while some community members were not familiar with this

technology. Therefore, selected study participants shared clarity on the fact that the DNA have countless successes and it is continuing to play a significant role during crime investigations in general, not only rape cases, but this forensic tool also helps the Criminal Justice System (CJS) in other contact crimes like murder, Gender-Based Violence (GBV), robbery and theft, amongst others. Subsequently, the impact of DNA analysis in the investigation and justice space has been, still is and will continue being inordinate. The biggest challenge right now is the serious backlog caused by infrastructure and shortage of personnel; however, the government is currently addressing this and there has been progress though it is at a snail's pace. The study also found that DNA evidence alone cannot determine whether a sexual act was consensual or not. Instead, it can only provide information about the presence or absence of bodily fluids and its origins. It is recommended that training of all officials handling samples or evidence (continuity of possession) be maintained. For this reason, it is important to collect, preserve and analyse DNA according to strict protocols and procedures. Importantly, the conceptual model for preserving DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa, consisting of Five (05) components is presented as a contribution to the new body of knowledge.

Key terms: Deoxyribonucleic Acid, Chain of custody, Conceptual model, Evidence, Investigation, Perpetrator, Rape, Sexual offence, Victims

ISISHWANKATHELO

Ubungqina bophando lwasenkundleni obufana ne-*Deoxyribonucleic Acid* (*DNA*) buya busiba sisixhobo esibalulekileyo kuphando lolwaphulomthetho, ngakumbi kumatyala odlwengulo. Uhlalutyo lobungqina be-*DNA* lunokubonelela ngolwazi olubalulekileyo olunokunceda ukwazi umrhanelwa, ukurhintyela umrhanelwa kwindawo yolwaphulomthetho okanye kwixhoba, kunye nokukhulula abantu abamsulwa abasenokuba batyholwa ngokungafanelekanga. Olu phando belunenjongo yokuhlalutya ngokuhlaba amadlala obungqina (*DNA*) ngethuba kuphandwa ngodlwengulo kwiPhondo loMntla Koloni. Olu phando belujolise ekuhloleni oku kulandelayo: ukuhlola ukusetyenziswa kobungqina be-*DNA* ngexesha lophando lodlwengulo kwiPhondo loMntla Koloni; ukuchaza iinkcukacha zemithombo ekhethiweyo yobungqina be-*DNA* ngexesha lophando lodlwengulo; ukuqokelelwa nokugcinwa kobungqina be-*DNA* kudlwengulo; ukuphuhlisa imodeli yengqiqo yokugcina ubungqina be-*DNA* ngexesha lophando lodlwengulo. Kusetyenziswe indlela yophando, lixhaswa luyilo lophando lokuqonda iziganeko. Izikhululo zamapolisa ezintlanu zibeyinxalenye yolu phando. Kubandakanywe ngenjongo abaphandi abangamashumi amabini anesihlanu beNkonzo yamaPolisa yoMzantsi Afrika yaseMntla Koloni (*Northern Cape South African Police Service* (*SAPS*)) (Isivandlakanyi A), abathathinxaxheba abahlanu, kuquka iingcali ezintathu zophando lwasenkundleni ze-*SAPS* ezivela kwi-*SAPS FSL*, ese-*Arcadia* (Isivandlakanyi B) kunye neengcali ezimbini ze-*DNA* ezivela kwiBhunga loPhando lwezeNzululwazi kunye nezoShishino (*Council for Scientific and Industrial Research* (*CSIR*)), elisePitoli, kunye namalungu oluntu angamashumi amabini anesihlanu avela kwiPhondo loMntla Koloni (Isivandlakanyi C).

Idatha iqokelelwe ngodliwanondlebe olungacwangciswanga lwabathathinxaxheba abaphambili (*KIIs*) kwiSivandlakanyi A no-B kunye neengxoxo zeqela ekugxilwe kulo (*FGDs*), ezibandakanya amalungu oluntu angamashumi amabini anesihlanu, kwiSivandlakanyi C. Ngaphezu koko, kukwasetyenziswe ifomu yokuhlalutya okanye iphepha lokuhlela (*simple observation schedule)* ukuqwalasela iimpendulo zeSivandlakanyi A – C ngokusebenzisa ifomu yokuhlalutya ube ungathathi inxaxheba kuphando (*non-participative observation schedule*), nanjengoko olunye ulwazi olubalulekileyo luye lwavela ngaphandle kwemiyalelo enikezelwe zii-*KII* nee-*FGD*, kunye nophando olubhaliweyo okanye olushicilelweyo. Idatha eqokelelweyo ihlalutywe ngendlela esetyenziswa kuphandontyilazwi yohlalutyo lokubhalwe phantsi eyaziwa ngokuba yi-*inductive Textual Content Analysis* (*TCA*). Olu phando lufumanise ukuba abahlalutyi be-*DNA*, i-*SAPS FSL* kunye ne-*SAPS LCRC* baye

banezimvo ezifanayo ngokubaluleka kohlalutyo lwe-*DNA* ngexesha lophando lodlwengulo, ngelixa amanye amalungu oluntu engayiqhelanga le teknoloji. Ngoko ke, abathathinxaxheba abakhethiweyo bophando baye banikeza ingcaciso ethe vetshe ngokuveza ukuba i-*DNA* ibe nempumelelo amatyeli amaninzi kwaye iqhubeka idlala indima ebalulekileyo hayi kwixesha lophando lwamatyala odlwengulo kuphela, kodwa ikwanceda inkqubo yobulungisa kwezinye izenzo zolwaphulomthetho ezifana nokubulala, ubundlobongela obuphathelele kwisini (*GBV*), uphango kunye nobusela, phakathi kwezinye. Ngaphezu koko, impembelelo yohlalutyo lwe-*DNA* kwindawo yophando nobulungisa iye yabamaxongo, kwaye iqhubeka isibamaxongo. Owona mngeni mkhulu ngoku kukwanda komsebenzi omninzi osafuneka wenziwe obangelwa zizibonelelo kunye nokunqongophala kwabasebenzi.

Lo ngumngeni urhulumente asaqubulisana nawo kwaye kuye kwakho inkqubelaphambili nangona ikho ngonyaw’ lonwabu. Ngaphezu koko, uphando lufumanise ukuba ubungqina be-*DNA* bodwa abukwazi ukufumanisa ukuba kwabelwane ngesondo ngokuvumelana okanye akunjalo. Endaweni yoko, i-*DNA* ikwazi ukunikeza kuphela ulwazi malunga nokubakho okanye ukungabikho kwencindi yomzimba kunye nokuba isuka phi. Kucetyiswa ukuba kuqhutyekekwe kuqeqeshwa onke amagosa asebenza ngeesampuli okanye ubungqina (ukuze kuqhutyekwe kugcinwe ezi sampuli okanye ubungqina). Ngenxa yesi sizathu, kubalulekile ukuqokelela, ukugcina nokuhlalutya i-*DNA* ngokwezicwangcisonkqubo neenkqubo ezingqingqwa.

Amagama angundoqo: Ukuqokelelwa nokugcinwa kobungqina, Imodeli yengqiqo, ubungqina be-*Deoxyribonucleic Acid*, Uphando lokuhlola, eMntla Koloni, Udlwengulo, eMzantsi Afrika, Imithombo ye-*Deoxyribonucleic Acid*

IQOQA

Ubufakazi bokuhlola obufana nolibofuzo (iDNA) sebuyithuluzi elibalulekile ekuphenyweni kwamacala obugebengu, ikakhulukazi ezimweni zokudlwengula. Ukuhlaziywa kobufakazi bolibofuzo kunganikeza imininingwane ebalulekile engasiza ekutholeni umsolwa, ixhumanise umsolwa nesigameko sobugebengu noma isisulu, futhi ikhulule abantu abangenacala okungenzeka ukuthi bamangalelwe ngokungafanele. Lolu cwaningo luzame ukuhlaziya kabanzi ubufakazi (beDNA) ngesikhathi socwaningo lokudlwengula eSifundazweni SaseNyakatho Kapa. Ucwaningo luhlose ukuhlola okulandelayo: ukuhlola ukusetshenziswa kobufakazi beDNA ngesikhathi sokuphenya ngokudlwengula eSifundazweni SaseNyakatho Kapa; ukuningiliza ngemithombo ekhethiwe yobufakazi beDNA ngesikhathi sokuphenya ngokudlwengula; ukugcina uchungechunge lokulondolozwa kobufakazi beDNA bokudlwengula; ukusungula imodeli yalokho okucatshangiwe yokulondoloza ubufakazi beDNA ngesikhathi sokuphenya amacala okudlwengula. Kulandelwe indlela yocwaningo yekhwalithethivu, isekelwa umklamo wocwaningo wesayensi yezenzakalo. Iziteshi zamaphoyisa ezinhlanu zaba yingxenye yalolu cwaningo.

Abaphenyi boPhiko Lwamaphoyisa LwaseNingizimu Afrika (beSAPS) eNyakatho abangamashumi amabili nanhlanu (Isampula ‘A’), ababambiqhaza abahlanu, okuhlanganisa ochwepheshe abathathu beSAPS abavela eSAPS FSL, abase-Arcadia (Isampula ‘B’) kanye nochwepheshe ababili beDNA abavela eMkhandlwini Wokucwaninga Ngezesayensi Nezimboni (i-CSIR), abazinze ePitoli, namalungu omphakathi angamashumi amabili nesihlanu abavela eSifundazweni SaseNyakatho Kapa (Isampula ‘C’) bakhethwa ngenhloso. Ukuze kuqoqwe imininingo, izingxoxo zabahlinzeki bemininingwane abangakahleleki (ama-KII) zasetshenziselwa ‘isampula ‘A’ no-‘B’ kanye nezingxoxo zamaqoqo agxile esihlokweni esithile (amaFGD), afaka kuwo amalungu omphakathi angamashumi amabili nesihlanu, isampula ‘C’. Ngaphezu kwalokho, kwaphinde kwasetshenziswa isheduli elula yokubuka ukuze kubhekwe ukusabela kwesampula ‘A‘ no-’C’ ngokusetshenziswa kwesheduli yokubuka engasiyo ingxenye yalokhu, njengoba eminye imininingwane ebalulekile ivela ngaphandle kwemingcele yamaKIIs namaFGD aqhutshwayo, kanye nokuhlaziywa kwemibhalo. Ukuhlaziywa kokuqukethwe imibhalo encike emfundisweni (iTCA) kwamukelwe ukuze kuhlaziywe imininingo eqoqiwe.

Lolu cwaningo lwaveza ukuthi umuzwa ofanayo wabahlaziyi beDNA, iSAPS FSL neSAPS LCRC wawuvamile maqondana nokubaluleka kokuhlaziywa kweDNA ophenyweni lokudlwengula, ngenkathi amanye amalungu omphakathi engabujwayele lobu buchwepheshe.

Ngakho-ke, ababambiqhaza bocwaningo abakhethiwe bacacisa kabanzi ngalokhu ngokuveza ukuthi iDNA isiphumelele kaningi futhi iyaqhubeka nokudlala indima ebalulekile ophenyweni lwamacala okudlwengula, hayi lokho kuphela, kodwa futhi isiza uhlelo lobulungiswa kwamanye amacala anokuxhumana njengelokubulala, udlame olubhekiswe kwabobulili obuthile (iGBV), ukuphanga nokuntshontsha, kokunye okuningi okukhona. Ngaphezu kwalokho, umthelela wokuhlaziywa kweDNA kwezokuphenya nobulungiswa ubulokhu ukhona, usazolokhu uba khona futhi usazoqhubeka ngokweqile.

Inselelo enkulu kunazo zonke njengamanje ukusilela emuva okubangelwa ingqalasizinda nokushoda kwabasebenzi; lokhu kuyinselelo uhulumeni asazama ukuyilungisa kanti sekube nenqubekelaphambili nakuba kuhamba kancane kakhulu. Ngaphezu kwalokho, ucwaningo lwaveza ukuthi ubufakazi beDNA bubodwa abukwazi ukunquma ukuthi abenzi bocansi bebevumelene yini noma cha. Kunalokho, ingahlinzeka kuphela imininingwane mayelana nokuba khona noma ukungabi khona koketshezi lomzimba nemvelaphi yalo. Kunconywa ukuba kuqhubeke ngendlela ukuqeqeshwa kwabo bonke abasebenza ngamasampula noma ngobufakazi (ukuqhubeka nokugcinwa kahle). Ngenxa yalesi sizathu, kubalulekile ukuqoqa, ukulondoloza nokuhlaziya iDNA ngokuvumelana nemigomo nezinqubo eziqinile.

Amagama asemqoka: Ukuqashelwa komkhondo walokho okugciniwe, Imodeli yalokho okucatshangiwe, Ubufakazi bolibofuzo, Ukucwaninga ngendlela ehlola kabanzi, iNyakatho Kapa, Ukudlwengula, iNingizimu Afrika, Imithombo yolibofuzo

LIST OF ABBREVIATIONS AND DESCRIPTIONS

AFIS	:	Automated Fingerprint Identification System
ARV's	:	Anti-Retro Virals
CGE	:	Commission for Gender Equality
CM	:	Community Members
CPA	:	Criminal Procedure Act
Col	:	Colonel
CR & CSM	:	Criminal Record and Crime Scene Management
CRFSS	:	Criminal Record and Forensic Science Service
CSE	:	Crime Scene Examiner
CSI	:	Crime Scene Investigation
CSIR	:	Council for Scientific Industrial Research
DA	:	Democratic Alliance
DCS	:	Department of Correctional Services
DFS	:	Division Forensic Service
DNA	:	Deoxyribonucleic Acid
DoJ & CD	:	Department of Justice and Constitutional Development
DPCI	:	Directorate for Priority Crime Investigation
DS	:	Detective Service
ERC	:	Ethics Review Committee
FBI	:	Federal Bureau of Investigation
FDA	:	Forensic Data Analysts
FEM	:	Forensic Exhibit Management
FGDs	:	Focus Group Discussions

FS	:	Forensic Services
FSD	:	Forensic Science Department
FSL	:	Forensic Science Laboratory
FSS	:	Forensic Science Service
FWG	:	Forensic Working Group
GBV	:	Gender-Based Violence
GBVF	:	Gender-Based Violence and Femicide
GPS	:	Global Positioning System
FCS	:	Family Violence, Child Protection and Sexual Offences Units
ICC	:	International Criminal Court
ID kit	:	Identity/Identification kit
IPID	:	Independent Police Investigating Directorate
IOL	:	Independent Online News
ISS	:	Institute for Security Studies
IT	:	Information Technology
KIIs	:	Key Informant Interviews
LCRC	:	Local Criminal Record Centre
Lt	:	Lieutenant
Lt Col	:	Lieutenant Colonel
MEs	:	Medical Examiners
mtDNA	:	MitochondriaDNA
NFDD	:	National Forensic DNA Database of South Africa

NFSL	:	National Forensic Science Laboratories
NGS	:	Next-Generation Sequencing
NPO	:	Non-Profit Organisation
OPP	:	Office of the Public Protector
PAIA	:	Promotion of Access to Information Act
PCEM	:	Property Control and Exhibit Management System
PCR	**:**	Polymerase Chain Reaction
PM	:	Post Meridiem
PTSD	:	Post Traumatic Stress Disorder
RSA	:	Republic of South Africa
SACR	:	South African Criminal Reports
SADC	:	South African Development Community
SAFLII	:	Southern African Legal Information Institute
SAPS	:	South African Police Service
SAPS CS	:	South African Police Service Crime Scene
SAPS CSI	:	South African Police Service Crime Scene Investigator
SAPS FS	:	South African Police Service Forensic Specialists
SAECK	:	Sexual Assault Collection Kit
Sgt	:	Sergeant
SORMA	**:**	South African Criminal Law Sexual Offences and Related Matters Amendment
SITA	:	State Information Technology Agency

STR	:	Short Tandem Repeats
Wacsa	:	Women's Action Campaign South Africa
WHO	:	World Health Organisation
WO	:	Warrant Officer
WPR	:	World Population Review
UN	:	United Nations
UNESCO	:	United Nations Educational, Scientific and Cultural Organisation
UNISA	:	University of South Africa
US	:	United States

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CHAPTER ONE: GENERAL ORIENTATION

1.1 INTRODUCTION AND BACKGROUND OF THE STUDY

In South Africa, there are high rates of reported violent offenses, encompassing murder, rape, aggravated assault, robbery, property crime, and vehicle hijacking Statistics South Africa (Stats SA, 2024). Medwed (2017:17) highlights that crime is a global crisis that threatens the safety and security of our communities. It threatens the stability of the country, its economy and its development. Rape cases are reported in shocking numbers throughout South Africa, and, most disturbingly, is the fact that very few cases end in convictions (Mulaudzi, 2020). The cause for such few convictions demands research, and its significance and relevance are that it will probe into the cause and recommend solutions (Ubisi, 2023).

The Women's Action Campaign South Africa (WACSA) conducted a survey between 14 and 20 February and explored reasons for what it regarded 'muted responses' to the sexual atrocities. This survey consisted of 808 participants and resulted in the following key findings:

- One in two South Africans knows someone who has been raped and/or experienced GBV.
- 97% agree that rape and GBV are profound problems.
- 90% believe that all rape victims should be supported, regardless of race, culture, religion or gender.
- 73% believe that rape is never justifiable; 25% say that it can be justified in wartime.
- 56% had not heard of Hamas and 62% did not know about Hamas' attack on Israel.
- When presented with details, 79% believe it was an unjustified act of war and terror.
- 70% support prosecuting Hamas' actions as war crimes and 54% believe that the South African government should apply pressure to this end (Fabricius, 2024).

During the Address by Police Minister (Honourable Bheki Cele), on the release of the 3rd quarter crime statistics for financial year 2023/24 (16/02/2024), in relation to sexual offences related crimes; it was hinted that "*the fight against Gender-Based Violence and Femicide (GBVF) crimes remains a priority for our men and women in blue and that is why we are encouraged to report that all our sexual offences crimes including, rape sexual assault and contact sexual offences all registered an overall* 1.7% *decline during this period. Rape declined by* 1,7 % *and six provinces including Gauteng, Eastern Cape, KwaZulu-Natal, Limpopo, Northern Cape and Western Cape all registered a decline in this crime category. More than two-thousand four-hundred suspect raids led to 4-thousand- 2-hundred and* 64 (4264) *suspects*

being arrested for GBVF related crimes such as rape and sexual assault. What is encouraging is that more awareness programmes are being conducted by our social crime prevention and Family Violence, Child Protection and Sexual Offences Units (FCS), which translates to an increase in the reporting of these crimes (Cele, 2024)."

In the life imprisonment category: 112 life sentences were handed down to 89 rapists and GBVF perpetrators, the 64 rapists and GBVF perpetrators were each handed down 20 years and above imprisonment sentence. About 172 rapists and GBVF perpetrators were handed 10 to 19 years imprisonment. The 261 rapists and GBVF perpetrators were handed down 1 to 9 years imprisonment. Notably, what is most encouraging was that Inanda has always been known as the rape capital of the country, however it has also seen a slight reduction in the number of rape cases by registering twenty counts lower than the same period under review. This goes to show that the SAPS FCS teams are proving to be acting decisively against those who are perpetrating rape crimes. Negatively, what is still worrying and of great concern is that many of the reported rapes, were committed at victims' residences. The perpetrators were either neighbours, friends or a family members. Commendably, the SAPS members in Limpopo Province apprehended a serial rapist; Manyike Monyuku, positively linking him to Twelves (12) rape cases through the use of DNA evidence (Cele, 2024).

A South African citizen is more likely to be raped either in their own home or the residence of the perpetrator, often by a person known to them. At the same time, just over 4 780 suspects have been arrested for sexual offences. This was according to the 2023/2024 financial year third quarter crime statistics, in accordance with rape, sexual assault cases. The police minister (Cele) states that the statistics showed an overall 1.7% decline in sexual offences between 1 October to 31st December last year. There was a decrease of 261 in the numbers of sexual crimes, totalling 15 284, when compared to the third quarter in 2022. According to the sexual offences' breakdown, rape cases went down by 1.7%, while sexual assaults decreased 1.9%. The SAPS recorded 12 211 rape cases in this quarter, showing a decline from 12 419 cases in 2022. Cele noted that Gauteng, Eastern Cape, KwaZulu-Natal, Limpopo, Northern Cape, and Western Cape all witnessed a decline in this particular crime category (Seeletsa, 2024).

Despite Cele reporting a marginal 1.7% decrease in sexual offences and a 1.9% decline in rape and sexual assault cases, he further highlights that these figures stem from an unacceptably high baseline. The South African's reputation as the 'rape capital of the world' is a chilling reminder of the pervasive nature of GBV, with over 43,000 reported cases of rape last year

alone. Yet, these statistics merely scratch the surface. With only one in nine cases of rape reported in the country, a more accurate picture is that close to 400,000 women were raped last year. This excludes the number of women who were assaulted physically and in other ways. While the slight decrease is somewhat encouraging, various factors can impact these nominal fluctuations, and we must never lose sight of the real-life impact on these women, their children, families, and society at large. Therefore, there is a critical need for substantial and sustainable reductions in GBV cases. This assertion necessitates an ongoing focus on addressing the root causes of GBV, with a particular focus on boys and men before they succumb to toxic masculinity, Independent Online News [IOL] (2024)

For a recourse, the DNA has been used in most criminal cases worldwide as a tool that has not only aided justice systems in placing perpetrators behind bars and making sure that they account for their actions with conclusive evidence but has also helped justice systems to exonerate the innocent in cases where they were wrongly apprehended (Maluleke, 2016). Rape is claimed to be the most vicious and monstrous crime against human beings, as it does not only leave physical scars, but also permanent emotional and mental scars to the victims and their families (Dintwe, 2009). For example, a man whose rape case was struck off the roll because of outstanding DNA results in 2016 but went on to rape another woman after his release, was sentenced to life in prison by the De Aar regional court. The first rape occurred on December 6, 2015. Nyeshe lured the 19-year-old female victim into his house in Malaykamp, De Aar, where he assaulted and raped her several times. The victim laid a charge, and the accused was arrested a few days later. Bail was successfully opposed but the case was struck off the court roll because of outstanding DNA results. On July 17, 2016, Nyeshe struck again and raped a 29-year-old female at her boyfriend's house in Nonzwakazi, De Aar. The offender threatened the victim and boyfriend with a knife and raped her in the presence of the boyfriend. He was arrested a week later by De Aar SAPS. He was later found guilty of the rapes and life sentence was passed (Mabuza, 2022).

Since its advancement during the early 1980s, DNA-testing technology has impacted on society in incalculable ways (Medwed, 2017:17). It has facilitated answers to questions of paternity, pinpointed hereditary diseases, and created novel biological products. "It has further altered the passage of criminal law through its capability to identify biological evidence deposited by a perpetrator at a crime scene and constitute an instrument to catch the 'bad guy' and exonerate the 'innocent guy'" (Medwed, 2017:17). Again, McInnes (2017:19) argues that "the DNA is a

molecule that transmits genetic instructions applied in growth, functioning, development and reproduction of all known viruses and many living organisms". SAPS FS extract DNA from semen, blood, saliva, skin or hair gathered at the crime scene in order to find DNA matching that of anyone who has been present at the crime scene, such as an offender. "This procedure is formally known as 'DNA profiling and individualisation'" (Alberts, Johnson, Lewis, Raff, Roberts & Walter, 2014:78). During his speech on the *'National Strategic Plan on GBV and femicide'* at the Cape Town Parliament, the President of the Republic of South Africa [Mr Cyril Ramaphosa], clearly stated the following:

> "*South Africa holds the shameful distinction of being one of the most unsafe places in the world to be a woman. We have amongst the highest rates of intimate partner violence, and recently released data from Crime Stats SA show that rape and sexual violence have become hyper endemic. This is a scourge that affects us all: young and old, black or white, rich and poor, queer or cis, rural or urban. It pervades every sphere of our society. Women and girls are being abused, assaulted and murdered in our country every day - at the hands of men. We are in the throes of a deep crisis that must be brought to a decisive end*" (National Strategic Plan, 2020:13).

Further, MacGregor Villalta, Clarke, Viner, Kramer and Khadr (2019:171) state that many women experience long-lasting health impacts, including direct and indirect psychological and physical morbidities and further submit that psychological impact includes Post Traumatic Stress Disorder (PTSD), as well as other anxiety disorders, depression and suicidality. "Extraordinary figures of rape cases have been reported, but very few cases stand during trial, or even see convictions", as indicated by the Crime Statistics South Africa (2019:13). The causes of such a low conviction rate call for research. Adams, Caddell and Kritzinger (2004:19) present the view that cases are solved with evidence, criminals are sentenced on the foundation of unquestionable evidence that is beyond criticism, and subsequently, victims obtain justice based on such evidence.

Therefore, it is not enough to only have the evidence, the collected evidence must be processed appropriately. It must be collected lawfully, by means that is beyond criticism, and which proves the guilt or innocence of the accused beyond any element of doubt. Adams, Caddell and Kritzinger (2004:87) claim that the DNA has proved to be the solution to these problems, as it has helped many innocent people to be exonerated, while also assisting investigators to catch the real criminals. This study reviewed literature studies describing that DNA as an adequate

tool that has high potential to evidence several crimes that are verified through any action that has been conducted in a mutual (Human body contact) touch manner, including rape, Adams, Caddell and Kritzinger (2004:87).

Garrett (2004:19) writes that framework legislation is particularly useful as a strategy because it addresses collective action problems, particularly by entrenching certain macro-objectives so that future decisions are more likely to align with them. The following laws and regulations were reviewed in this study: Most importantly, Section 205(3) of the Constitution of the Republic of South Africa, 1996, directs that the SAPS, amongst other relevant stakeholders, should perform the following objectives, reference to rape in the context of this study: Prevent, combat and investigate crime, maintain public order, protect and secure the inhabitants of the Republic and their property, as well as uphold and enforce the law (Burger, 2006:105; and South Africa, 1996).

However, since rape cases seem to be increasing in the Northern Cape, the researcher thinks that potential rape perpetrators seem to be in contradiction with the existing Constitutional foundations. The Criminal Procedure Act [CPA] (No. 51 of 1977) regulates the criminal procedure in the South African legal system. It outlines the procedure for the entire system of criminal justice, including search and seizure, arrest, the filing of charges, bail, pleading, testimony of witnesses and the verdict, sentencing and appeal (Devenish, 1977:1). The SAPS (No. 68 of 1995) also mandate the SAPS members to exercise its responsibilities aligned to the enriched objectives in the Constitution (1996) of the country. The local SAPS is also required to uphold and enforce existing laws and provide a safe and secure environment for all people in South Africa, while ensuring that potential rape criminals are brought to justice by making the necessary efforts to participate and address causes of crime (Lampbrechts & Prinsloo, 1996 and SAPS Act, 1995).

Besides, the South African Criminal Law (Sexual Offences and Related Matters Amendment Act - SORMA), 2007 reforms and codifies the law relating to sexual offences. It abolished various common law crimes (including rape and indecent assault) and replaced them with gender-neutral statutory crimes. It expanded the definition of rape, previously limited to vaginal sex, to include all non-consensual penetration; and it equalised the age of consent for heterosexual and homosexual sex at 16 years old (Artz & Roehrs, 2009:23). The Criminal Law (Forensic Procedures) Amendment Act (No. 37 of 2013), also referred to as the DNA Act, 2013, aims to provide for the collection of certain bodily samples from certain groups of people

for the purpose of forensic DNA analysis, to ensure the protection of the rights of women and children with regard to the collection of DNA samples (Knoetze & Meintjes-van der Walt, 2015, South Africa, 2014; and Horswell, 2004, Gilbert, 2004).

Therefore, the focus of this study is on tracing the evidential history that reveals the real perpetrator of rape, through the application of DNA analysis, which is the trusted technological mechanism that helps to conclude a successful investigation. It is through such an investigation that the real person who has committed rape at the crime scene is identified. The intervention of DNA reduces the time of investigation by providing a quick and adequate response to rape cases. This study provides DNA evidence analysis which demonstrates that the full introduction of DNA during investigation of rape cases does not only speed up investigations in rape cases, but also is a great tool during the process of individualising and narrowing the investigation as it ensures that only those who are guilty or have been part of the crime commission (rape) are arrested. The DNA intervention similarly means that the response to rape cases is a swift, accurate and irrefutable process. The problem is set out and interrogated throughout research while answering research questions. Literature and case studies are reviewed and discussed to understand the role and the significance of DNA analysis and why it is recommended as the best investigation tool.

This chapter (One) further gives a mind map of what the research carries and what is it that it seeks to achieve. The reason, the aim and the objectives that led to the researcher embarking on this research journey are discussed. The researcher answers the questions on why this research is important and deals with the hypothesis on why DNA is significant to be summoned during rape investigations. The DNA evidence and investigation are a complex and expert field. For this reason, key theoretical concepts are defined and explained. The significance of this research and why the researcher chose this topic and field are explained.

1.2 PROBLEM STATEMENT

According to Mouton (2010:19), the first phase of any research project involves transforming an interesting research idea into a feasible, researchable problem. The statement of the research problem should be a clear and unambiguous statement of the object of the study (The unit of analysis) and the research objectives. The researcher should read as much as he/she can, about his/her research idea, be clear about the unit of analysis, the objectives of the research, and must ensure that the formulation of the research problem is such that it is feasible" (Mouton, 2010:21). The problem statement defines the focus of the study and explains the specific

problem that the researcher intends to investigate (Creswell & Creswell, 2018:91). Leedy and Ormrod (2014:67) share that as a rule, appropriate research projects do not fall out of trees and hit you on the head. One must be sufficiently knowledgeable about their topic of interest to know what projects might make important contributions to the field. Leedy and Ormrod (2014:68) further submit that at every step of the research, the researcher must ask him/herself the following: What am I doing and for what purpose am doing it? The research problem must be clearly stated so that anyone who reads English can read and understand it. Research starts with a problem, which leads to research questions. The answer to such questions should then advance the frontiers of data by leading to new methods of thinking, signifying possible applications, or flagging the way for further research in the field. The researcher should discover a legitimate research problem. Researchers need to deal with the problem evidently, completely and deliberately through the validity of the project that is implied by the research. The research problem must be precise and be stated in a way that reveals an open mind regarding the solution (Leedy & Ormrod, 2014:71).

Furthermore, De Vos, Strydom, Fouché and Delport (2011:27) highlight that "the research problem and research questions eventually culminate in the formulation of the research goal and objectives of the study. Creswell and Creswell (2018:17) state that "the research problem comes from a void in the literature, conflict in research results, topics that have been neglected in the literature, a need to lift the voice of the marginalised and real-life problems that are found in our workplaces and societies. Creswell and Creswell (2018:20) further argue that the research problem should always be clear since it will be difficult to understand the significance of the research when it is not clear.

According to Zondi (2021:iv), a number of critiques concur that rape is the most heinous crime against humanity. Moreover, rape is believed to be a criminal offence that causes grave fear among communities. Its negative impacts limit the freedom of movement for most females, young and old. DNA evidence is presently utilised during criminal trials, including, but not limited to rape investigations, warrant its optimal use during court processes. It is vital that the legal community is appropriately conversant with the scientific foundation and demonstration of such evidence, and with its prospective pitfalls. Besides, Zondi (2021:iv) states that "the significance of biological evidence (DNA) is critical from the time it is collected from the scene, its preservation, transportation and storage, until it is presented in a court of law." In this sense, evidence found at the crime scene is of prime importance, as it is the firm base for a

successful investigation. The identified research problem for this study is as follows: The SAPS investigators do not effectively use DNA to its maximum as an investigative tool during investigation of rape cases. This problem influenced the researcher to conduct this study based on the following pertinent factors:

- DNA is treated as a luxury, and those who are charged with the immense responsibility to investigate this heinous crime against humanity are not fully trained in how to identify, collect, handle, preserve and present DNA evidence in court.
- DNA equipment is not sufficient: there are four DNA centres (Durban, Cape Town, Port Elizabeth and Pretoria) which are supposed to service South Africa and the Southern African Development Community (SADC). Only one of the four centres, the Pretoria Forensic and Analysis Centre, has full functional and serviceable DNA testing equipment.
- According to Business Insider (2021:08), "the Forensics Division of the SAPS is buckling under the weight of a DNA backlog, which is delaying justice for victims of violent crimes."
- By April 2021, the backlog exceeded 210 000 unsolved cases, due to unserviceable DNA equipment, and the cumulative total of all outstanding DNA cases, new entries and the ring-fenced backlog combined, is nearly 238 000.

The premise of this problem statement is to critically analyse DNA as evidence during rape investigations in the Northern Cape. From the conducted pilot study, the significance of DNA evidence during rape investigations was identified and deemed to be of utmost importance for the local investigator's considerations. According to Stats SA (2021:5), "rape offences are reported in startling numbers throughout South Africa." The SAPS recorded 12 218 rapes in 2020/21. This saw an increase of 181 cases from the previous 12-month cycle in 2019/20. South Africa recorded 11 357 rape cases in 2016/17, 11 545 in 2017/18, 12 068 in 2018/19 and 12 037 in 2019/20. This saw an increase of 1.5% in 2020/21. The noticeable fact is that rape crimes are increasing each year. As of the 2022/2023 fiscal year, a total of 43,037 reported rape offenses were committed in South Africa. Gauteng recorded the highest number with 8,811 cases, which accounted for approximately 20 percent of the total reported in the country. KwaZulu-Natal and Eastern Cape placed second and third, with 8,468 and 6,883 cases of rape, respectively (Cowling, 2023). The Northern Cape Province recorded about 328 sexual offences, rape included during the period of 3rd quarter [October-Oct-December - Dec, 2019-2023] (SAPS, 2019-2024:1). To provide clarity to the identified problem under the selected

Local Municipalities of Northern Cape, the latest rape statistics showcased the locations of occurrences, as depicted in Table 1 and 2.

Table 1: Comparison - 3rd quarter rape statistics (October-2019-2023): Northern Cape

Crime category	**Locations**	**Oct) 2019 to Dec 2019**	**Oct 2020 to Dec 2020**	**Oct 2021 to Dec 2021**	**Oct 2022 to Dec 2022**	**Oct 2023 to Dec 2023**	**Count Difference (Count Diff)**	**% Change**
Rape								
II	Galeshewe	11	22	17	19	13	-6	6 counts lower
II	Jan Kempdorp	11	15	4	4	10	6	6 counts higher
II	Kimberley	17	20	25	26	20	-6	6 counts lower
II	Pampierstat	10	10	6	8	10	2	2 counts higher
II	Roodepan	13	16	8	27	21	-6	6 counts lower

Source: SAPS (2019-2024:1)

Table 2: Five selected policing areas from the provincial [Northern Cape] top 30 police stations with most reported rape cases (2019-2024)

Province position	**Republic of South Africa position**	**Station**	**District**
2	189	Roodepan	Frances Baard District
3	203	Kimberley	II
5	349	Galeshewe	II
7	411	Jan Kempdorp	II
8	422	Pampierstat	II

Source: SAPS (2019-2024:1)

1.3 STUDY AIM

Creswell (2013:34) states that a clearly defined research aim helps the researcher deal with the research problem by responding to the research question(s) without deviating from the topic. In the same breath, Leedy and Ormrod (2014:97) reveal that the research aim must be a definite declaration which exhibits clearly, precisely and in a grammatically accurate sentence, the objective which the research seeks to achieve. Mouton and Marais (2016:103) maintain that any research should be aimed at finding facts and new data. The research should also seek to find whether patterns are visible in the data. While considering the cited definitions, the aim of this study was 'to critically explore analysis of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape, South Africa.'

1.4 STUDY OBJECTIVES

De Vos *et al.,* (2011:93) defines study objectives as the central thrust of the study and identify the specific issue that the researcher proposes to examine. Locke, Spirduso and Silverman (2013:32) stress that the research objectives indicate why a researcher wants to conduct a specific piece of research, and what it is that the researcher desires to achieve. Babbie, Mouton, Payze, Vorster, Boshoff and Prozesky (2014:132) state that research objectives carry three main functions: exploration, description, and explanation. Additionally, Schwandt (2014:11) argues that the research objectives should set a certain tone, starting with 'the objective,' followed by action verbs such as 'explore, understand, develop, examine,' and detail the reasons which identify the research problem. According to Creswell and Creswell (2018:17), research objectives convey the overall intent of a proposed study in a sentence or several sentences. They set forth the intent of the study, not the problem or issue leading to a need for the study. Therefore, the following study objectives guided this study:

- To highlight procedures followed during the use of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
- To describe the significance of the application of sources of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
- To identify how the chain of custody is maintained on DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.

- To develop a conceptual model for preserving DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.

1.5 RESEARCH QUESTIONS

According to Jesson, Matheson and Lacey (2011:56), the research question can be defined as the mind map, which directs the entire literature review of any research study. Leedy and Ormrod (2014:13) state that the significance of the research question (or questions) for any research is that it allows the focus of a research study to advance awareness into the problem that led to the research. Research questions can be defined as a hunt for an answer that is presently unknown, but which addresses through well-designed research (Wood, Percy & Giles, 2012:13).

This research sought to answer the following questions:

- What are the procedures followed during the use of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa?
- What is the significance of the application of sources of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa?
- How is the chain of custody maintained on DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa be effectively maintained?
- Can the developed conceptual model preserve DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa?

1.6 DEFINITION OF KEY CONCEPTS AND OPERATIONALISATIONS

Bachman, Russel and Schutt (2013:123) describe key theoretical concepts as a process of specifying what the researcher means by a term, and a process where the particular term is defined by contributing to the research work. Welman, Kruger and Mitchell (2015:113) contend that the concepts are definitions which are described conceptually to assist the researcher understand the value of such a term in relation to the research study. The key theoretical concepts that this study addresses are defined in this section.

1.6.1 Criminal investigations

Berg and Horgan (1998:19) state that criminal investigation is the legal search, a) For things and people, to recreate the circumstances of an unlawful act, b) To apprehend or identify the guilty party, and c) To assist in the state prosecution of the perpetrator. Marais (1992:42) adds that crime investigation is a lawful sketching of people and instruments, which could directly or indirectly add to the reconstruction of a crime scene and provide information concerning the people involved in it. For this study, criminal investigations is based on the investigative techniques offered by the participants of this study, namely: SAPS crime (Rape) scene investigators, SAPS FSL, DNA specialists, as supported by community members.

1.6.2 Deoxyribonucleic Acid

Royal Society (2017:19) and Erzinclioglu (2006:100) describe DNA as the material of genetic cells, which basically regulates physical human characteristics." DNA is the abbreviated form of the term DNA. It is present in all the cell nuclei, as well as in the extra-nuclear organelles of the cell, known as mitochondria. Human beings inherit their nuclear DNA from their parents, with fathers accounting for one-half, and mothers for the other half. Therefore, the DNA evidence and other related sources, as collected from rape scenes guide this study.

1.6.3 Forensic investigations

On one hand, Pollex (2001:10) states that 'forensic investigation' refers to an investigation pointed at (a) establishing court actions, and where a fragment or other scientific data is employed to a legal problem, and (b) conducting a civil or administrative matter that is, an in-depth, careful search for the truth through the procedure of specialised skills, expert understanding, and methodical approaches and techniques. On the other hand, Jackson and Jackson (2004:12) assert that forensic investigation is a process whereby scientific means are employed to explain circumstantial evidence, with the intent of deciding legal disputes. The use of science as a tool to investigate rape cases by the SAPS FSL members and DNA specialists form the basis of this study.

1.6.4 Rape

In terms of the South African Criminal Law, rape occurs when a male, with intent, unlawfully engages in sexual contact with a female being without her consent (Snyman, 2006:74). Rape

is further defined by Card (2004:32) as the intentional and unlawful sexual engagement with a female being without her consent. From this definition, it can be deduced that the most significant fundamentals of rape are intent, unlawfulness, penetration (sexual intercourse) and male and female involvement. According to the DNA Project (2020), any person ('A') who unlawfully and intentionally commits an act of sexual penetration with a Complaint ('B') without the consent of 'B' is guilty of the offence of rape and the following elements of this crime should be strongly considered to easily understand it: 1. Unlawfully, 2. Intentionally, 3. Sexual penetration, and; 4. Without consent (DNA Project, 2020).

According to the SORMA, 2007, rape should be defined as the forceful, violent and illegal penetration of a penis into a female's sexual organ (Vagina). In essence, rape occurs when a person forces another to have sexual intercourse without their consent. This is a crime and must be reported. The SORMA, 2007 also makes it a crime for a person to force another person to rape someone. This is known as compelled rape (Government of South Africa, 2024). However, this definition is also extended to a female who might force a male to perform sexual acts on them without the male's consent, the same as for the male to male, in the case of penetrating the anal organ of another male or female with their penis.

Moreover, there is, however, a new law which provides that any person, regardless of their gender or sexual orientation, can be a victim of rape. In a criminal case between the '*State V Masiya* 2007(2) South African Criminal Reports [SACR] 435 (Constitutional Court - CC),' the rape definition was expanded by the Constitutional Court to include anal penetration. Moreover, there have been new amendments to the sexually related offences law, which state that rape occurs when someone inserts their genital organs into a victim, or when any part of a person's body, such as the finger, is inserted into the anus or genital organs of the victim. This can also occur when the genital organs of an animal are placed or forced into the victim's mouth. Therefore, engaging in sexual activities without the consent of the next person is regarded as rape in the context of this study.

1.7 STUDY SIGNIFICANCE

De Vos *et al.,* (2011:15) highlight that the significance of the research can be defined as the statement where the researcher does the following: **a)** Assures the reader about the value of the proposed research study, and that the results of the study will be relevant; **b)** Persuades the reader that the research will entail building an argument that will link the research to a larger, important theoretical problem; **c)** Presents a significant value with respect to social policy and

concerns of policy; and; **d)** Where the researcher states in a clear and specific manner that the research study will bring a solution to the research problem. Besides, Denscombe (2012:16) states that the good research needs to be able to demonstrate and prove its significance.

Creswell (2013:76) is in agreement with this submission by alluding that the significance of any research can be proved when it is able to suggest a solution to the research problem, and by being able to answer research questions. In addition, "the value of the research should advance the reason for the researcher to embark on a research journey and provide an alternative or solution to the research problem (Creswell, 2013:76). Leedy and Ormrod (2014:14) argue that "research is not merely a process of gathering information, rummaging around for hard-to-locate information, and transporting facts from one location to another. The significance of a piece of research is tested when it can assist the researcher in discovering the truth and help the researcher to understand the phenomenon that concerns their study. The uniqueness of this research is that it explores the significance of the DNA as evidence during rape investigation, a gap that previous research and literature could not clearly address. Moreover, it is hoped that the following stakeholders will benefit from this study:

- **Academic community:** The new knowledge will be available to UNISA library. The greater academic community will also have access to the information. The information will be used both in curriculum and learning programmes and as a referral source for students and researchers for further research studies.
- **Industry:** The South African law enforcement industry, such as the SAPS, Department of Justice and Constitutional Development (DoJ & CD), Department of Correctional Services (DCS) and National Prosecuting Authority (NPA), amongst others; with intervention capabilities will benefit from this study because they will acquire more knowledge, improved skills, methods and techniques in terms of responding to factors contributing to rape. The knowledge will be used in curricula for future training to cultivate more professional community interventionists.
- **South African society:** Society will benefit because interventionists will be better skilled and competent, resulting in a better response to rape. The South African community (Selected areas in the Northern Cape Province) will, by providing information regarding the subject under investigation, empower themselves with knowledge and stimulate their way of implementing strategies to develop a model to combat rape.

- **Contributions to the new body of knowledge, involving of the following 05 components:**

1. Understanding the significance of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
2. Considering the selected sources of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
3. Maintaining chain of custody for rape DNA evidence in the selected Local Municipalities Northern Cape Province, South Africa.
4. Better DNA evidence resources for rape investigations, advanced training and educational initiatives in the selected Local Municipalities Northern Cape Province, South Africa.
5. Interactions and information exchange on preserving DNA evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa.

1.8 SUMMARY

This chapter provided the general orientation of this study, by providing the 'introduction, problem statement, study aim, objectives and research questions.' The definitions of key concepts and operationalisations, as well as the study significance was also discussed, including the chapter's progressions were also discussed. The next chapter (Two) provides the reviewed literature studies, based on the study aim and objectives that guided this study.

CHAPTER TWO: LITERATURE REVIEW ON DNA EVIDENCE

2.1 INTRODUCTION

According to De Vos *et al.,* (2011:34), "the purpose of a literature review is to establish the theoretical framework for the study, to indicate where the study fits into the broader debates, and thus to justify the significance of the research project against the backdrop of previous research." Grinnel and Unrau (2005:19) and De Vos *et al.,* (2011:35) submit that the literature review carries four (04) purposes:

1. To give assurance to the reviewers that the researcher understands the current issues related to their topic.
2. To point out ways in which the researcher's study is similar to, or different from, other studies that have previously been conducted.
3. To fit the researcher's study into the 'jigsaw puzzle' of present knowledge.
4. To introduce and conceptualise the variables (or constructs) that will be used throughout the study.

Denscombe (2010:19) opines that "a literature review is not a mere duplication of what other authors have written or done." It is, rather, a space within which the researcher studies, analyses, compares and evaluates similarities and differences in the works of other researchers. This is a process during which the researcher searches and analyses similarities, differences, weaknesses, strengths and possible radical newness, in order to fill whatever gap has not been filled. Further, Machi and McEnvoy (2012:23) define a literature review as the written exposition of a case that has been rationally argued, based on all-inclusive knowledge of a research topic. A literature review is simply an expansion or interrogation of existing literature (Mathew & Ross, 2017:82). Creswell and Creswell (2018:17) share that the literature review accomplishes several purposes: it shares, with the reader, the results of other studies that are closely related to the one being undertaken." It relates a study to the larger, ongoing dialogue in the literature, filling in gaps and extending prior studies. Equally, Creswell and Creswell (2018:18) stress that a literature review provides a framework for establishing the importance of the study, as well as a benchmark for comparing the results with other findings. The literature review often takes several forms, demarcated to the following:

- It integrates what others have done and stated.
- It criticises previous scholarly works.
- It builds bridges between related topics.

- It identifies the central issues in a certain field (Cooper, Heron & Heward, 2007:22; and Creswell and Creswell, 2018:19).

The DNA evidence is playing a significant role than ever before in solving criminal cases. It has become the basis of all sexual and murder cases investigations. DNA has been an integral instrument in unravelling cold cases. In addition, it has unlocked cases where there were no eyewitnesses, exonerating the wrongly accused, and assisting law enforcers to ensure that those who have committed rape or murder crimes face the might of the law (Mulaudzi, 2020; Maluleke, 2016, Dintwe, 2009, Ubisi, 2023; and Maffa, 2020). Lonsway, Archambalt, O'Donnell and Ware (2016:48), and Lynch (2013:101) note that it is, however, worth noting that the significance of DNA evidence strongly lies in its analysis and the understanding of DNA processes by those who are charged with the responsibility in the value chain of DNA analysis from the time a crime has been committed to the point where collected evidence is presented in the court of law.

From the above assertions, the researcher's experience on this subject confirm that the DNA evidence has become an increasingly significant tool in the investigation of rape cases. Furthermore, the use of DNA has revolutionised the way that sexual assault cases are investigated, prosecuted, and defended. DNA analysis can provide important information that can link a perpetrator to a crime and eliminate innocent suspects. This has been particularly relevant in rape investigations, where physical evidence is often difficult to obtain and witness testimony can be unreliable. According to the researcher, the problem statement that led to this research is that **a)** DNA is not applied to the extent that it should be, and **b)** those charged with the responsibility of handling, maintaining and presenting DNA evidence are not to the task as they should be. Another problem which has initiated this research is the deplorable backlog challenges within the SAPS environment concerning DNA analysis, particularly in rape-related investigations. As a result, women are extremely affected by stress related illnesses because of the kind of fear and experiences they go through because of rape incidents. When rape incidents are not investigated or when the outcome is not satisfactory to the communities, they do not only lose hope and trust to the law enforcement agencies, but they also find themselves in a place of fear and trauma. According to Wilson, McClure and Weisburd (2012:98), Lynch and Hancock (2012:97) Murphy (2015:69), Gourarie (2018:08), and Wyner, Barash and McNevin (2020:39), this increased role of the critical analysis of DNA during investigation of rape cases places a heavy responsibility on those dealing with the identifying, handling, collecting,

transporting and preserving of this evidence until it is presented in a court of law. Several authors, researchers, analysts and investigators agree that DNA evidence is the most reliable piece of evidence during the commission of contact crimes and that it is always available at the crime scene; however, only the eye that is looking or searching can either identify or miss it. This suggests that DNA evidence is one of the strongest alibis, if not the only strong *Alibi* [A claim or piece of evidence that one was elsewhere when an act, especially a criminal one, is alleged to have taken place] of a victim, and the greatest weapon in the investigator's arsenal.

The Royal Society (2017:29), Sing (2021:17), and Singh (2018:71) provides that although the evolution of DNA as a critical analysis tool has proved to be a great helping hand during investigations, particularly rape investigations, the training of those charged with the task of identifying, handling, transporting, preserving and presenting this evidence can never be overemphasised. Critical evidence has been historically thrown out of court, and suspects known to have committed sexual crimes have been set free based on investigators having failed to identify or maintain the integrity of DNA evidence from the time it is identified at the crime scene till its presentation in courts. One of the major factors facing the Northern Cape Province is the DNA analysis backlog, which has caused an outcry in communities of the Northern Cape Province and the Justice Departments. In some instances, suspects had to be released based on 'delayed justice is injustice' and lack of evidence. As the SAPS is currently faced with an extremely high burden of DNA backlog, particularly in rape cases, the Minister of Police, Mr Bheki Cele (2019:7), submitted to the Portfolio Committee that "the DNA backlog was standing at a startling 117 738 cases." The reason for this problem calls for research and recommendations that demonstrate that DNA is the most effective tool during rape investigations, and that its analysis should receive the recognition and attention it deserves. DNA analysis should not at any stage be treated as a luxury, but as the basic element that constitutes the base of rape investigations.

2.2 ANALYSING THE USE OF DNA EVIDENCE DURING RAPE INVESTIGATIONS

The study's aims *(To critically analyse DNA evidence during rape investigation in the Northern Cape Province)* and objective 01 *(To assess the use of DNA evidence during rape investigations in Northern Cape Province)* of this study were combined to provide guidelines in this section. Sulley (2023) submits that sexual assault is a prevalent issue worldwide, affecting people. The rate of sexual violence in Africa is among the highest in the world. One

in three women globally, around 736 million, have been subjected to physical or sexual violence in their lifetimes, according to a new analysis by the World Health Organisation (WHO). According to the report, women residing in low-income countries, such as Fiji in the Oceanic Islands, southern Asia, and sub-Saharan Africa, South Africa included are at a higher risk of experiencing physical and/or sexual intimate partner violence during their lifetime. Therefore, it is essential to recognise that sexual violence affects individuals of all genders, ages, and abilities and that access to justice for all survivors of sexual assault is critical. Age is also a significant factor in sexual violence, and children are particularly vulnerable to sexual abuse. In Africa, child sexual abuse is a prevalent issue, with estimates suggesting that one in five African children will experience sexual abuse before the age of 18.

Physical disabilities and mental health conditions can also increase the vulnerability of individuals to sexual violence. These individuals may face additional barriers in accessing justice due to societal attitudes and prejudices about disability and mental illness. However, it is crucial to recognize that all survivors of sexual violence, regardless of their abilities or mental health status, deserve access to justice. Male victims of sexual violence often face additional challenges in accessing justice due to societal stigmas and stereotypes about male victimhood. However, it is crucial to recognise that male survivors of sexual violence require the same support and resources as female survivors. Prostitutes are among the most vulnerable populations to sexual assault and other forms of violence due to the social stigma attached to their profession and their often-marginalised status in society. In some cases, perpetrators of sexual assault on prostitutes may attempt to use the nature of the victim's profession to their advantage by claiming that the sexual encounter was consensual or that the victim was lying about the assault (Sulley, 2023).

Notably, it was reported that a young girl was brutally attacked and viciously raped in the small town of Louisvale in the Northern Cape Province. Her injuries are so substantial that gang rape is assumed. This horrifying attack provokes outrage in the local community. Six men are swiftly arrested and subsequently spend the next three months in jail for their own safety, as the community have threatened them with their lives for committing this monstrous attack. All six men lose their jobs. On examining the case, the Public Protector summons DNA analysis to be applied to aid the investigation. First, samples are collected from the crime scene, which in this instance is the young girl herself (Lynch & Hancock, 2012:19). Investigators collect DNA samples from her clothing, body parts, which are sent to the Pretoria Laboratory's DNA Centre for analysis. In the meantime, DNA reference samples are also taken from the six

suspects and sent to the same laboratory for analysis to determine whether the DNA profiles of the six men match those analysed from the samples taken from the victim (Lynch & Hancock, 2012:78). According to the Royal Society (2017:07), DNA analysis was established by Sir Alec Jeffreys in 1984 when he discovered that individuals could be distinguished on the basis of readily detectable differences in their DNA. DNA profiling was then used for the first time ever in a criminal case in the United Kingdom in the investigation of rape and murder cases of Lynda Mann and Dawn Ashworth that occurred between 1983 and 1986 (Royal Society, 2017:07). In this case, Richard Buckland was exonerated through DNA analysis in 1987 and Colin Pitchfork was subsequently convicted. Since 1987, considerable scientific study and resources have been devoted to the expansion and enhancement of DNA analysis technologies. In 1995, the United Kingdom (UK) National DNA Database was established to maximise the investigative use of DNA profiles and to identify repeat offenders. "On a global scale, most countries now use forensic DNA analysis in one form or another" (Royal Society, 2017:07).

Additionally, Alberts *et al.*, (2014:18) state that the SAPS FS apply DNA in semen, blood, saliva, skin or hair gathered at the crime scene, such as from an offender. This procedure is formally known as DNA profiling. McInnes (2017:32) defines DNA as a molecule that transmits genetic instructions applied in the growth, functioning, development and reproduction of all the known viruses and many living organisms. McInnes (2017:33) highlights that DNA can best be described as a tool that can be adequately used to provide accurate information regarding the suspected person who has committed a rape crime. The DNA results reveal an unexpected turn in the investigation as they show that only one rapist is responsible for this terrible attack, and that none of the six accused men has a DNA profile that matches that of the assailant. Based on these results, the six falsely accused men are immediately released and cleared of the crime. In the context of Northern Cape Province, the following refers to few decided selected criminal cases where DNA played a significant role in conviction of the suspect or exoneration of the innocent, confirming the advantages and disadvantages:

- **Case 1:** A Northern Cape Province man received a life sentence plus 26 years for rape and robbery at the Kuruman Regional Court on Wednesday. Tshepiso Godfrey Oliphant, 32, was found guilty of raping two women in 2012 and 2013 and robbing them of their cellphones and money. The first rape occurred on 14 December 2012, when the 18-year-old victim was lured by Oliphant to Promise Land in Mothibistad. He took her to an open field and raped her twice. He also robbed her of her cellphone valued at R2 000, and money.

He left her and fled the scene. The victim was able to report the incident and received medical treatment, Southern African Legal Information Institute [SAFLII] (2022).

- The second incident occurred on 12 July 2013, when the 29-year-old victim met Oliphant at a hiking spot next to the Kuruman court. The victim and Oliphant got into the same vehicle. “He then grabbed her and dragged her into an abandoned house, where he raped her twice and also robbed her of her cellphone valued at R3 000 as well as cash” (SAFLII, 2022:39). Oliphant was arrested on 11 September 2013 and was granted bail. He absconded and was rearrested on 9 September 2020 and was linked to both cases with DNA. “His name was recorded in the National Register for Sex Offenders, and he was declared unfit to possess a firearm" (SAFLII, 2022:40).
- **Case 2:** (*Nyeshe V State* 2022 (1) SACR 29 (Supreme Court of Appeal - SCA): A man whose rape case was struck off the roll because of outstanding DNA results in 2016 but went on to rape another woman after his release, was sentenced to life in prison by the De Aar Regional Court on Monday. Acting police deputy commissioner for crime detection in the Northern Cape, Brig Nicky Mills, welcomed the sentence handed down to Monde Nyeshe for the rapes of the two women. The first rape occurred on 06 December 2015. Nyeshe lured the 19-year-old female victim into his house in Malaykamp, De Aar, where he assaulted and raped her several times. The victim laid a charge, and the accused was arrested a few days later” (SAFLII, 2022:61). Bail was successfully opposed but the case was struck off the court roll because of outstanding DNA results. On 17 July 2016, Nyeshe struck again and raped a 29-year-old female at her boyfriend’s house in Nonzwakazi, De Aar. He threatened the victim and boyfriend with a knife and raped her in the presence of the boyfriend. He was arrested a week later by De Aar police. In November 2016, the cases were combined, and the accused remained in custody until his sentencing. “On Thursday, the court after DNA analysis results, found Nyeshe guilty of the rapes and sentence was passed on 01 August 2022 (SAFLII, 2022:62).
- **Case 3:** Edmund Fredericks committed the rape five years ago, but only when his DNA came back from the lab, was he arrested. Fredericks, 44, was arrested for the rape of a 49-year-old mother in Grassy Park on 28 October 2017. The woman had gone to a tavern in the area where she encountered four minors from the school she was working at, for engaging with adult men. She tried to intervene and protect the minors but was accosted by Fredericks, taken to a dark room and raped. He then took her to a nearby field where he

held her at knife point and raped her again and again. “She escaped when Fredericks was distracted but has since been left in a state of trauma” IOL (2022:07).

The SAPS Detectives - Francois Philander stated that the suspect was unknown to the victim, and they had no leads when the crime was reported. He said, “What makes this case so awesome from the police side, was that this was an unknown person, the victim only described the suspect as a male, light in complexion, whom she would be able to identify, and there was absolutely nothing to work on.” The only thing we could work on was when the DNA came back from the lab and we had a linkage, because he was a repeat offender, so his DNA was on record. The suspect’s DNA was found on the body of the victim and because of that, he was successfully linked to the offence and the victim could also identify the suspect as the one who raped her” (IOL, 2022:07). Fredericks was sentenced to two life terms of imprisonment which will run concurrently, and an effective sentence of 25 years. “He was previously convicted for rape and sexual offences and was on parole at the time of the incident” (IOL, 2022:08).

- **Case 4:** A man serving 10 years for two rapes was linked to 18 other rapes that he had committed prior to his arrest. Johannes Nokeri, 28, was eventually caught for the crimes after raping two women and stealing their friend's car. While serving the sentence for the two rapes, DNA revealed that he was the man who had been sought for over four years for multiple rapes (SAFLII, 2022:19). Mr Nokeri has been slapped with five life terms and 191 years for 18 counts of rape, 23 of robbery with aggravating circumstances, theft of a motor vehicle and unlawful possession of a firearm and ammunition. Johannes Nokeri, 28, was sentenced at the High Court of South Africa Northwest Division, sitting in the Temba Regional Court for the crimes that were committed between 2012 and 2016 (SAFLII, 2022:19). In handing down the sentence, Judge Shane Kgoele said Nokeri had not shown remorse for the crimes that he had committed. According to the Northwest NPA Spokesperson, Henry Mamothame, Nokeri's reign of terror began in 2012 where women were raped and robbed. Mamothame said Nokeri embarked on a series of rapes, robberies and theft in the areas around Hammanskraal and Temba. However, he was never caught. After four years of eluding police, Mamothame said Nokeri was eventually arrested on 16 July 2016 in possession of a stolen vehicle and for two rapes that he had committed the previous day. In that incident, he had found two women with a man. He raped the women and had stolen the car. A tracking company led police to where the car was and

Nokeri was also found in possession of six live rounds of ammunition. Nokeri was given 10 years each for the crime and the sentences were to run concurrently (SAFLII, 2022:52).

- **Case 5:** One of the most wanted suspects has been arrested. He was placed on the most wanted list 13 years ago for a string of rape cases. He targeted women in the Northern Cape and Free State areas between 2009 and 2013. The 34-year-old suspect was arrested after two weeks of tracking and tracing by a dedicated team of police officials. He has been on the wanted list for the past 13 years and was arrested after he was linked through DNA. The man allegedly surprised his victims by sneaking from behind before grabbing them around the throat, Kareli added. He would often threaten to stab his victims, before forcing them to go to an open space or empty house. He then raped them and fled, said Kareli. The victims were aged 23, 24 and 43. "According to Kareli, the man appeared in the Bloemfontein Magistrate's Court on Monday on 13 counts of rape and attempted murder" (IOL, 2022:13). There have also been several high-profile cases globally in which DNA evidence played a crucial role in identifying and convicting perpetrators of rape. Examples of such cases are:

  "The 1993 rape and murder of an 11-year-old girl in Brazil. The DNA collected from the victim's body was used to identify and convict the perpetrator, who had previously been acquitted of the crime due to insufficient evidence. Similarly, in the 1999 rape and murder of a college student in New York City (NYC), DNA evidence was instrumental in identifying and convicting the perpetrator."

Another suspect, a former boyfriend of the young girl's mother, is subsequently arrested and a DNA reference sample is taken from him and sent to the DNA laboratory for analysis. The DNA results prove an exact DNA match with the rapist (the former boyfriend of the young girl's mother). He is sentenced to life imprisonment (Lynch & Hancock, 2012:97). Lynch and Hancock (2012:97) highlight that the main reason why DNA is the most significant piece of evidence during investigation of rape cases, is that the DNA is found in every cell (Except red blood cells) in our bodies, which makes it inevitable that the rapist will deposit and leave evidence at the crime scene. Smith and Urbas (2012:113) add that DNA has made a significant contribution to criminal investigations around the world since it was widely adopted. In addition, the direct matching of DNA profiles, such as comparing one obtained from a suspect or database, remain a widely used technique in criminal investigations which has aided investigators to solve many rape and violent crimes. Lynch (2013:101) argues that there are other evidentiary tools that provide indisputable evidence during rape and violent crime

investigations, not only about the facts of the matter, but also the identity of the person involved. The weight of DNA, when critically analysed as exculpatory evidence, far outweighs that of other incriminatory non-DNA evidence materials. Moreover, Lynch (2013:102) adds that the DNA evidence has freed those who have been falsely accused, while it has also helped investigators to link those who have been involved in a string of rape and violent crimes (Linkage analysis), in such a way that DNA has been considered the new 'gold standard' of rape investigations.

According to Wilson, McClure and Weisburd (2012:98), the identification of those involved in a crime is a crucial undertaking during rape investigations. Once potential suspects are identified, it becomes easier to understand the role that each of those suspects played, or did not play, during the commission of the crime. The more precise the method used to make such identification, the better the understanding of the events that transpired. DNA evidence, in this case, becomes the most accurate and reliable method of identification, with higher levels of certainty as compared to other methods. Murphy (2015:69) concurs with previous authors that DNA evidence is one single tool in the crime investigation field that investigators should lean on during investigation of rape cases, as it is a silent witness that can stand on its own without necessarily relying on other pieces of evidence. Murphy (2015:85) further states that the critical analysis of DNA may be helpful in addressing four critical levels of investigation, namely, *source* (Referring to the accused the source of semen found at the crime scene?), *sub-source* (Where are the DNA exhibits found, are they found at the crime scene, in the victim's vagina or are they from the semen of the accused?), *activity* (Did the accused have intercourse with the victim?) and *offence* (Did the accused rape the victim?).

Lonsway, Archambalt, O'Donnell and Ware (2016:48) echo that DNA evidence collected from the crime scene can link a suspect to or exonerate him from the crime and the crime scene. It is almost unavoidable that during sexual assault, biological evidence such as hair, skin cells, semen or blood will always be left on the victim's body or at the crime scene. In such a case, where there are deposits of DNA exhibits at the crime scene, investigators need to collect these DNA exhibits properly so that they can be compared with the known samples, to place or remove a suspect from the scene of the crime. Lonsway *et al.,* (2016:79) argue that DNA evidence support investigators to address the following aspects of rape:

- **Establish sexual contact:** First, biological evidence may help to establish that a sexual act occurred. Establishing that sexual contact took place, or a particular sexual act (Rape

included) was committed therefore focusing on establishing if there was sexual contact (Rape) may be critical not only for the investigation and prosecution of sexual assault, but also for sentencing purposes. However, it is crucial to note that the absence of biological evidence does not necessarily mean that a particular sexual act did not occur. There are many reasons why biological evidence may not be available in a sexual assault case, including the fact that no medical forensic examination was conducted, too much time elapsed between the assault and the medical forensic examination, or the suspect wore a condom.

- **Identify or exclude a suspect:** If the suspect is unknown, a DNA profile may be developed from evidence collected during the investigation, and then uploaded into the national DNA database known as the Combined DNA Index System (CODIS). The DNA profile can then be compared with others in the database, to identify who the suspect is. If the identity of the suspect (Or suspects) is known, investigators can compare legally obtained DNA reference samples with DNA recovered during the investigation. This can potentially match the individual(s) with biological evidence associated with the assault. This means that DNA reference standards should be collected from suspects whenever possible, and forensic profiles should be submitted to CODIS after the DNA from any consensual partner has been excluded. Of course, excluding suspects is another key use of DNA evidence, and it can also exonerate wrongfully convicted individuals.
- **Identify prior convictions or arrests:** If a suspect has prior convictions or arrests that are revealed by a CODIS hit, this information may be introduced during the prosecution of a sexual assault case. However, this is only true if the prior cases were substantially similar to the current one, demonstrating a pattern of past criminal behaviour. Otherwise, this information may only be presented at the sentencing phase of the trial and not for a verdict.
- **Link cases based on evidence:** DNA evidence may also assist to link cases with evidence submitted in any past cases, not just for sexual assault, but for any criminal offense included in the national database.

In a case where there is sufficient DNA, the interpretation of DNA analysis from a single individual's sample is straightforward and can provide critical scientific evidence either to exclude or to include an individual as a possible source of that DNA. That is done by calculating and presenting the match probability, that is, by calculating statistically how rare any matching DNA profile is in a population. DNA analysis focuses on examining specific sections of DNA that are known to be particularly variable between individuals to create a DNA profile. "During

a rape investigation, bodily fluid, hair, or tissue samples may be collected from the survivor or other elements such as the crime scene, which may contain traces of the attacker's DNA" (Gourarie, 2018:08).

The DNA collected during a rape investigation can be analysed using two methods." In one method, DNA is extracted from samples taken from the crime scene and compared to the DNA of a suspect. In the other method, known as 'rapid DNA,' DNA is extracted from the suspected assailant and compared to profiles in a database. Rapid DNA technology allows law enforcement agencies to receive DNA matches from a database in a matter of hours, speeding up the investigation process (Gourarie (2018:08).

According to Wyner, Barash and McNevin (2020:39), the significance of DNA analysis is supported by the fact that only small sections of an individual's DNA are analysed routinely for forensic evidence. The parts analysed are called Short Tandem Repeats (STRs), though mutations that affect the number of repeats is relatively common, so within a population there are usually several different versions of the DNA at an STR locus with different repeat lengths. The different versions are called alleles and the frequency of occurrence of a specific allele (i.e. a specific number of repeating units) at the tested locus in a specific population provides a measure of how common that allele is in that population. This information is essential for calculating match probabilities. If only one STR was analysed, there would be many people with the same allele, purely by chance. It is therefore necessary to analyse different STR loci to ensure that the chance of two unrelated people having matching DNA profiles is very small and that assists in affording the investigator with conclusive DNA analysis results. According to Wyner *et al.*, (2020:15), what makes DNA analysis and testing process so unique and significant for rape cases is the fact that it is applied using different methods to obtain the required genetic profile which will make sure that the results obtained through DNA analysis are correct and unquestionable. These methods include:

- **The STR analysis:** this is a commonly used method in forensic science that looks at specific regions of DNA where there are variations in repeated segments known as the STR.
- **Mitochondrial (Mt) DNA analysis:** this method looks at the DNA present in mitochondria, which are organelles found within cells. By using this method, it is possible to analyse DNA samples that may be old or degraded.
- **Y-Chromosome analysis:** this method focuses on the Y-chromosome found only in males, which is useful in paternity testing or determining the origin of a lineage.

- **DNA Sequencing analysis:** this method involves the complete sequencing of DNA, providing comprehensive information on the genetic material of an individual (Wyner *et al.,* (2020:15).

The Royal Society (2017:29) advises that "in the effort to ensure that conclusive DNA analysis results are achieved, it is also crucial to analyse the mt[Mitochondria]DNA, which is contained in small structures within cells. They are found in the cell body, rather than in the nucleus. The mitochondrial genome consists of only 16,500 bases, and in contrast to the presence of only two parental copies of the nuclear DNA, there are thousands of copies of mitochondrial DNA in the same cell. Both males and females have mitochondrial DNA, but it is exclusively inherited from the mother. Children from the same mother have the same mitochondrial DNA, which is the same as that of all their relatives in the same maternal line. Because of the many copies of mitochondrial DNA present in a cell, this analysis is useful when there is a minute amount of DNA present or when the DNA sample is very old and has broken down. The STR profiling and mtDNA analysis are distinctly different and there are many more individuals who would have matched mtDNA profiles by chance than with STR profiling (Royal Society, 2017:31).

If there is a match between the STR profiles of two DNA samples, then the possible explanation would be that the suspect is the source of the material, or the material came from a second person who has an identical DNA analysis profile to that of the suspect or the match is a false positive due to contamination or some other kind of error. The match probability is an estimate of the likelihood (or chance) of observing the DNA analysis profile obtained if someone other than, and unrelated to, the suspect, was the source of the DNA (Royal Society, 2017:31). Furthermore, Singh (2018:71) reveals that DNA analysis relies upon comparing DNA exhibits and these exhibits are drawn from body fluids or other cellular material deposited during the commission of a crime. Exhibits that would carry DNA exhibits are mostly hair, blood, saliva from a discarded cigarette or drinks can, semen from an intimate swab from the victim and the greatest advantage is that these evidence materials are always available. These exhibits are called *'questioned samples.'* Moreover, the DNA exhibits from the questioned sample are compared to the DNA profile of one or more known samples from suspect(s), the victim or other people with regular access to the location from which the crime scene samples were collected, or other relevant people such as family members. Generally, for known samples, mouth (Buccal) cells are collected rather than drawing blood. Singh (2018:71) highlights that Buccal cell collection involves wiping a swab against the inside cheek of an individual's mouth

to collect skin cells. The swab is generally frozen for storage. Known samples are collected from people already known to the investigation or from people found following a DNA database search and this makes DNA so unique that an investigator does not have to rely only on one source of DNA. Based on submissions by different authors (Lonsway, Archambalt, O'Donnell and Ware, 2016, Lynch, 2013, Wilson, McClure & Weisburd, 2012; and Lynch & Hancock, 2012), Murphy, 2015, Gourarie, 2018, Wyner, Barash & McNevin, 2020, The Royal Society, 2017; Sing, 2021, and Singh, 2018), it is evident that the critical analysis of DNA, its significance, and its value during rape investigations, forms a greater part of addressing and responding to the current scourge of sexual crimes. It is also the observation of the researcher that DNA significance can be influenced by several factors, including whether DNA exhibits are properly identified from the crime scene, whether they are properly collected, whether the chain of custody is maintained with integrity, and whether these biological exhibits are properly analysed.

Furthermore, DNA analysis is an essential step during the investigation of sexual crimes and the understanding of all processes to be followed from the time the evidence is identified, its analysis, and until it is presented in court. The significance of DNA proves to be of superior significance, especially where human understanding and capabilities have failed. However, it is important that those who are responsible for processes of chain of custody understand the sensitivity of the process. The Royal Society (2017:29), Sing (2021:20), and Singh (2018:71) share that the DNA samples collected from different sources such as victim's body, clothing, or other surfaces at the crime scene can be analysed to identify the perpetrator and link them to the crime, it assists by corroborating victim's statement especially where credibility is questioned, and it helps in exonerating the innocent.

2.2.1 Considered factors for DNA analysis during rape investigations

As echoed by the Royal Society (2017:29), Sing (2021:25) and Singh (2018:71), we all transfer DNA to objects that we touch, objects onto which we sneeze, cough or bleed, and onto each other through social or sexual contact. Transfer events require three things to be in place to be considered, source, opportunity and mechanism. Each of these parameters is considered by analysts in the context of each case and the information supplied. The first consideration by the analysts will concern whether or not it is possible to attribute the DNA to a particular body fluid. Depending on the type of sample, it might be possible to say that the DNA came from blood, semen or saliva (Royal Society, 2017:33). The crime investigation analysts use chemical

tests or special lighting to gain an indication of what body fluids might be present, however, the tests for these body fluids vary in their sensitivity and specificity, and there might be more than one body fluid present. If, for example, there is a very tiny, weak bloodstain, but a very strong DNA profile is obtained, it is also possible that the DNA might not have originated from the bloodstain but might have been from someone who subsequently touched the bloodstain. Therefore, in this case, DNA analysts will not be able to give an opinion on the body fluid of origin. If the analysts have sufficient information to infer that the DNA came from an identifiable body fluid, this information might assist with assessing by what activity the DNA came to be present in a sample (Royal Society, 2017:34).

Besides, Singh (2018:72) argues that very small amount of DNA sample can be used as evidence. Therefore, in the matter of contamination issues, greater attention is essential when collecting, and preserving the DNA evidence for analysis. The integrity of the biological sample is very important in forensic casework. Biological contamination of evidence from another source is a very real possibility, especially when dealing with trace evidence. Sing (2021:72) provides the following precautions that investigators should lookout for the following aspects to avoid contamination of evidence during sample collection for DNA analysis:

> "*Wearing full protective suits, face masks, disposable hand gloves before touching any evidence and change the gloves between handling different items. Use disposable instruments or clean them thoroughly before and after handling each sample. Avoid touching the area where you believe that DNA may exist. Avoid talking, sneezing, and coughing over evidence. Avoid touching face, nose, and mouth when collecting and packaging evidence. Air-dry the evidence thoroughly before packaging. Put evidence into new paper bags or envelopes, not into plastic bags. Do not use staples. Contact between victim and suspect samples should be always avoided. Each piece of evidence should be packaged separately into paper bags. Do not use plastic bags. Never re-use packaging* (Sing, 2021:72)."

The investigators and all those involved in the justice value chain must always take to cognisance the fact that the utilisation of DNA evidence in rape investigations is also subject to legal procedures and compliance requirements, and it is a requirement that those involved must maintain including the rights of the accused while ensuring justice for the survivor. DNA

evidence is admissible evidence in court, but the procedures for obtaining, testing, and analysing DNA evidence are meticulously regulated. Singh (2018:71) says that the use of DNA evidence must meet all constitutional requirements, especially when it comes to human rights. Furthermore, the prosecution must establish a clear chain of custody, from the collection of the DNA evidence to its analysis and presentation in court. Investigators must always keep in mind that, obtaining DNA evidence during rape investigations is intrusive and sensitive particularly to the victim, therefore investigators need to be always considerate.

Concerning the role of forensic DNA in solving sexual assault, Sulley (2023) highlights that one significant tool in the investigation and prosecution of sexual assault cases is forensic DNA analysis. DNA evidence can be collected from a variety of sources, including blood, semen, hair, and skin cells. By analysing this evidence, forensic scientists can identify suspects and link them to the crime scene. In addition to identifying perpetrators, forensic DNA analysis can also be used to exonerate innocent suspects who have been wrongly accused of sexual assault crimes. DNA evidence can be used to demonstrate that the suspect was not present at the scene of the crime or was not involved in the assault (Sulley, 2023).

DNA technologies such as Polymerase Chain Reaction (PCR) and STR analysis are used in solving sexual assault cases. PCR amplifies DNA samples, while STR analysis compares DNA profiles from the suspect and crime scene. Combined with a national DNA database, these technologies provide accurate identification of perpetrators and can exonerate wrongly accused individuals. The use of DNA evidence in sexual assault cases has revolutionized the way these cases are investigated and prosecuted. In the past, sexual assault cases were often difficult to prosecute because of the lack of physical evidence and the victim's reluctance to come forward. However, DNA evidence has provided a powerful tool for law enforcement and prosecutors to identify perpetrators and build stronger cases in sexual assault (Sulley, 2023).

According to Sulley (2023), the emerging DNA technologies such as Next-Generation Sequencing (NGS) are being explored for their potential in solving sexual assault cases. NGS can generate complete DNA profiles from limited or degraded samples through proper ethical, sample collection and validation procedures. Forensic genetic genealogy involves the use of genealogical databases and DNA analysis to identify suspects in criminal investigations. DNA phenotyping uses genetic information to predict an individual's physical characteristics, such as eye colour or hair colour. Both technologies are increasingly being used to help solve cold cases and accurately identify suspects in sexual assault investigations.

Generally, forensic DNA analysis plays a crucial role in identifying perpetrators of sexual assault crimes and providing evidence to support the prosecution of these cases. Forensic DNA analysis can provide objective evidence to support the victim's account and refute any false claims made by the perpetrator. For instance, in cases of sexual assault on prostitutes, forensic DNA analysis can be particularly important. Furthermore, the social stigma attached to their profession can make it challenging for sex workers to report incidents of sexual assault or even seek medical attention. Also, due to the nature of their work, prostitutes are often in contact with multiple sexual partners. This can result in a lack of physical evidence making it difficult to identify a suspect without DNA evidence (Sulley, 2023). What is more, the researcher is also of the opinion that, while DNA evidence is regarded as one of the most crucial pieces of evidence, one must always keep in mind that its evidential value can also be easily compromised if it is not handled with care. From the time it is collected at the crime scene, to the forensic laboratory, and till it is presented in the court of law; its integrity should always be incontestable. As submitted by Gourarie (2018:08), Wyner, Barash and McNevin (2020:39), The Royal Society (2017:29), Sing (2021), and Singh (2018:71), the DNA evidence can be easily contaminated.

In as much as it is easy for the perpetrator to leave their traces, the same is also true to those who handle this evidence, and it therefore requires that great care must always be exercised not to compromise the integrity of exhibits found at the scene" (Wilson, McClure & Weisburd, 2012:98). With DNA gaining trust and reliance, defence lawyers will always tap into loopholes as it is their job to do so, and while mistakes do happen, all those involved in the chain of DNA evidence should always try to eliminate or minimise mistakes" (Lynch, 2013:101). What used to be a mistake a decade ago should not be a mistake now. Therefore, there should be continuous training and development in the field of forensics to sensitise members about the importance and the sensitive nature of DNA evidence material (Lonsway, Archambalt, O'Donnell & Ware, 2016:48).

Besides, the researcher submits that care should always be taken from the time of receiving a call about rape incident or any other contact. Members responding to calls should be thoroughly trained on how to handle and guide victims or those reporting on how to preserve evidence. The first responder to a scene should be well trained on how to approach a scene, how to manage a crowd, how to manage those who will try to assist while risking tampering with evidence. Rape in its nature is a cruel and vicious act of criminality. Therefore, members should be trained on how to deal with traumatised victims, their families, neighbours and friends who

will mostly be found at a crime scene. The researcher further provides that DNA FS tasked to identify and collect evidence should attend regular awareness programmes or workshops to align with the new developments and the new methods of operations by the criminals. DNA is undoubtedly the most effective tool in the hands of any justice system as submitted by different authors, but the opposite is even true. The opposite carries more weight as it can mean that the perpetrator is left on the lose because of technicalities, might or will commit more rapes or terrorise the victim even more, especially if there is an error in the chain of evidence.

Importantly, (Wilson, McClure & Weisburd, 2012:98, Lynch & Hancock, 2012:97, and Murphy, 2015:69) highlight the importance of DNA evidence. The world is adopting DNA evidence as the most reliable piece of evidence. However, if this reliance on DNA evidence leaves a gap in continuous training and development for those who are at the helm of handling and presenting it, then the gains of its progression will be hindered.

2.2.2 Selected shortcomings of DNA evidence during rape investigations

The researcher reveals that DNA has become a crucial tool for investigating and prosecuting rape cases, however, there are shortcomings that come with identifying, handling, transporting, and presenting, amongst others. Contamination of evidence during rape and murder investigations has been identified as the most common shortcoming during rape investigations. Small size or degraded samples may also not provide enough DNA for analysis, making it inconclusive results. Human error during collection, handling or analysis of DNA samples can also lead to inaccurate results. The researcher also notes that the backlog on rape DNA analysis is often contributed by the fact that it is expensive to do it under private laboratories. The researcher also shares that interpreting DNA data require high degree of expertise, and if not interpreted correctly, that may result in misinterpretation or costly errors during analysis.

Some experts have pointed out that there are limitations to the use of rape DNA evidence, particularly when it comes to collecting and interpreting evidence. For example, rape DNA samples can be contaminated or degraded, potentially leading to false results. Additionally, rape DNA samples may not always be available in cases where there is no clear physical evidence of rape. Furthermore, Waltke, LaPorte, Weiss, Schwarting, Nguyen and Scott (2018:98) submit that while DNA evidence is generally considered to be highly reliable, there are limitations to its use in rape investigations. For example, the DNA evidence may not be available in cases where there is no clear physical evidence. Additionally, there is a potential

for false positives or false negatives, which can lead to incorrect conclusions about a suspect's guilt or innocence. As a result, it is important to approach the use of DNA evidence in rape investigations with caution and a healthy degree of scepticism. Besides, Meintjes-Van der Walt and Dhliwayo (2021:48) state that "DNA can have a disproportionate impact in the CJS, where the use of DNA evidence can lead to higher conviction rates and longer sentences." In some instances, DNA evidence has been used to erroneously convict defendants where it was later discovered that the evidence was contaminated, misinterpreted, or unjustly gathered. This has led to calls for more caution in the use of DNA evidence and ensuring that corroborating physical or testimonial evidence be present well. Rasool and Rasool (2020:19) state that the sexual assault is becoming a global epidemic, affecting close to a billion women throughout the world. Delays in the medical examination of victims, and improper collection and packaging of evidentiary material, compromise the probative biological evidence. In the last few years, existing laws have been amended to increase the utility of DNA evidence during criminal trials.

However, various issues like lack of proper knowledge of DNA evidence by investigators and judicial officers, inadequacies in existing laws and conflicting decisions of apex courts can affect the admissibility of DNA evidence during criminal trials. While the scientific underpinnings of DNA analysis are robust, several factors hamper its application. A review of these factors is important, because there are mixed views on the capabilities and limitations of DNA among the public and stakeholders, including forensic experts (Skinner & Wienroth, 2019:30). According to the Royal Society (2017:36), of the crimes that involve DNA evidence, identity may not be in question, or the suspect/offender may have been identified by other means such as fingerprints, facial image, or witness/victim account." For example, in an alleged domestic sexual assault, the identity of the suspect may not be material to the elements of the case, albeit DNA may be recovered from the victim. This scenario may also apply to non-stranger sexual offences, assaults, and other offences. In such cases, DNA may only be used to confirm the identity of the accused and/or establish the *corpus delicti* (Elements of crime) of the alleged incident, such as whether sexual intercourse or a violent attack has taken place. Alshehhi and Haddrill (2019:231) confirm that biological traces from an individual may be deposited at an incident scene before, during or after an alleged crime has been committed. There is currently no robust methodology to determine the exact time of deposition of biological material. Furthermore, the activity that resulted in the deposit of biological traces may be complex to determine. The so-called 'activity-level' problem in

detecting a DNA trace, and even identifying precisely where it was deposited, is that it can still only rarely provide any useful information about what a person was doing when it was deposited. Research shows that biological traces can be deposited directly or indirectly, affecting the interpretation of DNA evidence (Szkuta, Ansell, Boiso, Connolly, Kloosterman, Kokshoorn & Van Oorschot, 2019:34). Waltke *et al.,* (2018:19) share that "DNA evidence is sometimes not usable or can be proved corrupt if the samples of bodily fluids have not been collected or transferred properly.

Therefore, the researcher further submits that there are cases where DNA evidence has been falsified by law enforcement officers, to ensure a conviction. Even if the integrity of samples can be confirmed, DNA evidence can prove only certain things. If DNA belonging to the accused person is found at the scene of the crime or on the body of the victim, it proves they did spend time together. It may even prove they engaged in sexual activity, but the DNA itself cannot prove the sex was not consensual. It also does not rule out other possibilities, for example, a victim also may have engaged in sexual activity with someone else who could be the person who committed the assault. Clearly, rape is a growing thorn in South Africa and needs to be prosecuted without fear, favour, or prejudice. In the year 2023, the Minister of Police indicated that the South African CJS has been failing to prevent rape cases from occurring, hence more women and children continue to be abused. For rape cases to be prosecuted and a conviction to be secured, reliable DNA is of utmost importance because DNA evidence is the most reliable evidence employed in a trial to corroborate the evidence presented before a court. If the DNA test results come out negative despite having sufficient evidence, it may lead to acquittal or withdrawal of the case. As a result, in the same year (2022), the Commission for Gender Equality (CGE) held a meeting with the NPA, wherein the NPA raised its concerns in respect of prosecution and securing convictions (Madalane, 2023).

Moreover, Meintjes-van der Walt and Knoetze (2015:74) state that the DNA evidence is among the most valuable pieces of evidence used in criminal cases." No two people have the same DNA, meaning that the use of such evidence can prove either a person's innocence or guilt with great accuracy. While this powerful tool has helped exonerate wrongly convicted defendants, it can also damage a person's case if it is not properly obtained and handled. Meintjes-Van der Walt and Dhliwayo (2021:74) point out that the sufficiency of DNA evidence alone, regarding convicting accused persons, has been interrogated and challenged in criminal cases. The availability of offender databases and the increasing sophistication of crime scene

recovery of evidence have resulted in a new type of prosecution in which the State's case focuses on match statistics to explain the significance of a match between the accused's DNA profile and the crime-scene evidence. Several such cases have raised critical jurisprudential questions about the proper role of probabilistic evidence, and the misapprehension of match statistics by courts.

To stress the shortcomings in DNA analysis, Meintjes-Van der Walt and Dhliwayo (2021:19) contend that:

> *"A case of State (S) V Maqhina, where the court failed to find the objective reliability of the DNA results presented to the court due to the fact that the expert of the SAPS FSL had not followed appropriate standard protocols, the person(s) conducting the tests were not suitably qualified, the expert of the SAPS FSL had failed to run certain duplicate tests, which according to the defence expert, made it impossible to determine the reliability of the test and lastly that the SAPS FSL where the analysis was conducted was not an accredited laboratory."*

The researcher is of the opinion that although DNA is currently the best investigation tool during rape investigations, the shortcomings associated with it are too critical to be ignored. The current and biggest shortcoming of DNA as per the previous discussions is its inaccessibility. DNA is currently seen as a luxury, its accessibility is limited, and even when samples are collected and submitted for analysis, and the process takes too long, due to the backlog. Starting from the collection of samples from the crime scene. DNA is complicated though crucial, and it needs a thoroughly trained eye to identify, secure, collect, transport and ensure that its integrity is maintained until presented in court. Furthermore, for the purpose of this study, the researcher interviewed SAPS *Galeshewe* investigators in 2019. They all echoed the same sentiments that they are mostly sent out to crime scenes, especially rape and murder scenes, and when they get to the crime scene, they are mostly not equipped with the right equipment.

In accordance with the same study conducted by the researcher in 2019, the interviewed participants also claimed that they are never sent to attend courses that really help them to understand the process of DNA evidence collection. It was their admission that, more than often, their evidence gets attacked and dismissed by the courts, particularly on technicalities during sample collection. This answers the question of why there is such a low conviction rate in rape cases in the Northern Cape Province, as well as elsewhere in the country. This is a

shortcoming that needs to be addressed decisively. While DNA is an important tool during rape investigations, it is not without limitations. Investigators and all those involved in the value chain of DNA analysis must be fully aware of the challenges or shortcomings and always mitigate their impact on the investigation outcome.

2.2.3 The use of DNA evidence during rape investigations

The DNA application and dependence in assisting investigators to identify and arrest those who have committed sexual crimes are gaining thrust globally. It is therefore undeniable that DNA evidence is a significant tool in resolving not only sexual crimes, but also other contact related crimes. According to Wilson *et al.,* (2012), DNA is the most accurate and reliable mode of identification used during investigation of rape cases, with higher levels of certainty compared to other modes. Wilson *et al.,* (2012:39) argue that there are several other traditional methods such as footwear prints, eyewitnesses and victim statements, for example, but the overall strength of these methods diminishes in cases where there is no DNA evidence presented in support. Newton (2013:26) highlights that "DNA evidence is currently considered as one of the most dominant pieces of evidence for legal convictions in almost any court of law globally during rape and murder cases." Newton (2013:27) further cites that:

> "*What separates DNA from other evidence material is that it is always there, and it is conclusive; however, the presence of DNA alone does not prove rape; therefore, DNA, examined together with other evidential material such as lack of consent from the victim, violence and trauma, becomes critical in securing a valid conviction*."

Machado and Silva (2012:56) support Newton (2013) by sharing that the advent of DNA evidence is one of the best examples of how much technology has altered criminal justice for the best, particularly its effectiveness in exonerating the falsely accused. Machado and Silva (2012:56) further submit that "assuming that investigators properly collect and handle DNA evidence with critical analysis; DNA evidence is extremely accurate compared to any other piece of evidence." Lynch (2013:93) supports the submissions by both Newton (2013), Machado and Silva (2012) by indicating that the efficacy of DNA compared to any other evidential material during rape investigations, is much more solid, as the chances of an individual's DNA profile matching other persons are extremely small, about one in a billion, by some estimates. Lynch (2013:93) further opines that "because of DNA accuracy, criminal

lawyers around the world increasingly rely on DNA evidence more than on any other evidence, whether to support or argue against conviction and it is the most effective evidence material in proving the guilt or innocence of suspects. Richardson (2012:17) indicates that DNA evidence is often viewed as conclusive evidence and in most cases, it is regarded sufficient evidence of guilt." The DNA is also closely related to solving and prosecuting sexual offenses, because the physical nature of these crimes makes it especially likely that the perpetrator's genetic material will be found at the scene. Richardson (2012:18) alludes that because law enforcement officers have historically neglected the prosecution of rape and other sexual assaults, most lawyers believe that the law enforcement's recent increased use of DNA indicates greater attention to the problem of sexual violence and by default, the DNA significance increases hastily.

Huffman, Hanson and Ballantyne (2021:210) add that DNA effectiveness over any other biological exhibit is strongly supported by the endless, robust, scientific research data and continuous development of quality standards. These have ensured that DNA evidence provided is accurate, and results are most often highly reliable. What is more, Lonsway *et al.,* (2016:7) however argue that "many investigators and prosecutors only see DNA evidence as useful in stranger sexual assault cases, as a means of establishing or confirming the suspect's identity." This perspective fails to recognise the many purposes of DNA, especially in the majority of sexual assault cases where the victim and suspect know each other. Lonsway *et al.,* (2016:7) suggest that change is needed for investigators and prosecutors to stop viewing DNA as a means of confirming what they already know; they should instead appreciate its value for advancing an investigation by producing leads and corroboration, as well as identifying and excluding suspects.

Based on the information submitted by Wilson *et al.,* (2012), Newton (2013), Machado and Silva (2012), Lynch (2013), Richardson (2012) and Huffman, Hanson and Ballantyne (2021), it can be deduced that the DNA evidence is undoubtedly the most effective tool to apply during rape investigations. What also separates DNA evidence from other evidential materials is that it is always there and always available, as it can be recovered and extracted from many sources and areas including from the victim themselves to guide the direction of the investigation. The researcher's opinion is also informed by the submission of the Locard's Principle, which states *"when two objects come into contact, there will always be traces of evidence left on both."* This statement by Locard is best suited to be stressed to investigators and any persons responsible for investigations, specifically for rape investigations. The courts are now relying

more and more on DNA as a tool that provides conclusive evidence, which helps the courts to arrive at the best and correct decision during the sentencing process. As highlighted by Lynch (2013), Richardson (2012), and Huffman, Hanson and Ballantyne (2021), DNA is a silent witness that cannot lie, it is then essential that this piece of evidence and its analysis is conserved, and that there should be continuous development and training for those involved in the value chain. There have been great improvements from the time DNA was first discovered and applied during the investigation of contact crimes, it has proven to be of great importance in discovering hidden facts. The improvements on DNA analysis and utilisation must move along with personnel improvements to ensure that there is no gap between the two.

2.3 SOURCES OF DNA EVIDENCE DURING RAPE INVESTIGATIONS

Dintwe (2009:73) highlights that rape is one of the contact crimes where the victim and the perpetrator will surely touch each other. Owing to the contact, there are usually many traces that can be found at a rape scene. These exhibits may be barely visible, or minute in nature. Due to this nature, most of these can be cross transferred easily from one surface or substrate to another, without detection by the criminal. Cigarette butts, knives, clothes, hair fibres, nails, together with a host of other exhibits, can be found at a scene of crime. Additionally, Horswell (2004:98) states that in every crime against people, as in sexual assault, the contact between the perpetrator and the victim, or his/her environment, or both always leaves evidence, which is transferred from the perpetrator to the victim, to the scene, and vice versa. Horswell (2004:98) further argues that DNA evidence, in the broadest sense, is any item or information about a suspected crime, which is relevant to an investigation to find the truth of the facts." It may be useful to achieve the following: **1)** Police investigation; **2)** Provide a reliable identification of the perpetrator; **3)** Exonerate a suspect or an accused from a crime; **4)** Support or contradict a victim's, witness', or suspect's statement and, consequently, promote police to conduct further investigations; **5)** Provide information about the crime scene; and; **6)** Provide proof that attests to the occurrence of the alleged event.

Lynch and Hancock (2012:48) explain that the DNA, when compared to all other sources of evidence during sexual crime investigations, does more than merely identify the source of the sample; it places a known individual at a crime scene, in a home, or in a room where the suspect claimed not to have been. Lynch and Hancock (2012:49) further stress that DNA is always there, whenever a crime has been committed. Therefore, the following diagram displays locations and sources where DNA can be found and collected during rape investigations.

Table 3: Sources of Deoxyribonucleic Acid during rape commission

Locations of DNA	Sources of DNA
Bite mark or area licked	Saliva
Fingernail scrapings	Blood or skin cells
Inside or outside surface of used condom(s)	Semen or skin cells
Blankets, sheets, pillows or other bed linen	Semen, sweat, hair or saliva
Clothing, including undergarments worn during and after the assault	Hair, semen, blood or sweat
Hats, scarves, gloves or masks	Sweat, skin cells, hair or saliva
Tissue, washcloth or similar item	Saliva, semen, hair, skin cells or blood
Cigarette butt, toothpick, bottle rim, can or glass	Saliva
Dental floss	Semen, skin cells or saliva
Tape or ligature	Skin cells, saliva or hair

Source: Lynch (2013:94)

Table 4: Selected essential sources of Deoxyribonucleic Acid during rape investigations

Physical evidence	Places within the articles	Source of DNA
Hair	Root	Tissue
Clothing	Surface	Blood, Semen, sweat, saliva
Head comb	Surface	Sweat, hair, tissue
Consumed cigarette	Cigarette butt	Saliva
Razor	Blades	Tissue, hair root.
Gloves	Interior and exterior	Sweat, tissue
Bottle or sipper	Mouthpiece	Saliva
Toothbrush	Surface	Buccal tissue, saliva
Hat or mask	Inner surface	Sweat, hair
Used condom	Interior and exterior	Semen and vaginal cell
Knife	Surface and handle	Sweat, blood, tissue
Ligature	Surface	Skin, tissue
Bed sheet /blanket	Surface	Blood, Semen, sweat, saliva, urine
Toothpick	Tips	Saliva
Bullet head	Surface	Blood
Bite mark	Person's skin	Saliva
Fingernail	Scraping	Blood, skin
Dandruff	Whole	Cell debris
Eyeglasses	Ear and nose pieces	Sweat, tissue
Used Glass/ cups	Surface	Saliva
Shoes or socks	Inner surface	Sweat

Physical evidence	Places within the articles	Source of DNA
Chewing gum	Surface	Saliva
Tobacco spits	Stains	Saliva
Urine and faecal matter	Whole	Cell

Source: Sing (2021:39)

Apart from the reflections made in Table 2, there may be other locations that are not depicted on the diagram, which may be crucial for DNA evidence material (Lynch & Hancock, 2012). Lynch (2013) guides that most of the evidence during rape incidents will be found inside a victim's body. This evidence should be collected by a physician or sexual assault nurse examiner. Medical examinations should be conducted immediately after the assault to treat any injuries, test for sexually transmitted diseases, and collect forensic evidence such as fingernail scrapings, hair, and more. Lynch (2013:49) identifies the vaginal cavity, mouth, anus or other parts as the most critical parts of the body that may have come into contact with the assailant, and states that, they should be examined. Butler (2015:23) echoes that as technology advances, SAPS FS are now able to analyse smaller biological samples to develop a DNA profile, for example, if a person touched an object or weapon, skin cells may have been left behind. This low-level DNA is sometimes referred to as 'touch DNA.' It can even be collected from a victim's skin or bruises where they were handled roughly. Low-level DNA samples are remarkably helpful when examining evidence where it would be difficult to retrieve fingerprints, such as textured surfaces. Therefore, the following sources of DNA evidence during rape investigations formed a crux for this study:

- **Saliva**

According to Fisher (2004:23), saliva during rape investigations can be described as the kind of evidence that can prove an amount of evidence, which can lead an investigator to finding the culprit. Evidence from saliva may be found at the rape scene from cigarette butts, chewed matchsticks, ashtrays, toothpicks and chewing gum. Kobilinsky, Liotti and Oeser-Sweat (2005:83) argue that the strength of the use of saliva during investigation of rape cases is its presence; it is always there. Saliva at a rape scene can be obtained from inter alia, cigarettes and/or cigarette butts, glasses, eating utensils and bite marks (i.e., From the victim and/or the victim's mouth or body).

- **Semen**

Fisher (2004:12) states that the semen may prove to be evidence in some crimes, but its importance as evidence is most common and more valuable during rape case investigations. Similarly, Horswell (2004:13) showcases that "the presence of seminal fluids and spermatozoa in particular, is critical in a rape case scene, as it is undisputable evidence of sexual connection." The critical source of DNA found in any spermatozoa heads could provide evidence of identification. Gilbert (2004:19) and Horswell (2004:37) concur that the existence of semen and discovery of spermatozoa is extremely significant to the worth of semen as a tracing clue and can be detected on clothing despite washing. In several cases involving sexual assault, traces of semen will always be left behind on the victim's body, clothing and the location where the assault took place. Swab samples may be extracted from parts of the victim's body with which the alleged perpetrator is believed to have made contact. Semen is that element which simply proves that a sexual sperm release occurred; however, it does not necessarily suggest that rape took place (Cooper, Spruce, Webb & Borowitzka, 2014:38).

- **Blood**

Where the rape was committed with violence, it is likely that blood will be present at the crime scene. The blood may be from either the victim or the perpetrator, and that same blood might be used as a nodal point for investigation of a rape case. Hazelwood and Burgess (2001:91) provide that the presence of blood at a rape scene may give answers to what actions occurred, when they occurred, in what order they occurred, who was present during the event, what happened, and how it happened. In the same tone, Butler (2015:121) states that the blood is the most frequently tested substance in the forensic laboratory and is very common at rape scenes. Likewise, Hazelwood and Burgess (2001:101) argue that "blood is mostly the major evidential substance during sexual assault case investigations.

- **Hair**

Perpetrators tend to cover their faces so as not to be identified when they commit an offence. In most cases, during the struggle between victim and perpetrator, the perpetrator leaves an important clue, either hair or dandruff, which is later tested as DNA evidence to prove the perpetrator's presence at the scene. Gilbert (2004:21) provides that the significance of hair as evidence can in most cases only be associated with class characteristics, and not

individualisation of the perpetrator, if the root material of the hair is damaged or lost, since DNA can only be found in the root of the hair.

- **Vaginal swabs**

One of the most critical biological pieces of evidence most often sought in specimens from rape victims is the identification of spermatozoa. The absence of spermatozoa habitually dismisses biological investigation, and the testimony of the victim can be contested. Vaginal swabs are obtained from the rape victim, and they will reveal the presence of the spermatozoa. The perpetrator's DNA profile can be obtained from the swabs as proof of penetration or rather, the presence of the suspect. Vaginal swabs need to be collected within 72 hours of the rape, for full DNA evidential value. Swabs are mostly taken from the vaginal parts and any other parts where the suspect might have ejaculated (Savino & Turvey, 2005:78). It should be noted, however, that not detecting sperm in the vaginal swab content of the raped person does not exclude the possibility of them having had sexual intercourse, or a penetration of the penis, without ejaculation (Horsman, Bienvenue, Blasier & Landers, 2007:19).

According to Medwed (2017:67), a variety of DNA-containing material may be present at the scene of a crime, like blood, semen, hair pulp, saliva, tissue and cells, hair, bones and teeth." Such evidence should be collected by appropriately trained police officers or crime scene examiners. It is the responsibility of a medical examiner to collect and preserve evidence obtained from the body of a victim and perpetrator. In cases of sexual assault, the medical examination will be focused on the mouth, anus and genitalia of the individual. Medwed (2017:67) further provides that the importance of the correct methodology being used for the initial collection and preservation of biological material from the crime scene, stating that the methodology may become grounds for challenging the admissibility of the evidence provided in court.

Though Meintjes-Van der Walt and Dhliwayo (2021:43) collectively agree that the proper collection and documentation of evidence are important, they disagree that admissibility may be affected by the methodology may be challenged in court. They submit that the relevant evidence will generally be admitted in court and that the issue to be determined by the trier of fact will be the weight to be attached to such evidence. Williams, Panacek, Green, Kanthaswamy, Hopkins and Calloway (2015:22) reveal that after sexual assault there is a limited amount of time before the DNA evidence on the surface of the victim's body is not

recoverable.” During an assault, the offender may leave saliva on the victim's skin. Traditional examination methods use a swabbing technique to collect saliva for DNA testing. Victim activity, especially hygiene activity such as showering, may negatively affect DNA recovery.

Furthermore, the DNA evidence has been summoned in cases where all other evidence pieces were proved not to be aiding the justice system in either convicting the perpetrator, freeing the innocent, or just finding the answers as to what really transpired during the commission of the crime [Rape in this regard] (Dintwe, 2009, Sing, 2021; and Singh, 2018). On the other hand, DNA evidence is gaining attractiveness for its ability in solving cold cases where all hope has been lost. This is since the DNA evidence is always there and is mostly conclusive. As submitted by Dintwe (2009), Horswell (2004), Lynch and Hancock (2012), Lynch (2013), Butler (2015), Medwed (2017), Meintjes-Van der Walt and Dhliwayo (2021), and Williams, *et al.* (2015), there are several sources from which DNA can be extracted, and which assists significantly during rape investigations.

It is however important to stress that DNA evidence should not substitute or replace other evidence materials, instead it should complement them. It is a combination of a few factors that ensure that the right person accounts for crimes committed, or the innocent is freed from the crime of which they are accused of. In this case, it is equally key for investigators to be trained in all investigation processes from the time they are dispatched to the crime scene until the evidence is presented to the court. Therefore, the SAPS recruits new members each year and during the financial year 2022/2023 they are boosting 10 000 00 new recruits. But from the 10 000 00, it is only a small percentage that goes to specialisation whether for investigations or analysis. The DNA will always be existing, as echoed by Lynch and Hancock (2012), Lynch (2013), Butler (2015), Medwed (2017), Meintjes-Van der Walt and Dhliwayo (2021). However, those who are tasked with the responsibility to find, collect, transport, analyse and present evidence to the courts play a significant role. Equally, there is a necessity for prosecutors and defence lawyers to become acquainted with the developments in forensic science pertaining to DNA to ensure that they have the understanding and adequate knowledge when presenting or challenging DNA evidence.

2.4 MAINTENANCE OF CHAIN OF CUSTODY FOR DNA EVIDENCE DURING RAPE INVESTIGATIONS

Rasool and Rasool (2020:38) share that from identification of DNA materials to the time they are collected and sent to the Forensic laboratory, the aim is to identify any biological evidence

that may link a suspect to the crime. Collected samples are sent to a forensic laboratory for testing, where they are evaluated and analysed to achieve positive identification. The analysis process aims to provide a match between the suspect and the DNA materials found in the crime scene or the victim's body. It is however worth noting that the collection process of DNA samples during rape investigations must be guided by strict guidelines to prevent further victimisation or accusations of victimisation, and contamination of evidence. Therefore, it is always advisable that even when there is visible evidence, only trained personnel should collect such evidence. Moreover, in a case where the evidence is exposed to potential compromise, those at the scene must try their level best to protect it. No crime scene is completely free of evidence because criminals invariably bring something into the scene and leave something behind. An inability to find and collect physical evidence does not mean that it is a perfect crime, and reliable physical evidence can always be found. Technological developments have revolutionised forensic sciences, particularly forensic DNA profiling (Rasool & Rasool, 2020:48).

Besides, one of the cornerstones of the judicial process is the presentation of evidence in a court of law. The integrity of evidence is vital to reassure the courts that the correct procedures were followed throughout all the processes it was subjected to, from the time it was collected at the crime scene, through transportation, until it reaches the analysis centre. In South Africa, the SAPS FSL in Pretoria analyses and stores evidence. Storage facility should contribute to the prevention of evidence contamination or degradation, thereby also leading to improved service quality and output. Proper delivery of evidence can lead to the conviction of suspects and to the freedom of the innocent. The preservation of the integrity of DNA evidence is thus a continuous responsibility from the time it is discovered until the time it is presented in court, or until the final settlement of the case determines its disposal (Mphephu, 2022:15).

De Wet, Oosthuizen and Visser (2011:23) state that the DNA evidence is currently at the forefront of the list of evidence pieces employed in criminal trials. To ensure its optimum use in criminal proceedings, it is imperative that the legal fraternity be properly conversant with the scientific basis, handling and presentation of such evidence, and with its potential pitfalls. The application of DNA technology has caused a revolution in the field of forensic science and investigation. The scope of a complete DNA analysis consists of identification, collection, storage, transportation and interpretation. Many times, due to a lack of scientific knowledge on the part of the investigator, DNA evidence is compromised or destroyed at the scene, during

collection and transportation of evidence and during its storage (Sing, 2021:37). Sing (2021:37) further stresses that many factors contribute to the generation or degeneration of good DNA evidence; therefore, careful collection and storage of biological samples can provide useful information during DNA analysis.

Additionally, Butler (2015:87) states that the integrity of a biological sample is very important in any forensic casework. Biological contamination of evidence from another source is a very real possibility, especially when dealing with trace evidence. Consequently, precautions should be taken to avoid contamination of evidence during sample collection for DNA analysis, and this can be done by wearing full protective suits, face masks, disposable hand gloves before touching any evidence, and changing the gloves between handling different items. Therefore, investigators should use disposable instruments or clean them thoroughly before and after handling each sample. They (Investigators) should avoid touching the area where they believe that DNA may exist, and must avoid talking, sneezing and coughing over evidence, and touching their face, nose and mouth when collecting and packaging evidence.

Butler (2015:88) also advises that investigators must always put evidence into new paper bags or envelopes, not into plastic bags, and each piece of evidence should be packaged separately in paper bags. Biological evidence with forensic interest may be found in several cases of assault, being particularly relevant if sexually related. Sexual assault cases are characterised by low rates of disclosure, reporting, prosecution, and conviction. Additionally, Ferreira-Silva, Porto, Magalhães and Caine (2019:92) argue that biological evidence is sometimes the only way to prove the occurrence of sexual contact (Rape) and to identify the perpetrator, therefore, attention should be devoted to avoiding contamination, degradation, and loss of biological evidence, as well as respecting specific measures to properly handle evidence (i.e. Selection, collection, packing, sealing, labelling, storage, preservation, transport, and guarantee of the chain custody).

Biological evidence must be carefully managed since the relevance of any finding in Forensic Genetics is determined, in the first instance, by the integrity and quantity of samples submitted for analysis. This is supported by Ferreira-Silva *et al.,* (2019:3) who claim that the DNA analysis is highly beneficial to the court, as it provides comprehensive and just legal proceedings. Identification and collection of evidence, knowing that the patient's body is the crime scene, is a significant point for investigators; therefore, evidence must be identified, collected, packaged, secured and maintained correctly, in ways that are beyond reproach,

following strict chain of custody rules. Matheson (2015:11) suggests that evidence does not officially exist until someone recognises an item's potential value to the investigation and prosecution of this crime. Locating and collecting evidence must be done in a way that does not alter it in any way or cause the alteration of other evidential items around it. Contrarily, there is no technology that can resurrect evidence which has not been properly handled through its life cycle. DNA is a type of evidence that can be found on several exhibits, and because of that, it is very easy to tamper with or contaminate. It must therefore always be properly documented, handled and analysed.

Matheson (2015:16) highlights that for anyone to properly maintain the condition and integrity of evidence, they will require knowledge of the best way to package each type of evidential item, and all aspects of evidence handling must be meticulously documented throughout its life, to ensure that it retains its value to the CJS. According to Alghafri, Pajnič, Zupanc, Balažic and Shrivastava (2018:29), biological evidence from a rape scene needs to be collected carefully, transported and stored properly prior to its being presented in courts. Most biological evidence is best preserved when stored dry and frozen. Contamination in the context of DNA analysis can be defined as the introduction of extraneous DNA (Or biological material containing DNA) to a sample. The DNA profiling process is extremely sensitive and constant vigilance is required to ensure that contamination does not affect the results. Because of this sensitivity, contaminating DNA may still be observed even with careful precautions, and will routinely be monitored in laboratories. Forensic scientist must use all the information available to them to assess whether a contamination event, if it occurs, has had an impact on the results in a specific case.

Alghafri *et al.,* (2018:73) further add that the analysis of DNA is the most preferred, and often considered to be one of the most reliable, methods in forensics and criminal investigation. Forensic DNA typing is used in a wide variety of cases for proving guilt and innocence. From the time of lifting the exhibits at the crime scene or recovering the pieces of evidence from the victim or suspect, their transportation, laboratory analysis and reporting, while maintaining the chain of custody, are the tasks which are extremely critical and need to be taken care of by investigators. All these steps should be free from contamination and cross-contamination. The Royal Society (2017:19) affirms that the biological materials present at crime scenes first need to be detected, and these biological materials may be identified visually, by chemical analysis/test/reaction or with the use of different types of light source. Sometimes an approach

to testing is more intuitive and relies on the investigator's expectations of where a person may have handled an object depending on the circumstances of each case. One of the most common methods for collecting biological material from hard surfaces (i.e., Such as a broken window or a knife) is using a swab. A swab is moistened with sterile DNA-free water, and then rubbed over the surface to be sampled. This might be followed by a second swab to ensure that any remaining material is collected. The Royal Society (2017:19) explains that the biological material exhibits might be collected from fabrics by cutting out a stain or by using sticky tape to collect surface material (i.e., Such as from the collar of a shirt). Therefore, in choosing sampling sites for material not visible to the eye, such as cells left by handling an object, an investigator will use their knowledge of the circumstances to determine where to collect the material. For instance, if an assailant has grabbed a bag, the area of the bag which was grabbed will be sampled, or if an assailant has tied a ligature around a complainant's/complainer's neck, the areas where the ligature will have been handled most in tying the knot will be sampled. In allegations of rape or sexual assault, the victim will be medically examined, and will have intimate samples, such as from the vagina or anus, and swabs of any skin areas alleged to have been touched or licked by the perpetrator, taken by a medical practitioner.

Furthermore, Meintjes-Van der Walt and Dhliwayo (2021:24) reach a consensus that DNA analysis process is extremely sensitive, and relentless care against contamination is a must factor. Investigators or specialists collecting evidence can contaminate samples if proper care is not taken. In addition, one of the manners in which contamination could occur at a crime scene include an investigator or crime-scene examiner not changing gloves between handling different exhibits or talking without a properly fitted face mask. Likewise, a scientist analysing the DNA can inadvertently add their own DNA to the sample. It is important that all disposable items (i.e., For example, swabs) and all chemicals and kits used in the analytical process are free from DNA before use. It is critical that investigators ensure that, during the arrest of suspects, cross-contamination between suspects, police officers, potential victims and by-standers and the crime scene is avoided at all costs, for example, a suspect in relation to a sexual assault should not be transported in the same vehicle as was previously used to transport the victim. Similarly, if multiple suspects are arrested, they should be processed, detained and biological samples taken separately.

If intimate samples are to be taken, they should be taken by different medical practitioners in different facilities" (Meintjes-Van der Walt & Dhliwayo, 2021:24). According to De Wet,

Oosthuizen and Visser (2023:62), transporting DNA evidence in a secure and controlled manner is crucial to maintaining its integrity and ensuring that it can be used as reliable evidence in a court of law. De Wet *et al.,* (2023:26) provide the following useful guidelines on handling rape DNA evidence during transportation:

- **Packaging:** Immediately after identification, DNA evidence should be properly packaged and labelled to avoid contamination or degradation during the process of transportation. This means using sterile swabs, paper envelopes or approved plastic bags, and sealable containers that protect DNA materials from temperature changes, moisture, and other environmental factors.
- **Chain of custody:** Maintaining a strict chain of custody is essential to ensuring that DNA evidence remains intact throughout the transportation process. The chain of custody should be documented at every stage of transportation, from collection to delivery at the SAPS FSL.
- **Security:** Transporting DNA evidence requires a high level of security to prevent theft or loss of evidence. Transporting DNA samples should be done only by authorised personnel, with proper security measures such as tamper-evident container seals.
- **Global Positioning System (GPS):** tracking, and locked storage during transportation.
- **The SAPS FSL delivery:** Delivery of the collected DNA evidence must be carefully tracked and managed to avoid any loss of evidence. The delivery must be time-bound, preferably by a recognised courier company or law enforcement personnel.
- **Liability:** Transporting DNA evidence can come with significant legal liabilities, which must be factored in when planning for transportation. Agencies or personnel tasked with the transportation process must ensure that they are adequately insured and that they have established policies and procedures that protect both the victim and the suspect from accidental or intentional mishandling of evidence.

In addition, the recent murder case (*Still in progress*) of the late *Bafana Bafana* and Orlando Pirates goalkeeper, Senzo Meyiwa, *refers:* The DNA evidence presented in court by the forensic expert, Sergeant (Sgt) Thabo Mosia, came under a great deal of attack, due to the manner in which he collected the evidence, including the fact that he failed to collect the DNA evidence on the first day, only to come on the second day to collect it (De Wet *et al.*, 2023:03). Moreover, the way in which he packaged, transported, stored and presented the evidence in

court was questioned and is most likely to be rejected. Sgt Mosia collected what he viewed as important evidence on the first day and then realised the following day that he might have left other important evidence materials at the crime scene. Sgt Mosia then came back on the second day with the intention to collect more evidence only to find out that there had been movements and interference from the time he left the crime scene. Sgt Mosia kept the evidence in his car instead of storing it in an approved storage facility. Even though this case has not reached a verdict, it has been a clear and a profound lesson to investigators, particularly in relation to DNA evidence. Moreover, it is important to note that handling of DNA evidence plays a crucial role to ensure conviction and that mishandling it can be negatively impact the outcome of a case in a court of law. Sgt Mosia came under a lot of attack and the profession of forensic investigators including the South African Police Service Investigators were put under a huge spotlight (De Wet *et al.,* 2023:04).

According to the researcher, there are several other cases where evidence is attacked and get to be thrown out of court due to the lost integrity during the chain of custody. This gives an expensive lesson to the entire justice system not to mention the impact to the victims and their families. It is therefore the researcher's recommendation that the aspect of identification, collection, transporting and presenting should be treated with great caution. In illustrations, some notable finalised rape cases are recorded in the Northen Cape Province as follows:

- A 56-year-old Northern Cape man has been sentenced to 115 years in prison for sexual offences against minors. The NPA Spokesperson for the Northern Cape Mojalefa Senokoatsane said the man was convicted in the De Aar regional court of numerous charges, including rape, compelled rape, sexual assault and possession of 734 images and 172 videos of child pornography. With the insurmountable evidence against the accused, he pleaded guilty to all 18 counts. The accused was arrested after a minor male victim who was living with the accused reported at school that he started experiencing sexually inappropriate behaviour from the accused. Further investigations revealed that the accused started sexually abusing young boys as young as 11 in 1999 (Hancke, 2024).
- In another incident which occurred in Kimberley: 08 February 2024, the Northern Cape SAPS management welcomes the 18-year rape sentence that was handed down to a 27-year-old uncle from Platfontein in Kimberley. It was alleged that on 27 September 2021 at 18:45, the 12-year-old victim disclosed to her grandmother that her uncle raped her. The victim asked the uncle to assist her with washing her clothes at his house when the

incident happened. The accused was arrested and remained in custody until he was sentenced to 18 years for rape in the Kimberley Magistrates Court on 31 January 2024 (SAPS, 2024).

- A man (18) has been sentenced to seven years imprisonment by the De Aar Regional Court for raping a girl (17) in Colesberg. The Northern Cape police spokesperson, Lieutenant (Lt) Colonel (Col) Sergio Kock said, on 1 September 2023 at approximately 6:30pm, the victim attended a party with friends. The victim woke up later that evening at her aunt's house in Colesberg and found one of the men who attended the party, busy raping her, the victim screamed for help and alerted her aunt (Maje, 2024).
- A 60-year-old Northern Cape man was sentenced to five (5) years imprisonment for raping a 13-year-old girl inside his shack. The incident took place on July 19, 2021, at around (5.30 P.M), when the girl was sent by her mother to fetch goods at a neighbour's home in Modderrivier. The girl's mother found her inside the shack and immediately reported the matter to the police and the suspect was arrested hours later. The accused was recently sentenced to five years imprisonment for statutory rape by the Kimberley Magistrate's Court (Hoo, 2024).

2.4.1 Challenges faced by relevant stakeholders during rape investigations

The process of investigating rape cases remains an important phase of attempting to solve this crime and ensuring that the potential perpetrators face their consequences and possibly brought to book. Importantly, time is regarded as one of the essential tools of solving rape crimes. Thus, the rate of attrition in rape crimes is directly linked to how efficient the investigations are conducted and how much evidence is gathered (Gordon & Collins, 2013:98). In most cases, there is little evidence to convict someone, or the evidence is contaminated because a lot of time passes before all the evidence is put together. Moreover, the delays that are normally experienced in efforts to solve most rape cases are a clear testimony of the many challenges that the police encounter in their investigations. The nature of most rape case investigations is that constables normally lead in half of the cases.

South Africa has one of the highest rates of rape in the world. According to figures collated by World Population Review (WPR), a United States (US)-based organisation that gathers and collates data globally, experts acknowledge that, it is difficult to quantify such numbers, given the widely varying definitions of rape from country to country and the prevalence of underreported cases by victims to avoid stigmatization. The number of reported rapes was

about 72.1 rapes per 100,000 people in 2019-2020, according to the South African Police Service. Disturbingly, most rape survivors often do not report rapes and conviction rates are very low, Bhobo (2022). According to (Bhobo, 2022), one problem in prosecuting sexual assault offences, including rape cases in South Africa is that its national DNA forensics technology system is slow in processing thousands of samples. Delays make it more difficult for authorities to keep a repository of samples, which could lead to quicker convictions and less lengthy court proceedings, according to Molline Marume, United Nations (UN) Women's Pretoria-based programme specialist on ending violence against women. Notably, quick processing of DNA samples enables courts and police to add convicted rapists to the National Register for Sexual Offenders database, a digital repository created in 2007. The DNA evidence carries weight in court, therefore, if there are problems with the technology, she added, "it gives the perception that they [offenders] can get away with committing such crimes. While South Africa's rape statistics are grim, some hopeful changes have emerged in recent years, Marume said. "Some positive inroads have been made," she said, such as the establishment of a joint project between the South African NPA and the SAPS FSL and LCRC. The project has helped prioritize court-ready cases, she added, noting: "A total of 12,283 cases of rape and murder cases were prioritised as per requests and responded to, from August 2021 to July 2022.

Furthermore, there are many cases where the police investigation and documentation of physical evidence are found to be deficient. A deficient docket might be missing important details like the names and addresses of the crime victim or other important details relating to the actual crime. The DNA and a lack of political will are not the only problem in victims pursuing justice against their rapists. Police themselves have been accused of such abuse. Since 2012, SAPS officers have been accused of committing nearly 1,000 rapes, some of which allegedly occurred within police custody, according to the South Africa Independent Police Investigating Directorate (IPID), a government body. A report from the directorate in 2020-2021 registered 95 cases of rape by police nationwide, 15 of them allegedly having taken place in police custody (Bhobo, 2022).

The Advocacy Group, namely, Lifeline, states that the South Africa's DNA backlog is crippling the CJS, with more emphasis placed on the DoJ & CD, the justice system's ability to successfully prosecute perpetrators of rape. The police minister (Bheki Cele) revealed that over 10 000 rape cases were opened with police, between July and September 2022. The DNA backlogs have been reduced to 71 000 from just over 240 000. He promised that the DNA backlog will be cleared by January 2023. However, Lifeline's director of advocacy, Sinikiwe

Biyela, responded that the figures are not a true reflection of the challenges women and children face (Milazi, 2022).

Machisa, Jina, Labuschagne, Vetten, Loots, Swemmer and Meyersfeld (2009:12) establish that in the rape cases they studied, there were numerous irregularities that made it difficult for these cases to proceed to court. Some of the irregularities included the police's failure to record all the details of the victims like residential address, the complainant's signature on the docket, and even phone numbers. Machisa *et al*. (2009:12) further share that the medical examination and the Sexual Assault Collection Kit (SAECK) was properly collected in 76.7% of adult cases, 57.1% of cases involving 12-17year olds, and 33.8% of cases involving victims under 2 years. The study conducted by Ubisi (2023:25) reveals that in almost half of the cases they studied, the police were not able to attend rape scenes, and this meant that evidence was not collected properly, and this raised the risk of evidence contamination.

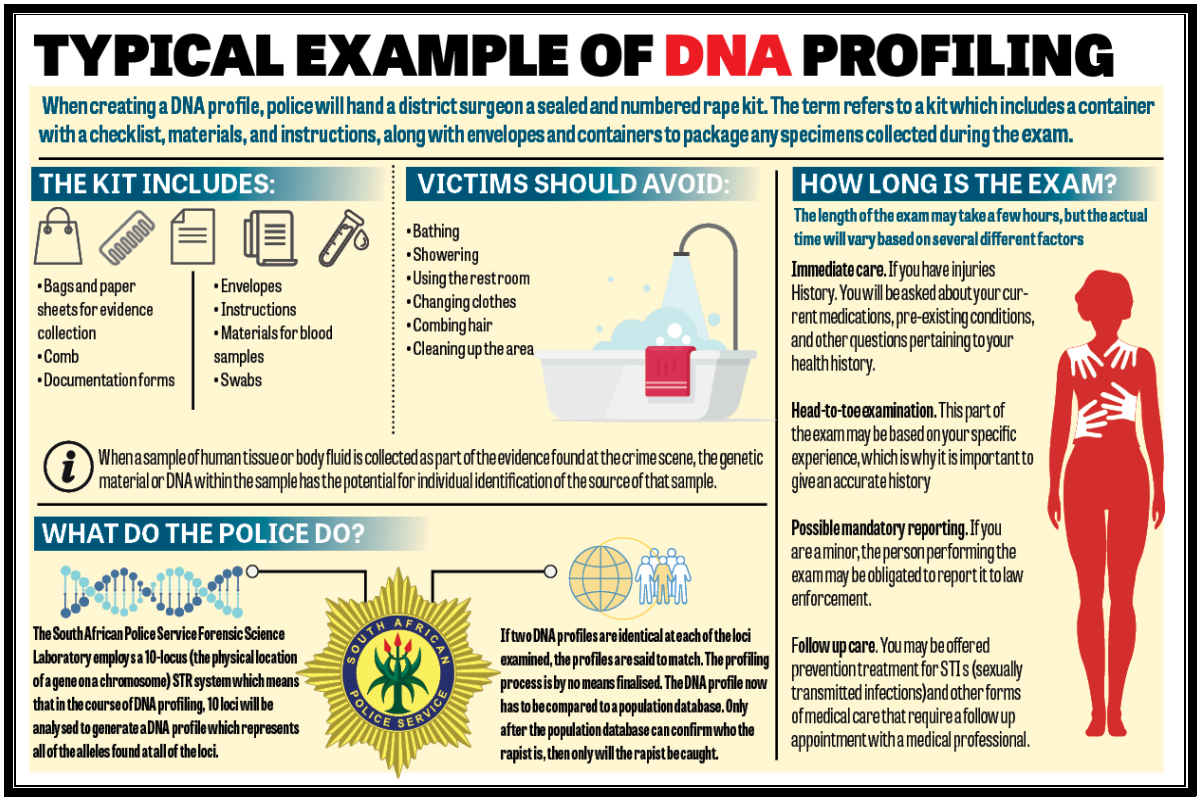
As a result, it was evident that the supervisory structure within the police force has issues and it is not working as it should be, because there is a lack of follow-up on many issues. There are many instances where statements from relevant witnesses are not taken simply because instructions are sometimes not given. Some cases fail because the victim might decide to withdraw their case, which leaves the police with little or no choice but to drop a case. However, there were cases that failed to proceed even though the victim had managed to identify the suspect, and this was noticed in 23.7% of dockets without arrests (Machisa *et al*. 2009:12).

Gordon and Collins (2013:99) present fact that some issues that lead to the collapse of a rape case have to do with the victim themselves. They point out that reasons that affect the progression of investigations are varied ranging from the inability of the victim to identify the suspect, and fear to speak out, to instances where there is a lack of evidence that there was force used (Gordon & Collins, 2013: 99). There is a serious need for junior officers to be trained in the taking of victim's statements because this has a negative impact on the case once it proceeds to court, without all the necessary details (Hallman *et al.,* 2015:12).

Therefore, understanding DNA profiling remains very essential (refer to figure 1 below). This typical DNA profiling is designed to assist the South African Police Forensic analysts/expects while investigating sexual related cases. While it may not be as comprehensive as expected, adhering to these guidelines and prescripts will immensely result in successful prosecution of sexual offenses perpetrators and contribute to the reduction of crime in South Africa. This

example is user-friendly, and investigators should be encouraged to carry it at all times when attending to crime scenes. Figure 1 below depicts DNA profiling. Adhering to guidelines in the example below will ensure that effective and successful prosecution of sexual violence perpetrators.

Figure 1: Example of DNA profiling



Source: Mabena (2020)

Mabena (2020) provides that he snarl-up in the processing of DNA evidence in state laboratories has not only distressed victims of violent crime, including rape, activists say it also flies in the face of efforts to curb gender-based violence. There was mounting support for the Democratic Alliance's (DAs) call to the then National Police Commissioner General Khehla Sitole to urgently consider partnerships with private laboratories to tackle the backlog at the National Forensic Science Laboratories (NFSL), which the party said stands at 117 736. As the country was approaching the 16 Days of Activism for No Violence against Women and Children campaign, Tears Foundation, a Non-Profit Organisation (NPO) confirmed that hundreds of sexual assault kits have not been processed and rapists are left to roam free. According to the nonprofit organisation specialising in the assistance and support network for survivors of rape and sexual abuse, the violation of women and children remains largely

unreported despite South Africa having some of the best laws on violence against women in the world.

Furthermore, there are two (2) other issues that seem to constitute a barrier in rape investigations, including; 1) shortages of transport, and; 2) Stress. It seems there is a direct link between the shortage of vehicles and the stress suffered by police officers. Investigating officers reported that the standard allocation of vehicles was an average of 3.5 persons per vehicle, and there are cases where even more SAPS officials share a single vehicle, (Machisa *et al.* 2009:12). The police were also overwhelmed with huge caseloads, transportation issues, a lack of adequate training to deal with sexual offences and collect evidence from rape crime scenes. All these factors only served to compound the challenges encountered by the police in their efforts to solve rape crimes (Hallman, Kenworthy, Diers, Swan & Devnarain, 2015:12). Besides vehicle shortages and stress from too much work, there are also instances where police officers have negative attitudes towards victims of rape. There is a tendency for older officers to be conservative in some cases and it works against their better judgment and eventually affects the case, (Machisa *et al.* 2009:13). According to Manyema, Norris, Twine, Kahn and Richter (2018:98), when the police exhibit negative attitudes towards victims of rape when they report their cases, it discourages the victims to the extent that they end up withdrawing the case and continue to suffer in silence.

Corruption has also been identified as one of the major obstacles which affect the progression of rape cases. Hallman *et al.,* (2009:13) went to highlight that many rape victims interviewed indicated that corruption was involved in the processing of their rape cases and that their dockets had been 'lost' by the police. In cases where the perpetrator is known, there is a high risk of the victim either being pressured or even intimidated not to make a report to the police. The DNA testing is the easiest way to identify rapists and violent criminals. It is unacceptable that there is a backlog of this nature. The DA urged the SAPS to urgently explore partnerships with well-equipped private laboratories to assist, where possible, in dealing with the backlog in DNA testing, submitted Mara Glennie, the Tears Foundation's founder. She said that it was time for government to empower civil society organisations to assist in addressing the inefficiencies in the DNA testing and investigation processes to accelerate the prosecution of sexual offenders. As a result, 'we need to have the confidence of the DNA evidence to prosecute sexual offenders (Mabena, 2020). The offenders need to be removed from our communities before they can destroy another life. Due to lack of faith in the police and judicial system, victims hesitate to report a crime. The government is failing the women and children

of South Africa, as the survivor of a violent attack her statement makes a great sense. The backlog in the processing of DNA has been a recurring problem since 2003, mentioned the Gender Activist and Researcher - Lisa Vetten, when she said it was unclear what the cause of the bottleneck was but said she suspected it was administrative. 'It is a recurring problem, and we need an answer. It could be because of budget cuts and posts not filled. Before we ask whether we need private laboratories, we need to first ask why (Mabena, 2020).'

It has been discovered that this is a major aspect that affects the rate of rape case attrition and because it is a more disguised factor, it is also very difficult to detect. The police cannot do much in instances like these because the case does not even reach the police. No amount of training would equip the police to identify such cases. In relation to this, Manyema *et al.* (2009:99) state that most rape cases where the perpetrator is known to the victim are very difficult for the police to identify unless the victim brings the case forward themselves. The only way these cases can be identified is through raising awareness in the communities on how to deal with situations of rape as soon as they occur. The communities need to be trained on the risks of protecting perpetrators and the psychological impact this has on the victims themselves. On the other hand, the police need to be efficiently trained to effectively deal with rape cases in ways that encourage progress. Improved basic conditions of work and availing of adequate tools would motivate the police to conduct their duties with more positive attitudes.

2.5 THEORENTICAL FRAMEWORK

The Locard Theory of exchange was adopted in this study. This section provides the knowledge of this theory, including the lasting value(s) of its applications.

2.5.1 The Locard Theory of Exchange

This is a theory of transfer with a basic premise that whenever a person enters or exits a crime scene, he or she alters it in some way, however significant or insignificant it may be (Adams Caddell & Krutzinger, 2004:3). These authors further claims that there is a possibility that the perpetrator left something behind at the scene and took something away from the crime scene. The following scenario explains this process:

> "*Wherever he steps, whatever he touches, whatever he leaves, even unconsciously, will serve as a silent witness against him. Not only his fingerprints or his footprints, but his hair, the fibres from his clothes, the glass he breaks, the tool mark he leaves, the paint he scratches, the blood or semen he deposits or collects. All of these and more bear*

mute witness against him. This is evidence that does not forget. It is not confused by the excitement of the moment. It is not absent because human witnesses are. It is factual evidence. Physical evidence cannot be wrong, it cannot perjure itself, and it cannot be wholly absent. Only human failure to find it, study and understand it can diminish its value." (Professor Edmond Locard (1877-1966) (in Forensic Working Group - FWG, 2014:7; and Maluleke, 2016:282).

A crime scene is a location at which a suspected criminal offence has occurred. Processing the crime scene is normally one of the most important phases of the investigation. It is here that the investigator focuses on the search for physical evidence. All crime scenes, to a varying degree, contain physical evidence. This may be visible to the naked eye, or minute, to the point of being microscopic. The physical evidence comprises all objects and material found in connection with investigations that are instrumental in discovering the facts. The investigator must be prepared to apply crime scene skills virtually anywhere; crime is pervasive, it knows no boundaries, as it is a common misconception that most crimes conveniently occur indoors, in spacious, well-lighted rooms. Unfortunately, they do not. Criminal offenses occur in nearly every locality imaginable: indoors, outdoors, in automobiles - literally in any place, at any time." (Gilbert, 2007:81; and Gilbert, 2010:100).

The true challenge of the crime scene is in the area of detection. Again, evidence that could solve the crime will frequently be present at the scene. Successfully locating this evidence is essential, for such tracing clues can often aid in location of the perpetrator of the offence, or the evidence may help investigators determine the type of criminal offence that has taken place. Further, the evidence may identify the victim, if the victims' identify is not known. The officer should not totally limit the search for physical evidence to the location of the crime scene. Physical evidence can also be found on the person of the victim or suspect, or within their immediate environment (Gilbert, 2007:79-80). When a crime is reported to a police agency, a patrol officer is notified by radio to proceed quickly to the scene. Rapid response time is frequently instrumental to the success or failure of an entire investigation, for the longer a crime scene remains unprotected, the greater the chance of crime scene contamination. Contamination of the scene takes place when evidence is altered, removed, or destroyed in any manner (Gilbert, 2007:81; Gilbert, 2010:100; and Maluleke, 2016:283).

Dr Edmond Locard (13 December 1877-4 May 1966) was a forerunner in forensic science and his contributions to the field have proved priceless (Wilding, 2012). Orthmann and Hess

(2013:18) elucidate that Dr Locard was one of the founders of the International Academy of Criminalistics and he has published over 40 books and articles in French, English, German, and Spanish. The Locard Theory of Exchange can be simply stated as follows: every contact leaves a trace, meaning that when a person comes into contact with an object or another person, an exchange of material occurs, therefore the person leaves something behind and takes something with him. In the case of the scene of sexual assault reported to be the suspect's residence, an investigator who applies the exchange theory would realise that physical evidence left by the victim would be the most probative proof. Jackson and Jackson (2011:15) likewise mention that the perpetrator of a crime will not only take traces of the crime scene away but will also leave traces behind at the crime scene. Hence, Locard based his argument on the fact that it is impossible for an individual to act without leaving traces of his or her presence (Van Graan & Budhram, 2015:45).

This theory has gained prominence as an effective linkage and identification strategy using the DNA sources as evidence during rape case. This evidence is regarded as the transfer that occurs through contact. In essence, rape is a violent physical crime of interaction and contact between the perpetrator and the victim. Therefore, the crime of rape in the context of this theory is attributed to Locard Exchange Theory. It can be maintained that when it comes to rape, the DNA sources as evidence plays essential roles. Overall, rape, is a contact crime with the possibility of physical evidence being left behind and taken away.

2.5.2 The application of the Locard Theory of Exchange to this study

The application of the Locard Theory of Exchange would alert the investigator to the specific types of physical evidence potentially resulting from the sexual intercourse (Birzer & Roberson, 2012:85). Similarly, Siegel, 2012:54) state that when two things come into contact, information is exchanged, and it seems simple, yet it is the central guiding theory of forensic science. Lyman (2013:39) explains that when the Locard Theory of Exchange is applied to the Crime (Rape) scenes where the perpetrator of the crime is exposed to the scene, the perpetrator will bring something into the scene and leave with something from the scene. According to the Locard Theory of Exchange, the mutual transfer of traces takes place in two ways. The criminal inadvertently leaves traces at the scene or takes traces from the scene with him or her. These two ways of transferring traces are referred to as 'trace donors' and trace recipients' (Lochner & Zinn, 2015:12). Lyle (2012:20) explains that this theory is the roots of criminal

investigations. A rape scene in his explanation of the Locard Theory of Exchange, is that the forensic investigator will find blood, other bodily fluids, fibers, hair, skin, fingerprints, and shoe prints at a rape scene (Lyle, 2012:21).

Moreover, the researcher without reservation states that the Locard Theory of Exchange is of utmost importance, as the main reason for searching the crime scene is to find physical evidence based on this principle. Rape in this context is not just about sex, but rather about the DNA evidence obtained from a rape scene, as transferred during the commission of this crime. In essence, rape is viewed as a violet contact crime. Therefore, the crime of rape in the context of this theory is attributed to the transfer of evidence. It can be argued that when it comes to rape, the balance of identification relies largely on physical evidence. Overall, the DNA sources as evidence during rape cases occurs when two objects are exposed to each other, and a linkage is established.

According to Maluleke (2016:313), obtaining evidence is often a complicated process, yet the high rate of case dismissal indicates a need for further education and training in this vital area (Gilbert, 2007:65). The crime scene is the locale within the immediate vicinity of the occurrence wherein evidence may be found. It may contain much of the evidence and information that is essential to a successful investigation. A methodical and detailed evaluation, examination and search of the crime scene may establish the crime elements, for example, *Corpus Delicti* (Element of crime) of the crime, the *Modus Operandi (MO)* used, and evidence that connect the suspect(s) to the crime. The investigative principles and techniques applied will not differ materially from the type and size of the scene, whether it is in an indoor, outdoor or mobile locale. These factors will affect only the required number of personnel, such as the technical or otherwise, and the time required to process the scene. All investigative activities regarding the crime scene must be carefully recorded and documented (Pena, 2000:57). French scientist Edmond Locard was an early pioneer in forensic science. He believed that when two objects came into contact with the other, each of these objects would leave or transfer particles to the other. This became known as the Locard Theory of Exchange. There are different types of crime scene, which may influence the value of different types of forensic evidence.

This process of maintaining the chain of custody will be integrated with the new case-flow management system, as implemented by the South African judiciary. This system is believed to ease the burden on court rolls and reduce the previous long wait for cases to be heard in

court, while placing more emphasis on the assignment and allocation of cases to a judicial officer at the earliest opportunity and allocating the responsibility of managing the flow of cases in an efficient and effective manner to ensure their speedy finalisation (Maluleke, 2016:313). This theory normally provides investigators with the leads of investigation (Fish, Miller & Braswell, 2011:110; Fish, Miller, Michael, Wallace, Wallace & Anderson, 2014:91, Fisher, 2004:18; and Fisher & Fisher, 2012:30). Moreover, it has been proven in this study that the value of this theory in rape cases, has guided the SAPS LCRC and FSL when processing crime scenes. Therefore, the Locard Theory of Exchange has a lasting value in the field of criminological and forensic research as it can prove contact and linkage, therefore it contributes value to this study.

2.6 THE CONCEPTUAL MODEL FOR PRESERVING DNA EVIDENCE DURING RAPE INVESTIGATIONS

According to Cele (2024), there has been significant progress in the finalisation rate of DNA cases and the eradication of the historic DNA backlog which is currently standing at Zero from 251 000 in the 2021/2022 financial year. Further to this, the expansion of the DNA laboratory in Gqerberha, which was opened by the President in August 2023 has contributed immensely to the processing of more DNA samples in the country. All these efforts have contributed positively to the SAPS fight against gender-based violence and femicide cases. For example, the NPA and SAPS project has led to more than 40 000 DNA forensic reports being finalised to ensure that cases of GBVF are prioritised (Cele, 2024).

Whilst it is frightening and horrendous that South Africans need to be educated on what to do in the event of rape, or to even contemplate the possibility of being raped, the following information may ensure that the rapist is brought to justice through the proper collection of evidence. What strikes one most when reading the following section is that the victim is subjected to even further trauma and suffering throughout the ordeal of being examined after the attack, and it is for this reason that we believe it is essential that the Medical Examiners (MEs) handling the case are properly informed insofar as knowing what they are doing when collecting evidence from a rape victim, and above all, are compassionate. Furthermore, it is important that the victim or family member or friend of the victim know what to expect and what the victim's rights are during the examination. Knowledge is power and empowering (DNA Project, 2020). Therefore, some of the important facts to remember when conceptualising rape cases are as follows:

- Rape can happen to anyone, a male or female, of any age, race, class, nationality or religious affiliation.
- No one asks to be raped no matter what they wear, where they are, what they have done or whether they have been using drugs or alcohol.
- You can be raped by a stranger or someone you trust.
- Rape is about power and control, not sex.
- Rape is a crime of power not passion.
- Rape is abuse of your human rights and is against the law (DNA Project, 2020).

In response to a DA parliamentary question, the Minister of Police, Bheki Cele, confirmed that as of the end of May 2023, there was still a backlog of 55 891 DNA samples. This revelation contradicts the statements made by the Minister during his budget vote speech in May 2023. In his speech, he explicitly stated the following (Whitfield, 2023:1):

> "*Honourable members, the historic DNA backlog stood at 241 152 cases in the first quarter of the 2021/2022 financial year. As of today, the DNA backlog stands at 636, representing a reduction of 99.70%. The Biology environment of the SAPS received and registered 398 439 new case exhibits and finalised 525 538 case exhibits during the 2022/23 financial year. The finalisation rate has progressively increased from 21% in the 2021/22 financial year to over 131% at the end of the 2022/23 financial year*."

Prior to the recent disclosure in response to the written question, the Minister had been evasive about the exact number of the DNA backlogs, often interchangeably referring to the historic DNA backlog and the current backlog, potentially leading to confusion and uncertainty. By claiming that the backlog has been reduced by 99.7% and creating the impression that all received samples were processed and finalised at a rate of 131% in his speech, the Minister has presented the most compelling evidence yet that he may have either lied or misled Members of Parliament and the South African public to conceal his failures in this regard. Since assuming office in 2018, Minister Cele has been woefully ineffective, and the fact that 55 891 samples remain backlogged today, despite his knowledge of the DNA sampling issue since his appointment, implies that there may be 55 891 murderers, rapists, and criminals roaming free on our streets, while the victims are denied justice (Whitfield, 2023:1).

Considerably, DNA evidence is by far the most effective crime fighting tool, but despite the president proclaiming war against GBV on many occasions, the government and especially the

SAPS are not taking any real action in sorting out the DNA backlog. Thousands of victims of rape and violent crime, as well as families of murder victims, are not getting their day in court. Action Society believes this has become a human rights violation which undermines South Africans' constitutionally entrenched rights to equality, fair administrative action, as well as access to courts. Despite all the work to ensure the formation of a DNA database against which new samples could be compared, all DNA testing at the SAPS FSL ground to a halt in 2020 because Bheki Cele failed to pay the agreed fees for the Property Control and Exhibit Management System (PCEM) system in June 2020, causing the subsequent shut down of the system. This caused a backlog in forensic testing in over 125 000 cases, of which 92% were sexual assault kits. In November 2020, Cele admitted that the DNA backlog was a whopping 117 738 cases. By December 2023, this figure had grown to 142 504. In March 2021, the SAPS FSL head, Major General - Edward Ngokha confirmed that the backlog stood at 172 787 and that nothing had been processed in January or February. Action Society learned through a Promotion of Access to Information Act [PAIA] (No. 2 of 2000) application that the backlog stood at 241 152 in April 2021. By July 2021, a backlog of more than 300 000 cases led to Action Society's complaint with the Office of the Public Protector [OPP] in October 2021 (Action Society, 2023).

The SAPS is making slow progress in processing its backlog of DNA samples, having reduced outstanding cases by just 21% over the past five months. South Africa's fight against gender-based violence and sexual assault is being undermined by SAPS' delay in processing DNA samples. The burgeoning backlog of cases continues to squeeze the brakes on the wheels of justice and further frustrate victims of violent crimes. This crisis in not new. Reports of South Africa's DNA backlog stretch back almost two decades, according to the Institute for Security Studies (ISS) which examined SAPS' Criminal Record and Forensic Science Service (CRFSS) in 2008. The situation has become considerably worse in recent years. 'The backlog experienced at the SAPS FSL has given us sleepless nights,' said Police Minister Bheki Cele during a parliamentary debate before the National Assembly in May 2021. Equally, it has been a nightmare for everyone relying on the services of the laboratories to find justice and closure. Cele blamed the backlog on budget constraints and ineffective contract management, adding that a request for additional funding was made in 2019. From June 2020, electronic track and tracing ground to a halt when disputes led to IT service provider Forensic Data Analysts (FDA) shutting down the computer systems (Daniel, 2021). Positively, as initially confirmed; after years of dealing with a crippling DNA backlog, police minister Bheki Cele has announced it

has finally been cleared. He revealed this at the release of the crime statistics for the third quarter of the 2023/2024 financial year. Cele, during the same period in the year 2023, said the backlog had been reduced by 99.3% to 1,600 from 251,000. Providing an update during the briefing in Pretoria, he said the following in verbatim:

> "*There has been significant progress in the finalisation rate of DNA cases and the eradication of the historic DNA backlog, which is now standing at zero from 251,000 in the 2021/2022 financial year. Further to this, the expansion of the DNA laboratory in Gqeberha, which was opened by the president in August 2023, has contributed immensely to the processing of more DNA samples in the country. All these efforts have contributed positively to the SAPS fight against GBVF cases. For example, the NPA and SAPS project has led to more than 40,000 DNA forensic reports being finalised to ensure that cases of GBVF are prioritised. Cele's remarks come as police registered 7,710 murder cases between October and December 2023, up from 7,555 during the same period the previous year. This marks a 2.1% increase. Sexual offences went down to 15,284, from 15,545 in 2022, a 1.7% decrease* (Ngcobo, 2024)."

The Portfolio Committee on Police welcomed improvements within the National Forensic Oversight and Ethics Board (DNA Board), which have enhanced the functionality of the National Forensic DNA Database of South Africa (NFDD) and the SAPS FSLs. Since its inception, the committee conducted heightened oversight over this environment in the belief that forensic science is at the centre of successful criminal prosecutions. Nocks Seabi, the Chairperson of the committee had this to say:

> "*We have been steadfast that the monitoring function of the DNA Board is critical to ensure that the work of the SAPS FSL is improved. The committee's commitment to this environment was highlighted by various oversight visits to the SAPS FSLs countrywide*."

The committee welcomed the information that because of the enhanced monitoring and oversight, the DNA analysis backlog was reduced by approximately 99%. This intervention is necessary to enhance investigations, especially in light for the call by the President to strengthen the fight against GBV. Also, following the intervention of the Board, two complaints received by the Board led to positive resolutions and the DNA samples analysis was conducted. The committee has called for the DNA Board to continuously monitor the

process for the onboarding of the CODIS project and the training of the SAPS on the system. Also, the committee has called for enhanced monitoring of the challenges the Board raised following inspection visits to the four laboratories, including infrastructural challenges, human resources and capacity challenges, Information Technology (IT) infrastructure challenges and supply chain management processes. The committee remains of the view that enhanced monitoring will ensure that these challenges are resolved expeditiously (Forensic, 2024). The notable contributing factors to rape according to Kann (2008:1), suggests that many men rape because of the various risky behaviours that some girls display. For instance, going home from night activities (Clubs) with boys, accepting gifts from them and dressing in revealing clothing or even drinking alcohol. It appears that there is often an assumption made by the boys that by partaking in these high-risk behaviours, such as wearing revealing clothing or drinking alcohol, the girl is consenting to sexual relations with them. Consequently, the boys see the girl's withdrawal before the act as irresponsible. In support of the contributory factors that Kann (2008:1) outlines, Freccero, Harris, Carnay and Taylor (2011:3), also outline culture and gender, to mention a few, as contributing factors of rape in many communities. Kann (2008:1) also emphasises peer pressure and alcohol as being major contributing factors to rape in communities. The Centres for Disease and Control Prevention (2019) outlines that individual, relational, community, and societal factors are contributing factors of rape.

Jewkes (2002:1423) states that being a girl/woman, being young, being an alcoholic, and having been previously raped are contributing factors to rape. United Nation [UN] Women (2016) (in Frecerro *et al.*, 2011) outline having multiple sex partners or engaging in risky behaviour as contributing factors to rape. Socio-cultural factors, which include the role and position of women in society, gender norms and the concept of masculinity, also influence rape. Denov (2006:319), states that the concept of masculinity and superiority that men have over women has now been normalised. The community believes that women are subordinate to men; hence, rape is tolerated (Denov, 2006:342). Other factors include alcohol and drug use, acceptance of violence, a family environment characterised by physical violence and conflict, childhood history of physical and sexual abuse, lack of institutional support from police, general tolerance of sexual violence within the community and weak community sanctions against sexual violence perpetrators (Centres for Disease and Control Prevention, 2020).

As a results, some of the strategies to address rape, according to Gluck (2022), includes learning about rape prevention is something women can do to proactively protect themselves from possible attack. But even if you take all the necessary precautions to protect yourself and stay

safe, you may not be able to prevent rape. Victims are never responsible for sexual assault; the offender bears all responsibility and criminal liability. The avoidance of rape entails strategies to be used by women to minimise their risk of being sexually assaulted (Daruwalla, Machchhar, Pantvaidya, D'Souza, Gram, Copas & Osrin, 2019). Crowell and Burgess (1996) suggest that notable strategies, involving; avoiding attendance of dangerous places, keeping doors and windows locked, and avoiding going out alone at night. Although these may serve as techniques to reduce women's risk of being sexually assaulted, they however, do not give a guarantee that rape will not take place. The abovementioned strategies are how individuals can prevent being sexually assaulted.

In South African context, rape is a severe crime, and the courts hear several rape cases each year. However, a sizable portion of these cases results in acquittals due to issues encountered during the gathering of evidence from the scene of the rape. According to the DNA, the first-time responders in South Africa are untrained in the correct gathering and processing of evidence (DNA Project report, 2017:32). This increases the risk that the evidence will be tainted, making it ultimately inadmissible in court (Van Der Westhuizen, 2011:19). At the Mamelodi police station, 547 rape charges against the suspected perpetrators were dropped, while rape offences rose by 80% between January 1 and December 31, 2015 (SAPS, 2015:7).

According to the DNA Project report (2017:33), if physical evidence is not handled to ensure justice in established processes, its value as evidence is impaired. The police must ensure that all investigators in the investigation department are appropriately trained and knowledgeable on evidence collection at rape crime scenes to avoid disappointing the rape victims. This will help to reduce the withdrawal of cases against the alleged rapists. Individuals with specific skills, such as forensic accounting, sex crime investigation, undercover investigation, particular language skills, or technology may have an advantage as a selection of investigators may be more focused on a particular attribute of applicants, according to Osterburg and Ward (2010:89).

This is because the investigative field has become more specialised. An investigating officer only has one chance to collect physical evidence at a rape crime scene. However, in most cases, this chance is ruined by the crime scene's contamination because the initial responders, such as paramedics, private security guards, and lower-level police officers, are unprepared to ensure that the scenes of rape crimes are well protected in a professional manner (DNA Project report, 2017:34). Suspects are often let off the hook because the evidence was not gathered or was

tainted. It is crucial to inform investigators that physical evidence might be utilised as supporting evidence in rape case investigations. Foreman, Champod, Evett, Lambert and Pope (2018:19) state that DNA as an investigative tool has grown, through a series of imaginative ideas and brilliant technological implementation, to become the most powerful scientific technique available to the crime investigator since the adoption of fingerprints as a means of personal identification at the turn of the 20th century. When a serious crime hits the national headlines, DNA evidence is often expected to play a vital role in bringing the perpetrator to justice. In many ways, DNA analysis has become a model for how new techniques should be introduced into the forensic arena.

The crime investigator should have a basic awareness of criminalistics principals, according to Jackson and Jackson (2008:5) and Palmiotto (2013:120), to manage the crime scene appropriately and recognise the significance of any evidence discovered there. The CPA, 1977, states that the "State may seize anything" at a crime scene and seize certain articles to obtain evidence for the institution of a prosecution. This legislation mandates the SAPS Crime Scene Technicians (CST) also known as forensic investigators and SAPS Crime Scene Investigator (CSI) from the SAPS LCRC, to process and collect exhibits at a crime scene. According to Omar (2008:29-30), the SAPS LCRC's duties include maintaining criminal records and using cutting-edge methods to recover physical evidence from crime scenes, thus, the roles of the first scene members, crime (Rape) scene investigators and the SAPS FSL and LCRC should be clearly spelled-out and communicated to these stakeholders, as Table 5 refers herewith:

Table 5: The roles of relevant stakeholders during rape investigations

First scene members	**crime (Rape) scene investigators**	**The SAPS FSL and LCRC**
Attend the crime (Rape) scene immediately	Attend crime (Rape) scene immediately	Search and process crime (Rape) scene in consultation with the crime scene investigator
Cordon off the crime (Rape) scene and ensure that no unauthorised persons enter the crime (Rape) scene	Take over crime scene from 1st member and receive briefing	Search and collect any physical evidence on crime (Rape) scene, for example, hair, semen, blood cigarette butts, fingerprints and footprints, amongst others
Interview the complainant / victim - Minors must be interviewed in the presence of their	Interview the complainant and obtain detailed statement. Minors must be interviewed in the	Hand in any exhibits found on the crime (Rape) scene into SAPS 13

parents/guardian. Record their full particulars.	presence of their parents or guardian	
Request additional human resources to assist in securing the crime (Rape) scene when necessary	Take victim for medical examination together with SAPS 308, J88 and applicable sexual assault crime kit (Complainant may consult with his/her private MEs)	Take photographs / video footage of the crime (Rape) scene. Compile plan and key to plan
Summon all role players to crime scene, for example, the SAPS detectives, LCRC, FSL, amongst others	Arrange for Victim support systems	Take photographs of the injuries of the victim
Arrange for medical treatment if the victim is injured	Interview the reporter and obtain detailed statement	Always avoid contamination
Arrange for victim support systems	Obtain full description and particulars of suspect. If on crime scene arrest	
Obtain full description and particulars of suspect. If on crime (Rape) scene arrest	Obtain detailed witnesses' statement	
Hand over crime (Rape) scene to first detective on the scene	Arrange for Identity/Identification (ID) Kits to be compiled if victim / witnesses can identify suspect(s)	
Submit statement regarding crime scene and condition of victim immediately	Obtain statement of person to whom the complainant (Victim) first reported the crime	
Remain on crime (Rape) scene and assist the crime scene investigation team to manage the scene	Obtain exhibits, J88, Sexual Assault Crime Kit from doctor. Hand exhibits into SAPS 13. Summons the forensic expert to crime (Rape) scene. Conduct a thorough search of the crime (Rape) scene together with forensic expert. Hand in any exhibits from scene into SAPS 13. Always avoid contamination	

Source (DNA Project, 2020)

A fundamental understanding of forensic science or criminalistics is most often required for an investigator to understand the basic techniques for the collection and preservation of physical evidence. Omar (2008:30) further explains that the SAPS LCRC forensic investigators are responsible for collecting evidence from a crime scene, ranging from taking photographs to removing spent cartridges, or samples of bodily fluids, left at a scene. The SAPS Learning Guide (SAPS, 2013; and SAPS, 2017) state that the SAPS CST and their processing team are the 'eyes and ears of the court' at the rape scene. Good management by the SAPS CST will ensure that a coordinated effort takes place, and that each expert has the time to conduct a professional search, thereby increasing the chances of finding good quality physical evidence.

The role played by the application of DNA during rape investigations has proven to be one of the most critical elements in assisting the justice system to fight sexual crimes, as well as many other related crimes. As per the cases below, DNA has placed criminals at crime scenes where no person could have done so. Additionally, innocent persons have been removed from crime scenes where they were placed, even though they had never been there. The significance of DNA analysis has proven to be a weighty factor in crime-fighting efforts regarding sexual crimes and sexual violations. Therefore, the developed conceptual model for preserving DNA evidence during rape investigations in the Northern Cape Province for this study consisted of five (5) components, to offer contributions to a new body of knowledge, as depicted in Figure 2 in chapter five of this study, as advised by Blackie (2009:19) and Denscombe (2010:41). De Vos *et al.* (2011:72) state that research must make an appropriate direct or useful contribution to an area of high priority in the public or private sector. Therefore, the five (5) components were restricted to the following, detailed schematic representation will be shared on section 5.4 of this study, coupled with discussions:

1. Understanding the significance of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
2. Considering the selected sources of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
3. Maintaining chain of custody for rape DNA evidence in the selected Local Municipalities Northern Cape Province, South Africa.
4. Better DNA evidence resources for rape investigations, advanced training and educational initiatives in the selected Local Municipalities Northern Cape Province, South Africa.

5. Interactions and information exchange on preserving DNA evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa.

2.6 SUMMARY

This chapter presented an overview of the consulted literature studies. The chapter was based on the analysis of DNA evidence during rape investigation. The analysis was founded on the study aim and objectives. The next chapter covers the research design and methodology that guided this study.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

This chapter provides the adopted research design and methodology. The evaluative research design and qualitative research approach are employed in this study. The study location, population and sampling procedures, and data collection and analysis methods form part of this chapter. The discussions in this chapter also cover methods to ensure trustworthiness and ethical considerations.

3.2 RESEARCH DESIGN

Zikmund and Babin (2010:102) argue that a research design is a major plan that delivers a framework for gathering and examining data. Gravetter and Forzano (2012:98) describe a research design and approach as a research strategy that will be implemented to approach the research study. It specifies the population that will be used in the study, in terms of groups, individuals, participants and the way in which assessments will be made and includes the number of variables that will be included in the research study. Creswell (2013:30) stresses "that a research design is defined as the procedure for collecting, analysing, interpreting and reporting data in research studies. According to Creswell (2009:23), research designs are the procedures for research that span the decision from broad assumptions to detailed methods of data collection and analysis. The decision as to which research design or approach the researcher will take must be informed by the worldview assumption the researcher brings to the study, procedure of inquiry (i.e., Called strategies) and interpretation. There are three research designs that inform a research approach. They should not be viewed as opposite or dichotomised. Instead, they present different ends of a continuum.

For this study, the phenomenological research design was the most appropriate for the aim of the study, which was to evaluate and understand the experiences of the students and community at large. Phenomenology aims to gain a deeper understanding of the nature of the meaning of our everyday experiences, which are facts, unlike opinions. The phenomenological approach allowed participants, through the applied interviewing type and technique, to prompt the own meaning of their experience of being in a community where students become victims of crime, which also attracts criminals to the community. This research design aims to describe individuals' lived experiences (Phenomena) to enrich lived experience by drawing out its meaning (Holloway, 2005:25). The researcher considered a phenomenological research design to be the best method and approach in this study. This research design shares the true meaning

of phenomena be explored through their experience as described by the individual. It is inductive in nature, thus, in this study, the researcher adopted this research design with a goal to describe lived experiences of the targeted sample, and this was done by analysing their unique experiences on this subject (Burns & Grove, 2001:41).

3.2.1 Advantages of phenomenology research design

Phenomenology research design consists of the following selected advantages:

- It is a highly appropriate approach for researching human experience.
- Phenomenological research is unique in perspectives, to be sure, there is value found in focusing on research based on how people perceive an event or phenomenon, rather than simply how the phenomena exist in a clear manner.
- It is understandable and the biggest benefit of phenomenological research is the fact that it can provide a profound, detailed understanding of a single phenomenon.
- The phenomenon research has rich data picked from enough individuals; the data received through phenomenological research is rich and impressive.
- As a research method, it is a rigorous, critical, systematic investigation of phenomena (Streubert-Speziale & Carpenter, 2011:40).

3.2.2 Disadvantages of phenomenology research design

The phenomenological research design has been well articulated (Boyd, 2001:96), and few studies have documented the disadvantages of using the phenomenological research design and challenges that researchers encounter while using a phenomenological approach (Miller, 2003:102).

The qualitative researchers may encounter the following limited difficulties while using phenomenology research design:

- Data gathering can take up a great deal of time and resources. Selecting the participants from ‘sample A, B and C’ often aid into having direct responses towards the subject under research, this might provide biasness and pre-conceived ideas at time.

- This research design may include difficulties with analysis and interpretation, usually lower levels of validity and reliability while more time and resources are required for data collection.

- The analysis and interpretation of data may be difficult, but the fewer participants selected, helped the researcher to analyse and interpret the data easily (Creswell & van Manen, 1990:14).

3.3 RESEARCH APPROCH

The available research approaches are demarcated into qualitative, quantitative and mixed methods. The distinction between the three (3) highlighted methods is that 'qualitative' uses words, by means of exploring and understanding the meaning individuals or groups ascribe to a social or human problem; 'quantitative' uses numbers, by testing objective theories and by examining the relationship among variables; and 'mixed methods' resides in the middle of the continuum, as it incorporates elements of both qualitative and quantitative approaches, and involves philosophical assumptions (Creswell, 2009).

Soiferman (2010:38) supports Creswell (2009:15) by stating that research approaches are strategies and techniques that encompass steps of general assumptions concerning the method of how data is collected, the analysis, and the interpretation thereof. Therefore, this study adopted qualitative research approach. Minnaar, Mistry, Patel and Rustin, (2016:43) state that research approach is generally associated with interpretative epistemology, which tends to be utilised to refer to different forms of collecting data and interpretation, which depend on understanding, with a prominence on meaning. They further highlight that research approach refers to a set of strategies that most often include the involvement of smaller sample sizes, with an examination that is in-depth of the participants' experiences.

3.3.1 Advantages of qualitative research approach

Ayres (2020:72) highlights that a subject matter can be assessed with considerably more detail, there are many restrictions in terms of time that rests on research methods. The objective of a restricting time is to generate a quantifiable result meaning metrics can be established. This research approach pays less attention on the metrics of the information collected and more on the delicacy of what can be established in that data. Allowing data to have increased level of detail to it; therefore, provides more occasions to obtain insights from it during exploration and the frameworks of this research approach can flow easily and be based on available or incoming

information. Opportunities available for research should follow a particular design for data collection questioning and information reporting. Research studies in qualitative nature provides a contrasting perspective; it allows for the modification to the information of the quality that was collected. If the data that are available do not appear to be delivering any outcomes, the research gathered can instantly be altered and desire to obtain the data in a different direction. Thereby offering more chances to collect key evidence; about any other subject and therefore not being restricted to finite and a self-satisfying perspective (Ayres, 2020:1; and Rahman, 2016:90).

Furthermore, Rahman (2016:97) highlights that thorough and appropriate analyses of an issue can be produced by utilising qualitative research methods, and therefore the participants, have sufficient freedom to determine what is consistent for them. As a result, the complex issues can be understood easily. Collected data have a surmising quality to it. One of the most common of faults that occur within qualitative researching is a speculation that a personal perspective can be deduced into a group perspective (Ayres, 2020:1). This is only possible when individuals grew up in almost identical circumstances, have similar outlooks about the world itself and go through life with similar objectives. When these groups can be discovered, however, the collected individualistic data can have a guessing quality for those who are in a harmonious grouping. The information has quality that is predictive; for the person from whom the data was collected (Ayres, 2020:1). Regoli, d'Errico, Nardi, Mezzelani, Fattorini, Benedetti, Di Carlo, Pellegrini and Gorbi (2019:83) state that "the qualitative research approach is one of the most affordable ways to glean information from individuals who are being studied." Focus groups tend to be the primary method of collecting information using this process because it is fast and effective. Qualitative research provides a predictive element, the data which researchers gather when using the qualitative research process provides a predictive element to the project.

This advantage occurs even though the experiences or perspectives of the individuals participating in the research can vary substantially from person-to-person. The goal of this work is not to apply the information to the public, but to understand how specific demographics react in situations where there are challenges to face. This research approach focuses on the details of personal choice (Regoli, *et al.,* 2019:14). In terms of language testing, Rahman (2016:17) shows that the results of qualitative studies provide the relationship of information processing with performance specifically and deeply and it is employed to achieve deeper insights into issues related to designing, administering, and interpreting language assessment.

There are some who argue that qualitative research approach (interpretivist) holistically understands the human experience in specific settings.

3.3.2 Disadvantages of qualitative research approach

Rahman (2016:18) argues that qualitative research approach sometimes leaves out contextual sensitivities and focus more on meanings and experiences." It is also hinted that, with the use of phenomenological research design; qualitative researchers attempt to uncover, interpret and understand the participants' experiences, as the motive of this study. Ayres (2020:1) states that data inflexibility is more demanding to evaluate and display. Because viewpoints of individuals are normally the basis of the collected data in qualitative research, it is harder to demonstrate that there are inflexibilities in the information that is collected. The mind of a human being is so inclined to recall things in such a way in which it wants to recall them. Therefore, memories are often gazed at fondly, even though the actual events that took place may have been disturbing at that time. This desire in humans to look at all the good in things makes it that much harder for researchers to show data reliability.

According to Regoli, *et al.,* (2019:16), qualitative research approach can create subjective information points. The quality of the information collected using the qualitative research process can sometimes be questionable. This approach requires the researchers to connect all the data points, which they gather to find the answers to their questions. That means that the results are dependent upon the skills of those involved to read the non-verbal cues of each participant, understand when and where follow-up questions are necessary, and remember to document each response. Because individuals can interpret these data in many ways, there can sometimes be differences in the conclusion because each researcher has a different take on what they receive.

This research approach can involve significant levels of repetition. Although the smaller sample sizes found in qualitative research can be an advantage, this structure can also be a problem when researchers are trying to collect a complete data profile for a specific demographic. Multiple interviews and discovery sessions become necessary to discover what the potential consequences of a future choice will be. When you only bring in a handful of people to discuss a situation, then these individuals may not offer a complete representation of the group being studied. Without follow-up sessions with other participants, there is no way to prove the authenticity of the information gathered (Regoli, *et al*, 2019:17). What is more,

Rahman (2016:17) mentions that this research approach is more focused on the participants' experience rather than any other imperative issues in the context. Besides, Ayres (2020:1) states that data generated via qualitative research approach is not at all times acknowledged. Due to the personal nature of the data gathered in qualitative research, the scientific population will not always acknowledge findings. It is advisable to conduct a second independent endeavour in the qualitative research approach. This can construct comparable findings which is often imperative to begin the procedure to allow for acceptance from the community. It has been found that what can cause a negative influence on data that is being gathered is the influence of the researcher conducting the research. The calibre of the gathered data with the use of qualitative research approach is tremendously dependent on the scrutiny and skills of the qualitative researcher. If the researcher does have a predisposed opinion about the subject under research, then the viewpoints of the researcher will be placed within gathered data and will possibly have an influence on the study findings.

Ayres (2020:1) further mentions that this research approach often controls what must be in place to assist the disconnect for the potential of prejudice, so that the data gathered can be evaluated with utmost integrity, otherwise, the feasibility for a researcher to forge any claim and then utilise his or her prejudice through the qualitative research approach in order to demonstrate his or her viewpoint. To be able to reproduce qualitative research results can be very hard. The technological population desires to see results that can be substantiated and reproduced to accept the completed research as fact based. Within qualitative research, this can be somewhat hard to achieve. The researcher does not only have the variability of the prejudice of the researcher for which needs to be calculated in the data, but also the informal prejudice constructed in the data from the provider itself. Meaning the extent of data collecting can be very restricted, even if the structure is fluid for collecting information, because of individual perspective of humans; therefore, hard decisions could need recurring periods of research approach, Ayres (2020:1).

Further, Ayers (2020:1) warns that while adopting this research approach, the interviewer is heavily involved and should have skills that are distinctive, must have expertise in subject matter that is being researched and the experience. It will also be of great help if they are also familiar with the matter that is being assessed and have the knowledge to comprehend replies that are obtained. If there is an absence of any part of the skill set, the calibre of the collected data can then be open for inference. This research approach is not known for being statistically illustrative. One of the advantages of qualitative research, which seems to always exist, tends

to be the lack of illustration statistically. It is a technique that is perspective-based of only research, meaning that the responses that are obtained are not calculated. Replication can occur because comparisons can possibly be made which may be necessary for situations which need statistical illustration and that does not form part of the qualitative research procedure. It is possible to collect and interpret individual data on levels that are deeper because of the advantages and disadvantages of qualitative research. Making it feasible to obtain new perspectives into the emotional reasoning processes and demographical behavioural patterns (Ayers, 2020:1).

3.3.3 Study location

The Northern Cape Province with a population of just over 1.3 million people is situated in the western corners of South Africa, bordered to the North of Namibia and Botswana; to the East by North West, Free State, and Eastern Cape provinces; to the South and South-West by Western Cape province; and to the West by the Atlantic Ocean. The Northern Cape was administratively created out of Northern and Central Cape of Good Hope province in 1994. "Kimberley is the provincial capital of the Northern Cape (Stats SA, 2019:24). According to Stats SA (2019:24), "Northern Cape's Eastern half and Southwest form part of the Highveld, an arid Plateau that gradually rises to the Great Escarpment (More than 6,000 feet (1,900 metres) in elevation) along the province's Southern border." To the North-West is the desert, including the sand dunes of Kgalagadi Transfrontier Park, a conservation area jointly managed by South Africa and Botswana. The Orange River traverses the Province from East to West and provides water for irrigation. The Orange River is joined by one of its main tributaries, the Vaal River, near Douglas, in the East. In the West, near the Namibian border, the river plunges in a series of cataracts and rapids at Augrabies Falls, a total drop of more than 600 feet (183 metres).

Moreover, the Thornveld is the natural vegetation of the province, and the climate is generally hot and arid. Annual rainfall increases from 4 inches (100 millimetre - mm) in the west to about 14 inches (350 mm) in the East. Northern Cape is the largest and most sparsely populated province of South Africa. About half of the population is of mixed race. Blacks make up about one-third of the population, and whites constitute about one-tenth. Afrikaans is by far the most broadly used language, spoken by about two-thirds of the population. Tswana is spoken by about one-fifth of the population. Several other languages are also spoken, including isiXhosa, *IsiZulu* and English. More than two-thirds of the population live in urban areas. "The major

urban centres are Kimberley and Upington" (Stats SA, 2019:25). The Stats SA (2019:24) further provides that "the 'Mining' is an important industry in Northern Cape. Major copper mines are located in Nababeep, Okiep, and Aggeneys. Diamonds are recovered throughout the province." Many diamonds and other precious stones are mined in the arid region of Namaqualand in the West, along the Atlantic coast.

Kimberley, in the East, is well known for its diamond-mining past and is still a centre for mining and cutting diamonds. Northern Cape Province produces almost all the manganese mined in South Africa. Tungsten, zinc, lead, asbestos, iron ore, and limestone are also extracted at various locations. Area 143,973 square miles (372,889 square kilometre - km) (Stats SA, 2019:26). Additionally, according to the SAPS Journal (2022:09), Northern Cape houses 91 Police stations, 5 districts, 11 satellite stations and 17 accounting stations. Kimberley Police Station, stationed at 31 Phakamile Mabija Street, is the Provincial head of SAPS. Again, Kimberley Police Station is responsible to serve all the other 90 police stations, meaning that cases, rape cases in particular, must be sent from those police stations to the provincial office, then sent to the Pretoria DNA centre for analysis.

3.3.4 Targeted study population and sampling procedures

Welman *et al.,* (2015:101) define a target population as the total collection of all units of analysis from which the researcher wishes to draw specific conclusions. This comprises the size of such a population, the distribution, growth, density, unemployment rate, ethnic groups and vital statistics such as age, education and income. According to Babbie (2007:19), a population is a group of individuals from which hypotheses will be taken when addressing a research question. Brink, Van der Walt and Van Rensburg (2012:49) also explain 'population' as "the total group of persons or objects of concentration to the researcher. Babbie (2007:21) and Creswell and Creswell (2018:32) add that a target population comprises all fundamentals where the sample is selected. Generally, the ideal population of this study can purposively include all Northern Cape community members who have been directly and indirectly affected by rape, local SAPS investigators from all Northern Cape police stations who directly deal with rape investigations, DNA specialists from the CSIR, the SAPS FSL in Pretoria, and community members. Specifically, Grove, Burns and Gray (2013:119) define sampling as a subsection or portion taken from the total population that is nominated for a research study. Target sampling is a method of choosing who takes part and contributes to the research study. "It involves a process of choosing a small number of key elements that hold relevant information that will

provide the most relevant and impactful information, and assist in knowledge expansion" (Patton, 2015:65). Alvi (2016:89) adds that target sampling represents a group of relatively smaller, selected number of people from the population chosen for the investigation purposes.

Based on the discussions in this section, for the sampling procedures, the researcher employed the non-probability: Purposive sampling. This type of sampling is also known as the 'judgmental sampling,' involving selecting specific elements of a target population suitable for a specific study (Champion, 2000:68). Samples of subjects are purposely selected for a study. De Vos, *et al*., (2011:35) mention that researchers using this sampling method should think critically about the characteristics of the target group and choose the intended samples accordingly." A clear identification and formulation of criteria for the selection of participants are, therefore, of cardinal importance. De Vos *et al.,* (2011:35) add that this sampling method is guided by processes that will provide rich detail to maximise the range of specific information that can be obtained from and about that context, while the researcher looks for both typical and divergent data. Therefore, this study purposively selected Twenty-Five (25) Northern Cape SAPS investigators who deal directly with rape investigations, three (3) SAPS FS from SAPS FSL, situated in Arcadia, and Two (2) DNA specialists from the CSIR, based in Pretoria, and 25 community members from the Northern Cape Province. Overall, 55 participants formed part of this study. The selected samples were distributed as follows:

- **Sample 'A': First Sample (25:5 participants):** SAPS crime scene (Rape) investigators, stationed at the following five (5) police stations in Northern Cape Province: Kimberley Police Station (001310), Jan Kempdorp Police Station (001322), Galeshewe Police Station (001320), Roodepan Police Station (001324), and Pampierstad Police Station (007114). The 25 participants were selected based on their experience in rape investigations, or because they had responded to rape scenes as first respondents and collected DNA evidence.
- **Sample 'B': Second sample (05 participants):** This sample comprised three (3) randomly selected SAPS FS from the SAPS FSL, situated in Arcadia, Pretoria, and other two (2) DNA specialists from the CSIR in Pretoria.

  Sample 'C': Third sample (25 participants): consisted of community members residing within the five (5) selected police stations (**Kimberley, Jan Kempdorp, Galeshewe, Roodepan, and Pampierstat**).

  As initially highlighted, the total number of participants for this study was 55 participants, and all these participants were interviewed guided by the Interview Schedule Guide. Most

importantly, confidentiality, sensitivity, and ethical requirements were observed during this process. The targeted group participated in this study on their free will. The researcher explained to them that they had the right to withdraw from participation anytime if they felt so. The researcher further explained to them that there would be no remuneration for their participations and all participants confirmed to be comfortable and willing to continue participating thereof.

3.4 DATA COLLECTION METHODS

According to Polit and Beck (2008:45), data collection is the process of collecting information to address a research problem. Leedy and Ormrod (2014:24) state that "qualitative research uses multiple forms of data collection in any single study." These forms might include the use of observations, interviews, objects, written documents, audio-visual materials, electronic entities, and anything else that can help to answer the research question. Quantitative research uses numbers, but numbers are meaningless unless they are analysed and interpreted in order to reveal the truth that lies beneath them. The numbers in the quantitative method represent aspects of the observable, physical world, such as the pull of gravity on a concrete object, and a number of people engaging in a particular study (Leedy & Ormrod, 2014:24). In addition, Creswell and Creswell (2018:17) support Leedy and Ormrod (2014) by claiming that qualitative data involves the gathering of information by means of interviews, observations, documents and records, while quantitative data can be instrumental data, observational checklists, or numerical records such as census data, and it is always ideal to collect both forms of data using the same or parallel variables, constructs or concepts. Welman *et al.,* (2015:05) argue that a researcher must consider which data collection method is the most suitable for their particular research.

In this study, different data collection methods were employed. More than a single data collection method was adopted to ensure that the arising gaps in this study are filled, without heavily relying on one data collection method. This was compensated by strength of the other employed data collection method. To this end, a variety of literature studies were consulted to respond to the research problem, study aim, objectives and research questions. The researcher consulted various types of literature studies relevant to the research topic, closely looking at 'National and International' sources, such as the 'books, accredited journals articles, academic databases, SAPS annual reports, SAPS statistics, internet sources, dissertations, thesis, amongst others. The researcher further embarked on in-depth search of relevant information in this

subject. It was established that sufficient literature studies and information responding to this research topic were readily available for analysis. The researcher is firmly persuaded that the information, which responds to the research topic and the research problem, study aim, objectives and research question, as presented in chapter two of this study was sufficient. Overall, four (4) data collection methods [not in order of importance] were applied for this study. The four data collection methods are presented and discussed in the following section.

3.4.1 Unstructured Key Informant Interviews

Unstructured interviews are sometimes called discovery interviews and more similar to assisted conversation rather than a rigid organised interview. They are also sometimes referred to as informal interviews. An interview schedule might not always include questions which are open-ended that can be asked in any particular order. Some questions might be included or overlooked as the interview itself continues. The unstructured interviews are however more changeable as questions can be modified and changed depending on the answers of the participants (McLeod, 2014:19).

McLeod (2014:19) further highlights that the unstructured interviews produce data that is qualitative with the utilisation of questions that are open." Allowing participants to speak in depth and allowing them to choose their own words assist the researcher to establish a real sense of a persons' comprehension of an occurrence. This also have an increased rationality because it provides the interviewer with the chance to explore for an understanding that is deeper. The interviewer will be able to request for simplification and permits the respondent to guide the interview and the direction the interview takes. The unstructured interview has some restrictions such as that it can take considerable time to perform and interpret the qualitative data. Employing and training interviewers is costly and not cheap as gathering data in the Interview Schedule Guide (McLeod, 2014:20).

For data collection, the researcher utilised the unstructured KIIs. Macfarlan (2014:47) states that the KIIs are 'qualitative, in-depth interviews of fifteen (15) to thirty-five (35) people chosen for their first-hand understanding about a topic of interest, therefore this study targeted 55 participants. The advantages of KIIs are that they are an economical way to obtain a big picture of a situation; the information collected comes from people who have applicable knowledge and understanding. They permit for new and unexpected issues and ideas to appear.

Other disadvantages of KIIs are that there is a prospective for the new interviewer to unknowingly influence the responses given by participants. There is a potential for prejudice if informants are not chosen with care. Systematic analysis of an enormous number of qualitative data can take a considerable amount of time. The reliability of the data can sometimes be hard to demonstrate. Therefore, for this study, the researcher conducted the KIIs in person at selective Northern Cape study areas, with 'Sample 'A' and 'B'' targeting the SAPS rape investigators, SAPS FSL and DNA FS.

This interview type involved 30 participants. Procedurally, the Interview Schedule Guide was drafted and submitted to the allocated doctoral supervisor, as an expert in this study field, for approval. The participants were selected and subjected to KIIs for approximately 30-60 minutes. The selected participants were also made aware that the researcher is available to assist them at any given time, if they face difficulties in responding to the posed questions. The KIIs were conducted in a comfortable environment suitable for the researcher. Informed consent form detailing their rights of participations was read to all of them and it was made clear that they had the right to withdraw or refuse to participate in this study at any given time, as their participation was voluntary. Follow-up questions and probing were done to ease this process. Refer to Appendix C relating to the Interview Schedule Guides.

3.4.2 Simple observation schedule

According to Huysamen (2013:98), observation can be defined as the systematic description of events, behaviours, and artefacts in the social setting chosen for the study. The need for this data collection method was realised during interviews (KIIs and FGDs). This reason was rooted on participants' reactions and the given responses of the participants. Therefore, the researcher's attention was drawn from the onset of the meetings arranged with participants. The reaction from sample 'A' and 'C' compelled the researcher to employ the non-participative observation schedule, as some of the most significant information came outside the parameters of the conducted KIIs and FGDs. Furthermore, the researcher observed some of the general activities displayed during the data collection methods process. This was in support of Huysamen (2013:99) who argues that to study and understand the conditions and the sufferings of individuals, it requires that the researcher or anybody collecting data to reside with the participants for few days, even weeks or even longer and the researcher must be willing to live their daily experiences. Clark (2011:73) reveals that typology of researcher roles suggests a

continuum of possible roles: the participant-as-observer (A primarily a participant, while admitting an observer status); the observer-as-participant (Being primarily a self-professed observer, while occasionally participating in the situation) and a complete observer (being an observer of a situation without becoming part of it). Babbie and Mouton (2004:35) propose that in qualitative research, we usually find two types of observation; namely: **1)** Simple observation, where the researcher remains an outside observer; and; **2)** Participant-observation, where the researcher is simultaneously a member of the group she or he is studying, and a researcher, doing a study. For this study, the researcher's major observations were directed to simple observations with sample 'A' and 'C, involving of the 25 SAPS crime (Rape) scene investigators and 25 community members, the researcher observed their daily operations (SAPS members) and the way they interact and engage on the rape topic, as well as the manner they responded to the asked questions.'

3.4.3 Unstructured Focus Group Discussions

De Vos *et al.,* (2011:19) state that the FGDs refers to a carefully planned discussion, designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment." It is also a research technique that collects data through group interaction on a topic determined by the researcher. Dantzker and Hunter (2012:67) and Maluleke (2016:76) highlight that the best way to structure FGDs lies in interviewing several individuals in one setting. This method is not meant to replace individual interviews but to gather information that can perhaps not be collected easily by means of individual interviews. This refers to an information gathering method where the researcher directs the interaction and inquiry. The advantages of using FGDs include limited expenses, flexibility and stimulation. This method can be a useful qualitative method for gathering information and can be particularly interesting.

Moreover, the researcher made use of pre-arranged Interview Schedule Guide in the FGDs. The FGDs comprised 25 community members. Arrangements to meet with them were made through the Community Traditional Leader. The study aim, objectives and research questions were methodically explained to these members, and they understood that their participation was voluntary in nature, and they had the liberty to also withdraw anytime if they felt the need be. It was explained in detail that withdrawal would not result to any judgement or victimisations. It was also explained to them that the information to be provided would be used for the purpose of this study only. It was further stated that no person would be misquoted or victimised by participating in this study. Moreover, it was explained that the information

collected will be stored in line with UNISA protection of information policies and such information was going to be only used for the purpose of this study. They were also informed that their particulars would not be disclosed, confidentiality and their anonymity was guaranteed.

3.4.4 Documentary studies

Mogalakwe (2006:48) provides that the use of documentary methods refers to the analysis of documents that include information about the phenomenon we wish to study. This data collection method is described as a technique used to categorise, investigate, interpret and identify the limitations of physical sources, most commonly written documents whether in the private or public domain. For the orientation of this study subject, the researcher read the existing and published literature that appeared relevant to the research topic under research (Mogalakwe, 2006). Considering this, the following are selected primary and secondary sources that were consulted by the researcher:

- Constitution of the Republic of South Africa, 1996.
- The DNA Act, 2013.
- The CPA, 1977.
- SAPS Act, 1995.
- SORMA, 2007.

Other relevant publications on DNA evidence are SAPS journals, SAPS annual reports, SAPS official crime statistics, the KZN DCSL documentation and Stats SA information on the Northern Cape.

Also consulted:

- Textbooks on the research subject.
- Internet sources.
- Journal articles on DNA evidence and rape.
- Internet sources on DNA evidence and rape combating, investigation and policing.
- Dissertations and theses on crime combating, prevention and policing of rape and DNA evidence.
- Other local and international Acts.

3.5 DATA ANALYSIS METHODS

Barnard and Ryan (2010:69) define 'data analysis as the pursuit of similar patterns, in data, for thoughts that help to explain why such patterns are present. De Vos *et al.,* (2011:63) state that " the aim of data analysis is to look for trends and patterns that reappear within a single focus group or among various groups." During data analysis, the researcher should consider the words, context, internal consistency, frequency and extensiveness of comments, specificity of comments, and what was not said, as well as finding the 'big idea.' Data analysis is a process of bringing order, structure and meaning to the mass of collected data" (De Vos *et al*., 2011:64).

Again, Wayhuni (2012:41) argues that data analysis can involve multiple methods which are applied sequentially, and it is an important tool in interpreting the findings to answer the research question." Leedy and Ormrod (2014:33) suggest that "researchers should employ a data analysis spiral approach, which will capture the research accurately, as it also detects patterns and common trends. According to Creswell and Creswell (2018:27), data analysis in mixed methods research primarily entails classifying things, persons, events and the properties which characterise them. It also relates to the type of research strategy chosen for the procedures. Thus, in a proposal, the procedures need to be identified within the design; however, analysis occurs both within the quantitative and the qualitative approach and, often, between the two approaches.

Furthermore, Creswell and Creswell (2018:64) stress that data analysis in mixed methods consists of the process of integrating the two databases through side-by-side comparison, changing or transforming qualitative themes into quantitative variables, and then combining them into mixed databases and merging the qualitative and quantitative approaches in a table or graph. Therefore, drawing from the cited different authors like Barnard and Ryan (2010), De Vos *et al.,* (2011), Wayhuni (2012), Leedy and Ormrod (2014), and Creswell and Creswell (2018), data analysis is said to be a literature discussion and comparison of the identified study themes, while evaluating different patterns and similarities and, later, finding the relationship. Responses from the questionnaires were analysed and interpreted, different types of literature were analysed and interpreted, and laboratory results were analysed using scientific tools. The researcher embarked on a rigorous process of analysis to understand the analysis of DNA evidence as an investigative tool during rape investigations. Data were analysed using the inductive TCA. The researcher collected the empirical data, interpreted it, aided by the supervisor, who is an expert in the forensic and policing fields, with SAPS experience, guided

by the study aim, objectives and research questions. The inductive TCA was adopted to analyse collected data. Braun and Clarke (2014:19) state that this analysis focuses on the identification and classification of patterns or themes in qualitative data. This study utilised the inductive approach of the inductive TCA. According to Alhojailan (2012:47), the inductive TCA inductive approach means that the themes identified are strongly linked to the data themselves." Therefore, the researcher followed Clarke and Braun's (2014) model of the inductive TCA to analyse the collected data. The following are phases which were used by the researcher for data analysis:

- **Phase 1: Familiarisation with data**

The researcher familiarised himself with the collected data from sample 'A, B and C' using the KIIs, FGDs, documentary studies and simple observation schedule. This was achieved by transcribing and going through each script consisting of empirical data repeatedly to make sense out of the data in question. The researcher paid close attention to non-verbal cues and the tone of the responses when posing the questions and solicited responses.

- **Phase 2: Generating codes**

The researcher arranged codes to identify features of the collected data, focusing on semantic content that appears interesting, referring to the most basic segment, or element, of the raw collected data or information that was assessed in a meaningful way regarding the phenomenon [DNA evidence, as an investigation tool of rape in the selected Local Municipalities of Northern Cape Province, South Africa] under research. The coding in question allowed the researcher to simplify rich and complicated data, and further helped the researcher to determine short, yet meaningful segments of participants' responses. The researcher also identified key concepts from the participants' responses to check the commonality of their responses based on each question asked.

- **Phase 3: Identifying themes**

After codes have been identified across the data set, this phase re-focused on the analysis process of the identified study themes, rather than codes. This involved sorting different codes into potential study themes. The researcher organised the study themes based on the selected codes from the transcribed data, based on the study aim, objectives and research questions.

- **Phase 4: Reviewing themes**

This phase involved the review of the identified study themes, in terms of whether they correlate with the codes and the entire collected data, based on the study aim, objectives and research questions. The researcher also reviewed the identified study themes to ensure that they correspond with the research topic, problem statement, study aim, objectives and research questions, while guided by the Interview Schedule Guide.

- **Phase 5: Defining themes**

This phase enabled the researcher to define and name the study themes after sorting the collected data, based on the research topic, problem statement, study aim, objectives and research questions, while guided by the Interview Schedule Guide.

- **Phase 6: Report writing**

The researcher believed that it was necessary to develop a model to *"critically analyse DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape, South Africa."* This was devised to possibly improve investigations and policing of rape by sample A, B and C. Finally, the Thesis was produced, comprising five (5) chapters.

3.6 METHODS TO ENSURE TRUSTWORTHINESS

This study was conducted heavily relying on SAPS and UNISA approvals and further conformed to the four (4) elements of ensuring trustworthiness. The collected data was subjected to realisation of these elements to afford data integrity and not to compromise. The collected information with any other party, not involved in this study, and a non-disclosure agreement [Informed consent form] was submitted and signed by all members involved [The 55 selected participants and the researcher]. Yin (2011:19) states that the researcher should always apply measures that aim at influencing credible conclusions, by conducting trustworthy and dependable research, despite disagreements in overall research strategy, methodology, gathering of data or choices made. Saunders, Lewis and Thornhill (2012:27) argue that others have expressed new terms to address research methods, replacing reliability and validity with measures of trustworthiness; however, these measures are two entities with different requirements with different outcomes. Dunn (2013:32) submits that "validity relates to whether an instrument measures what it is meant to measure, and if it forwards the truth of the subject.

3.6.1 Credibility

Pilot and Beck (2008:48) hold that credibility refers to the extent of reliability within the study. The researcher will link the study with actual reality and use semi-structured interviews to collect data. The literature that the researcher collected and presented a true and accurate picture of what was claimed by the consulted and reviewed documentary studies through correct adhering to correct citations of sources and the acknowledgement of sources used in the study.

3.6.2 Transferability

Pilot and Beck (2008:51) refer to transferability as the ability to transfer the study to other contexts, situations and people. The researcher used the KIIs, FGDs, documentary reviews and simple observation schedules for data collections. The researcher made used of the study aim, objectives and research questions as guidelines for drafting chapter two of this study for transferability purposes. It is submitted that the research design and methodology applied in this study can be replicated and transferred to similar contexts if similar methods can be followed and literature studies can be consulted.

3.6.3 Dependability

De Vos *et al.,* (2011:82) define dependability as the extent to which the study can heavily depends upon. This means that a study must weigh the trustworthiness within it. The researcher ensured that the right questions are asked when soliciting relevant information, based on the study aim, objectives and research questions. The provided responses were recorded, and notes taken down, while supported by the gathered relevant literature studies on this subject. This study adopted the phenomelogical research design, supported by qualitative research approach, allowing the researcher to gain adequate data from 55 selected participants. Furthermore, non-probability: Purposive sampling technique was used, and data were collected in the form of IDIs, FGDs, documentary reviews and simple observations schedule. The adopted research design and methodology ensured coherent linkages between the collected data and reported study findings. The procedures and processes followed in the study are deemed acceptable, and in a case where other researchers conduct the same study using similar methods, there are high chances to obtain the same results. To further ensure dependability, consensus discussions were

held between the researcher and allocated supervisor to corroborate the identified study themes and created inferences.

3.6.4 Confirmability

Confirmability refers to the degree to which the findings of the study could be confirmed by other researchers (Korstjens & Moser, 2018:19). The confirmability of the study included the consideration of qualitative research steps. The researcher further ensured that selected participants forming part of sample 'A, B and C' are from policing area of the Northern Cape Province of South Africa, and the discussions offered by this study present the identified study themes, and are based to the study aim, objectives and research questions. The researcher confirmed with each participant if his or her responses are recorded correctly. The researcher also ensured that their point of views and biases are not brought forward, and the information obtained is not from other sources apart from their respective reflections (Shenton, 2004).

To ensure confirmability, the researcher also kept records of all consulted literature studies. As a result, the researcher can be able to prove that the study findings are not derived from his imagination but are clearly linked to the collected empirical data and literature studies. To prevent biasness, the researcher included the Interview Schedule Guide, which directed that the posed questions be answered adequately. Consequently, the study findings are determined by the reviewed literature studies on analysis of DNA evidence on rape investigations in the Northern Cape. To further ensure confirmability, the researcher documented procedures when checking and rechecking the collected data throughout this study.

3.7 ETHICAL CONSIDERATIONS

The researcher submits that the research topic is sensitive in nature. It has a potential of provoking emotions to the sensitive and fragile, and particularly to women who are mostly at the receiving end of rape. The researcher approached all participants with great caution, respect, professionalism and sensitivity. All members who took part in this research study were made aware that should they feel that they did not want to continue with participation anymore, the option to withdraw was available to them at any given time. The researcher further pleaded with participants to answer questions as unbiased and truthful as they possibly can. The value of their honest and unbiased contribution was clarified as a point of departure in assisting the researcher, SAPS and UNISA, and decisively addressing challenges that are faced in relation to DNA evidence on rape investigations in the Northern Cape. All the consulted authors from

journals, publications, dissertations, verbal communications, speeches and persons that were reviewed during the process of this study were duly acknowledged. The researcher respected the rules, regulations and standard operating procedures from all individuals and departments involved in the research study. No harm was caused to any participant, environment or animals during this research study. The rights of participants were always respected, and the researcher conducted himself professionally during the entire process. The whole process was voluntary, and all participants understood that they could withdraw from participation anytime.

Dantzker and Hunter (2012:35) state that ethical considerations in a research study means doing what is legally and morally correct during the process of the research journey. Grove, Burns and Gray (2013:65) provide that researchers are responsible for monitoring the integrity of their research protocol, results and publications. Leedy and Ormrod (2015:30) advise that there are standards to be adhered to by the researcher, namely:

- **Protection from harm:** No harm in any form was caused during the research process; the research is in the form of questionnaires and a literature review. All the data were properly acknowledged, no damage was caused to any authors' work, and no harm or damage was caused to any of the participants.
- **Right to privacy and confidentiality:** The researcher respected and honoured the privacy and confidentiality of the participants, and the information that was revealed to the researcher. Such information will not be used to either argue or support published information. The selected participants were each given the informed consent forms, where the nature of the research was explained, as well as all the details of the participants and their participation in the research study. All participants were free to discuss and deliberate on questions relevant to the research and their participation. Confidentiality of all the information gathered during the interview was guaranteed.
- **Voluntary participation, obtaining prior consent and informed participation:** The researcher ensured that participants know and understand that their contribution was a voluntary process during which they could terminate their participation at any time. Prior consent was requested, and participants involved were fully aware of the procedures available to them in case their participation was compromised, or the researcher violated their consent or voluntary participation. All the information used throughout the research was legally and ethically obtained. This reads with Appendix A (Informed Consent Form) and Appendix B (Information sheet).

- **Consent regarding conducting research at UNISA and in the SAPS:** In accordance with the National Instruction 4 of 2022, a written consent was acquired prior to the start of the research. The researcher requested access to SAPS and CSIR material and records, in terms of their policies regarding research, and regulations regarding interviewing SAPS investigators, including the community members, this reads with the attached Appendix D, indicating the request letters to conduct research with external organisations (i.e., SAPS, CSIR and Sol Plaatje Local Municipality - Galeshewe, Kimberley and Roodepan and Phokwane Local Municipality - Jan Kempdorp and Pampierstad). A reference can be made with the following Appendix: Appendix E - UNISA research ethics approval letter, Appendix F (SAPS approval letter) and Appendix G (The Local Municipalities approval letters).
- **Honesty towards professional reporting:** The collected data in this study were submitted in a comprehensive and honest manner, without any misrepresentation or fabrication of information, and no data or findings were dishonestly presented.
- **Maintain high standards:** The researcher takes plagiarism seriously; therefore, all sources were acknowledged and referenced accordingly. The researcher maintained the highest standards, to the best of his ability, throughout the research.
- **Professional code of ethics:** The researcher is familiar with the standards required from a UNISA student, especially at this level; therefore, the researcher did not compromise those standards, particularly regarding the institution's code of ethics. All the data collected by the researcher will be safely stored and will remain so for a period of not less than five years. The researcher is fully aware that this research belongs to UNISA, this reads with the attached Appendix E.

Further, Strydom and Delport (2011:29) submit that it is the ethical responsibility of the researcher to guarantee that the information will be expressed plainly, that plagiarism should never be committed at any time, and that both the confidentiality of the participants and the sensitivity of information should be upheld. Again, De Vos *et al.,* (2011:36) describe ethics as "a set of moral principles that are suggested by an individual or group, are subsequently widely accepted, and offer rules and behavioural expectations about the most correct conduct towards experimental subjects and participants." As initially highlighted, the researcher acknowledged all the authors whose information is used in this research. Members participating in the research study were treated with great respect at all times, and confidentiality was upheld.

3.7.1 The Belmont Report

The Belmont Report attempts to summarise the basic ethical principles identified by the Commission during its deliberations. According to the Belmont Report (2005:1) and Maluleke (2016:82), the researcher should follow appropriate guidelines in the selection of human subjects for participation in such research and take the nature and definition of informed consent in various research settings into consideration when conducting research. The researcher will, in this study, follow appropriate ethical guidelines as outlined by the Belmont report (Belmont Report, 2005).

3.7.2 Singapore Statement on Research Integrity

According to Marušić (2010:1) and Maluleke (2016:91), the researcher should be honest in all aspects of the study, be accountable in the conduct of research, have professional courtesy and fairness in working with others, have good stewardship of research on behalf of others, take responsibility for the trustworthiness of their research and adhere to the regulations and policies that are related to the study.

3.7.3 The UNESCO guidelines on research ethics Code of Conduct in social science research

The United Nations Educational, Scientific and Cultural Organisation (UNESCO) ethical declaration outlines some guidelines that should be followed when conducting research. “This includes the prevention of harm, the precautionary approach, equity and justice, scientific knowledge and integrity” (UNESCO, 2018:193). The researcher prevented any possible harm to participants, treated everyone equally, and had knowledge of this study and follow all ethical guidelines related to research.

3.8 SUMMARY

This chapter focused on the adopted research design and methodology in this study, to offer the descriptions of the research design, and research approach. This was done by presenting the study locations, study populations and sampling procedures, data collection and analysis methods. The methods used to ensure trustworthiness were also shared, together with the ethical considerations. The next chapter (Four) offers data presentations, analysis and discussions.

CHAPTER FOUR: DATA PRESENTATIONS, ANALYSIS AND DISCUSSIONS

4.1 INTRODUCTION

This chapter carefully presents, discusses and interprets the study findings. These are presented based on the collected responses from the selected participants. The responses were gathered using unstructured KIIs and FGDs, coupled with observations schedule. Information was gathered from three (3) samples [A, B and C], involving the 'DNA analysis specialist, SAPS investigators and community members.' The unstructured KIIs, FGDs and simple observation schedule were conducted, as discussed in section 3.3.5.1 (Unstructured KIIs), 3.3.5.2 (Simple observation schedule), and 3.3.5.3 (FGDs) of this study respectively. About twenty-three (23) questions were posed to the selected participants (Refer to Annexure A).

The significance of conducting the said interviews was to offer answers to the aim, objectives and research questions of this study. Moreover, constructive discussions on the emerging study themes were commenced to identify familiar patterns and trends associated with the study aim and objectives, as mentioned in section 1.3 (Study aim), 1.4 (Study objectives) and 1.5 (Research questions) of this study. The importance of the adopted research design and research approach were presented in section 3.2 and 3.3 of this study, and the targeted study sample, as expressed in section 3.3.4 of this study. Furthermore, to achieve the trustworthiness of this study, section 3.5 showcased the employed (4) elements to this study.

During the data collection process, the study aim, objectives and research questions were used as guidelines to structure the offered discussions. The themes of the study emerged from the answers of the 55 participants. Their verbatim responses were presented and discussed in this chapter. The referencing method for the conducted interviews in this study comprised a numerical sequence, based on the selected participants. For example, 'SAPS crime scene (Rape) investigators, sample 'A,' 1-25: SAPS Crime Scene [SAPS CS] rape investigators, sample 'B' consisting of 1-3: SAPS DNA FS, 4-5: SAPS DNA FS, from the CSIR in Pretoria, and sample 'C' involving 1-25: Community Members (CM). Thus, the referencing methods were designed as follows:

- SAPS CS (Rape) investigators.
- SAPS FS.
- SAPS DNA FS.
- CM.

4.2 INTERVIEWS, FOCUS GROUP DISCUSSIONS, OBSERVATIONS AND INTERPRETATION OF STUDY FINDINGS

Through the application of the purposive sampling, the researcher selected 55 suitable participants to form part of the KIIs and FGDs. This selection was based on expert knowledge and experience on DNA evidence analysis during rape investigations in the Northern Cape, while considering the problem statement of this study. Therefore, the findings of this study are categorised under the study aim and objectives. All the participants gave permission prior to them being interviewed by the researcher.

The presentation of the emerged themes and sub-themes during the conducted interviews and observation schedule are highlighted using their verbatim expressions. The findings of this study are incorporated into already discussed literature studies on this subject. This aided the interpretation of study findings, based on each study theme. About 25 participants were interviewed to specifically provide answers to the study aim. The cited responses emanate from the selected participants, namely: SAPS crime scene (Rape) investigators, stationed at Kimberley Police Station (001310), Jan Kempdorp Police Station (001322), Galeshewe Police Station (001320), Roodepan Police Station (001324), and Pampierstad Police Station (007114). The SAPS FS from the SAPS FSL, situated in Arcadia, Pretoria, and other (2) SAPS DNA FS from the CSIR in Pretoria, and community members residing within the (5) selected police stations (Kimberley, Jan Kempdorp, Galeshewe, Roodepan, and Pampierstad.

The targeted samples A and B were the SAPS officials with the following ranks: 'Lt Col, who is the Unit Commander of Kimberley SAPS FCS, a Constable, who recently started as an investigator, a Sgt and Warrant Officer (WO), who was a senior investigator, and a Captain. Furthermore, the themes and sub-themes that emerged during interviews and observation schedule are summarised in Table 6.

Table 6: The emerged study themes and sub-themes

Theme 1: Analysis of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape, South Africa / procedures followed during the use of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa
Sub-themes: 1.1 Proper assessment of using DNA evidence during rape investigations in the Northern Cape Province
1.2 The importance of DNA evidence from rape scenes

Theme 2: The significance of the application of sources of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa
Sub-themes: 2.1 Positive usage of DNA evidence during rape investigations
2.2 Involvement of specific role-players or stakeholders need to respond to the identified rape scenes
Theme 3: The chain of custody is maintained on DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa
Sub-themes: 3.1 DNA traces and reconstruction of rape scenes
3.2 various locations of DNA sources during rape investigations
Theme 4: Developing a conceptual model for preserving DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa
05 components of the designed conceptual model: 4.1 Understanding the significance of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa. 4.2 Considering the selected sources of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa. 4.3 Maintaining chain of custody for rape DNA evidence in the selected Local Municipalities Northern Cape Province, South Africa. 4.4 Better DNA evidence resources for rape investigations, advanced training and educational initiatives in the selected Local Municipalities Northern Cape Province, South Africa. 4.5 Interactions and information exchange on preserving DNA evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa.

Source: Researchers' illustrations (2023)

4.2.1 Theme 1: Analysis of DNA evidence during rape investigations

Theme 1 of this study consists of two sub-themes, namely: 1) Proper assessment of using DNA evidence during rape investigations in the Northern Cape Province, and; 2) The importance of DNA evidence from rape scenes. Therefore, the first study theme demonstrates the insights of the selected participants from sample A and B. In accordance with the study aim (Critically analyse DNA evidence during rape investigations in the Northern Cape) and objective 01 (To assess the use of DNA evidence during rape investigations in the Northern Cape Province). Most importantly, the answers for the bolded posed questions shaped the emerged study themes and sub-themes, as indicated in Table 6. As already stated, the study aim, and objective of this study were used in this section. The reviewed literature studies in Section 2.2 (Analysis of DNA during rape investigations/ procedures followed during the use of DNA evidence during

rape investigations) of this study, together with participants' responses showcased that the DNA can be positively used for rape investigations by linking a potential suspect to this crime. A notable case involving a young girl who was brutally raped in the small town of Louisvale in the Northern Cape showcased the practical nature of this technology. The collected DNA from the rape scene (The victim's body) was the main evidence.

It was also indicated that DNA evidence support investigators during rape investigations with many aspects. Moreover, the uniqueness of DNA analysis and testing process during rape cases depend on the use of different methods to obtain the required genetic profile. Furthermore, many factors for DNA analysis during rape investigations are considered, as shared in section 2.2.1 of this study. This was done in conjunction with the selected shortcomings of DNA evidence during rape investigations, in reference to section 2.2.1 of this study. The use of DNA evidence during rape investigations, as presented in section 2.2.2 of this study showcased the importance of this technology in addressing rape. It can be used to assist investigators to identify and possibly arrest individuals responsible for the commission of this crime and it is the most accurate and reliable mode of identification to be used during rape investigations.

Considering the findings of this study, the researcher submits that local SAPS investigators, DNA analysts and community members should be informed of what rape scenes reconstruction entails. This can be done practically and theoretically, since some of them are not largely vested with the concept *(Analysis of Deoxyribonucleic Acid evidence during rape investigations in the selected Local Municipalities of Northern Cape, South Africa)* and its importance. Therefore, the following phases of rape investigations should be adhered to during this process:

- **Preliminary investigation** (Rape is determined, suspect arrested, if possible, rape scenes are protected, victims and witnesses identified, basic statement taken, and rape scenes processed).
- **In-depth investigation** (The rape preliminary investigations data are re-examined, rape scenes revisited, rape scenes processed further, existing and new victims and witnesses are located and interviewed, documents processed, facts and evidence gathered, application of criminalistics - SAPS investigators, SAPS FSL and DNA analysts - are arranged).
- **Concluding investigation** (When a rape case is suspended, or a case is successfully concluded and prepared for a possible prosecutions). There is no doubt that the DNA can assist them during the course of rape investigations. These stakeholders, singling out the SAPS investigators and DNA analysts should properly utilise resources available to them

to clearly understand the commission of rape and determine what occurred during rape incident. This will aid to maintaining the chain of custody. The rape scenes reconstructions should be conducted carefully to avoid evidence contaminations. The preliminary investigations of rape scenes should be conducted, while avoiding various mistakes. This can assist these stakeholders to determine possible sequence of rape events leading a possible prosecution. Efficient rape investigations are very important for court proceedings, as the court will be able to arrive to a conclusive decisions with less hassle and deliberations.

The admissibility of DNA evidence in court proceedings should always be prioritised. The rape scenes reconstructions should be done adequately and conducted irrespective of whether or not the initial rape scenes investigated was done by the SAPS FSL. This can also allow for a review of the photographs, notes, sketches and physical (DNA) evidence collected during the preliminary investigation to be examined to determine the sequence of rape events as initially stated. Therefore, the bolded questions were posed to sample A and B, consisting of SAPS CS (Rape) investigators, SAPS FS and SAPS DNA FS, to offer analysis to the aim, objectives and research questions which guided this study. Some of their verbatim expressions are shared to make sense of their responses in verbatim.

4.2.2 Theme 2: The significance of the application of sources of DNA evidence during rape investigations

This theme is linked to the identified two (2) sub-themes, namely: 1) Positive usage of DNA evidence during rape investigations, and; 2) Involvement of specific role-players or stakeholders need to respond to the identified rape scenes. Thus, to be able to identify DNA evidence is a skill that plays a significant role in crime investigation, particularly sexual-related crimes. To this end, first responders to these types of crime must ensure that the scene is cordoned off, no unauthorised persons are allowed to tamper with the scene until crime scene is handed over to analysts, who will also ensure that there is a proper recording or record keeping, especially the continuity of possession. It is also important to note that crime scenes should be treated like a shrine and that victims of crime must be treated with respect and dignity as they would have just been subjected to traumatic experiences. Sensitivity regarding questioning of crime victim is of paramount importance. The presented literature studies in chapter two of this study presented in detail the analysis of DNA (As presented in 2.2), South

African Criminal Law (Sexual Offences and Related Matters) Amendment Act 32 of 2007. Moreover, the Constitution (South Africa 1996), which is the custodian of the South African legal system, emphasises the fact that victims of crime must be afforded their right to dignity. It is noted by Lynch and Hancock (2012:19), as discussed in Section 2.2, that "the main reason why DNA is the most significant piece of evidence during investigation of rape cases, is that DNA is found in every cell (Except red blood cells) in our bodies, which makes it inevitable that the rapist will deposit and leave evidence at the crime scene." In addition, Murphy (2015:69) concurs with previous authors by highlighting that the fact that DNA evidence is one single tool in the crime investigation field that investigators should lean on during investigation of rape cases, as it is a silent witness that can stand on its own without necessarily relying on other pieces of evidence.

It is further highlighted by Lonsway, Archambalt, O'Donnell and Ware (2016:48) that "DNA evidence collected from the crime scene can link a suspect to or exonerate him from the crime and the crime scene." This means that there is a greater chance of identifying perpetrators of sexual offenses when the crime scene is professionally handled. This fact emphasised the significance of training to ensure that procedures are followed from the beginning until the matter is presented to court and for successful prosecution of perpetrators and exonerating innocent suspects. Besides, during in-depth interviews with focus-group participants, it became clear that there are different views and/or perceptions in terms of understanding of DNA evidence. Participants were asked if they have attended a rape crime scene. Participant responded as follows:

"Yes, *I did, a countless time*; *Quite a few*; *Yes, a number of times*; *Yes, many times*."

In addition, participants were asked if they consider themselves as experienced investigators, and they had this to say:

"*Yes, with confidence; partially; Yes, definitely; Yes, absolutely*."

The literature by Wilson, McClure and Weisburd (2012) in Section 2.2 of this thesis emphasises the significance of proper training and experience of crime scene investigators. This will ensure the integrity of crime scenes and to avoid contamination of crime scenes, ensure continuity of possession of evidence and ultimately, successful prosecution. It is therefore of utmost importance that only properly trained and skilled crime scene investigators are dispatched to attend crime scenes. Also, while first responders are not trained regarding crimes scene analysis, they too must be trained to ensure the integrity of crime scenes until

such scenes are handed over to experts. Based on the responses by participants, it appears that they had a total grasp of what is expected to become an investigator, and how to handle DNA evidence at rape crime scenes. However, the responses of these participants do not necessarily mean that all investigators have the same understanding.

This means that refresher courses should be continuous, to ensure that investigators remain relevant and accustomed to the latest developments about crime scenes. Although criminals do everything to conceal their tracks, Locard principle always prevails. These principles are because 'every contact leaves a trace.' As a result, investigators must ensure that every effort is made, to trace evidence left behind by perpetrators of crime. Investigators should be concerned to attend a crime scene and be able to locate evidence as there is no such thing as a perfect crime. Section 2.3 highlighted sources of DNA evidence and this provided information for investigator of sexual crime scenes. It would also be advantageous if crime scene investigators are aware of such sources, as this will lead to arrest and successful prosecutions of perpetrators. The following section presents the interpretation of the third theme.

4.2.3 Theme 3: The chain of custody is maintained on DNA evidence during rape investigations

This study theme reads with the two (2) identified sub-themes, namely: 1) DNA traces and reconstruction of rape scenes, and; 2) Various locations of DNA sources during rape investigations. Therefore, maintaining the chain of evidence, often referred to as the chain of custody is a very significant investigative procedure in the legal and CJS. Simply put, it means that investigators must ensure that every activity in the investigation process is properly documented/recorded in one form or another. It involved documenting and preserving the chronological and documented history of the physical evidence involved in a case, from the moment it is collected to its presentation in court. The purpose is to establish the integrity and reliability of the evidence, ensuring that it has not been tampered with, altered or contaminated during the investigative process. This meticulous tracking of the evidence's handling is essential for legal proceedings as it adds credibility to the presented evidence and reinforces the trustworthiness of the overall investigative process. "In this process, physical evidence, clues or exhibits that are found, identified as an exhibit, and seized at the crime incident are covered, stored, packaged, analysed, transported and presented in court, as an exhibit, without any alterations" (Lochner & Zinn, 2015:14-15). These include samples taken from a victim, a complainant, an exhibit, physical evidence or a suspect. This in essence also involves the

preservation of evidence, which according to these authors means the deliberate and specific actions taken with the intention of preventing contamination of damage to or the loss or destruction of any evidence.

Moreover, these authors (Lochner & Zinn, 2015:15) opine that the process involves: safeguarding the evidence at a fixed location; forwarding the evidence to the laboratory for examination and analysis; obtaining the evidence from the laboratory; keeping the evidence safe under lock and key where it cannot be tampered with until it is delivered in court). Participants were asked about their understanding about chain of evidence. They responded as follows:

> "*I understand the process and ensure that procedures are followed when attending crime scenes*." "*I ensure that evidence collected from crime scenes are kept safe until presented to court as evidence*." *We keep record of all activities related to evidence collected from crime scenes and ensure the integrity of evidence is maintained*." *There is no room to compromise the integrity of evidence and we ensure that evidence is properly documented and/or recorded*."

These responses are in line with the assertion by Butler (2015:87) in Section 2.4, who states that the integrity of a biological sample is very important in any forensic casework. Moreover, it is evident from the above responses that participants understand the significance of maintaining the chain of possession, also known as continuity of possession. However, these are the views of the interviewed participants, therefore, it is not clear if all investigators have the same understanding. This is the subject of further investigation, based on a number of both successfully prosecuted cases as those cases which were not successfully prosecuted due to lack or insufficient evidence.

At the time of writing this thesis, there were high-profile cases which integrity issues were deliberated or questioned, as there were questions about continuity or chain of evidence collected at those crime scenes. It will be important for investigators to investigate issues related to this aspect, going forward. This will ensure that there are no loopholes or gaps which the defence will use to defend their clients. To this end, the researcher developed a conceptual for preserving DNA evidence during rape investigation. Implementation of the guidelines in this model will result in high number of convictions and the reduction of crime in South Africa. The following section presents development of the conceptual model for DNA evidence proposed for use during rape investigations.

4.2.4 Theme 4: Developing a conceptual model for preserving DNA evidence during rape investigations

Based on the discussion offered in section 2.6 of this study and section 5.4 of this study. The following five (5) components of the conceptual model are shared:

- Understanding the significance of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
- Considering the selected sources of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
- Maintaining chain of custody for rape DNA evidence in the selected Local Municipalities Northern Cape Province, South Africa.
- Better DNA evidence resources for rape investigations, advanced training and educational initiatives in the selected Local Municipalities Northern Cape Province, South Africa.
- Interactions and information exchange on preserving DNA evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa.

The designated DNA experts dealing with rape investigations remain a positive link for investigating this crime, and they also offer specialisation of rape scene reconstructions. These individuals also specialise as 'fingerprint experts, facial identification experts and compilers of identikits. The inclusion of rape scenes reconstruction specialists on SAPS LCRC can allow these experts to be easily accessible across the Northern Cape Province. These reconstructions should be done using 3Dimension (3D) photography, while the local SAPS [Rape] investigators match-up to the international standards employed at US selectively and conduct rape scene reconstructions by adopting 'photogrammetry and animations.' This offers a distinct advantage of producing 3D realistic models of rape scenes. The SAPS investigators, as specialist of rape scenes reconstruction, ensure that aspects of rape scenes reconstructions are used to the fullest, and that all evidence is collected and presented before a court of law with detailed information and evidential value. The SAPS investigators fully understand what rape investigation entails, and what comprises the objectives of investigating this crime. The following section presents participants' responses to questions posed during focus-group interviews as well as other engagements with participants in various research environments of this study. The responses either confirmed the literature review information and also added other perspectives related to DNA evidence and continuity of possession.

4.3 PARTICIPANTS RESPONSES AND DISCUSSIONS

Moreover, the following Seventeen (17) statements were used to formulate questions posed to the selected participants to achieve the mentioned study themes and sub-themes, as depicted in Table 6 of this study:

- **Statement 1: Exploring participants' views of the significance of preserving chain of custody of DNA evidence.**

This section presents, analyse and discuss data on the views of participants on how to maintain the 'chain of custody for rape DNA evidence in the Northern Cape Province', as discussed in section 2.4 of this study. The collected DNA materials are sent by the responsible SAPS investigators to the SAPS FSL for analysis and storage timely and they should be protected from any possible damage or contamination. The DNA analysts are responsible for extracting required evidence, while ensuring that the cornerstone of the judicial process is maintained for the presentation of DNA evidence in a court of law.

Importantly, DNA evidence for rape cases does not officially exist until someone recognises an item's potential value to the investigations and related prosecutions. Thus, the biological evidence from rape scenes needs to be collected carefully, transported and stored properly prior to courts presentations. This section (2.4) also presented useful guidelines on handling rape DNA evidence during transportation. Therefore, DNA evidence during rape investigations plays a major role in solving this crime. The DNA evidence obtained from rape scenes can be positively used to link a potential suspect to the alleged committed rape crime. This technology can also be used to exonerate or exclude innocent people suspected of committing this crime. The selected South African legislative frameworks, SAPS policies and SAPS National Instructions offer guidelines on how to manage DNA evidence during rape cases. Thus, the SAPS LCRC and FSL should adherence to the selected legislative frameworks, SAPS policies and National Instructions. These are essential in this regard, as they are responsible for the management of DNA evidence during rape investigations.

It is also revealed that the standing order be developed and included in the guidelines on how to collect biological exhibits that collection of biological exhibits must be done by the forensic fieldworkers only. The guidelines must clarify that identification and individualisation of biological exhibits are the responsibility of the analysts and not the SAPS investigators and other relevant stakeholders. The non-compliance to the legislative frameworks, SAPS policies

and National Instructions, is guided by the Constitution, CPA, 1957, and SAPS Disciplinary Regulations, and the SAPS Code of Conduct. The DNA Act of 2013 is the current legislation that oversee the usage of DNA samples collected at rape scenes and possible victims. The suspect's DNA samples are kept on a database to be compared and linked to the potential suspect. The collected DNA evidence is packaged using a prescribed packaging container and properly sealed to minimise evidence contamination. The prescribed protective gear must be worn during the collection process and be changed regularly after the collection of certain items. The documentations of handling DNA evidence are done for SAPS investigators involved in the handling of DNA evidence to ensure to avoid evidence tampering.

The SAPS investigators involved in the management of DNA evidence often experience various challenges, including instances where rape scenes are not 'properly secured, weather conditions, humiliation experienced by potential victims after rape incident, inexperienced investigating officers, as well as inexperienced by-standers/onlookers next to the identified rape scenes. Moreover, the management of DNA evidence in rape cases involves the collection, preservation and packaging of DNA evidence. The experiences of the selected participants (SAPS CS (Rape) investigator, SAPS FS and SAPS DNA S) of this study showcased the importance of DNA evidence, as located from rape crime scenes and for them to undergo specific training to gain the expertise to perform their duties effectively remains of utmost importance. However, the community members were found to be having limited knowledge on the usage of DNA evidence during rape investigations. To elicit information from participants, the following question was posed to participant: Can you please explain the chain of custody of evidence from the time you arrive at the scene until it is presented to the courts? Participants responded to this question as follows:

> *"Above answer remains, however what is important is that the chain of evidence should be always maintained. I have not been into faced with that situation. It must be maintained from start to finish, when handing over any piece of evidence. It must be done through proper documentation. From the time the evidence is collected from the crime scene till the case is finalised, it must never be compromised. Chain of evidence is what guides those who are responsible for evidence from collection to presenting the evidence in court. The rule is the same and that is that evidence must be transported in a manner that does not leave question marks. That is done by the forensic experts. That is done by the forensic experts. The most important thing about the chain of evidence is that its chain must be maintained with great care and must never be questioned. The*

most important thing about the chain of evidence is that its chain must be maintained with great care and must never be questioned. What is important is that the chain of evidence should be always maintained. The rule is the same and that is that evidence must be transported in a manner that does not leave question marks."

It is evident from these responses that participants have some knowledge about the concept. Moreover, these responses are in line with what has been highlighted by Lochner and Zinn, (2015:14-15). The vast differences of the responses by participants make this study to enhance the quality of investigators and analysts the SAPS should jealously look after to prevent these investigators to be poached by other institutions. From the literature, as discussed in chapter two, it became evident that participants have a conceptual understanding of the concept. Furthermore, the interpretation of statement 02 is presented below.

- **Statement 02: Exploring participants' background and training in a specialised setting.**

This refers to understanding the education, skills and experiential knowledge that individuals have acquired in a specific and focused environment. In this context, it involves exploring the participants' past experiences, qualifications and training relevant to a particular specialised field or context. This analysis was aimed at gathering insights into the diverse expertise and preparation that individuals bring to a specific setting, providing a comprehensive understanding of their capabilities and contributions within that specialised domain. It has been established in this research that participants in the focus group interviews are highly qualified and the criteria to be analysts in the SAPS FSL must meet a set criterion. There was no question about participants' qualification and experience shortfall. It is therefore insignificant to repeat their answers regarding this aspect as they were responses such as 'Yes and No' answers to the questions posed. The interpretation of statement Three (03) follows below.

- **Statement 3: Exploring participants' understanding of using the right equipment when collecting evidence.**

Ensuring the use of appropriate equipment in evidence collection is of significance. This will ensure the maintenance of the integrity of evidence. The choice of tools and instruments to be used during the collection process significantly impacts the quality and reliability of the evidence presented in legal proceedings. Moreover, the use of proper and correct equipment assists in minimising or preventing evidence contamination and ensure that the originality of

such evidence is maintained until presented in court. Furthermore, the use of specialised and calibrated equipment enhances the accuracy of forensic analysis (Crime Scene Investigation: A Guide for Law Enforcement, 2000). This is particularly crucial in DNA analysis, where precise measurements and conditions are essential for reliable results. Subsequently, courts often scrutinise the methods used in evidence collection. To this end, it is crucial for investigators to employ correct equipment to enhance the defensibility of their evidence, making it more likely to withstand legal challenges.

As a result, ensuring the use of correct and appropriate equipment in evidence collection not only safeguards the evidentiary material, but also contributes to the overall reliability and trustworthiness of forensic investigations in the CJS. When asked about using the right equipment when collecting evidence, participants responded as follows:

> *"Firstly, you must always use gloves before touching any item/object from the scene. Normally investigators are not collecting evidence by themselves, our photographers from the local record centre are the ones collecting the evidence. However. The investigating officer will also be at the scene during the time when the victim points out exhibits that have been used. The evidence will then be photographed first by the SAPS LCRC then collected, sealed in front of the investigating officer and the victim; it will then be put into the evidence collection bag. In a case whereby its stick, it will be collected by the investigating officer."*

The follow up question was posed: do you have the correct specialised equipment? And participants responded as follows:

> *"I must have rape kit all the times. Yes, the rape related cases can be difficult to investigate, requiring specific equipment. Yes, but it is mostly used by experts. Yes, tailored special equipments are required to perform rape investigations correctly. I must have rape kits at all times. Yes, the rape related cases can be difficult to investigate. Yes, but it is mostly used by experts. Yes, tailored special equipment is required to perform rape investigations correctly. Yes, the SAPS organisation does have them. No, I am still under training, so I always go to the crime scene with someone who has the kit. Yes, however, not all specialised equipment are available. Yes, we do, with limitations though. Yes, they a limitedly available."*

From the literature and responses from participants, it became evident that participants are aware of the significance of proper crime scene handling. Moreover, if this approach is

maintained, there is a greater chance of successful prosecutions of perpetrators of crime. The vast difference in opinion of these participants makes these responses trustworthy, thus reaffirming the requirement of the urgent need for training of investigators of crime and the implementation of policies as well as adherence to these policies. The literature contained in chapter two serves to emphasise and highlights the facts as stated by participants. As clearly noted in chapter two, Foreman *et al.*, (2018:19) write that the DNA as an investigative tool has grown, through a series of imaginative ideas and brilliant technological implementation, to become the most powerful scientific technique available to the crime investigator since the adoption of fingerprints as a means of personal identification at the turn of the 20th century.

Therefore, it is crucial that investigators of crime are properly trained and equipped with relevant resources to ensure successful prosecutions. This reads with section 2.6 of this study. The interpretation of statement Four (04) follows below.

- **Statement 4: Exploring participants' perceptions about the potential outcomes of using equipment inaccurately in evidence collection.**

In this section, the researcher explored participants' perspectives about the potential consequences which are likely to arise because of inaccurate use of equipment in the context of evidence collection. The objective was to understand their perceptions of challenges that may unfold employing wrong equipment while collecting evidence at crime scenes. The correct usage of equipment means that the integrity of evidence collected at such crime scenes will not be compromised and will ensure successful prosecution of perpetrators of crime. In response to the given statement, the selected participants responded as follows:

> *"The evidence will be contaminated and not admissible in the court of law. Evidence will be lost; the bottom line is that you cannot collect any evidence without the right collection kit. Evidence will be contaminated. Critical evidence will be destroyed. Destroying the most important or the only evidence. There is a lot of things that can go wrong, photos must be taken, K9 must be there with their dogs to collect the evidence and evidence can be easily tempered with in a case where one does not have the correct equipment. The evidence will be contaminated and not admissible in the court of law."*

From the literature presented in chapter two, it became evident that participants are aware of the compromises which may result from carelessness regarding evidence handling as well as the significance of continuity of possession. This is supported by De Wet *et al.*, (2023) when referring to forensic investigator who came under a lot of pressure during his testimony

regarding crime scene management related to one of the high-profile cases where the South African team player was murdered. The handling of the crime scene by such investigator have left some questions unanswered and have had a potential to compromise the case.

The literature by Gourarie (2018:8) presented in chapter two clearly identifies the significance of managing crime scenes properly. Furthermore, it is important to note that the case can either be won or lost right at the crime scene, because of how such a scene was managed or handled. The presiding officers in court must judge whether evidence presented in court is sufficient to prove the innocence or guilt of alleged perpetrators of crime. Training of investigators as well as capacitation plays a crucial role to ensure that crime scenes are properly investigated. Furthermore, the literature discussed in Section 2.4 of this thesis highlights section 51 of the Criminal Law Amendment Act 105 of 1997 (South Africa, 1997) that specifically deals with DNA evidence and how to handle exhibits.

Rasool and Rasool (2020) clearly highlighted processes emanating from identification of DNA materials to the time they are collected and sent to the Forensic laboratory. The aim is to identify any biological evidence that may link a suspect to the crime. While most crime investigators in South Africa comply with the prescripts governing crime scene management, failure by the few to do so is a course for great concern as there should be no single case which should be thrown out of court due to lack or insufficient evidence. However, it appears that training remains a critical factor in terms of crime scene management, resulting in low conviction rate. It would be advantageous if investigating officers in the South African Police Service are aware of handling of crime scenes and that would lead to high conviction rate, particularly sexual offences.

Therefore, the following section presents interpretation statement 05:

- **Statement 5: Exploring participants' perspectives with regard to collection, packaging and transportation of sexual assault crime scene evidence.**

Navigating the delicate terrain of collecting, packaging and transporting evidence from sexual assault crime scenes requires a meticulous blend of sensitivity, precision and adherence to established protocols (Holloway, 2005). There are critical processes which are involved in handling evidence. Investigators must recognise the significance of preserving not just physical evidence, but they must also respect the dignity and well-being of victims of crime. During the interview process, participants had this to say:

"There is a specific way of collecting the evidence from taking the statement and recording it and booking it to the commander through the chain statement based on the evidence collected. I am not familiar with that process as it is always done by experts. It must be collected with care; correct kit must be used, and its transportation must be conducted in a professional manner. That is a job of experts, but it should be collected in a manner that portrays integrity and respect to the investigation. Through specialised collection kit. Through specialised collection kit. It is best left at experts as they know what to do and what tools to use, no one who is not trained should collect evidence as that would end up compromising important evidence. There is a specific way of collecting the evidence from taking the statement and recording it and booking it to the commander through the chain statement based on the evidence collected."

From the consulted literature studies, as discussed in chapter two, it became evident that some crime scene investigator does not have sufficient training about crime scene management and processes to be followed when evidence must be collected and packaged. In some instances, investigators appear to be intimidated when high-ranking officers arrive at crime scenes while such investigators are busy analysing the scene. These lead to valuable evidence being either over-looked or compromised. According to the Royal Society (2017), investigators must ensure that time is spent on crime scene until all biological materials present at crime scenes are detected, collected and packaged, this reads with section 2.1 of this study.

As illustrated in chapter one and two of this study, De Wet, Oosthuizen and Visser (2023) are of the opinion that transporting DNA evidence in a secure and controlled manner is crucial to maintaining its integrity and ensuring that it can be used as reliable evidence in a court of law. Similarly, Lynch and Hancock (2012) state that "evidence will always be existing at crime scenes and just have to be discovered, collected and packed." The literature contained in chapter two highlights the significance of proper crime scene processing. The reviewed literature further points to the advantages of adhering, implementing and maintaining correct crime scene management (Dintwe, 2009, Foreman *et al.,* 2018 and Alshehhi & Haddrill, 2019). From the responses of participants, it is evident that investigators must be properly trained and equipped to efficiently be able to process crime scenes which will eventually result in convictions. Equally, the interpretations of statement Six (06) is discussed below.

- **Statement 6: Exploring participants' perspectives on the significance of DNA evidence and its analysis relative to other types of evidence.**

"DNA holds a significant thread in the intricate web of forensic investigation, and there appears to be a secret code which is woven into its existence" (Sing, 2021). Therefore, it is important that investigators recognise the unparalleled significance of DNA and to ensure that no crime scene evidence is compromised, or its integrity exposed to questions. "Understanding the unique capabilities and limitations of DNA evidence is paramount in the pursuit of justice" (Meintjes-Van der Walt and Dhliwayo, 2021; and Alghafri *et al.,* 2018). From the in-depth interviews with participants, it became evident that they understood the significance of DNA evidence, and that DNA holds a key about proving the innocence or guilt of alleged sexual offence suspects, this reads with chapter one and two of this study, refer to section 2.4 and 2.2.2. In response to the questions posed, participants responded as follows:

> *"DNA put the suspect on the crime scene. If we do not apply it, it will be that person's word against that one. Its importance can never be compared. More than anything, I think all evidence materials complement each other. It is the one that is superior to any because it can stand in court alone without support from other evidence materials. One of the most effective evidence materials. It is more superior to any other."*

The literature presented by Alghafri *et al.,* (2018) in chapter two of this thesis clearly highlight the significance of DNA evidence analysis. Furthermore, as noted in Section 2.2.2 in chapter two, other authors also emphasised DNA evidence analysis (Waltke, LaPorte, Weiss, Schwarting, Nguyen & Scott, 2018). To this end, it is advisable for crime scene investigators that they adhere to crime scene management protocols. This will ensure successful prosecutions of sexual offenses perpetrators. For illustrations, the interpretation of statement Seven (07) is presented below.

- **Statement 7: Exploring participants' knowledge of the effective use of DNA as a tool in criminal investigations**

"In criminal investigations, DNA emerges as a powerhouse tool, and it wields incredible ability to unravel and unlock mysteries and secrets hidden in its code," Waltke *et al.,* (2018). These authors further opine that the effective utilisation of DNA in criminal investigations plays a significant role in terms of providing investigators with crucial insights into the who, what and how of crime. During interviews with participants regarding the effective use of DNA as a tool in criminal investigations, they responded as follows:

"Yes, many and I have had a number of successes through DNA analysis. I have two cases where the victim did not know who raped her but her kit was sent to the Forensics and the rapist was identified. Yes definitely, more rape cases are solved using this investigative tool. Yes, a lot of them. Many, actual, countless. Yes, a lot of them and my station has been a part of such successes. Yes, many and I have had a number of successes through DNA analysis. I have two cases where the victim did not know who raped her, but her kit was sent to the Forensics and the rapist was identified."

The presented literature studies in chapter two (Section 2.3) confirms participants' responses (Dintwe, 2009:73, Foreman *et al.,* 2018). From participants' responses, it is evident that DNA evidence does not only serve as an irrefutable link between crime scene and suspects, but also acts as a silent witness. To this end, it is evident that DNA is an invaluable ally/friend in the pursuit of justice.

To this end, the interpretations of statement Eight (08) is as follows:

- **Statement 8: Exploring participants' perspectives on challenges in DNA analysis within the context of rape investigations**

There are a multifaceted challenges and complexities of DNA analysis within the context of sexual assault investigations. Moreover, DNA holds the potential to expose the truth. It is important to note that, investigators are faced with challenges when they navigate crime scenes in search of DNA. For this reason, DNA analysis must be understood within sexual assault context and the multifaceted challenges associated with its investigation. In addition, it is important to note that DNA holds the potential to expose the truth in a situation where no other evidence can do so. Moreover, one must understand the DNA analysis in sexual assault investigations is a delicate exercise which demands patience and resilience on the side of investigators. Participants were asked about their perceptions or viewpoints on this matter, and they responded as follows:

"No, not at all. However, it is too earlier to be conclusive. Not yet, still working on many rape cases involving this investigative tool. I am not aware of any and I doubt if there are any. Yes, but it is mostly because there was an error during collection or handling of the DNA. Not really. However, the future of DNA usage on rape cases will reveal more details."

The literature in chapter two was corroborated by some of the responses from participants (Lynch & Hancock, 2012; Butler, 2015). It is evident from the participants' response that there is a general understanding of the significance of DNA in the investigation of sexual offences. Thus, the following section presents statement Nine (09) interpretations.

- **Statement 09 Exploring participants' insights regarding the impact of rape on victims**

While the impact of rape on victims can only be described by victims, people around them are also affected in various ways. Moreover, it is evident that addressing the impact of rape on victims is a challenge but it is crucial that investigators understand such impact so that required support can be provided while investigation is ongoing. Investigators must ensure that there is no secondary victimisation, and the privacy of these victims is always respected. This issue involves both physical and psychological trauma and therefore, have implications which victims are most likely to grapple with for their lifetimes. It is therefore important that investigators are empathetic and offer required support in their investigations. To understand this impact, participants were asked to give their opinions on this aspect, and they responded as follows:

> *"Never ending trauma and fear. Some victims never really heal. Trauma, victims are always left with withdrawal symptoms and shame. Lifetime trauma. The impact cannot be imagined, and it should not be imagined as it is the worst, with unimaginable trauma."*

The literature presented by (Mphephu, 2022; and De Wet *et al.,* 2011) in chapter two of this thesis clearly highlight the impact of rape on victims. The researcher is of an opinion that investigators of rape cases must be properly trained and must be able to refer rape victims to relevant departments and avoid secondary victimisation by making sure that inappropriate questions are not posed to victim at any stage of their investigation. From the responses of the participants, it is evident that rape victims suffer irreparable damage both physically and emotionally, and therefore require support for them to recover from the ordeal. Considerably, the following interpretation focuses on statement Ten (10).

- **Statement 10: Exploring participants' perspectives of societal, national and global impact of rape**

It is important to note that the impact of rape extends beyond the victim or survivor. According to (Skinner & Wienroth, 2019; Royal Society, 2017), "rape have a potential to send ripples and shockwaves across the fabric of society, nations and the global community." For this reason, societies across the globe must unequivocally denounce this anti-social behaviour where it occurs. "Rape has a propensity to strain the social fabric, challenge legal systems as well as healthcare infrastructures" (Royal Society, 2017), this reads with section 2.4 and 2.2.2 of this study. It is therefore essential to understand its (Rape) impact at various levels so that society can collectively protect the vulnerable. Participants were asked their viewpoints and had this to say:

> *"Northern Cape is currently known as the Head Quarters (HQ) of rape so you can imagine the black cloud it puts on the community, the fear and all sorts of negative things. Communities never really rest; they keep looking over their shoulders. Hostility amongst communities. Same as to the victim. Fear amongst the direct victims, secondary victims and potential victims who are all law-abiding citizens."*

Furthermore, emanating from the aim of this study, the following objectives were formulated to reveal the following study findings. The verbatim responses of the same selected participants are shared in the following section. In essence, the SAPS CS (Rape) investigators, SAPS FS and SAPS DNA Section continued sharing their valuable views and opinions concerning the use of DNA evidence during rape investigations in the Northern Cape Province. Based on the analysis made for 'theme 1, comprising the study aim: Analysis of Deoxyribonucleic Acid evidence during rape investigations in the Northern Cape,' and study objective 1: To assess the use of Deoxyribonucleic Acid evidence during rape investigations in the Northern Cape Province.' It was clear that the selected participants were familiar with the usage of DNA evidence for rape investigations, as well as the related importance. This discussion is supported by the reviewed literature studies in section 2.2 of this study. During rape investigations, specific role-players or stakeholders need to respond to the identified scenes. This is done during the preliminary investigations of this crime for proper collections of DNA evidence, as well as other related evidence. These stakeholders are not limited to the 'forensic experts, SAPS FSL members and SAPS investigators.' Moreover, medical doctors are also responsible for collecting DNA evidence from potential victims and suspects. Most importantly, the most

common DNA evidence to be found at the rape scenes can be demarcated to 'semen, blood, hair and saliva.' The mentioned DNA evidence should be collected and submitted to the SAPS FSL Biology Unit for analysis, and it is used to assist in identifying a potential suspect. Members responsible for collecting DNA evidence are strictly expected to wear gloves and they should change them regularly to minimise contaminations. The collected DNA evidence is then dried-up and submitted to the SAPS FSL for analysis. Importantly, the local SAPS is working together with the State Information Technology Agency (SITA) and developed the Forensic Exhibit Management (FEM) System. This new system, which also has a track and trace functionality, replaced the previous system run by the service provider.

The FEM system can now speedily locate the source and storage of the forensic evidence. For example, the prioritisation of the DNA samples is already bearing fruits, as recently as Friday, 23 April 2021, a Benoni man was confirmed a serial rapist after being positively linked to 60 rape cases through DNA identification. This man was arrested earlier this month on a single rape charge and the evidence collected at the crime scene matched evidence collected in 59 other cases connected to the same man. The SAPS management is satisfied with the progress made since the introduction of the SITA developed FEM system and remains encouraged by the continuation of the DNA testing due to the availability of the 'Quantification Kits.' With all the new measures put in place, the management of the SAPS believes a resolution in this matter is well within reach.

For further remedy, the relevant stakeholders should receive more in-depth training in the field of forensics and DNA analysis for rape investigations, they should become experts in this field. Adequate knowledge on the protection and preservation of DNA evidence during rape investigations should be regarded as one of the fundamental tools of forensic science during rape investigations. This can allow these stakeholders to clearly understand the importance of safeguarding rape scenes and preventing contaminations thereof. The deployment of the SAPS LCRC members to the rape scenes should be utilised to effectively search for DNA evidence, as well as other related evidence for proper collections of relevant physical (DNA) evidence, which can assist the prosecution process. The increased utilisation of the DNA analyst on the other hand can also allow for better collections of quality physical evidence from rape scenes, as well as proper documentations of such scenes.

The annual workshops on DNA analysis during rape investigations should be held for the relevant stakeholders to be familiar with the latest developments of 'forensic science' and

duties of the SAPS FSL and SAPS LCRC, as well as to provide adequate information on how these SAPS partners can assist the local SAPS investigators during the processing of rape scenes. Furthermore, as theme 1 was a combination of the study aim and study objective 1: *'To assess the use of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.'* Therefore, the interpretations of statement Eleven (11) is discussed in this section.

- **Statement 11: Exploring participants' insights on crucial evidence by first responders at crime (Rape) scenes**

First responders at crime scenes take centre stage as they are first to respond to calls. For this reason, they must be properly trained to ensure the integrity of evidence and to ensure that the scene is cordoned-off until relevant investigator arrives, and the scene is handed over. It is crucial that first responders exhibit diligence and professionalism about their handling of crime scenes. First responders have the responsibility to conduct preliminary investigations while waiting for crime scene analysts. In addition, first responders must secure and preserve the integrity of evidence to ensure that the scene is not tampered with. Therefore, their actions are a backbone of the entire legal chain. During interviews, participants responded to this aspect as follows:

> *"Firstly, the victim is basically our first crime scene, from there it then depends on her state of mind whether we must start with her first and then look where she points out to be where the incident happened. Mostly, there will be no semen or blood as it would be difficult to see with a naked eye, that is why we make use of our Forensic Semen and Blood Dog Unit on our crime scenes as well as our Local Record Centre for the photographs. If there were objects used on the scene, you must look onto that too. The crime scene should then be safe guarded and cordoned off for those other role players to obtain the scene so that they can conduct their work. Being there for the victim and getting the medical assistance for the victim, always tell her that it is not her fault. That for me are the basic things that one must observe before looking for any clues. Clues would be things like blood, used condom, sticks, hair. Anything and everything that was not present at the crime scene before the crime was committed, but the most important clues will be sourced from the victim. Anything that can be identified by the victim not to have been on the scene before the incident. Anything that came into contact with the suspect and the victim during rape occurrence. First you have to make sure that the*

crime scene is cordoned off. You must then ensure that it is safe to enter the crime scene. There are always people from the stations who will be there before us, then I have to interview the member who arrived first regarding the crime scene. It is either he will inform me that all necessary people were contacted, or I will contact them (other experts), our local LCRC members, members from K9 unit, amongst others. The first point that any investigator must identify is the victim and then move outwards to anything in the crime scene. Firstly, the victim is basically our first crime scene, from there it then depends on her state of mind whether we must start with her first and then look where she points out to be where the incident happened. Mostly, there will be no semen or blood as it would be difficult to see with a naked eye, that is why we make use of our Forensic Semen and Blood Dog Unit on our crime scenes as well as our Local Record Centre for the photographs. If there were objects used on the scene, you must look onto that too. The crime scene should then be safe guarded and cordoned off for those other role players to obtain the scene so that they can conduct their work. The crime itself is a clue; the victim is also a clue."

The literature by Horswell (2004) stated that "in every crime against people, as in sexual assault, the contact between the perpetrator and the victim, or his/her environment, or both always leaves evidence, which is transferred from the perpetrator to the victim, to the scene, and vice versa." Responses by participants about the significance of crime scene preservation by first responders are supported by Horswell (2004).

Thus, the interpretations of statement Twelve (12) is discussed in the following section.

- **Statement 12: Exploring participants' perspectives on the handling of rape scenes victims by first responders**

First responders play a significant role in the shaping of the trajectory to ensure that rape survivors are afforded an opportunity towards healing and justice. It is therefore important to note that rape is a delicate process. It is evident that first responders are the first to interact with rape victims, and this means that these responders must be properly trained to avoid secondary victimisation. They (First responders) must be compassionate and empathetic towards rape victims. First responders have a responsibility to ensure the physical and emotional well-being of rape victims, and to preserve evidence. When asked their perspectives on the handling of rape crime scene victims by first responders, participants responded as follows:

"Normally we go out with campaigns from our communities and talk with them to give guidelines so that whenever somebody is being raped, not only us as police officials know what to do but they are also aware of what to do and what procedures to follow when approaching a crime scene. The answer is yes, there is a certain way of approaching a crime scene. Yes definitely, and that has to do with you not walking around messing or tempering with important evidence. Yes definitely, never temper with the crime scene, if you find people in the crime scene, try to keep them in one place until experts arrive. Yes definitely, treat the crime scene as your best answer to the questions you have about 5 Ws and H. Yes, you protect the crime scene until experts arrive. Normally we go out with campaigns from our communities and talk with them to give guidelines so that whenever somebody is being raped, not only us as police officials know what to do but they are also aware of what to do and what procedures to follow when approaching a crime scene. The answer is yes, there is a certain way of approaching a crime scene. Crime scenes differ but the common thing is that the crime scene must always be secured and locked."

The presented literature studies by (Newton, 2013) in chapter two of this study (Refer to section 2.2.3) clearly highlights the significance of crime scene management and the preservation of evidence. The researcher is of the opinion that emphasis must be made for the proper training of all officers as it is not known who will arrive at the scene first. If there are only a few trained officers, then it will mean that there will be a delay and compromise of the integrity of evidence due to contamination.

However, the interpretations of statement Thirteen (13) refers to the following observations.

- **Statement 13 Exploring participants' comprehension of chosen DNA evidence sources in rape investigations**

In reference to objective two (To detail selected sources of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa) of this study, section 2.3, rape as a contact crime, victims and perpetrators are bound to touch each other to leave DNA traces, the victim's body can be used as a source of evidence, as well as the physical environment or location can be touted as a rape scene. Various locations and DNA sources during rape investigations should be protected and preserved at all costs. It is very important to emphasise that DNA evidence should not substitute or replace other evidence materials, instead it should complement them, as depicted in Table 3 and 4 of this study.

The researcher found that the reconstructing of rape scenes involves scientific analysis of DNA evidence. Therefore, the rape scenes events should be attended in a chronological manner, to link detailed series of events to scientific explanations leading to the commission of this crime. This practice serves as a major purpose in the collection of physical evidence and DNA evidence. This process not only focuses on the incident itself, but also on the events leading up to the rape crime. The rape scenes reconstruction supports the sequence of events and physical evidence, and DNA evidence found at rape scenes. It was also revealed that rape scenes investigation relies heavily on combined efforts by various departments within the SAPS, as this study identifies. The reconstruction of rape scenes is done when there were no preliminary investigations because rape scenes were cleaned up without being processed by the SAPS LCRC or SAPS rape investigators.

Additional questions were posed to the selected participants; the SAPS CS (rape) investigators, SAPS FS, SAPS DNA CS and these are some of their verbatim quotations on the asked questions.

> *"Yes, I do, we often use it to solve rape cases in our province. Yes, I do, it remains a common knowledge in our police station. Yes, it is one of the most important tools used to solve rape cases. Yes, I do, we are using it as the rape investigation team. Yes, I do, it is used frequently in our organisation to work against rape reported cases. Yes, as it can provide conclusive evidence to quickly solve rape cases. Not actually. Once DNA gets collected or submitted from our unit, we then wait for the lab centre to send back the results. No not at all. It is something I should learn soon. Yes, I am, however, I do not perform that practically. I am familiar with the process, as the rape investigator. Yes very well, as my job require such understanding. Yes, but not in a practical manner, just the investigation part of it and collections of evidence. Not actually. Once DNA gets collected or submitted from our unit, we then wait for the lab centre to send back the results. DNA is everywhere, everything that has come into contact with the victim and the suspect becomes DNA evidence. Any evidence linking a suspect to the scene. It will mostly be any fluids and materials that are left by the suspect. Anything that comes into contact with the suspect.*
>
> *Blood, semen, hair, mucus, buccal substances etc. The scene, the victim, and anything found on them including from the suspect. Hair, mucus, buccal samples, blood and any other thing believed to have been left by the suspect. DNA is everywhere, and it is found*

everywhere so it will be difficult for me to point one item. Anything found at the scene. Especially that which connects the suspect to the scene. DNA is everywhere, everything that has come into contact with the victim and the suspect becomes DNA evidence. The scene, the victim, and anything found on them including from the suspect. I think its things sperms left by the rapist in the lady's Vagina. I think its obvious things like the sperms from the person who raped and if maybe he used objects like knives, amongst others. I think I do but not to an expert level. I think it's blood if any, sperms, and hair but I have no deeper knowledge of what each means as evidence. I know now; I am actually a nurse by profession. From common sense, I think that it will be semen and Saliva. Yes, I think things like blood, sweat, the sperms and anything that can be left by the rapist. After my ordeal, I took it up on myself and joined support groups so I do."

Commendably, the interpretations of statement Fourteen (14) is discussed in the next section.

- **Statement 14: Development of the conceptual model for the preservation of DNA in rape investigations**

The preservation of DNA evidence in rape investigation is crucial as it holds the key to revealing the truth and ensure that innocent individuals are excluded, and perpetrators are held accountable to ensure that justice is served. In this study, the researcher developed a conceptual model for the preservation of DNA in rape investigations (see Figure 2). This model is designed to assist investigators of rape crime scenes safeguard the most intricate evidence. This model will also ensure that the integrity of evidence from crime scenes is retained until presented as evidence in court. This is in line with objective 03 *(To develop a conceptual model for preserving DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa)*. The study selected Five (05) criminal cases where DNA played a significant role in convicting rape suspects or in exonerating them.

This was followed by the developed conceptual model, consisting of 05 components to offer contributions to a new body of knowledge, namely:

- Understanding the significance of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
- Considering the selected sources of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.

- Maintaining chain of custody for rape DNA evidence in the selected Local Municipalities Northern Cape Province, South Africa.
- Better DNA evidence resources for rape investigations, advanced training and educational initiatives in the selected Local Municipalities Northern Cape Province, South Africa.
- Interactions and information exchange on preserving DNA evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa.

This study presents that DNA evidence is essential during rape investigations and additional techniques can be used to search for hidden evidence, even those that are cleaned up, the searching of blood can be done using a 'Bluestar,' as indicated in the SAPS module on 'Forensic Biology.' Therefore, the SAPS LCRC and DNA analysts should positively use 'Bluestar' to locate blood samples while reconstructing rape scenes that are already compromised or tampered with. The SAPS investigators also need to understand the value of DNA evidence through the operations of SAPS LCRC and FSL. The SAPS investigators positively consider the use of DNA evidence during rape investigations and the reconstruction patterns, while attending located scenes. The training workshops, lectures and refresher courses focusing on the value of DNA evidence during rape investigations are important. Knowing the importance of the SAPS divisions, such as the SAPS FSL and the utilisation of SAPS LCRC on a daily for the reconstruction of rape scenes is pivotal to ensure better conviction rates in South African courts of law. This proves to be beneficial, not only for the SAPS, but also to the NPA and the South African society.

In the following section, the interpretation of statement Fifteen (15) is discussed:

- **Statement 15: Exploring participants' views on the utilisation of DNA analysis in presenting evidence in court**

DNA offers a level of precision and certainty in a court room. The utilisation of DNA analysis in presenting evidence in court dates to centuries before the modern courts as we know them today. "DNA evidence must stand scrutiny, scientific rigour to either exonerate the innocent or convict the guilty" (Foreman *et al.*, 2018). When asked about the utilisation of DNA analysis in presenting evidence in court, participants responded as follows:

> *"It must definitely be prioritised especially for child victims. It helps when the victim has forgotten or does not know the suspect. If the DNA was previously taken of that particular suspect, it will be checked through the DNA database and if results match*

without someone, then that would be the suspect. I think DNA analysis must be the basis of evidence presentation in any court like how they do it in other countries like America. We must always take these samples to either Cape Town or Pretoria and that takes too long, and sometimes we cannot meet the requirement of 7 days' submission due to transport shortages so that affects the process. There must be more DNA analysis centres. DNA can be the only witness to crime as it reveals what happened and who did what so it needs to be handled with high regard. Let the government push for more DNA analysis centres. Nothing much except that all investigators should understand its power. It must be done with speed. The process must be speedily done, and the backlog must be solved quickly. It must be easily and speedily available. It must definitely be prioritised especially for child victims. It helps when the victim has forgotten or does not know the suspect. If the DNA was previously taken of that particular suspect, it will be checked through the DNA database and if results match without someone, then that would be the suspect. Nothing much except that all investigators should understand its power."

"Yes, definitely, nobody's DNA is the same, that's why we educate our communities that once rape is committed, the victim should not shower and must report within 72 hours so not to destroy the DNA evidence because there is no other evidence as important as DNA evidence. Definitely. The DNA analysis can be conclusive in solving rape reported cases in our province. It is the most significant tool in the hands of an investigator. Yes definitely. This can be used as a powerful tool against rape cases in our province. It is so significant that nothing can be done without it. A huge significance in the solving of rape cases. Yes, definitely, it a major contributor to the solving of rape cases. Yes definitely, it is the most important and superior piece of evidence. Yes definitely, it is the most important and superior piece of evidence. Yes, definitely, nobody's DNA is the same, that's why we educate our communities that once rape is committed, the victim should not shower and must report within 72 hours so not to destroy the DNA evidence because there is no other evidence as important as DNA evidence. A huge significance. It should be always supported at all costs."

The literature presented by (Williams *et al.*, 2015) in chapter two of this study revealed that DNA analysis is crucial when presenting evidence in court. The presiding officer must be able to make judgment based on meticulous presentation of evidence. The researcher agrees with these authors and maintains that presenting DNA analysis in court must not be questionable,

and investigators must convince the court about the integrity of evidence they present in court. Thus, statement Sixteen (16) is presented below.

- **Statement 16: Exploring participants' perspectives on challenges faced by investigators and the community regarding rape incidents**

Investigators and the community face various challenges about rape incidents. These challenges extend beyond the immediate crime scene as rape may be regarded as a societal challenge. It is therefore important that the police and the communities collaborate to commonly find solutions. "The police grapple with the investigation while the community contends with societal stigmas as well as systemic barriers" (Rasool & Rasool, 2020; and Mphephu, 2022), this reads with section 2.4 and 2.2.2 of this study respectively. During interviews, participants were asked to reflect on this aspect and responded as follows:

> *"I think it is the police and the fact that they are not trusted by the people around here. The reason for the police not to be trusted is that many cases were reported but you see the criminal walking on the streets and sometimes terrorizing the same community again and again. We are trying to form support groups that will support rape victims and prevent rape incidents, but government and some community members are not supporting the initiative. I think it will be lack of knowledge. Not so long ago, there was a family that did not report a case to the police because the person who committed rape was a friend to the senior police official, so I think that is a challenge. Not having faith on our justice system and that's not only police, I am talking the whole value chain. Not knowing who to talk to exactly and also not trusting police anymore. The shortage of police investigators and cases take too long because you would be told that investigators are dealing with lots of files.*
>
> *I am not sure but I believe that it is anything found in the crime scene and that can be used during investigations or in courts like in the recent case of the Orlando Pirates goalkeeper. I remember the Sgt that collected the evidence was questioned a lot about DNA. I do not know what is DNA. I do not know any. Yes, I know, and I have helped a lot of rape victims and their families in this regard. I do not know what DNA is but I have seen how helpful it is from the Television Channel 171. I honestly do not know, and I do not want to lie about this question. Yes, I think it is when things that are found on the crime scene get tested to check if they can be linked to the rapist. I fully do now and I think it is helping a lot in solving rape crimes.*

The literature presented in section 1.1 of this study by (Meintjes-van der Walt & Knoetze, 2015) in chapter two highlights the fact that collaboration between various stakeholders in the community and the police is crucial in terms dealing with crime. The researcher is of the opinion that such collaboration must be maintained in order to deal with rape crimes. Responses by participants emphasise the significance of collaboration to deal with rape crimes in identified areas of this study. The interpretation of statement Seventeen (17) is discussed below.

- **Statement 17: Exploring participants' perceptions of community members reporting rape incidents**

The role of community members in crime prevention cannot be over-emphasised as numerous authors have written about it" (Burger, 2006 and Champion, 2000). The role of communities in crime prevention is crucial in the pursuit of justice. The act of reporting crime by community members will ensure a safer environment and give support to rape victims, this reads with section 1.1 and 3.3.4 of this study. During the interviews, participants responded to the questions as follows:

> *"Yes, I believe so but also people are scared to report because they fear humiliation and identifying the criminal. And the worst is when that criminal gets released and come back to make the lives of the same community a living hell. It is difficult to tell because I do not know what is the kind of equipment they are using but I wish they can speed up the processes. No, I can tell you with so much confidence that most rape cases are not reported at all. No, they are not, if anything, they are encouraging men to rape us. Some choose not to now because they know that nothing is going to happen. Not at all. They are trying but I am not sure if cases are a lot for them to be able to handle them, but I believe that they can do better, and I believe so but also people are scared to report because they fear humiliation and identifying the criminal. And the worst is when that criminal gets released and come back to make the lives of the same community a living hell. A lot should be done; I think law enforcement agencies should be trained because they do not understand some of the issues. Especially if you compare with other countries and I think fear is the one think that prevents them from reporting because they will wonder what if this guy is released and kill me. No, as long as we still have such a huge DNA backlog, whatever that they are doing can never be enough. It is very few who are reporting. People do not trust the justice system and police in general."*

From the above responses, it is evident that community members have a crucial role to play in crime prevention in general, and rape crime in particular. While some communities are reluctant to collaborating with the police as they cite risks to their personal safety, some communities have been successful in crime combating and continue to collaborate with the police.

4.4 SUMMARY

The integrations of the empirical findings of this study were based on the identified study themes, emanating from the aim, objectives and research questions. Moreover, the reviewed seminal literature studies further guided this chapter. The researcher presented, discussed and interpreted the collected data. The next chapter (05) showcased the study summary, conclusion and recommendations.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This section is based on the summary, discussion of the limitations, recommendations and conclusion of this study. It includes the overall study summary, findings relating to study significance, study aim, study objectives, findings relating to research design and methodology, study limitations, conceptual demarcation, financial constraints and travelling distance, limited previous research in South Africa, study implications, study recommendations, identified study categories, general recommendations relating to this study, study overall conclusion and future research studies.

5.2 STUDY SUMMARY

- **Chapter one** focused on general orientation of this study, by providing the 'introduction, problem statement, study aim, objectives and research questions, definitions of key concepts, study significance, and the chapter's progressions.
- **Chapter two** presented an overview of literature review on analysis of DNA evidence during rape investigation, based on the study aim and objectives, demarcated as follows:
    - The combination of the study aim and objective 01 of this study was achieved by providing literature studies based on the study aim: *'Critically explore analysis of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape, South Africa,'* and; *'to highlight procedures followed during the use of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.'* (Objective 01 of this study).

In addition, the following 03 objectives guided this study:

- To describe the significance of the application of sources of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
- To identify how the chain of custody is maintained on DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
- To develop a conceptual model for preserving DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.

- **Chapter three** concentrated on the research design and methodology employed in this study, to offer the descriptions of the research design, and research approach [This was done by presenting the study locations, study populations and sampling procedures, data collection and analysis methods]. The methods used to ensure trustworthiness were also shared, together with the ethical considerations.
- **Chapter four** dealt with the integrations of the empirical findings of this study, and the reviewed literature studies guided this chapter. The researcher presented the collected data, analysed and discussed them based on the study aim and objectives.
- **Chapter five** dealt with the summary, conclusion and recommendations, based on the study aim and objectives and the conceptual model consisting of five (5) components that was formulated from the empirical research findings of this study and consulted literature studies to contribute to the new body of knowledge was shared. The conceptual model in questions involved the following 05 components:

1. Understanding the significance of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
2. Considering the selected sources of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
3. Maintaining chain of custody for rape DNA evidence in the selected Local Municipalities Northern Cape Province, South Africa.
4. Better DNA evidence resources for rape investigations, advanced training and educational initiatives in the selected Local Municipalities Northern Cape Province, South Africa.
5. Interactions and information exchange on preserving DNA evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa.

5.3 STUDY OVERALL CONCLUSION

The Interview Schedule Guide was used as a blueprint to critically analyse the DNA analysis during rape investigations in the Northern Cape. The study aims and objectives were used as the basis of forming the sub-questions to solicit detailed information on this subject. The sentiments shared by the DNA analysts, SAPS FSL and SAPS LCRC were common on the significance of DNA analysis during rape investigations, while some community members were not familiar with this technology. Therefore, further clarity was provided by the selected study participants by arguing that DNA has had countless successes and it continues to play a significant role during the investigation of not only rape cases, but it also helps the justice system in other contact crimes like murder, gender-based violence, robbery, and theft, amongst

others. They further alluded that with the few cases where DNA evidence was either dismissed or never accepted, the unchanging fact has always been the recklessness of officials when handling DNA evidence. No matter the case or circumstances around the case, DNA evidence will always be there and available. The only common challenge is that sometimes victims or those who are first at the crime scene do not understand the value of each piece found at the crime scene. It sometimes happens that even first responders to the rape scenes do not exercise caution on their arrival to the scene and that has had a very negative impact.

The selected participants of this study also provided that it needs to be noted that as much as DNA plays such a significant role during investigations, there needs to a change in the old traditional and inconclusive investigation methods. Participants further suggested that one must understand that the absence of DNA does not always mean that no crime was committed, as much as the presence of DNA does not necessarily mean that crime was committed. The selected participants of this study made an example of a case where sometimes two people engage on a consensual sexual act and then later the other party makes demands, which is mostly financial demands. In such a case, semen will be found on the body of the victim, and other pieces of evidence like hair, skin scrapings etc. will be found. The presence of such pieces of evidence does not necessarily mean that rape or any other contact crime occurred. It happens when the victim has come into contact with people before the crime occurs, their fingerprints will be found at the crime scene. In such a case, other evidence materials can be summoned to either support or disprove their involvement.

Some of the selected study participants hinted that DNA analysis does not begin with the actual analysis but with observing and verifying the integrity in which the samples were taken through, from collecting at the crime scene (whether the correct collection kit was used during collection), packaging of the evidence (Whether the correct evidence carrying bags were used), right personnel (Whether the individuals who actually collected it from the scene are actually qualified to handle DNA evidence), transporting (Whether the correct transportation mode was used from the time it was collected until to the storage facilities), and storage (Whether the evidence was kept at a correct storage facility that meets all DNA storage requirements). These are all important steps and if one of them is missed, then that leaves the DNA evidence under a lot of attack and scrutiny. This study further shared that rape is a global crisis that threatens the safety and security of South African communities. Rape also put the lives of law-abiding citizens at various risks, directed to emotional, financial, physical and psychological abuse.

SAPS has reported rape cases in shocking numbers throughout the country, and what is most disturbing is the fact that very few cases end in convictions. The causes of such fewer convictions called for research. The significance and relevance of DNA is that it probes into the causes and recommend solutions. This chapter outlined tools and measures that are used to prove the significance of DNA as evidence during rape investigations. The chapter further explains the methods to be used to collect data and gave a mind map of the way in which the research will be conducted. Worryingly, without proper analysis of exhibits or rather evidence collected at the scene, one can conclude that the courts would struggle to find conclusive evidence, as additional debate emanate in court. However, the DNA sample are received from the SAPS FSL, which is regarded as one central point, and their duties begins as soon as they are delivered to the SAPS FSL.

The SAPS FSL have to check and make sure that the submitted DNA samples are in good conditions, and that there is no tempering on them. What is also important refers to the verifications of chain of custody from the time they were collected from rape scenes, transportation from such locations to the local SAPS storages, and from the SAPS Unit storages to the SAPS FSL Unit (Biology Unit). All these checks must be verified from the evidence book and by physically looking at the obtained evidence. This study revealed that DNA analysis is a process where samples are received from the units/stations/departments for the purpose of individualising or narrowing the investigation or inquiry. It mostly is a case where contact crime has been committed and there are samples left at the crime scene by the perpetrator. It is said that when two objects come into contact, traces will always be shared. The lab receives these samples from the unit and analyses them and matches them with those of the suspect(s). Results will also be placed on the DNA database and that assists if perhaps the suspect is on the database for previous committed offences. The analysis is not only conducted to prove guilt of a suspect, but it has also actually assisted in exonerating members who were accused of crimes they never committed.

Furthermore, the impact of DNA analysis in the investigation and justice space has been, still is, and will definitely continue being inordinate. The biggest challenge right now is the serious backlog caused by infrastructure and shortage of personnel. This is a challenge that the government is addressing and there has been progress though it is at a snail's pace. The training of all officials handling DNA samples or evidence is also of paramount importance. It has happened around the world that crucial evidence gets lost during its early stages due to several

reasons like mishandling of evidence, and many other reasons. Everyone involved in the chain of DNA evidence analysis has a significant role to play, and their importance is seen in all stages that DNA passes before having to be presented in the court of law. If DNA analysts receive evidence that has been exposed or tampered with, analysis becomes meaningless. It is equally important to also educate communities because they also play an important role in preserving or destroying evidence. Once the evidence has been cleared from the checkpoint, it goes through the isolation process where DNA samples get isolated from DNA samples of unknown origin. Then sample collection, extraction and quantitation, genotyping to generate an individual pattern of the STR and then interpretation and storage of the results.

Several basic steps are performed during DNA testing regardless of the type of test being done. The general procedure includes the isolation of the DNA from an evidence sample containing DNA of unknown origin, and generally at a later time, the isolation of DNA from a sample (i.e. blood) from a known individual; the processing of the DNA so that test results may be obtained; the determination of the variations in the DNA test results (or types), from specific regions of the DNA; and the comparison and interpretation of the test results from the unknown and known samples to determine whether the known individual is not the source of the DNA or is included as a possible source of the DNA.

Any probative biological sample that has been stored dry or frozen, regardless of age, may be considered for DNA analysis. Each additional test at a previously untested locus (location or site) in the DNA provides another opportunity for the result of ‘exclusion’ if the known individual being used for comparison is not the source of the DNA from an evidence sample of unknown origin. If, however, the known individual is the source of the DNA on the evidence sample, additional testing will continue only to include that individual as a possible source of the DNA. When enough tests have been performed, in which an individual cannot be excluded as the source of the DNA by any of the tests, a point is reached at which the tests have excluded virtually the world's population and the unique identification of that individual as the source of the DNA has been achieved. During the DNA analysis process, it is always important to interrogate how the DNA was deposited to the crime scene to understand the materials which the DNA came from. What investigators or anyone presenting DNA evidence in courts need to understand is that they may not provide an opinion as to the DNA evidence from which exhibits originated. The DNA can in some occurrences be transferred from person A to person B and then onto object 1 (‘secondary transfer’) or from person A to object 1 to person B and then

onto object 2 (‘tertiary transfer’). In both cases, traces of person A’s DNA might be found on an object even when they have never been in direct contact with that object. It is also perfectly possible that the DNA of person B will not be present on an object with which they have had direct contact. In some cases, but not always, it will be possible to make a comparative assessment between alternative explanations for the presence of the DNA. All DNA analysis specialists echoed the thoughts that DNA analysis is an extremely important tool that contributes immensely towards solving contact crimes. What also became clear is that DNA analysis process is a strict process that leaves no room for error. Several references were made on solved, unsolved and pending cases where DNA was applied.

The researcher was taken through the DNA analysis process and what was clearly visible is the amount of backlog that is faced by the country; however, it is also fair to note that there has been great and noticeable progress as compared to few years ago. On the question of the availability and the readiness of the DNA analysis equipment, the analysts indicated that the equipment is available and meets the required standards; however, upgrading is needed to speedily respond effectively. Analysts indicated that though they do not meet physically with the victims of rape crimes, the scourge of rape in this country is a worrying factor that calls for condemnation at all levels. They went further and said that DNA is one of some of the tools that are effectively used to ensure that those who commit contact crimes (rape included) are apprehended and account for their crimes even though this might be seen as a reactive measure.

This study fully discussed the analysis of DNA evidence during rape investigations. This requires proper applications and management of DNA evidence during the investigation process. The location where rape occurs (i.e., Crime - Rape scene) should be protected at all costs. More emphasis should be placed on ‘collections, preservations and packaging of DNA evidence.’ The available roles and values of DNA evidence during rape investigations should be spelled out not to confuse the DNA analysts, SAPS FSL and SAPS LCRC, and community members. There should be high and competent performance for securing rape scenes to ensure that physical and DNA evidence are preserved, not tampered with and contaminated. The problem statement, study aim, objectives and research questions revealed the importance of conducting a research study on this subject to offer tailored recommendations. The solicited information, as retrieved from the consulted literature studies and empirical data empowered the researcher to have adequate knowledge of DNA analysis during rape investigations in the Northern Cape. Therefore, the DNA analysts, SAPS FSL, SAPS LCRC [SAPS investigators]

and community members will benefit through production and gaining of more knowledge from the findings of this study.

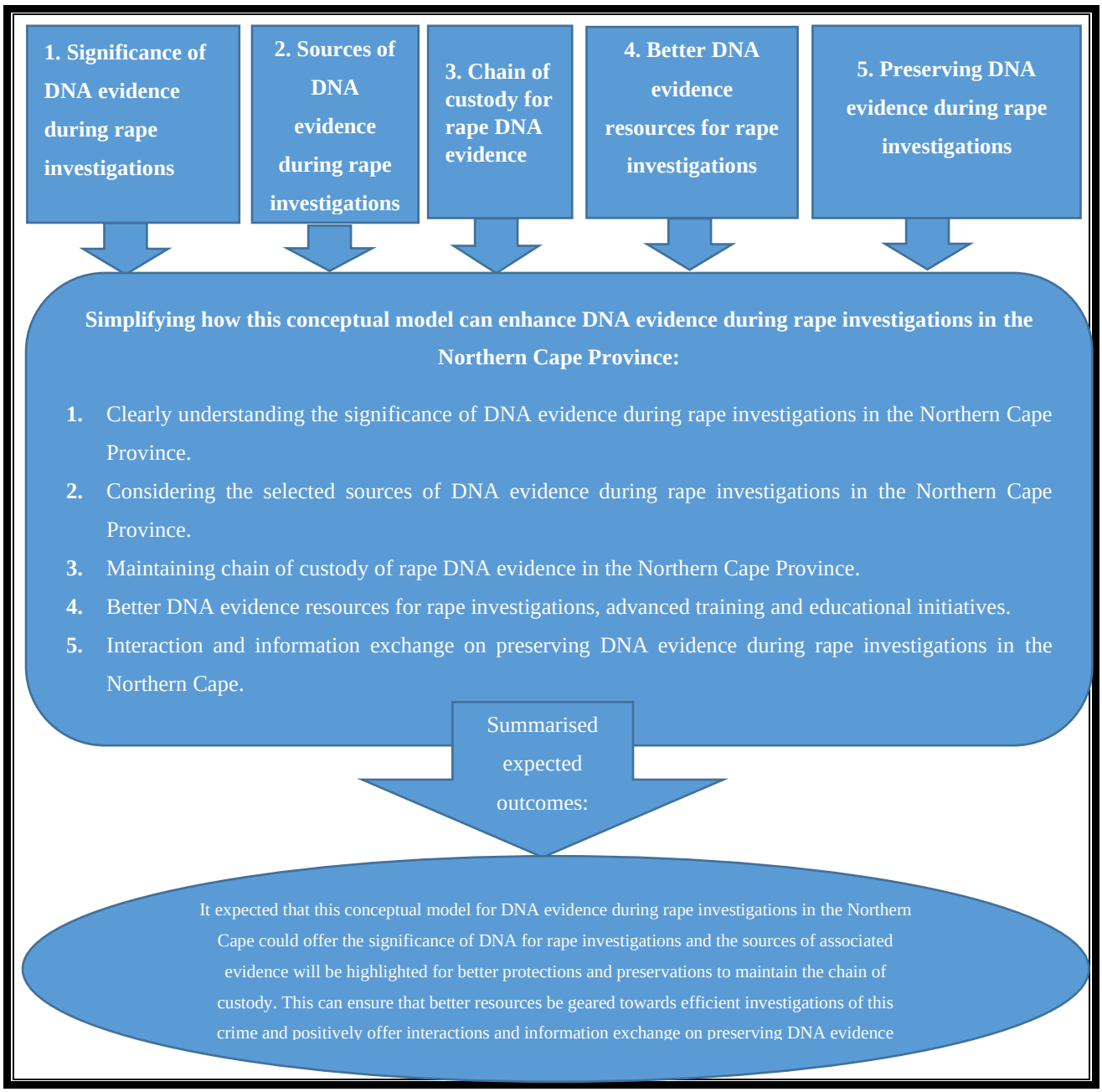
Therefore, it is recommended that investigators move away from the traditional investigation methods when investigating rape cases. DNA technology must be used more frequently in order to realise the significances of biological exhibits. Every biological exhibit found at the scene of rape case must be seen as a potential source of DNA and must be scrutinised by the fieldworker or crime scene examiner. This scrutiny coupled with presumptive tests will minimise the collection of unnecessary samples from the crime scenes thereby overloading the DNA analysts, SAPS FSL, SAPS FSL and SAPS investigators. If the screening is done properly by the fieldworkers or examiners, the DNA analysts, SAPS FSL, SAPS LCRC and SAPS investigators will not conduct unnecessary tests to eliminate DNA samples with no evidential value.

This study shared that the comparison of the old and new definitions of rape, should be disseminated to the DNA analysts, SAPS FSL, SAPS LCRC and SAPS investigators (Detectives), including community members to ensure the smooth transition of the significance of biological exhibits from the old definition to the new one, without compromising the quality of rape investigations. There should be an endeavour by these stakeholders to use biological exhibits in identifying, individualising, supplementing the eyewitness or victim testimony and availing the expert testimony when needed by the courts of law.

5.4 STUDY RECOMMENDATIONS

This section addresses the conceptual model for DNA analysis during rape investigations in the Northern Cape. The analysis entails five (5) components attempting to respond to rape. In addition, below representation encapsulate conceptual theoretical and observations obtained during interviews with selected participants in identified relevant fields of specialisation in the SAPS FSL, CSIR among others. Participants provided valuable information, some of which will assist investigators of sexual offences to have successful convictions and to ensure that the rate of such crime is reduced exponentially. Figure 2 below depicts the schematic representation of a conceptual model for DNA analysis during rape investigations.

Figure 2: Schematic representation of a conceptual model for DNA analysis during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa



Source: Researcher's illustration (2023)

The components of the developed conceptual model for DNA analysis during rape investigations in the Northern Cape Province are explained as follows:

1. Understanding the significance of DNA evidence during rape investigations in the Northern Cape Province

To ensure that all the selected participants (SAPS crime scene – Rape - investigators, SAPS FS from the SAPS FSL, SAPS DNA specialists and community members), as they are regarded as important stakeholders/role-players in the process of dealing with DNA evidence of rape crime. These stakeholders are believed to be well vested with the significance of DNA evidence during investigations in the selected province. Therefore, attending of rape scenes remains of utmost importance in this regard.

2. Considering the selected sources of DNA evidence during rape investigations in the Northern Cape Province

To improve and change existing narratives surrounding sources of DNA evidence during rape investigations. This can enhance the existing knowledge on this subject for the preservations and protections of DNA evidence in the selected study locations, within the Northern Cape Province to clearly address and respond to the contributory factors to rape in the province.

3. Maintaining chain of custody for rape DNA evidence in the Northern Cape

Relevant stakeholders (SAPS crime scene (Rape) investigators, SAPS FS from the SAPS FSL, SAPS DNA specialists and community members) will understand the chain of custody on collecting, handling and protecting DNA evidence until it reaches the SAPS FSL laboratory for proper presentation in the court of law to possibly achieve prosecutions.

4. Better DNA evidence resources for rape investigations, advanced training and educational initiatives

It is of utmost importance that the identified police stations in the Northern Cape should be consistently exposed to the available relevant and advanced training that will develop their knowledge systems on DNA analysis during rape investigations. The selected police stations, together with the SAPS crime scene (Rape) investigators, SAPS FS from the SAPS FSL, and SAPS DNA specialists and community members to a certain extent, should be encouraged to share and co-ordinate their intelligence-gathering and analysis capabilities better, and establish a unified strategic view of DNA evidence resources for rape investigations. In instances where there is a shortage of personnel from the listed units, better vested staff members should be hired and those who completed courses relating to DNA analysis of rape crime should continue to support each other in their respective investigations of rape.

5. Interactions and information exchange on preserving DNA evidence during rape investigations in the Northern Cape

The Intelligence-led operations currently employed by the SAPS crime scene (Rape) investigators, SAPS FS from the SAPS FSL, and SAPS DNA specialists require a new approach, involving interactions and information exchange on preserving DNA evidence during rape investigations in the Northern Cape. This approach will offer establishment of intelligence functions to produce operational and tactical intelligence concerning DNA evidence analysis during rape investigations within the Northern Cape Province, which are currently inadequate, based on rape scenes investigations. Community members should form part of this process where meetings should be held frequently to foster closer co-operations with the mentioned stakeholders. Section 2.4.1 of this study highlighted that the faulty DNA testing and politics continue to fail South Africa's rape victims Mabena (2020). The backlog in testing of more than 100 000 DNA samples at government laboratories is leaving survivors, especially those of rape, with little hope perpetrators will face the law. The problem was not only in relation to sexual offence evidence kits. Murders remained unsolved as general forensic analysis for prosecution got delayed. The other problem was that police had difficulties in investigating and arresting rapists to match with DNA samples.

Based on the findings of this study, the following recommendations are made:

5.4.1 Recommendations to improve the study objective 01: DNA evidence analysis during rape investigations.

- **Recommendation 1: DNA evidence analysis during rape investigations**

Rape is a serious issue in South Africa, with high rates of both reported and unreported cases. The utilisation of DNA evidence during investigations has proven to be a valuable tool in identifying perpetrators and ensuring justice for victims. Investigators, as well as the entire justice value chain, have been supported by DNA evidence since the early 1980s. Its significance and evidential value have impacted the justice system, victims, and also those who were wrongly accused of crimes that they did not commit. Cold cases have been revived through DNA usage. Repeat offenders who would not have been caught have now been caught through DNA, while those who were wrongly accused have been exonerated, through DNA. The Northern Cape Province has seen the might of DNA analysis in cases where finding justice would have been impossible if it were not for the analysis of DNA found at the crime scene.

Based on *socialisations,* this study shares that the well-principled norms and values are learned within family environment, this can be from a 'word of mouth' or illegal actions. Thus, positive

socialisation of children and siblings can play enormous roles in shaping future law-abiding citizens. This can be done through offering teachings of strong norms and values to avoid falling prey to delinquent behaviour. Therefore, mitigation of sexual violence culture by abolishing dominant patriarchal ideologies, focusing on rape perceiving male superiority, should be supported by working on social, cultural inferiority that undervalues women. Families should account for and refrain from any abuse that may hamper the socialisation of a child. The sexual, physical, emotional and psychological childhood abuse has been proved to contribute to an offending behaviour later in life. The resources, such as the DNA-testing equipment should be made accessible timely and rape DNA evidence backlog should be revisited to fully understand this problem. The full operations of the four (4) DNA testing centres in South Africa should be enhanced as the SAPS are servicing the SADC region and South Africa largely. The workload can be overwhelming, as many rape case files, and can result to DNA evidence finalisation backlog.

- **Recommendation 2: Establishment of an African Centre of Excellence**

  There is a need for an Africa DNA Centre of Excellence in countries like Ghana, Nigeria, South Africa, Kenya and Rwanda. These countries have been making strides to be at the forefront of forensic DNA technology and training in their regions. The proposed Centre will serve as a resource with state-of-the-art testing and training laboratories. It will also help the training and development of expertise in advanced DNA analysis, develop validation guidelines and training modules. This will help minimise case backlog and improve the level of expertise in African countries. To overcome these challenges, it is essential to invest in the development of forensic DNA infrastructure and expertise in Africa. This includes improving laboratory facilities and equipment, increasing the number of trained forensic scientists, and providing ongoing education and training to law enforcement and judicial officials. There is also a need for public education and awareness campaigns to increase understanding and support for the use of DNA evidence in sexual assault investigations.

In reference to section 2.1.1 of this study, meeting the challenges of using DNA evidence during rape investigations, a consensus is reached that despite the critical role that forensic DNA analysis plays in identifying perpetrators of sexual assault and supporting criminal investigations. However, there are challenges to its effective use in Africa which needs to be addressed. These challenges include limited resources, inadequate training and expertise

among forensic personnel, and a lack of awareness and understanding of the technology among law enforcement and judicial officials. Many African countries lack the resources and expertise needed to conduct DNA analysis effectively. This has led to a backlog of untested DNA evidence in many African countries, which can delay the investigation and prosecution of sexual assault cases. Another challenge is the lack of forensic science communication in most African countries. There is a lack of awareness and education about DNA evidence among law enforcement officials and the public. Many people in Africa are not familiar with DNA evidence, its technicalities and its implications for sexual assault investigations. This has potentially led to the mishandling of evidence, inaccurate analysis, and wrongful convictions or acquittals (Sulley, 2023).

- **Recommendation 3: Resource allocation**

One potential solution to the lack of resources and expertise in forensic DNA analysis is the use of mobile forensic laboratories. Mobile forensic laboratories are fully equipped laboratories that can be transported to crime scenes or areas with limited resources. These laboratories can provide on-site DNA analysis, which can speed up the investigation and prosecution of sexual assault cases ensuring that survivors of sexual assault receive the justice they deserve.

In response to the shortcomings of using DNA evidence during rape investigations, Madalane (2023) in section 2.2.2 of this study advised that in rape matters, DNA test results often come out negative, despite prosecutors having sufficient evidence to secure a conviction. Securing As section convictions and sentencing perpetrators serves as a much-needed deterrence and discourages other potential perpetrators from committing rape. The prompt processing of DNA samples would lessen the doubt cast on DNA evidence and assist with securing more convictions (Madalane, 2023).

- **Recommendation 4: Procedures followed during the use of DNA evidence during rape investigations.**

South Africa in general and the Northern Cape in particular face several challenges concerning the investigation and prosecution of rape cases. A significant number of rapes remain unreported, mostly due to fear of retaliation and belief that the CJS is ineffective. Inadequate or lack of training for investigators, prosecutors etc. concerning rape investigations using DNA analysis has a huge impact on successful or unsuccessful investigations. Improper training mostly leads to errors during collection and analysis process. DNA backlog has been an obstacle in what this application of DNA could have by now achieved. With all the limitations

that there are pertaining to DNA, particularly in rape cases, the DNA backlog is the main and most serious one affecting the efficacy of the justice system in dealing with rape cases. The training of investigators and/or first-time respondents to the rape scenes is another serious challenge that needs attention from the SAPS. The SAPS crime scene (rape) investigators, SAPS FS from the SAPS FSL, and SAPS DNA specialists were familiar with this technology, they confirmed that DNA evidence is one of the most significant and conclusive tools which can help to solve rape cases, and to identify potential rape suspects. They provided practical examples to illustrate their expressions. Some of them fully understood the processes to follow for DNA analysis during rape investigations. They confirmed that DNA analysis during rape investigations could be used as sole witness in court, when there were no witnesses or when the victim was a minor. However, it was clear that this technology was not used to its full potential. Community members had common knowledge, with limited personal experiences on this subject.

Moreover, the training of the selected participants of this study, the SAPS crime scene (Rape) investigators, SAPS FS from the SAPS FSL, and SAPS DNA specialists, including the community members on collection of DNA evidence, involving rape crimes should be prioritised. The availability of resources should be enhanced to avoid rape DNA evidence to be tampered with, contaminated or lost. The specific duties and responsibilities of these stakeholders should be clearly spelled out. In relation to the importance of DNA evidence (Biological exhibits) prioritisation for rape crimes, the selected participants were knowledgeable about this practice; some revealed that ‘semen is the most important, followed closely by hair and blood,’ and some of them mentioned ‘saliva sweat and swabs.’ Importantly, the estimated length of time for delivering DNA exhibits obtained from rape scenes to retain their value and validity is within 72 hours of collection, under certain conditions, semen in reference. However, the environmental conditions on protections and preservations of rape DNA evidence have a huge influence on maintaining their value.

5.4.3 Recommendations to improve the study objective 02: The significance of the application of sources of DNA evidence during rape investigations.

Rape DNA evidence is always available, but it depends on the eye that is looking, and its chain of custody, from the time it is collected from the scene until its presentation in court, is equally important. The use of rape DNA evidence has become increasingly common in South Africa

over the years. Rape DNA evidence provides a reliable way to link perpetrators to the crimes they commit and can even help to exonerate innocent individuals who have been wrongfully accused. Rape continues to be a serious issue in South Africa, with high rates of both reported and unreported cases. The use of rape DNA evidence in investigations has proven to be a valuable tool in identifying potential perpetrators and ensuring justice for victims in the Northern Cape Province. However, there is still much work to be done in terms of addressing the underlying societal issues that contribute to rape, as well as ensuring that victims receive the support and care they need.

Some of the selected participants, the SAPS crime scene (Rape) investigators, SAPS FS from the SAPS FSL, and SAPS DNA specialists, shared a common in-depth knowledge on the importance of rape DNA evidence, while a limited number of them were found to be unfamiliar with this technology. Moreover, some of the community members were lost on the value of this technology. They did not know what DNA evidence entails, while some of them were well vested about this technology, with limited knowledge. The high level of importance of rape DNA evidence, as a forensic tool during rape investigations cannot be overruled in this regard.

5.4.4 Recommendations to improve the study objective 03: To identify how the chain of custody is maintained on DNA evidence during rape investigations.

There is a need for training in the identification, analysis, collection and preservation of DNA exhibits to maintain the chain of custody. This should also be accompanied by inductions of refresher courses, which should be made compulsory for all rape investigators, while considering technological advancements. This should be included in the investigation courses of the SAPS basic training. The dismissed tried rape cases in court or the ones which are proved positively should be used as a blueprint to better the maintenance of chain of custody during rape investigations, while proper analysis of DNA evidence should always be prioritised.

Furthermore, the associated technicalities and limited basic knowledge on DNA analysis should be revisited. This is also in conjunction with limited knowledge about DNA samples and available sources, as this knowledge can positively aid to the integrity of DNA evidence being questioned in a court of law and the contamination and tampering of DNA evidence can be minimised to ensure that the chain of custody is not compromised. Adequate resources should be made available for the SAPS FSL and SAPS LCRC, and SAPS investigators,

inclusively. This can assist in speeding up rape cases and finalise DNA evidence, to reduce backlog currently existing in the Northern Cape police stations.

5.4.5 Recommendations to improve the study objective 04: To develop a conceptual model for preserving DNA evidence during rape investigations.

The following 05 components from the designed conceptual model of this study (Refer to figure 2) are considered:

1. Understanding the significance of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
2. Considering the selected sources of DNA evidence during rape investigations in the selected Local Municipalities of Northern Cape Province, South Africa.
3. Maintaining chain of custody for rape DNA evidence in the selected Local Municipalities Northern Cape Province, South Africa.
4. Better DNA evidence resources for rape investigations, advanced training and educational initiatives in the selected Local Municipalities Northern Cape Province, South Africa.
5. Interactions and information exchange on preserving DNA evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa.

Considering the listed 05 components of the developed conceptual model, it is recommended that selected SAPS crime scene (rape) investigators, SAPS FS from the SAPS FSL, SAPS DNA specialists and community members and other relevant stakeholders, should be knowledgeable of rape DNA evidence management. They should undergo intensive training courses for operational and personal development, while equipping them with adequate knowledge and understanding of how rape DNA evidence can be positively managed. The well experienced SAPS crime scene (Rape) investigators, SAPS FS from the SAPS FSL, and SAPS DNA specialists should be taken to a refresher course to be empowered and updated of the new legislative frameworks on DNA and other sexual-related offences legislations. The courses for the first responders on rape scenes should be conducted to equip these stakeholders who attend rape scenes with the knowledge of securing the scenes and identifying physical evidence and DNA evidence on rape scenes.

Furthermore, programmes to educate them about roles of DNA evidence on rape investigations should be created and implemented during the SAPS Basic Training phases. This will help in

sensitising them about the significance and value of DNA evidence. Community members should be educated to report rape crimes as soon as it occurs to avoid losing the most valuable physical evidence, as well as proper collection, preservation and protection of rape DNA evidence. Victims of rape should also be informed that they should not wash and change clothes after the incident, to retain the evidence that might be left by potential perpetrators of rape. The processes of identifying, understanding, collecting, preserving and presenting rape DNA exhibits have proved to be the most critical elements in solving the crime of rape, as well as other crimes, especially vicious crimes such as rape and murder. Proper handling processes during the selection, collection, labelling, packaging, storing and the process of transportation of exhibits to the SAPS FSL are vital steps aiming to accomplish valid, final and reliable results before the evidence is presented in court.

Therefore, it is also recommended that a common term 'biological exhibits' be used for all samples that originate from human beings, which can be analysed through the DNA technology and remains instrumental in rape investigations cases. This should be declared a new category other than serological exhibits, which include the analysis of pollen, larvae and insects, which are more relevant in other investigations other than the rape investigations. The term biological exhibits must be used to denote DNA samples, biological laboratory samples and sexual assault (rape) samples to avoid confusions. This recommendation should be implemented at different training interventions of SAPS investigators and other relevant stakeholders by embedding it to the SAPS Learning Programmes and the Detective Commanders Learning Programme, as well as during curriculum development of universities and other training institutions.

5.5 FUTURE RESEARCH STUDIES

There are several gaps in the knowledge around DNA analysis during rape investigations in the Northern Cape, following from the study findings that would benefit further research, are demarcated to the following aspects:

- Research on DNA analysis during rape investigations and related backlogs should be urgently looked at. Further research might uncover further challenges that impede any progress of speedily finalising DNA evidence for this crime. Research could explore the leading contributory factors to the witnessed DNA backlog for rape reported cases.
- It would also be helpful to conduct further studies that explore closing the gaps on rape investigations and rape DNA evidence analysis, assessments, selected sources of DNA

evidence, maintain chain of custody for rape DNA evidence and developing a conceptual model for preserving DNA evidence.

- The findings from this study revealed that training is critically important in the protection and preservation of rape DNA evidence. This training should be inclusive to cater for all relevant stakeholders. It is also important to look into the training space, the legislations and policy frameworks guiding the combating, investigations and prevention of this crime.

- The *'sexual violence (Rape) curriculum,'* should offer limited DNA evidence knowledge. This can be used as a powerful weapon to fight rape crimes and social ills. Sexual violence knowledge that can be imparted within the schooling environment can make individuals develop consciousness whenever confronted with the opportunistic circumstances for the commission of rape. Therefore, future studies should cater for this area of research, which will closely look at available ideas and norms about sex, relationships, and bodily autonomy all shifted by the schooling environment. There is a need for the incorporation of the sexual violence curriculum within the primary, secondary schools and tertiary institutions. Children need to be familiar with the details and literature of sexual violence and popularise 'consent.'

- Other future studies should look at *'liquor regulations*. Rregulation of liquor is of utmost importance given the negative consequential nature of binge drinking, contributing largely to rape. Therefore, there is a dire need for the license holders to comply with the conditions to minimise rape crimes.

- Other future research studies can look at *'target hardening,'* target hardening relates to control and security to limit and restrict potential criminals to commit crimes and reduce possible opportunistic circumstances. Preferred Closed-Circuit Television (CCTV), alarm systems, electric fences, and domestic animals, such as dogs can be used to alert and detect the home dwellers when there is an intruder. The vulnerability of a victim is empowered by easier entry of the perpetrator into the targeted house. The wealthy, marginalised and low-security households are prey to the potential perpetrators of rape. The alarm systems within the household should be designed to detect perpetrators whilst trying to bypass the outside gate/wall.

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CASE LAWS

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ANNEXURE A: INFORMED CONSENT FORM

TITLE: CRITICAL ANALYSIS OF DEOXYRIBONUCLEIC ACID EVIDENCE DURING RAPE INVESTIGATION IN THE SELECTED LOCAL MUNICIPALITIES OF NORTHERN CAPE PROVINCE, SOUTH AFRICA

Dear Participant(s),

Your willingness to comment on the topic of this study is very important but completely voluntary. If you are willing to take part in the study to respond to the questions below regarding your knowledge, experience, beliefs, ideas and understanding with regards to *critical analysis of Deoxyribonucleic Acid (DNA) evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa;* giving consent will be the point of departure for this study.

Your name and that of the organisation you are affiliated to will not be made public, your personal identities will be concealed at all costs; codes will be used as forms of referencing instead and the organisation, department or organisation which the participants work for will not be revealed.

Your real personal identity will only be known to the researcher and his supervisor and not to the Chair of Department (CoD): Police Practice at the University of South Africa (UNISA), top management and Research and Post-graduate studies at UNISA, external examiners and future readers.

Your participation in this study is deemed important and completely voluntary. If you are older than 18 years and willing to take part in this interview, you will be requested to answer questions regarding your knowledge, experience, beliefs, ideas and understanding with regards to your critically analysis of DNA evidence during rape investigation in the Northern Cape Province. You are free to withdraw from participating in this study at any time when you feel like you cannot take part anymore. Importantly, your identity will NOT be divulged to any parties not part of this research. All your answers will therefore be used anonymously in the study when submitted for examination and when published in any form at a later stage. Only the researcher and his study supervisor will have access to the original information. All the hard copies of the questionnaires that you will complete will be stored in a secure place for five years, after which they will be destroyed. External examiners, UNISA academics and students will only have access to the analysed findings, including the external stakeholders (South

African Police Service - SAPS, Council for Scientific and Industrial Research - CSIR and community members residing in Kimberley, Jan Kempdorp, Galeshewe, Roodepan and Pampierstad.

Answering the questions to be posed will take between 30 minutes to 01 hour. Your responses will be treated with confidentiality and privacy. It is hoped that the findings of this study will make a contribution towards the better understanding of the significance of DNA analysis during rape investigations and will therefore contribute to the success and improvement on DNA analysis.

The Faculty Committee for Postgraduate Studies and the Research Ethics Committee of UNISA have approved the formal study proposal. The ethical clearance approval number is Reference: #TS75-2022. All parts of the study will be conducted according to the local and internationally accepted ethical principles.

Moreover, this study is not sponsored by any business or political institution and the cost thereof is fully funded by the researcher himself. There is no financial benefit for the researcher in completing neither this study nor an obligation to any other individual or third party. Furthermore, there is 'NO' conflict of interest on the research study by the researcher or supervisor.

The researcher, Mr Joseph Wanda Zondi, can be contacted any time between 08h00 and 17h00 at his cell mobile number 081-802-0721 or through his e-mail 44820666@mylife.unisa.ac.za . The study supervisor, Dr Dumisani Quiet Mabunda, can be contacted between 08h00 and 16h00 on his office number 012-433-9467 or through his e-mail address mabundq@unisa.ac.za Should you have any questions regarding the ethical aspects of the study, you can contact Prof E.L. Kempen of the UNISA Research Ethics Review and Data Management Committee at FitzL@unisa.ac.za.

PARTICIPANT CONSENT

I _____ hereby confirm that I have been adequately informed by the researcher about the nature, conduct, benefits and risks of the study. I have also received, read and understood the above written information. I am aware that the results of the study will be anonymously processed into a research report. I understand that my participation is voluntary and that I may, at any stage, without prejudice, withdraw my consent and

participation in the study. I had sufficient opportunity to ask questions and of my own free will declare myself prepared to participate in the study. Summarily, I understand my rights as a selected participant of this study and voluntarily give my consent, prior to the commencement of the interview, to participate in the study.

Participant's name(s) and surname:

Participant's signature: _____

Date:

Researcher's name(s) and surname:

Researcher's signature: _____

Date:

ANNEXURE B: INFORMATION SHEET

TITLE: CRITICAL ANALYSIS OF DEOXYRIBONUCLEIC ACID EVIDENCE DURING RAPE INVESTIGATION IN THE SELECTED LOCAL MUNICIPALITIES OF NORTHERN CAPE PROVINCE, SOUTH AFRICA

This doctoral (Doctor of Philosophy: Criminal Justice) will be guided by the Interview Schedule Guide for data collections. The researcher (Mr Joseph Wanda Zondi) is enrolling with University of South Africa (UNISA) for this research topic: *'Critical analysis of Deoxyribonucleic Acid (DNA) evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa.'*

From a qualitative standpoint, with the adoption of phenomenology research design, the participants of this study were selected using the non-probability: Purposive sampling, involving about twenty-five (25) Northern Cape South African Police Service (SAPS) investigators who deal directly with rape investigations were selected for this study, and three (3) SAPS FS from SAPS Forensic Science Laboratory (FSL), situated in Arcadia, and two (02) Deoxyribonucleic Acid (DNA) specialists from the Council for Scientific and Industrial Research (CSIR), based in Pretoria, and 25 community members from the Northern Cape Province. Overall, 55 participants formed part of this study, distributed as follows:

- **Sample 'A':** First Sample (25:5 participants): SAPS crime scene (Rape) investigators, stationed at the following Five (05) police stations in the Northern Cape: Kimberley Police Station (001310), Jan Kempdorp Police Station (001322), Galeshewe Police Station (001320), Roodepan Police Station (001324), and Pampierstad Police Station (007114). The 25 participants were selected based on the experienced in rape investigations, or they had responded to rape scenes as first respondents and collected DNA evidence.
- **Sample 'B':** 05 participants of this sample comprised 03 randomly selected SAPS FS from the SAPS FSL, situated in Arcadia, Pretoria, and other 02 SAPS DNA specialists from the CSIR in Pretoria, overall, 05 participants were selected in this category.
- **Sample 'C':** This sample involved 25 participants, consisting of community members residing within the 05 selected police stations (Kimberley, Jan Kempdorp, Galeshewe, Roodepan, and Pampierstat).

The unstructured Key Informant Interviews (KIIs) and the simple observation schedule were respectively directed to sample 'A and B,' with the Focus Group Discussions (FGDs) employed for sample 'C.'

During the interviews, the researcher will dedicate enough time to explain ethical considerations issues in relation to the following information based on this study: Purpose of the study, Study procedures, Risks and discomfort, Benefits, Participant's rights, Confidentiality, Privacy, Data storage and dissemination of finding and Questions and concerns,' amongst others.

Participant's name(s) and surname:

Participant's signature: _____

Date:

Researcher's name(s) and surname:

Researcher's signature: _____

Date:

ANNEXURE C: INTERVIEW SCHEDULE GUIDES

Appendix C1: South African Police Service crime scene (Rape) investigators

'This Interview Schedule Guide is directed to **'Sample 'A': First Sample (25:5 participants): South African Police Service [SAPS] crime scene (Rape) investigators**, stationed at the following **five (05) police stations** in the Northern Cape: **Kimberley Police Station (001310), Jan Kempdorp Police Station (001322), Galeshewe Police Station (001320), Roodepan Police Station (001324), and Pampierstad Police Station (007114).'** This category included about 25 participants.'

1. Can you kindly introduce yourself, your position and your job description?
2. Would you consider yourself an experienced investigator?
3. Have you ever attended to a rape scene as a respondent or as an investigator?
4. Based on your experience, what are the clues or evidence pieces that an investigator or first responder should identify or look for, immediately after their arrival at the crime scene?
5. As an investigator or first responder, is there a specific way that you are expected to handle the rape scene including the victim? Please elaborate.
6. Is there any special equipment that you are expected to use as an investigator when collecting evidence?
7. Do you have the mentioned specialised equipment?
8. What are the possible implications of not using the correct equipment when collecting evidence?
9. How should the evidence collected from a rape scene be packaged and transported?
10. Can you please explain the chain of custody of evidence from the time you arrive at the scene till it is presented to the courts?
11. What is Deoxyribonucleic Acid (DNA) evidence in relation to rape investigations?
12. What are the sources of DNA, particularly in rape incidents?
13. Are you familiar with DNA analysis processes?
14. Is there any significance of collecting or utilising DNA analysis when investigating rape cases?
15. What is the weight of DNA evidence and its analysis as compared to other evidence pieces?
16. Are you aware of any successes related to DNA as an investigation or analysis tool?
17. Are you aware of any failures/shortcomings/challenges related to DNA analysis during rape investigations?

18. As an investigator dealing with rape incidents, what would be your recommendations to assist the process of using DNA analysis when presenting evidence in a court of law?

19. In your own understanding and experience, what are the impacts of rape to the victims of rape?

20. According to you, what is the impact of rape in our society, country and the world at large?

THANK YOU FOR PARTICIPATING

Appendix C2: South African Police Service Forensic Science Laboratory and Council for Scientific and Industrial Research specialists

'This Interview Schedule Guide was directed to '**Sample 'B'** 05 participants. This sample comprised 03 randomly selected **South African Police Service Forensic Specialists (SAPS FS)**, attached to the **SAPS Forensic Science Laboratory (SAPS FSL)**, situated in Arcadia, Pretoria, and other 02 **Deoxyribonucleic Acid (DNA) specialists from the Council for Scientific and Industrial Research (CSIR)** in Pretoria, overall, 05 participants were selected in this category.'

1. Can you kindly introduce yourself, your post and job description?

2. What is the level of your knowledge pertaining to DNA analysis?

3. Can you please explain the process of DNA analysis from the time you receive samples to the point where DNA evidence is presented to court?

4. Is there any special equipment that you are expected to utilise as specialists, do you have such equipment and what is its status of serviceability?

5. What are the possible implications of not using or having the correct equipment during DNA analysis?

6. How long does the process of DNA analysis take from the time it arrives at your office until completion and sending results to the stations or investigators?

7. How does the process of analysis work, do you follow the same process for all the cases or do you prioritise cases?

8. How do you determine if a certain piece of evidence qualifies for analysis or does not qualify?

9. What are the challenges that you encounter pertaining to DNA evidence or any piece of evidence, particularly when you receive it from investigators?

10. What are the challenges that you as DNA analysis experts experience?

11. What is the significance of DNA evidence as compared to other pieces of evidence?
12. Are there any shortcomings/failures related to the utilisation of DNA analysis?
13. How many DNA analysis centres in South Africa and are they all functioning?
14. Are there any successes that are owed to DNA analysis? Please explain.
15. Is DNA analysis applied as a compulsory tool for rape cases or is it applied optionally?
16. According to your understanding, are investigators well trained in identifying, collecting, transporting and presenting DNA evidence?
17. In your own analysis, do you think as the country, we are attending to rape incidents with speed and efficacy as we should?
18. In your own understanding and experience, what are the impacts of rape to victims of rape, community members and the country at large?

THANK YOU FOR PARTICIPATING

Appendix C3: Community members

'This Interview Schedule Guide was tailored to Sample 'C': This sample involved 25 participants, consisting of community members residing within the 05 selected police stations (Kimberley, Jan Kempdorp, Galeshewe, Roodepan, and Pampierstat).'

1. Can you kindly introduce yourself?
2. Have you or any person you know ever been affected by rape?
3. What can you do if you can find yourself in a rape scene?
4. Do you know what evidence in relation to rape is?
5. Do you know what to do and not to do when you are at the rape scene?
6. Do you know what to look for or protect in a case of rape which can be useful and assist law enforcement officers to get the person who has committed rape arrested?
7. The Northern Cape is said to be topping the list in terms of rape incidents, what do you think is a lead problem and contributor to this?
8. Have you or anyone you know ever reported a rape case, were you satisfied with how the process unfolded, and was the person who committed rape identified and arrested?
9. What are the challenges that you or members of the community experience with regards to rape incidents generally?
10. What have been the challenges with regards to rape reporting, if any?
11. In your own understanding, what impact does rape bring to victims, family and community?

12. Do you know what DNA is? If yes, do you understand its importance during rape investigations?

13. Do you think the country and law enforcement agencies in particular are doing enough to address rape incidents?

14. According to your knowledge, are community members reporting rape incidents? Please elaborate.

THANK YOU FOR PARTICIPATING

ANNEXURE D: REQUEST LETTERS TO CONDUCT RESEARCH WITH EXTERNAL ORGANISATIONS

Appendix D1: Letter to request permission to conduct research to the South African Police Service investigators and Forensic Science Laboratory specialists.

University address

Mr Joseph Wanda Zondi

University of South Africa (UNISA)

Department of Police Practice

College of Law: School of Criminal Justice

Florida campus, Tswelopele building

1709

Physical address

364 Christoffel Street

Pretoria West

0183

South African Police Service

The Head: Research

Private Bag X94

Pretoria

0001

TO WHOM IT MAY CONCERN

I am Mr Joseph Wanda Zondi, a Doctor of Philosophy: Criminal Justice candidate from the University of South Africa (UNISA), under the Department of Police Practice, College of Law: School of Criminal Justice. I wish to request to conduct research with about twenty-five (25) SAPS investigators, as sample 'A,' attached to the following Five (05) police stations in the

Northern Cape, namely: Kimberley Police Station (001310), Jan Kempdorp Police Station (001322), Galeshewe Police Station (001320), Roodepan Police Station (001324), and Pampierstad Police Station (007114).' and the Three (03) SAPS FS under the South African Police Service Forensic Science Laboratory (SAPS FSL) based in Pretoria regarding this research topic: *Critical analysis of Deoxyribonucleic Acid (DNA) evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa.*

During the interviews, the researcher will dedicate enough time to explain ethical considerations issues in relation to the following information based on this study: Purpose of the study, Study procedures, Risks and discomfort, Benefits, Participant's rights, Confidentiality, Privacy, Data storage and dissemination of finding and Questions and concerns,' amongst others. The researcher will interview the participants to be selected using the unstructured Key Informant Interviews (KIIs) and the application of 'simple observation schedule' for sample 'A and C.' The participants in question will be requested to provide answers to the questions to be posed, while adhering to the given timeframe by the SAPS station commanders of the 05 selected police stations and the SAPS FSL unit. There will be no compensation nor monetary benefit for participating in this study, however, the findings will be made available to the Department of Police largely and the mentioned police stations.

The researcher, Mr Joseph Wanda Zondi can be contacted any time between 08h00 and 17h00 on his cell mobile number 081-802-0721 or through his e-mail 44820666@mylife.unisa.ac.za . The study supervisor, Dr Dumisani Quiet Mabunda, can be contacted between 08h00 and 16h00 on his office number 012-433-9467 or through his e-mail address mabundq@unisa.ac.za.

Should you have any questions regarding the ethical aspects of the study, you can contact Prof E.L. Kempen of the UNISA Research Ethics Review and Data Management Committee at FitzL@unisa.ac.za.

Hoping for a positive response.

Thank you in advance.

Yours faithfully

Mr Joseph Wanda Zondi

Appendix D2: Letter to request permission to conduct research to the Council for Scientific and Industrial Research.

University address

Mr Joseph Wanda Zondi

University of South Africa (UNISA)

Department of Police Practice

College of Law: School of Criminal Justice

Florida campus, Tswelopele building.

1709

Physical address

364 Christoffel Street

Pretoria West

0183

Council for Scientific and Industrial Research (CSIR)

Physical address

Meiring Naudé Road

Brummeria

Pretoria

South Africa

Postal address

PO Box 395

Pretoria 0001

South Africa

TO WHOM IT MAY CONCERN

I am Mr Joseph Wanda Zondi, a Doctor of Philosophy: Criminal Justice candidate from the University of South Africa (UNISA), under the Department of Police Practice, College of Law: School of Criminal Justice. I wish to request to conduct research with the Two (02) Deoxyribonucleic Acid (DNA) specialists from the CSIR, as sample 'B.' to share their respective thoughts on this research topic: *Critical analysis of DNA evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa.*

During the interviews, the researcher will dedicate enough time to explain ethical considerations issues in relation to the following information based on this study: Purpose of the study, Study procedures, Risks and discomfort, Benefits, Participant's rights, Confidentiality, Privacy, Data storage and dissemination of finding and Questions and concerns,' amongst others. The researcher will interview the participants to be selected using the unstructured Key Informant Interviews (KIIs), as well as the application of 'simple observation schedule' for sample 'B.' The participants in question will be requested to provide answers to the questions to be posed, while adhering to the given timeframe by the CSIR unit management, as to be selected. There will be no compensation nor monetary benefit for participating in this study, however, the findings will be made available to the Department of Police largely and the mentioned police stations.

The researcher, Mr Joseph Wanda Zondi can be contacted any time between 08h00 and 17h00 on his cell mobile number 081-802-0721 or through his e-mail 44820666@mylife.unisa.ac.za. The study supervisor, Dr Dumisani Quiet Mabunda, can be contacted between 08h00 and 16h00 on his office number 012-433-9467 or through his e-mail address mabundq@unisa.ac.za.

Should you have any questions regarding the ethical aspects of the study, you can contact Prof E.L. Kempen of the UNISA Research Ethics Review and Data Management Committee at FitzL@unisa.ac.za.

Hoping for a positive response.

Thank you in advance.

Yours faithfully

Mr Joseph Wanda Zondi

Appendix D3: Letter to request permission to conduct research to the community members

University address

Mr Joseph Wanda Zondi

University of South Africa (UNISA)

Department of Police Practice

College of Law: School of Criminal Justice

Florida campus, Tswelopele building.

1709

Physical address

364 Christoffel Street

Pretoria West

0183

Community members 'of Sol Plaatje Local Municipality (Galeshewe, Kimberley and Roodepan) and Phokwane Local Municipality (Jan Kempdorp and Pampierstad)

Phokwane Local Municipality

Postal: Private Bag X3, Hartswater, 8570

Physical: 24 Hertzog Street, Hartswater

Sol Plaatjie Local Municipality

Postal address: Private Bag X5030, Kimberley, 8300. **Physical address:** Jan Smuts Street, Boulevard, Kimberley

The Northern Cape Province Department: Co-operative Governance, Human Settlements and Traditional Affairs

Postal address: Private Bag X5005, Kimberley, 8300

Physical address: Larry Moleko Louw Building, 9 Cecil Sussman Road, Kimberley, 8300

Selected local Ward Councillors of the Northern Cape: South African Local Government Association (SALGA)

Postal Address

PO Box 3183

Kimberley

8300

Physical Address

Block Two

Montrio Corporate Park

Number 10. Oliver Road, Monument Heights

Kimberley

8300

TO WHOM IT MAY CONCERN

I am Mr Joseph Wanda Zondi, a Doctor of Philosophy: Criminal Justice candidate from the University of South Africa (UNISA), under the Department of Police Practice, College of Law: School of Criminal Justice. I wish to request to conduct research with the … community members, as sample 'C.' to share their respective opinions on this research topic: *Critical analysis of DNA evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa.*

During the interviews, the researcher will dedicate enough time to explain ethical considerations issues in relation to the following information based on this study: Purpose of the study, Study procedures, Risks and discomfort, Benefits, Participant's rights, Confidentiality, Privacy, Data storage and dissemination of finding and Questions and concerns,' amongst others. The researcher will interview the participants to be selected using the unstructured Focus Group Discussions (FGDs). The participants in question will be requested to provide answers to the questions to be posed, while adhering to the given

timeframe by the SAPS station commanders of the 05 selected police stations. There will be no compensation nor monetary benefit for participating in this study, however, the findings will be made available to the Department of Police largely and the mentioned police stations.

The researcher, Mr Joseph Wanda Zondi can be contacted any time between 08h00 and 17h00 on his cell mobile number 081-802-0721 or through his e-mail 44820666@mylife.unisa.ac.za. The study supervisor, Dr Dumisani Quiet Mabunda, can be contacted between 08h00 and 16h00 on his office number 012-433-9467 or through his e-mail address mabundq@unisa.ac.za.

Should you have any questions regarding the ethical aspects of the study, you can contact Prof E.L. Kempen of the UNISA Research Ethics Review and Data Management Committee at FitzL@unisa.ac.za.

Hoping for a positive response.

Thank you in advance.

Yours faithfully

Mr Joseph Wanda Zondi

ANNEXURE E: UNIVERSITY OF SOUTH AFRICA RESEARCH ETHICS APPROVAL LETTER

UNISA university of south africa

UNISA 2022 ETHICS REVIEW COMMITTEE

Date: 2 September 2022

ERC Reference No.: ST75-2022
Name: JW Zondi

Decision: Ethics Approval from 2022:09:02 to 2025:09:02

Researcher: Mr Joseph Wanda Zondi

Supervisor: Dr DQ Mabunda

CRITICAL ANALYSIS OF DEOXYRIBONUCLEIC ACID EVIDENCE DURING RAPE INVESTIGATION IN THE NORTHERN CAPE PROVINCE

Qualification: PhD (Criminal Justice)

Thank you for the application for research ethics clearance by the Unisa 2022 Ethics Review Committee for the above-mentioned research. Ethics approval is granted for 3 years.

*The **low-risk application** was **reviewed** by the CLAW Ethics Review Committee on in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.
2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the CLAW Committee.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
6. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
8. No field work activities may continue after the expiry date **2025:09:02**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number TS75-2022 should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.

Yours sincerely,

Prof L Fitz
Chair of CLAW ERC
E-mail: fitzlg@unisa.ac.za
Tel: (012) 433-9504

Prof OJ Kole
Acting Executive Dean: CLAW
E-mail: koleoj@unisa.ac.za
Tel: (012) 429-8305

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ANNEXURE F: SOUTH AFRICAN POLICE SERVICE APPROVAL LETTER

SUID-AFRIKAANSE POLISIEDIENS SOUTH AFRICAN POLICE SERVICE

Privaatsak/Private Bag X 94

Reference:	3/34/2
Enquiries:	Lt Col (Dr) Smit AC Thenga
Telephone:	(012) 393 3444 082 778 8629
Email Address:	ThengaS@saps.gov.za

THE HEAD: RESEARCH
SOUTH AFRICAN POLICE SERVICE
PRETORIA
0001

A. The Provincial Commissioner
NORTHERN CAPE

B. The Divisional Commissioner
DETECTIVE AND FORENSIC SERVICES

PERMISSION TO CONDUCT RESEARCH IN THE SOUTH AFRICAN POLICE SERVICE: UNIVERSITY OF SOUTH AFRICA: DOCTORATE DEGREE: CRITICAL ANALYSIS OF DEOXYRIBONUCLEIC ACID AS EVIDENCE DURING RAPE INVESTIGATION IN THE NORTHERN CAPE PROVINCE: RESEARCHER: JW ZONDI

A-B. 1. Regarding the abovementioned heading refers.

2. The researcher, JW Zondi, is conducting a study topic/titled: ***"Critical Analysis of Deoxyribonucleic Acid as Evidence during Rape Investigation in the Northern Cape Province"*** *and requests permission* to conduct research in the South African Police Service (SAPS).

3. The research proposal was perused by the Component: Research according to the National Instruction 4 of 2022. Therefore, this office recommends that the research study be permitted, subject to the final comments and further arrangements by the office of the Provincial Commissioner: Northern Cape and the Divisional Commissioner: Detective and Forensic Services.

1

PERMISSION TO CONDUCT RESEARCH IN THE SOUTH AFRICAN POLICE SERVICE: UNIVERSITY OF SOUTH AFRICA: DOCTORATE DEGREE: CRITICAL ANALYSIS OF DEOXYRIBONUCLEIC ACID AS EVIDENCE DURING RAPE INVESTIGATION IN THE NORTHERN CAPE PROVINCE: RESEARCHER: JW ZONDI

4. The aim of the study is ***"to explore the significance of DNA as an investigation tool during rape investigations in Northern Cape".*** Furthermore, the researcher selected to conduct a mixed method research study to collect data from participants.

5. The researcher, JW Zondi, intends to collect data by distributing twenty (20) questionnaires randomly to the members of the SAPS Kimberly (as the nodal point of all provincial investigators who deal directly with rape investigation) as well as three (3) questionnaires will be distributed to the SAPS Forensic Specialist from Arcadia Forensic Service Centre in Pretoria in line with the proposed topic/title.

6. This office hereby requests your support on the condition that your office agrees with our recommendations and confirms the proposed official research is viable. Additionally, your office has the authority to set terms and conditions for the researcher to comply with set standards to be followed during the research study process and not harm the SAPS' image.

7. Kind find the relevant documents of the requested application topic/titled" ***"Critical Analysis of Deoxyribonucleic Acid as Evidence during Rape Investigation in the Northern Cape Province"*** for your consideration:

   Annexure A: Application to conduct research;
   Annexure B: Signed undertaking;
   Annexure C: Research proposal; and
   Annexure D: Research approval from the University of the South Africa.

8. The researcher will conduct the research at his/her own expense.

8.1 The researcher will conduct research without disrupting the duties of the participating members of the Service. **In addition, the researcher must communicate and make prior arrangements with the respective commanders of the participating members of the study.**

PERMISSION TO CONDUCT RESEARCH IN THE SOUTH AFRICAN POLICE SERVICE: UNIVERSITY OF SOUTH AFRICA: DOCTORATE DEGREE: CRITICAL ANALYSIS OF DEOXYRIBONUCLEIC ACID AS EVIDENCE DURING RAPE INVESTIGATION IN THE NORTHERN CAPE PROVINCE: RESEARCHER: JW ZONDI

8.2 The researcher, JW Zondi, should bear in mind that participation in the interview questions and the completion of the questionnaires must be voluntary.

8.3 Information will at all times be treated as strictly confidential.

8.4 The researcher, JW Zondi, will provide an electronic copy of the final report to the Service.

8.5 The researcher, JW Zondi, will ensure that the research report complies with all conditions for the approval of the research.

9. Should your office be in agreement with this research request and to facilitate smooth coordination between your office and the researcher, the following information is kindly requested to be forwarded to our office within **18 days** after receipt of this letter.

- **Signed Certificate/Letter:** Confirm the proposed research request is viable;
- **Contact person**: Rank, Initials and Surname; and
- **Contact details**: Telephone number and email address.

10. Your cooperation will be highly appreciated.

MAJOR GENERAL
THE HEAD: RESEARCH
DR PR VUMA

DATE: 2022 -09- 27

ANNEXURE G: LOCAL MUNICIPALITIES APPROVAL LETTERS

Appendix G1: Phokwane Local Municipality approval letter

PHOKWANE LOCAL MUNICIPALITY

Postal: Private Bag X3, Hartswater, 8570
Physical: 24 Hertzog Street, Hartswater
Tel: 053 474 9700, Fax: 053 474 1768
Website: www.phokwane.gov.za

Ref: #10/1/3/3

Mr Joseph Wanda Zondi

364 Christoffel Street, Pretoria West, 0183

Dear Sir/Madam

SUBJECT: LETTER OF PERMISSION TO CONDUCT DOCTORAL RESEARCH FOR MR JOSEPH WANDA ZONDI

1. As the above matter bears reference.
2. This serves to confirm that Mr Joseph Wanda Zondi, student number: 44820666, a student from the University of South Africa (UNISA) has been granted a permission to conduct research in Phokwane Local Municipality, restricted to these study locations: Jan Kempdorp and Pampierstad.
3. The Doctoral research is based on *"Critical analysis of Deoxyribonucleic Acid evidence during rape investigation in the Northern Cape Province."*
4. Hope you find this in order.

Kind regards

Municipal Manager: Ms Busisiwe Mgaguli (Acting)
Cell: 081 736 9630, Email: bmgaguli@gmail.com

2022/11/24

Appendix G2: Sol Plaatjie Local Municipality approval letter

SOL PLAATJE LOCAL MUNICIPALITY

Postal address: Private Bag X5030, Kimberley, 8300. **Physical address:** Jan Smuts Street, Boulevard, Kimberley

Reference: 148/2023.

Enquires: Electronic mail: www.solplaatje.org.za, **Telephone:** 053 830 6911**, Fax:** 053 833 1005

AUTHORISATION TO CONDUCT A RESEARCH

Research title: Critical analysis of Deoxyribonucleic Acid evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa.

Researcher: Mr Joseph Wanda Zondi

Supervisor: Dr DQ Mabunda

As the above matter refers.

1. We hereby give permission to Mr Joseph Wanda Zondi (44820666) to conduct research at Sol Plaatje Local Municipality, focusing on 'Galeshewe, Kimberley and Roodepan study location areas, as part of the researcher's requirements for a Doctor of Philosophy: Criminal Justice Degree at University of South Africa (UNISA) on April 2023. This qualitative study, was supported by the phenomenological research design, while using the unstructured Focus Group Discussions (FGDs) for data collections. About Twenty-five (25) community members were selected as participants using the non-probability: Purposive sampling and they were all subjected to the semi-structured FGDs.

2. It is hoped that Plaatje Local Municipality will benefit from the findings of this study, which will serve as tools to critically analyse Deoxyribonucleic Acid (DNA) evidence during rape investigation in the selected Local Municipalities of Northern Cape Province, South Africa, while contributing to the new body of knowledge in this study field.
3. This study may arrive at recommendations for good practices based on the subject under research and can possibly add value to the Plaatje Local Municipality and the affected study locations in reference to the current practices to respond to this ever-increasing scourge.
4. In case of any challenges, you can contact the Municipal Manager and the final Thesis should be presented to this office before the final draft is offered to UNISA to avoid litigations and other irregularities.

Hope you do well in your research.

Kind regards

Municipal Manager: Mr Mangaliso Mabija
Tel: 053 830 6101
Fax: 053 833 1005

ANNEXURE H: TURNITIN REPORT

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CRITICAL ANALYSIS OF DEOXYRIBONUCLEIC ACID EVIDENCE DURING RAPE INVESTIGATION IN THE SELECTED LOCAL MUNICIPALITIES OF NORTHERN CAPE PROVINCE, SOUTH AFRICA

BY

JOSEPH WANDA ZONDI

Submitted in accordance with the requirements for the degree of

DOCTOR OF PHILOSOPHY

In the subject

CRIMINAL JUSTICE

At the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: DR DQ MABUNDA

2024

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CRITICAL ANALYSIS OF DEOXYRIBONUCLEIC ACID EVIDENCE DURING RAPE INVESTIGATION IN THE SELECTED LOCAL MUNICIPALITIES OF NORTHERN CAPE PROVINCE, SOUTH AFRICA

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EDITING SERVICES
YOUR IDEAS IN A SIMPLE WAY

16 Apiesdoring Drive, Heuweloord, Centurion
Pretoria 0157
+27(0) 65 660 3839
pmavimele1@gmail.com

Date: 23/11/2023

TO WHOM IT MAY CONCERN

This serves as proof that the research report titled **"CRITICAL ANALYSIS OF DEOXYRIBONUCLEIC ACID EVIDENCE DURING RAPE INVESTIGATION IN THE NORTHERN CAPE PROVINCE"** by **JOSEPH WANDA ZONDI** has been edited.

Regards