

# **Exploring the factors influencing the sustainability of mobile clinics for the delivery of the Expanded Programme on Immunisation to the rural areas of the Northern Cape.**

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**A mini-thesis submitted in partial fulfilment of the degree Master of Science in Pharmacy Administration and Policy Regulation in the Faculty of Natural Sciences School of Pharmacy, University of Western Cape.**

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**March 2021**

## Declaration

I declare that this thesis that I submit for assessment on the programme of study leading to the degree Master of Science in Pharmacy Administration and Policy Regulation has not been submitted for the purpose of a degree at this or any other higher education institution. It is entirely my own work has been cited and acknowledge within the text of this work.

I agree to deposit this thesis in the University of Western Cape's library and Health care-Learning 's institutional repository and or allow these institutions to do so on my behalf, subject to University of Western Cape's condition of use and acknowledgement.

Signed at Cape Town on the 29 March 2021



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## Acknowledgements

I am grateful to all those who have assisted me with this research project.

I would like to give a special thanks to the following people who have assisted me:

- My supervisor, Professor Angeni Bheekie, for her competent guidance.
- Mr Boitumelo Mashute who provided support in obtaining the Northern Cape department of health approval during the pressure of the COVID-19 pandemic.
- My friends and family who have provided much needed support and encouragement.
- All the participants who contributed immensely in the research study, by sharing their valuable insight and experience in the operations of mobile clinic service delivery in the Northern Cape.



# Abstract

## Background

The Northern Cape province has not been able to achieve the 90% immunization target recommended for South Africa's expanded programme on immunisation (EPI). The situation has been attributed to the lack of access to EPI in the rural community. The Northern Cape's poor infrastructure renders the provision of equitable preventive care service to rural communities a complex and costly task. The province is predominantly a rural setting consisting of farmland, with low population densities, and many residents have poor access to public transport to receive primary health care services from surrounding fixed or satellite clinics. Consequently, mothers often do not adhere to the immunization schedules, and lack awareness of the risks associated with the failure to have their infants vaccinated against communicable diseases. EPI services delivered via mobile clinics serve the primary health care needs for rural communities, but their sustainability remains a challenge. Additional barriers are found in literature which highlighted the shortage of health professionals, unreliable funding, limited transportation within rural areas and deficiencies in maintenance and suitability of mobile clinic vehicles.

## Objective

The study objective is to identify the inhibitory factors that influence the sustainability of EPI mobile clinic service delivery to the rural areas of the Northern Cape.

## Method

A descriptive exploratory study design using a snowball sampling method was used. An online zoom interview was first conducted with a key informant, who subsequently identified additional participants located within a multidisciplinary team of EPI role players. The interviews were conducted to explore the inhibitory factors influence the sustainability of mobile EPI service delivery. A semi-structured guide was used to interview the participants to share their in-depth insights into EPI mobile clinic services; among others the routine operational procedures, vehicle maintenance, vaccine supply, cold chain management, staffing, resources and funding. The interviews were recorded on zoom, transcribed verbatim, coded and categorised into themes, and analysed deductively.

## Results

The following 8 participants employed by the Northern Cape department of health was interviewed: the assistant pharmaceutical district manager, deputy manager of provincial pharmaceutical services, head of provincial pharmaceutical services, deputy director of child health services, acting district health director, deputy nursing manager for child health and two mobile clinic professional nurses. Study findings provided insight into to the operational challenges that impact the sustainability of mobile EPI services. Themes identified from the multidisciplinary interviews provided several systemic, organisational and community level factors that directly and indirectly influence the sustainability of EPI mobile clinic service delivery to the rural areas. Participants reiterated that without funding and the dedication of the clinic nurse the mobile EPI services would not exist and that department of health needs to independently consider the operation and maintenance needs of the EPI delivery via mobile clinics.

## Discussion and Conclusion

The findings exposed the difficulties in sustaining EPI services via mobile clinics and revealed its importance in providing EPI access to rural communities in the Northern Cape. The inhibitory factors such as lack of funding, human resource constraints, lack of community engagement, poor mobile clinic maintenance and geographical challenges provided valuable insight into EPI service delivery and consequently adherence to EPI schedules. EPI decision-makers are required to prioritise mobile clinic service through stakeholder collaboration and community engagement so that informed decision can be made.

## Key words

Vaccine access, cold chain management, farming communities, funding, health care, immunisation, inhibitory factors, mobile clinic, mobile clinic nurse, rural remote areas, sustainability.

## **List of abbreviations**

DHIS - District health information system  
EPI - Extended programme on immunisation  
IMCI - Integrated management of childhood illnessf  
JTG - John Taolo Gaetsewe  
NC - Northern Cape  
NHI- National Health Insurance  
SANC - South African Nursing Council  
UNICEF - United Nations International Children's Emergency Fund  
USA - United States of America  
WHO - World Health Organisation  
ZFM - Zwelentlanga Fatman Mgcawu

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# CHAPTER 1

## Introduction

### 1.1 Background and problem statement

Children's access to health care services drives the promotion of their right to achieve optimal development, health, and future well-being (Lake et al., 2019). Immunisation promotes child health, in turn healthy children demonstrate better cognitive performance and educational attainment at school, securing a future economically active workforce (Rodrigues & Plotkin, 2020). Universal health coverage is optimised through preventative care initiatives such as the Expanded Programme on Immunisation (EPI), and its success depends on compliance to the EPI schedule (Feilden et al., 2001; World Health Organization, 2018). The World Health Organisation (WHO) identified a list of the urgent, global health challenges for the next decade which they established in 2020 (World Health Organization, 2020). The goal is to action sustainable solutions to 13 listed challenges by 2030, and expanding access to medicines and stopping infectious disease were among them (World Health Organization, 2020).

Limited access to quality health products negatively impacts the health and lives, while vaccine preventable diseases continue to take the lives of many adults and children due to insufficient funding and health systems and health infrastructure (World Health Organization, 2020). Among the WHO's list of urgent global health challenges, expanding access to medicines and stopping infectious disease were listed, while vaccine preventable diseases that cause the deaths of many adults and children due to insufficient funding and barriers to health systems and health infrastructure were identified (World Health Organization, 2020).

The WHO founded the EPI (1974) to ensure that all children are vaccinated to provide immunisation against vaccine preventable diseases (Rodrigues & Plotkin, 2020). The national EPI schedule of all the required vaccines that are to be routinely administered, aim to ensure optimal vaccination coverage (Shen et al., 2014). In South Africa's EPI schedule there are 10 antigens offering protection against diphtheria, pertussis, tetanus, measles, mumps, rubella, polio and tuberculosis, thereby preventing widespread illness and disability (Dlamini & Maja, 2016). In addition vaccinations are offered against cervical cancer (caused by the human papillomavirus) offered to girls aged nine years and older attending Grade 5 in public sector schools. Vaccine doses are given at appropriate ages to promote immunity to prime the immune system initially. Some vaccines require follow-up doses to ensure seroconversion while booster doses of other vaccines maintain immunity (Baker, 2014).

In developing countries, the programmatic objectives of vaccine delivery services aim to ensure that vaccine administration is available, affordable, and accessible (Shen et al., 2014). Access to vaccines to the most vulnerable population such as those living in remote rural areas remains a priority for South Africa as they pose the largest risk and are least likely to be vaccinated (Fine et al., 2011). The availability of vaccines alone will not achieve EPI objectives as it is a constant challenge to meet the health demands of a developing country given limited financial and human resources (Gaede & Versteeg, 2011). Governments ought to invest in the vaccination of every individual based on the morbidity and mortality effects (Ehreth, 2003). Although policies and programmes have been created to promote child health and the right to health care, there is still a high burden of child mortality (Lake et al., 2019). If health decision-makers and health care practitioners recognise the costs avoided due to vaccine prevention, they would resonate with the importance of sustaining vaccine programmes (Ehreth, 2003).

Accessible proximity to health care services is a basic right of South Africa's rural communities (McLaren et al., 2013). One-fifth of children (20%) are required to travel more than 30 minutes to visit a health care facility even though it is reported that 90% of the population resides within a 5km proximity to a health facility (McKenzie et al., 2017; Lake et al., 2019). Hard to reach places, marginalised communities, and farming communities, such as those experienced in the Northern Cape (NC) have poor access to clinics, and it is crucial that their children receive timely immunisation (Barron et al., 2009). Transport expenses and travel on remote roads pose a safety concern and remain a challenge to health care access (Lake et al., 2019). Equitable health coverage requires consideration of socio-geographic factors, where vulnerable populations have accessible health care that is continuous and reliable (Gaede & Versteeg, 2011).

EPI delivery via mobile clinics requires the co-ordination and participation from different government departments and stakeholders, but fragmentation seems visible during its operational processes. While EPI forms part of district health services, the government garage is responsible for the mobile clinic vehicle maintenance, underpinning fragmentation within the operational framework (Bosman et al., 2013; Barron et al., 2009). Immunisation should be a shared concern of communities and governments however, the fragmented functions of EPI programme management have affected the efficiency and effectiveness of the advisory bodies to make informed decisions (Shen et al., 2014). The department of health at national, provincial and district levels are obliged to share in the responsibility of providing quality health care not only to hospital patients and the general population, but also marginalised communities (Gaede & McKerrow, 2011).

## 1.2 Context of the Expanded Programme on Immunisation (EPI) in the Northern Cape

The NC province covers the largest geographical area but inhabits the smallest population figure of all the provinces in South Africa (Visagie & Schneider, 2014). Providing access to health care and EPI services is thus challenging and costly due to the province's inadequate infrastructure and rural landscape, as the population is vastly scattered across small towns, farms and rural settlements (Barron et al., 2009). The long travel distance to primary health care clinics requires long hours of absence from work. Farmers are not often able to offer access to transport regularly for communities to attend clinics, and in areas where mobile clinics are available, communities and health care workers endure travelling on underdeveloped roads which pose a safety risk (Bosman et al., 2013).

The prioritisation and allocation of resources and funding can become difficult to co-ordinate given the complexity and fragmentation of EPI operational processes (Shen et al., 2014). The NC's department of health operates on a vertically structured EPI accountability framework (Mabona & Shakantu, 2016). The vertical structure of EPI limits decision makers at national level to make holistic decisions regarding the district level programme (Semali et al., 2005). This incumbers improved efficiency, equity and integration of the community to ensure quality health care services are provided (Semali et al., 2005). Decentralization increases effectiveness of immunisation services by optimising integration, which assists in identifying more cost-effective strategies and reduces duplication of efforts (Feilden et al., 2001). On the contrary, EPI decentralisation can also be disadvantageous especially when districts are required to manage both immunisation and other health care services concurrently (Shen et al., 2014).

## 1.3 Purpose of the study

The NC is not able to reach the target of 90% immunization national coverage and 80% immunization coverage in every district, as per the WHO global action plan to maintain herd immunity, due to the vast distances that the rural community is expected to travel to gain access to immunisation services (Andre et al., 2008; World Health Organization, 2015). It is reported (2011) that the highest percentage of household members (56.9%) had walked to access a health facility, while some (15.3%) took 30-89 minutes to reach a health care facility (Lehohla, 2013). Furthermore, accessibility to public secondary health care services can be as far as 200 km and a tertiary health care service almost 800 km away (Visagie & Schneider, 2014).

This research study aims to understand the operational processes required to sustain EPI services via mobile clinics to rural areas of the NC.

#### 1.4 Research objective

The study objective is to conduct interviews with key role-players who are involved in the operational processes of mobile clinics in the provision of EPI services. More specifically the objective is to explore the inhibitory factors that influence the sustainability of the EPI health service delivery to the rural areas of the NC.

#### 1.5 Importance of the study

The rural communities are dependent on mobile clinics to provide consistent, convenient, and reliable immunisation services that will encourage adherence to vaccination schedules. By increasing access to immunisation, herd immunity will be promoted, which will reduce the health and financial burden of communicable diseases on the province's health system. The direct benefit of participation of the role-players is to acknowledge the importance of mobile clinic service delivery and identify the inhibitory aspects that prevent continuation and promotion of this mode of service delivery. The indirect benefit of participation may be that EPI decision-makers and role-players within the department of health have an opportunity to reflect on current practice and identify opportunities towards optimising preventative care to rural community members. The findings obtained from this study would provide the NC's EPI department of health management and key health care service providers insight into the plethora of interrelated factors which influence the sustainability of mobile clinics for delivery of vaccinations to the rural areas of the NC.

The exponential benefits of EPI are the prevention and eradication of infectious diseases, which results in health, economic and social benefits (Rodrigues & Plotkin, 2020). The information obtained from key role players of EPI would provide the evidence that could enable decision-makers to optimise access to immunisation and seek to strengthen alternative service methods such as mobile clinics or semi-fixed structures. A framework to establish standards to maintain optimal and consistent delivery of EPI could be mapped. Against the backdrop of COVID-19 mass immunisation being undertaken nationally, EPI mobile clinic services to rural areas require equal attention among decision makers who need to ensure equitable access to vaccines.

## 1.6 Outline of the mini-thesis

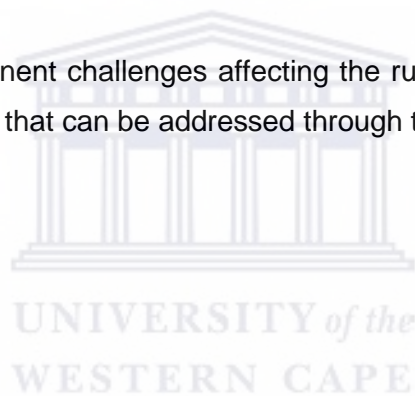
Chapter 2 discusses the literature review of the perspectives on child health, immunisation coverage and the poor access to health services in rural areas of the NC against the backdrop of low population density and road infrastructure.

Chapter 3 focuses on the study methodology of the qualitative research method used and discusses the study context, research design, technique for sampling, data collection and analysis.

Chapter 4 highlights the results obtained from semi-structured interviews. The themes and sub-themes identified from the interview transcripts relating to the participants perceptions and experiences of EPI delivery via mobile clinics are described and supported by their quotes.

Chapter 5 discusses the results exposing the direct and indirect factors affecting sustainability of EPI services via mobile clinics. The discussion focuses on the barriers associated with the suitability and maintenance of mobile clinic vehicles, EPI vaccine supply, funding and staff resources.

The conclusion highlights pertinent challenges affecting the rural communities in sustaining EPI services via mobile clinics, that can be addressed through the recommendations.



## CHAPTER 2

### Literature Review

#### 2.1 Introduction

This chapter provides a review on the factors that negatively affect sustainability of the EPI mobile clinic service delivery such as the poor adherence to logistics and cold chain management of EPI vaccines, the vertical operational framework of EPI and the health staff shortage that is reported in the NC. Review of primary health care outreach teams and community health care workers as an enabling factor of EPI sustainability are discussed. Finally, the public health gains resulting from immunisation and perspectives on child health are explored to underpin the importance of EPI.

#### 2.2 Perspectives on child health

##### 2.2.1 Global perspective

The WHO published strategic objectives to improve the quality, equity and dignity of the health care provided to mothers, new-borns and children (World Health Organization, 2018). The strategic objectives for quality of care were to address the challenges of leadership, learning and accountability and to emphasize the need for community engagement (World Health Organization, 2018). Access to equitable and timely health care, that overcomes financial and geographical barriers secures continuity of care (World Health Organization, 2018). The United Nations Children's Fund (UNICEF) initiative known as the first 1000 days was encouraged as the first 1000 days of life which is a critical window to ensure that children meet their development potential, survive and thrive (UNICEF, 2017). The health and development of babies are jeopardised by challenges to immunisation coverage which is partially because of geographic disparities, inequities and inefficiencies of health care service to underserved communities (UNICEF, 2017).

The International Covenant on Economic, Social and Cultural Rights (ICESCR) and the United Nations Convention of the Rights of the Child (UNCRC) states that the right to timely and appropriate preventative care forms part of children's right to attain the highest standard of health (Lake et al., 2019). The South African government should prioritise child health within the health care planning framework to ensure that services and programmes are of ideal quality, available and accessible (Lake et al., 2019). Facilities are required to ensure that health services are sufficient and sustained in a child-centred manner by well-capacitated



proficient health care professionals (Lake et al., 2019). Accessibility of health care should not be an inhibitory factor as health care is meant to be accessible to all and community members should not have to travel far to access health services (Lake et al., 2019).

## 2.2.2 Perspectives in South Africa

The integrated management of childhood illness (IMCI) is a WHO and UNICEF strategy started in 1992 that advocated for application of comprehensive child health guidelines to promote the holistic well-being of children under 5 years of age (Meno et al., 2019). The IMCI has both curative and preventative elements that patients and communities can implement, for example mothers and caregivers should be made aware that minor illness is not a contraindication for immunisation and that children should not delay vaccination unnecessarily (World Health Organization et al., 2005). However, community health education on IMCI is poor and there are influxes at clinics due to child related illnesses that could have been dealt with at home if the guidelines in the IMCI booklet was enforced (Meno et al., 2019). A North West province study done in the Mafikeng sub-district found that time limitations precluded nurses from undertaking comprehensive assessments for health management given the shortage of human resources (Meno et al., 2019).

South Africa's re-engineering of primary health care strategy which was established 2010, focuses on three streams, ward-based outreach, school health services, district-based specialist teams to address the impact of social determinants on the impact of health (Scott et al., 2017; Subedar, 2011). All three streams have a strong focus on maternal and child health (Subedar, 2011). The policy commitments to programmatic action at different levels within the health care system have failed to accomplish patient-centred quality care by 2020 (Scott et al., 2017; Stemmet, 2016). Suboptimal programmatic outcomes necessitate an overarching plan that acknowledges the importance of collaboration in identifying aspects that affect the burden of disease (Scott et al., 2017; Stemmet, 2016).

The National Health Insurance (NHI) is a strategy to obtain universal health care which aims to provide South Africans their constitutional right to access to health care (Rispel et al., 2019). Immunisation under the age of one was one of the interventions assessed in phase 1 of the implementation of NHI interventions in pilot districts in South Africa (Analytics, 2019). There are strong ethical and moral imperatives to ensure that the department of health monitors the implementation of its legislation and key policies with regulatory stakeholders along with strong leadership to achieve universal high quality of care (Rispel et al., 2019).

### 2.3 Poor access to health services in rural areas

The National Patients' Right Charter of South Africa stipulates that everyone has a right to access primary health care (Gaede & Versteeg, 2011). The Alma-Ata declaration defines primary health care as being essential, however for many rural remote communities essential and affordable medicine is not made available to all, especially those living and working in hard-to-reach areas (Aneni et al., 2013). Rural communities are deprived of access to health care facilities with no means of transportation, resulting in mortality of children under five years old (Gaede & Versteeg, 2011). Lack of understanding, linguistic, culture and the intimidation of health care settings are contributing barriers to vaccination programmes, disconnecting rural communities from accessing sufficient health education on preventative care (Andre et al., 2008).

EPI requires an interrelated system to ensure its sustainability, in which integration of child health and immunisation services provide useful data for monitoring of health indicators, improving the efficiency of equitable health services (Feilden et al., 2001; Shen et al., 2014). Adaptation of health services are needed based on the changing needs of the community. The department of health has implemented strategies to strengthen the health care system, such as the re-engineering of primary health care and NHI, but neither one has comprehensively met all its objectives (Subedar, 2011).

When comparing the use of clinics between urban and rural communities, their disparities may be attributed to trade-off of equity for efficiency, where trading equal access and availability of health care is required to meet health outcomes and indicators (Tanser et al., 2006). Efficiency does not necessarily consider fair distribution of health outcomes for the overall population, rather efficiency can be based solely on a health care system that maximises health gains and outputs to meet a target (Reidpath et al., 2012). Inequitable provision of health care infrastructure is attributed by experience in the capita spending between rural and urban areas (Gaede & Versteeg, 2011). A higher level of funding is required to maintain already established well-resourced health infrastructures to sustain the current level of health care experienced in urban areas; not only is there a larger capacity to spend, but the leverage for additional funds is consequently favourable (Gaede & Versteeg, 2011).

Mobile services which require extraordinary travel time and additional resources are less efficient and costly in that they only visit few patients. The cost and workload however should not dictate its place in the health care system, as availing vital services to rural areas and addressing the right to health is crucial (Gaede & Versteeg, 2011). In, the United States of



America (USA) mobile clinics offer a means for better data collection that can be used to identify both social and medical determinants of health (Stephanie et al., 2017). Similarly, a qualitative study found that in the NC, mobile clinics such as Lutzburg Mobile Clinic in ZF Mgcawu which is located near the church, and Bophelong Mobile Clinic located near Rietrivier Primary School in Ritchie, are collaborating with local agencies to widen networks to reach more members of the community (Hlabangane, 2017).

## 2.4 Northern Cape: Population and road infrastructure

The NC is South Africa's largest province in occupying 30.5% of the country's total land area, with the smallest population at 2.2 % (Stats SA, 2020; Visagie & Schneider, 2014). With the lowest population density of 3.3 per km<sup>2</sup> the NC has rural towns extremely remote from urban areas especially those which have farming communities and mining areas (Moses & Yu, 2009). The land area of the NC is approximately 361 800km<sup>2</sup> of which only 3257km are national roads, 4989km provincial surfaced roads and 22746km provincial gravel roads (SANRAL, 2020). The concentration of people in urban areas, gives them more access to public transport and health care facilities which are situated in densely populated areas (Gaede & Versteeg, 2011). Stats SA (2015) reported that 59.2% of the NC had spent 10% of their income on public transport, the highest percentage among all provinces even though they have the least amount of public transport users (Stats SA, 2015).

## 2.5 Immunisation coverage

### 2.5.1 Public health gains resulting from immunisation

Health gains of immunisation are attributed to the reduction on morbidity and mortality (Lockett, 2016). The WHO reported an estimated 85% decrease in measles related deaths (2000-2010) in Africa (Lockett, 2016). Vaccine administration is a highly cost-effective health intervention. Globally it is estimated to have saved 386 million life years and 96 million disability-adjusted life years as well as prevented 6 million deaths annually due to vaccine-prevented diseases (Ehreth, 2003; Rodrigues & Plotkin, 2020). Outcome related productivity gains of immunisation are experienced through decreased antibiotic resistance, prevention of illnesses that affect school and work attendance, and the positive health effects of herd immunity (Deogaonkar et al., 2012; Bloom et al., 2005; Rodrigues & Plotkin, 2020).

The prevention of vaccine-preventable diseases is dependent on herd (or population) immunity, which can be achieved when a sufficiently large population of vaccinated individuals halts the spread of diseases to the unvaccinated population (Hinshaw, 2013; Rodrigues &

Plotkin, 2020). The percentage of the population requiring immunisation to obtain herd immunity varies for each disease and is dependent on the vaccine and the mechanism of herd immunity (Rodrigues & Plotkin, 2020). South Africa's EPI vaccine schedule is the most comprehensive vaccination programme among developing countries (Baker, 2014), however only 61% of children under the age of 5 years (2016) were reported to be fully immunised (Lake et al., 2019). The national immunisation target is 87%, however the district health information system (DHIS) reported that the level of coverage increased to 81.9% (2018/2019) which is insufficient to achieve herd immunity (Lake et al., 2019; Massyn et al., 2020).

The cost-effectiveness analysis of vaccine delivery revealed that an estimated 12-18% return on investment was accomplished through the eradication of diseases such as polio and small pox (Rodrigues & Plotkin 2020). In addition the prevention of long term morbidity and acute associated infection for example hearing impairment and limb amputation following diseases such as pneumococcal meningitis or meningococcal disease was also beneficial (Rodrigues & Plotkin 2020). Productivity gains stem from sustaining a healthy population through vaccine delivery, contributing to enhancing economic growth (Deogaonkar et al., 2012; Bloom et al., 2005; Rodrigues & Plotkin, 2020). In South Africa childhood deaths under five years declined to 47 409 (2013) from 89 418 (2005) which was attributed to EPI; furthermore, 2.5 million premature deaths are averted by immunisation a year (Dlamini & Maja, 2016). South Africa's last case of wild polio virus (1989) was eliminated (Ngcobo, 2008), and the National Institute for Communicable Diseases reported (2015) that there was over 40% reduction in pneumococcal diseases across all ages (Dlamini & Maja, 2016).

### 2.5.2 Immunisation coverage in the Northern Cape

According to the World Health Statistics (2011), world-wide 20% of deaths are children under the age of five years old (Lockett, 2016). A burden of disease report showed that in the NC the leading cause of death under five years of age (2010-2015) was attributed to communicable disease together with maternal perinatal and nutritional conditions (Lockett, 2016). Non-adherence to immunisation schedule is often a result of the travel distance to facilities, despite the availability of immunisation services (Lockett, 2016).

Table 1: Population density and percentage of immunisation coverage of children under 1 year (2018-2019) for the Districts of the NC (Massyn et al., 2020).

Districts of the Northern Cape	Population estimates 2018	Distance (km <sup>2</sup> )	Population density per km <sup>2</sup>	Immunisation coverage of children under 1 year (%)
Namakwa	113554	126 836	0.9	84.5
Pixley Ka Seme	209791	103,410	2.0	73.4
Frances Baard	381186	12,836	29.7	92.7
John Taolo Gaetsewe	243804	27,283	8.9	89.6
Zwelentlanga Fatman Mgcawu	263401	102,524	2.6	92.2

The NC district data outlining the population density and immunisation coverage of children below 1 year (Table 1), indicates that in 2016/2017 none of the districts had reached their national EPI target of 87% for immunization, placing an enormous potential health and financial burden on the province and the country (Lake et al., 2019; Massyn et al., 2019). Districts such as Pixely Ka Seme with a low of 65.4% are amongst the poorest districts, with the lowest population density, indicating that the rural communities are affected by the lack of accessibility to immunisation (Massyn et al., 2017). NC's lack of resources and scarcity of infrastructure decreases its economic viability compounded by the misdistribution of funds, which limits availability and accessibility of services to rural communities (Visagie & Schneider, 2014).

## 2.6 Factors affecting the sustainability of mobile clinic service delivery

The many challenges rural remote communities face in accessing basic primary health care and immunisation services are not only experienced in South Africa. There are many other countries where the lack of proximity to health facilities a barrier to the promotion of immunisation services and adherence to EPI schedules (Tanser et al., 2006). EPI service delivery requires routine delivery of cold chain reliant vaccines, which further poses a challenge to mobile clinic service delivery in locations which have extreme weather conditions and harsh rural landscapes.

### 2.6.1 Mobile clinic health services

In Namibia mobile clinics provide affordable health care access for hard-to-reach populations located mostly in rural remote areas such as farms and mines (Aneni et al., 2013). Farmers indicated that the average one-way distance to a clinic could be approximately 63.6km<sup>2</sup> (Aneni et al., 2013). The inaccessibility to clinics is a health burden, particularly for women and children, who are more likely to require health care (Aneni et al., 2013; Fine et al., 2011). Children require immunisation and without this preventative service there is a risk of poor health outcomes in areas with poor access to primary health care clinics (Aneni et al., 2013). The government provides the vaccines for primary health care services and the mobile clinic nursing practitioners who administer the vaccines service, undertake a triple role as nurse, multipurpose driver and fulfilling administrative duties (Aneni et al., 2013).

In the USA mobile clinics were implemented to improve health outcomes by increasing the accessibility of health care services (Stephanie et al., 2017). The mobile clinics offer flexible and safe health care to the vulnerable populations, and mobile clinic utilization has seen a surge given the recent COVID-19 pandemic (Beks et al., 2020). The cost-effectiveness and capacity of mobile clinics was identified as a limitation, as purchasing a suitable vehicle is often funded by a non-profit organization and consistent funding for maintenance is not always available as financial losses due to complication such as breakdowns, vehicle maintenance, poor weather conditions and equipment damage serve as barriers (Stephanie et al., 2017). Consequent to scarce resources the health care services are poorly managed and underfunded, resulting in deteriorating health infrastructure (Stephanie et al., 2017).

Rural Australia faces similar barriers to NC, due to the low population density and geographical isolation, health care facilities are not common or may not be situated near most of the rural residents, and regular health services are out of reach (Alston, 2007). The patients in rural parts of Australia are willing to travel to the nearest health care facility, but public transportation systems are often limited or non-existent (Gao et al., 2019). Road conditions are not favourable for long-distance travel, thus mobile clinics incur high costs in sustaining services due to maintenance requirements (Gao et al., 2019). Unsafe road conditions and poor visibility during inclement weather affects the availability of mobile clinic services (Gao et al., 2019).

### 2.6.2 Logistics and cold chain management of EPI vaccines

Logistic and cold chain systems of vaccines are critical to the efficacy of vaccines but are often under-recognised (Shen et al., 2014). Vaccine availability, accessibility, and quality are impaired when supply chain management throughout the delivery process does not function

optimally (Zaffran et al., 2013). When vaccines are received, the facilities must ensure that cold chain has been maintained and that product information is noted, such as the expiry date, date of receipt and issue and duration out of refrigeration (World Health Organization, 2019; South African Pharmacy Council, 2015). Vaccine wastage is commonly attributed to breakage, theft, poor temperature monitoring and ineffective cold chain management (World Health Organization, 2019; South African Pharmacy Council, 2015). Vaccine exposure to extreme temperatures, overstocking and lack of adherence to first-in-first out (FIFO)/ first expired first out (FEFO) principles, may also result in expiration of vaccines and wastage (World Health Organization, 2019; South African Pharmacy Council, 2015). FEFO will be prioritised ahead of FIFO, based on the expiry date of the vaccine.

The WHO and UNICEF estimated wastage rates of 5% for single dose vaccines and up to 50% for multi-dose vaccines dependent on the vaccine used and if the vaccine is provided routinely or as a campaign (World Health Organization, 2019). In developing countries failure to supply vaccines has been attributed to mishandling of vaccines (Setia et al., 2002). The costs associated with vaccine wastage has been estimated to range from ZAR2.33 to ZAR8.61 per dose administered for a multi-dose vaccine (Setia et al., 2002). In Tshwane district of the Gauteng Province, vaccine boxes were being left unpacked for 2-3 days after being delivered without any accountability at facilities, as pharmacist assistants were not delegated to manage stock (Ngcobo & Kamupira, 2017). Ngcobo and Kamupira (2017) describes the nurse's frustration and resentment towards having to cope with pharmaceutical responsibilities of vaccine management along with clinical responsibilities (Ngcobo & Kamupira, 2017).

Given the value of vaccines and its intricate nature, staff who are handling vaccines require extensive training on vaccine management practices (World Health Organization, 2005). Quality and management of cold chain must be monitored throughout the full cycle prior to administration (World Health Organization, 2005). Most vaccines are required to be stored at 2-8 °C whilst on the mobile clinic vehicle (World Health Organization, 2005). In developing countries without reliable electricity, there are challenges in maintaining adequate temperature control measures during transporting of vaccines to communities located far from health care facilities (Songane, 2018).

### 2.6.3 The operational framework of EPI

EPI operates as a vertical programme which requires governance, organisation, management and delivery of routine immunisation (Shen et al., 2014). Vertical programmes function separately from other services so that the health care system can maintain focus on critical

services such as EPI, where planning, staffing, management and financing are segregated from the mainstream (Travis et al., 2004). The mobile clinics in Namibia operate as a vertical operating system focusing on individual programmes where few provide comprehensive services (Aneni et al., 2013). Similarly, in the NC, a multidisciplinary team consisting of various role players within the department of health are responsible for sustaining mobile clinics. Vertical programmes limit the outcome of objectives for EPI that should be a shared interest amongst multiple stakeholders to ensure quality service delivery (Travis et al., 2004). In Tanzania health sector reforms that included decentralisation of EPI led to community participation and positive health outcomes (Semali et al., 2005), were attributed to harmonised planning and allocation of resources from all stakeholders (Shen et al., 2014). Since immunisation is an extension of child health, it is necessary to rely on comprehensive outcome and reporting to monitor health care provision and have reliable information to base decision making (Gray et al., 2019).

To obtain national EPI objectives, adequate resources must be availed, which is highly dependent on the support of external partners and the will of decision-makers (Shen et al., 2014). Children in developing countries are more likely to die from a vaccine preventable disease than those in a developed country, because of under-utilisation of immunisation due to budgetary constraints for primary health care (Ehreth, 2003).

<b>Policy, guidelines, standards and legislation</b>	
<b>Governance, organization and management</b>	
<b>Human resources</b>	<b>Vaccine cold chain and logistics management</b>
<b>Quality, reliable service delivery</b>	
<b>Communication and community partnership</b>	<b>Data generation and use</b>
<b>Sustainable financing</b>	

Figure 1: Eight critical elements that are integral to routine immunisation programmes (Shen et al., 2014).

According to Shen et al., the eight critical elements (figure 1) provide an enabling environment for sustaining immunisation service delivery (Shen et al., 2014). Mobile services will not be



explicitly stated as such in Figure 1, as outreach services, PHC services and hospital services are all considered service delivery platforms, including mobiles. Such lack of visibility is a concern, especially when addressing the health needs for marginalised communities who are highly dependent on a mobile clinic. EPI services offered via mobile clinics depends on the availability of professional nurses, appropriate vehicles, vaccine logistics, and funding of operational costs (Lockett, 2016; Rodrigues & Plotkin, 2020). In addition, effective communication between the community and the department of health staff is essential to promote compliance to EPI schedules (Lockett, 2016).

#### 2.6.4 Health care staff shortages in the Northern Cape

Nurse-driven community health care centres provide primary health care supported by outreach services to areas in the NC (Visagie & Schneider, 2014). Studies on the shortages of nursing staff in South Africa (2008), stated that the NC was one of the four provinces with the highest shortage of qualified nurses, with a patient to nurse ratio of 544:1 (Joubert, 2009). Strained work environments demote individuals wanting to enter the profession for the purpose of working in South Africa, instead it promotes emigration of qualified nurses and encourages early retirement (Joubert, 2009). The South African Nursing Council (SANC) website claims that only one public nursing education institution currently offers qualifications in the NC (SANC Statistics for 2019). Based on the estimated population of 1 262 786 (2020) there were only 2382 registered nurses, which equates to a high patient to nurse ratio of 543:1, that underpins an alarming shortage of nurses (SANC Statistics for 2020), in comparison to the WHO recommended patient to nurse ratio of 500:1 (Joubert, 2009).

In the USA, the quality and extent of service delivery via mobile clinics is limited by the recruitment and retention of staff (Stephanie et al., 2017). This is attributed to the poor working environment and risks associated with travelling into underserved areas which are not always safe (Stephanie et al., 2017). In some Californian hospitals a rigid method was adopted where nurses were appointed to legally enforce nurse/patient ratios (Joubert, 2009). Down-scaling of staff such as care givers who are less qualified, led to increasing the nurses' workload (Joubert, 2009). In contrast, Australia applied a more flexible approach, where the ratio of nurses to patients are tailored according to the needs of a particular hospital, an approach that would be most ideal for South Africa based on factors such as geographical location, population density, and caseload (Joubert, 2009).

## 2.7 Primary health care outreach teams and community health care workers

Literature explains that provision of community health workers linked to primary health care facilities are critical to child health outcomes (Subedar, 2011). EPI in Bangladesh's administration of vaccines is assisted by family welfare assistants at outreach and various EPI spots, even though it is the primary responsibility of the health care workers at the health care facilities (Jamil et al., 1999). In the NC community health workers are significant due to their proximity to communities. Ward based primary health care outreach teams are mediators between the district health department and marginalized communities (Ramukumba, 2020). The community health care workers register households into wards to identify patients, check the immunisation status and for any missed vaccination dose (Ramukumba, 2020). This information is used to advise community health care workers on the referral to nurses that are required to provide an intervention or refer patients to primary health care clinics (Jinabhai et al., 2015). Community health care workers also provide health promotion to schools and crèches, administer vitamin A and deworming pills, thus they are a critical to the adherence and monitoring of routine vaccinations (Ramukumba, 2020).

## 2.8 Conclusion

EPI is highly beneficial and crucial to the development and sustainability of child health. The department of health's initiatives aimed at increasing the accessibility and availability to EPI requires evaluation of the sustainability of mobile clinics. Many health programmes have overlooked the social determinants of health, such as remote areas with geographic limitations that require access to basic preventive care. Due to departmental fragmentation, poor collaboration and lack of community engagement, the effective, efficient and equitable provision of health care in rural areas is deemed to be unsustainable.



## CHAPTER 3

### Methodology

This chapter describes the qualitative research method used to explore the inhibitory factors influencing the sustainability of mobile clinics for delivery of EPI services to the rural areas of the NC. The chapter explains the study context, research design, technique for sampling and the data collection and analysis.

#### 3.1 Research setting

The NC was selected as the study site, due to the poor infrastructure of its rural setting, low population density of 2.6 people per squared kilometre and significant need for access to immunisation requiring mobile EPI services (Philip, 2004). Currently, there is no documented evidence in the public domain that indicates how many mobile clinics that are operational in the NC and personal communication (09/2019) with the administrative officer of the Chief Director District Health Services in the NC provincial department of health was inconclusive. Figure 2 provides a visual representation of the five districts and 26 sub-districts within the NC province.



Figure 2: Five districts and sub-districts of the Northern Cape

Map taken from: Northern Cape Municipalities

<https://municipalities.co.za/provinces/view/7/northern-cape>

## 3.2 Research design

A descriptive exploratory qualitative study design was used as it provided the ability to probe with the intention to obtain in-depth insight during a dialogue between the interviewee and the researcher (DeJonckheere & Vaughn, 2019). Semi-structured interviews were conducted, to best allow the interviewees to express their views, insights and opinions relating to the inhibitory factors that influence the daily operation of mobile clinics in the delivery of EPI (Welman et al., 2005).

## 3.3 Study population

The study population was employees at the department of health who are role-players in EPI programmes across the NC districts (Noy, 2008). Selection criteria was based on participants professional role in the EPI programme and their availability to participate in the study amidst COVID-19 demands on their workload. The professional health services team and senior members of health care who play a vital role in the NC's EPI programmes were invited to participate in the study. These included representatives of provincial and district pharmaceutical services; child health care services management in the NC; professional nurses who administers the vaccinations via mobile clinic service delivery and members of district health care services involved in decision-making.

## 3.4 Sampling strategy

Snowball sampling was applied to access study participants who may not be otherwise easily accessible (Ghaljaie et al., 2017). The researcher engaged with a key informant who identified important contributors in decision-making and service delivery in EPI, which further led to identifying other suitable contributors to be recruited for an interview (Welman et al., 2005). The key informant is a registered pharmacist who occupies the position of deputy manager of provincial pharmaceutical services whose role is to oversee the coordination and logistics of vaccination for successful EPI implementation. This is an influential role in sourcing funding and resources for the delivery of EPI vaccines via mobile clinics. Pharmaceutical services manage EPI logistics which entails vaccine supply and cold chain management from the pharmaceutical depot to the point of administration. The key informant was therefore in a pivotal position to provide the names and contact numbers of potential participants for the study.

The researcher contacted study participants telephonically to verify their electronic mail addresses, inform them briefly about the study, and subsequently forwarded the study

information sheet (refer to appendix 4), and informed consent form was obtained (refer to appendix 5). After permission was obtained, an appointment date and time for the virtual interview was noted. Thereafter a link to the zoom application was emailed inviting them to join a virtual interview which was expected to take approximately 1 hour at the pre-arranged time.

### 3.5 Data collection

#### 3.5.1 Semi-structure interview

Semi-structured interviews are an optimal tool in health service research into explore the experiences and perspectives of individuals (DeJonckheere & Vaughn, 2019). The advantages of semi-structured interviews are that predetermined open-ended questions would allow for extended probing (Newcomer et al., 2015; DeJonckheere & Vaughn, 2019). The individuals could elaborate on significant issues that were highlighted during the interviews, allow for flexibility in comparison to standardised questionnaires such as surveys that are limited in providing data without open-ended questions and further probing to address emerging themes (Newcomer et al., 2015; DeJonckheere & Vaughn, 2019). In addition, semi-structured interviews allow interviewees to be more forthcoming with information about the topic especially when they are conducted individually. Comparatively, focus group participants are less likely to be candid, which limits data collection regarding unexplored issues (Newcomer et al., 2015).

An information sheet outlined the study's purpose, objective, significance benefits and risks of participating and was emailed to each participant in July/August 2020 prior to the interview (Appendix 1). The interview questions were compiled from the review of literature and those published by renowned South African researchers who synthesised findings from EPI programme managers' views on barriers to EPI in South Africa, and from reliable systematic reviews (Wysonge et al., 2012). In addition, the Vaccinator's manual (2015) provided insight into policy guidelines, standards on immunisation practice and details on monitoring of immunisation coverage at the clinic level (The National Department of Health, 2015). The researcher's experience (2015) and insight as a registered health care practitioner in a NC department of health provincial pharmaceutical distribution centre, contributed to finalising questions. The research supervisor further checked the questions before the question guide was used during the interviews. Prior to the interviews only the researcher had access to the question guide and not the participants.

The semi-structured guide consisted of predetermined topics namely; roles and responsibilities, EPI mobile services, schedule of mobile clinic visits, EPI tracing of dropouts and funding. The questions on roles and responsibilities were designed to assist the researcher in understanding the participants function in EPI delivery via mobile clinics. All the participants were asked the same questions as noted in Appendix 3. To ease the flow of the interview the sequence of the pre-determined questions was posed relative to the response of the participant and additional probing was done where necessary to obtain in-depth insight. The semi-structured interviews were conducted virtually via the zoom video communications application due to COVID-19 risks associated with face-to-face interviews.

The researcher was not able to pilot the semi-structured guide during COVID-19 restrictions because it was not possible to recruit 1 or 2 staff members from the EPI programme due to their extensive workload (2020). The total number of participants recruited for the study was crucial to ensure that a full spectrum of views and perceptions were captured authentically based on their lived experiences. Familiar terminology that is aligned with EPI programme objectives, implementation and outcomes were used during the online semi-structure interviews. The semi-structured guide was printed in English, which is the official communication language among management and staff working in EPI in the NC.

### 3.6 Data analysis

The audio interviews were recorded, transcribed and coded manually according to emerging themes and sub-theme (Braun & Clarke, 2006). Each transcription was repeatedly read, and information was segregated through abstraction of interview transcripts per theme and sub-theme using deductive content analysis (Braun & Clarke, 2006). Participant quotes were manually colour coded in accordance with a colour that was assigned to each interviewee code. The researcher verified the themes, subthemes and codes with the research supervisor. Thematic analysis was used to systematically identify iterating themes and relationship between themes which appeared in coded data (Castleberry & Nolen, 2018). The frequency of words or phrases that resonated with a particular theme or sub-theme among the transcripts added to the verification process. Direct quotes were extracted to show transparency and dependability of data (Castleberry & Nolen, 2018). The analytic transparency demonstrated how the researcher interpreted the data (Morvacsik, 2020). A wide spectrum of interviewees which included participants at management level provided reliable and consistent research findings. Credibility of data was determined from the responses obtained from the participants who occupied varied roles in the EPI operations. The researcher identified emergent themes to probe subsequent participants based on their experiences and insight to ascertain whether

their responses were similar, consistent or common, thereby adding credibility to converging themes.

### 3.7 Ethical consideration

Confidentiality of all interviewees was maintained throughout the study. Participants were not identifiable by name, responses were not associated to an individual, rather responses were coded per professional category. Written informed consent was obtained from each participant (Appendix 5) before the interviews commenced. Participants were at liberty to withdraw from the study at any time, if they no longer wanted to participate, without the risk of exposure. Interviews were conducted independently from each other, where possible to protect participant identity. Responses from the interviewees were transcribed verbatim and the transcriptions were filed in a password protected computer; the password is only known to the researcher. Approval of the study was obtained by the University of the Western Cape Humanities and Social Sciences Research Ethics Committee (2020) reference HS20/3/9 and the Northern Cape Department of Health Research Ethics Committee (2020) reference NC\_RP01\_06. A summary report will be submitted to the study participants after the study is completed.

### 3.8 Conclusion

This chapter provided a description of the study population, research design, sampling strategy, key concepts of the semi-structured interview guide, data collection and analysis process, and the ethical consideration required for this study. The study received ethical clearance from the University of the Western Cape Humanities and Social Sciences Research Ethics and Northern Cape Department of Health Research Ethics Committee. Participation in the study was completely voluntary and informed consent was obtained by all participants prior to conducting the semi-structured interviews, virtually via the zoom application.

## CHAPTER 4

### Results

#### 4.1 Introduction

This chapter presents a description of results from the semi-structured interviews conducted with 8 role players of EPI service delivery. The themes and subthemes identified from the participant interview transcripts relating to their perceptions and experiences of EPI delivery via mobile clinics are described. Similar subthemes were categorised under one major theme and supported by quotes from the study participants.

#### 4.2 Results

The profile of the eight study participants is outlined in table 2.

Table 2: Profile of study participants

Professional category (code)	Gender	Location	Qualification	Years of service in department of health	Role and responsibility in EPI
Assistant Pharmaceutical District Manager (APDM)	Male	ZF Mgcawu District Sub-district: Dawid Kruiper: Upington	Bachelor of Pharmacy Degree	16 years	Ensures that various service delivery platforms across the district provides vaccines at patient level
Deputy Manager: Provincial Pharmaceutical Services (PPS2)	Female	Frances Baard: Kimberly	Master's in Philosophy (HIV/AIDS) Bachelor of Pharmacy degree	29 years	Oversight role of pharmaceutical provision of vaccines. Provides guidance and support for successful coordination of EPI provision. Monitoring, informing, and advising EPI programme managers in the NC on vaccines and pharmacy related issues.
Head of Provincial Pharmaceutical Services (PPS1)	Male		MBA Government Finance Diploma	13 years	Oversight role of pharmaceutical provision of vaccines across all districts in the NC. Financial decision maker regarding allocated vaccine and pharmaceutical resource budget.
Deputy Director: Child Health Services (CHS)	Female		Honours Social Sciences (population studies) Degree in Nursing Science, diploma in primary health care and paediatric nursing	18 years	Assists with the coordination and implementation of the EPI services at a provincial level. Ensures that the implementation of EPI is in accordance to the EPI vaccine guidelines and adherence is maintained. Provides guidance and technical support to all districts in the NC.
Chief Professional Nurse, mobile clinic professional nurse Professional Nurse 1 (PN1)	Female	Frances Baard District: Phokwane	Diploma in Nursing, post-basic Diploma in Pharmacy and Primary Health care	19 years	Consults patients and administers EPI vaccines. Provides comprehensive health care services via mobile clinic ie screenings, deworming
Operational Nursing manager Mobile clinic	Female		Diploma in Nursing Midwifery	23 years	Consults patients and administers EPI vaccines. Provides comprehensive health care



professional nurse Professional Nurse 2 (PN2)			and Primary Health care		services via mobile clinic ie screenings, deworming
Acting District Health Director (ADHD)	Male	Pixley ka Seme District: De Aar	Doctor of Philosophy, Medicinal and Pharmaceutical Chemistry Bachelor of Pharmacy Degree	5 years	Oversight role of district health. Monitors of EPI target performance. Motivates for resources and funding.
Deputy Manager Nursing: Child Health Professional Nurse 3 (PN3)	Female		Diploma in Nursing midwifery and Primary Health care and Advanced Diploma in Child Health Services (UFS)	18 years	Monitors and coordinates EPI services. Offers mentoring and training of EPI vaccine guidelines. Serves as paediatric nurse on district clinical specialist team. Coordinates Integrated School Health Programme. Member of the Ministerial Committee on the Morbidity and Mortality in Children under 5.

The 8 themes and 10 sub-themes that were identified from the analysis of the study participants' transcripts are summarised in Table 3. In addition, the frequency of responses relating to aspects of the themes that were collated from the interview transcripts, are noted in Table 4.

Table 3: Themes and subthemes identified from interview transcripts of the study participants relating to in EPI delivery via mobile clinics.

Themes	Sub-themes
Mobile clinic vehicle	Suitability of mobile clinic vehicle
	Mobile clinic vehicle maintenance
Availability of vaccines	Stock management of vaccines
	Cold chain maintenance of vaccines
Staff resources	Expected duties of nursing staff
	Staff shortages
Funding	EPI funding
	Mobile clinic vehicle budget allocation
Pre-determined use of donated and government sponsored mobile clinic vehicles	
Communication	Community expectations from primary care services
	Lack of community dialogue
	Decision-making in the department of health
Coordination of mobile clinic visits with the community	
Monitoring of the immunisation system	

Table 4: Frequency of participant responses relating to key aspects of the identified themes.

	PPS1	PPS2	APDM	CHS	PN1 & PN2	ADHD & PN 3
Suitability of mobile clinic vehicle: appropriate, type of vehicle, off-road vehicle <b>(n=28)</b>	0	3	18	0	3	4
Vehicle maintenance: repair, fixed, maintenance, breakdown <b>(n=26)</b>	5	8	4	4	2	3
Travel landscape: rural, roads, remote, vast <b>(n=30)</b>	2	11	8	4	2	3
Staff resources: nurse, staff, sister <b>(n=148)</b>	40	30	35	36	5	2
Driver availability <b>(n=24)</b>	4	4	8	4	0	4
Driver's licence <b>(n=12)</b>	1	2	5	0	1	3
Cold chain management: cooler box, fridge <b>(n=41)</b>	10	3	5	7	5	11
Funding: budget, money <b>(n=113)</b>	29	23	26	14	6	15
Monitoring of immunization <b>(n=35)</b>	7	0	14	10	1	3
Co-ordination: services, visit <b>(n=37)</b>	8	1	20	3	0	5
Patient confidentiality <b>(n=9)</b>	1	0	8	0	0	0

### Mobile clinic vehicle

The suitability of the mobile clinic vehicle and its maintenance is fundamental in achieving sustainability of the EPI services to rural communities.

#### Suitability of the mobile clinic vehicle

The study participants had different opinions relating to the suitability of vehicles in the provision of mobile clinic services. PN 1 and PN 2 expressed that their mobile clinic vehicles were suitable as they were able travel on the routes chosen by the sub-district's mobile clinic nurse, team of health care workers, health area managers and district managers. Participants APDM, PPS1 and ADHD stated that the available vehicles should have off-road capability for use in some remote areas located in districts such as Namakwa and John Taolo Gaetsewe (JTG). Some of the more recently acquired vehicles have built-in fridges however, because of the absence of an electrical power



source, cooler boxes are used instead to maintain cold chain during transportation of vaccines. Three participants (APDM, PN1 and PN2) added that since there were no suitable back-up vehicles available at times, inappropriate vehicles such as bakkies or cars were substituted, which lack a private patient consultation area.

*“I mean, to get to a place like for example, Van Wyk’s Vlei in the Northern Cape, you’re going to need some serious off-road capability. So, it really has to be tailor made according to geographical location. And again, remember, we’re dealing with desert weather here.” ADHD*

*“Area like John Taolo Gaetsewe where for it is just rocks and stones and you can’t drive with a mobile clinic there and you need to have one of these fancy trucks “ “If there’s one person that falls ill, in an area, which is a thousand kilometres away from the nearest clinic and there’s a call that’s coming through, then an ambulance must go there.” PPS1*

*“So, mostly in our district, we make use of the available fleet vehicles, which is of course are not ideal. Some are bakkies some are cars we now have a truck on board. So, the suitability of the other mobile vehicles is one that we’ve been struggling with. Patient confidentiality, you know, being one of the major ones, because these did not allow for services to be rendered in a in a closed and confidential environment and doesn’t allow for your patient waiting, areas and the rest.” APDM*

#### Mobile clinic vehicle maintenance

The NC’s remote rural terrain imposes extensive wear and tear on mobile clinic vehicles. All the participants attested that maintenance of the mobile vehicle is a concern across the districts. Study participants APDM, PPS1, ADHD, PN1, PN2 expressed that in the event of an imminent mobile vehicle breakdown, the prolonged time to repair would halt the mobile clinic services and, in many cases, the service may not return to the designated area. The same participants expressed that inefficient vehicle maintenance was a challenge, while the cause of the inefficiency was unclear, as it seemed to stem from administrative issues and funding constraints. In the Frances Baard district the two professional nurses, claimed that they ensure that their mobile clinic vehicles are optimally cared for, with the concern that if a vehicle breaks down, the vehicle may not be returned to the clinic, and the service would be subsequently terminated.

*“In fact, there’s been decommissioning of mobile vehicles more than there has been any addition to the, fleet of mobile vehicles. And that is exactly why we transgressed into you*

*know, in a status of using inappropriate fleet vehicles for the purpose of rendering mobile services.” APDM*

*“So, that’s why we are so eager to keep our on the road and to look after it, in other places when something happens to the vehicle it sometimes for years just doesn’t get fixed or then the services is just discontinued.” PN1*

## Availability of vaccines

Access to vaccines for mobile clinic services depends on stock availability and cold chain management systems.

## Stock management of vaccines

Since the mobile clinics are linked either to fixed or satellite clinics, they are therefore not treated as an independent entity within the district health services. As a result, the vaccine orders that are placed for the fixed and satellite clinics also include the stock orders that are required for the mobile clinic. The professional nurses indicated that they provide stock monitoring information, which is relayed to the stock visibility system, a transparent stock level system that is accessible to the national department of health. The professional nurses PN1 and PN2 indicated that vaccines and the EPI services are a priority to them, therefore they ensure that enough stock is ordered and supplied for continuity of the services. In contrast, CHS expounded that some districts experience stock shortage because professional nurses tend to monitor stock levels poorly. To mitigate vaccine stock outs due to supplier constraints PPS1 stated that the provincial and national pharmaceutical services would endeavour to implement a contingency plan such as sourcing vaccines from alternative suppliers. All the participants concurred that if stock is available at another facility or district, stock would be mobilized to assist those facilities in need, but within reason.

*“Okay, so, formally when each satellite clinic was still responsible for a particular route and their medicine order would have included the consumption of the mobile route.” “The information is fed into the system by the professional nurse or the person responsible for managing the stock in a clinic.” “They might struggle with some other items, but they will make sure that they have sufficient vaccines in stock.” APDM*

*“If we are having vaccines available sometimes, our monitoring of stock, when they are supposed to go now and take the services, the sister did not order the vaccine. So, it is not stock out it is because, of bad monitoring to ensure that each and every facility is*

*having vaccines, so that when she's having plans to go and take the services, she's giving available stock.” CHS*

### Cold chain maintenance of vaccines

Given the thermolabile nature of vaccines, and the NC's extreme fluctuating temperatures during seasonal changes, all study participants expressed the challenges they experience with mobile clinics. The professional nurses concurred to using a cooler box with ice packs and thermometers to maintain vaccine integrity during transportation but added that some vehicles have air-conditioners while others do not. While PN1 stated that even though her mobile clinic vehicle is installed with an air conditioner she occasionally had to discard vaccines due to heat exposure. PN1 stated that even though some mobile clinic vehicles are fitted with a built-in fridge, they are unable to make use of it, because it requires electricity which is unavailable. APDM discussed solar power as an option, but given the poor vehicle maintenance and repair services, the continuation of EPI service delivery is primarily dependent on access to funding.

*“We have cooler boxes and I don't know about you, but it's a very, very hot here in the Northern Cape. I've had to discard immunizations on the mobile, because of heat exposure and stuff like that.” PN1*

*“Reliable electricity supply to be able to store EPI vaccines on site. And looking at just solar solutions to be able to as a means of backup supply for your fridges” APDM*

### Staff resources

Vaccine delivery and administration is solely dependent on the availability of the professional nurses who are willing to endure unconventional working environments to serve rural communities via mobile clinics.

### Expected duties of nursing staff

Three participants (PPS1, CHS and ADHD) concurred that in districts where the mobile clinics are operational, it would be at the behest of professional nurses who are linked either to fixed or satellite clinics. In this regard, they would be expected to close their clinics when operating the mobile clinic, as only one nurse is deployed to offer either service. Further, nursing staff are required to singlehandedly pack the mobile clinic with equipment and stock, drive to remote rural locations, provide health care services, unpack, and clean the vehicle. Some of the remote rural areas require many hours of travel on deserted gravel roads which demands driver concentration, and for the majority

who are female professional nurses, undertaking this duty single-handedly is deemed to be very daunting and unsafe.

*“Providing the mobile services to the villages, it's a one man show facilities, where we will be having one professional nurse who is having a fixed clinic and also is expected to provide the services to the areas where we don't have facilities.”* **CHS**

*“In terms of traveling now because it's not safe probably to travel alone in a mobile as a female, with all the things that are happening in the country as well in terms of gender and in terms of that are threatening in terms of endangered lives and being on the road is at risk as well.”* *“The connectivity issues which you can drive between towns in the Northern Cape and have no connectivity because yes there is just no network and if your vehicle get stuck there as well, then you have to hope that nothing bad happens also.”*

## **PPS2**

### **Staff shortage**

The NC is faced with a shortage of human resources in the health sector. According to ADHD, one of the contributing factors is the inability to attract and retain staff, therefore staff turnover is frequent and expected. ADHD added that many health care professionals who hail from various provinces seem to disfavour the rural living and working conditions. Further, it seemed evident that the districts do not have allocated drivers to render the mobile clinic service. Many of the nurses who coordinate and operate the mobile clinics possess a code 10 driver's licence and often they are expected to drive the vehicles unaccompanied to remote areas. Since only a few nurses have code 10 drivers' licences and given the absence of replacement nurses, this poses a further challenge to support continuation of mobile clinics services. Nursing staff face many challenges about stock management. PPS1 expressed that due to the high workload placed on the mobile clinic nursing staff, strict adherence to “first in first out” stock management principle, (where the first to expire stock is used first) is not perceived to be their priority. PPS1 suggested that by deploying pharmacist assistants they could offer support to professional nurses working in understaffed clinics to improve stock management.

*“Yeah, your turnaround staff, because if you're getting dedicated staff for that particular facility, especially in this area, if you're not really from the Northern Cape or from De Aar you know, we get a lot of, professionals coming from other provinces and the turnaround is quite quick.”* **ADHD**

*“I would say it's more of the challenge might be infrequent visits of mobile visits to rural communities in the outline areas and sometimes get shifted on a very short notice, when nurse is in training or has a meeting which needs to be attended, then unfortunately that route is just not covered.” APDM*

*“Well obviously the first resource, we need to have obviously conditions, sufficient staff to actually do it, that is our biggest challenge at the moment, that we do not have enough staff and if I am talking staff I am talking nursing staff, I'm talking pharmacy staff out there, because that's the scarcity. We were able now to actually appointment 100 basic learners throughout the province to maybe obviously start as basic and hopefully after two years, you hope to have these people to become post-basic and then it will improve our situation.” PPS1*

## Funding

Access to funding to meet the operational costs for mobile clinic service delivery is paramount to ensuring its sustainability. Funds required for the supply of vaccines and vehicle maintenance underpin efficient EPI service delivery via mobile clinics to rural communities.

### EPI funding

Even though funding is crucial in sustaining the supply of essential medicine such as the vaccines, PPS1 stated that there were challenges to secure medicine access because of an inadequate budget. PPS2 elaborated that the availability and affordability of vaccines is discussed with provincial pharmaceutical services especially when forecasting the medicine budget, as vaccines are rated as one of the most expensive pharmacological categories listed on the analysis of medicine expenditure report. PPS1 and PPS2 agreed that vaccines do not have a ring-fenced budget and added that the budget for vaccines should specifically reflect EPI requirements to avoid out of stock situations that may arise due to funding constraints. PPS1 elucidated that predictions on population growth can aid projections made at national level to assist with a more accurate forecasting, however, this is hampered by lack of access to comprehensive, reliable data to make evidence-based decisions. In addition, pharmaceutical companies tend to suspend supply of vaccines until outstanding payments are first settled, and stock outs that tend to occur would result in an increase of catch-up vaccination and tracing requirements.

*“It is always advocated to say that for EPI they don't want to hear about there isn't money for EPI or for vaccines, they've always said, that but it still happens that it is a challenge.”*

**PPS2**

*“If we do have sufficient EPI vaccines and the reason why I'm saying, because sometimes it does happen that you know because of non-payment of accounts.”* **PPS1**

### Mobile clinic vehicle budget allocation

All the participants concurred that throughout the province, the number of vehicles which currently provide mobile clinic services are not sufficient to meet the health care needs of the rural and remote populations. One of the key concerns was that the mobile clinic operational and maintenance costs are allocated to two independent budget frameworks. The operational costs of mobile clinics are funded from the budget allocated either to the fixed or satellite facilities to which mobile clinics are attached. Participants concurred that those unforeseen costs such as vehicle maintenance, which is paid from the transportation budget had resulted in decommissioning of vehicles, and the discontinuation of mobile clinic services. They added that since back-up vehicles are not available to continue the EPI service, nursing staff have opted to use vehicles which are not ideal thereby compromising the quality of the service that is delivered to the communities.

*“There is a great need all over we need mobile clinics, because you see there is no way with the limited funding the government has there is no way that they will be able to put a clinic in the rural areas.” “We do not have sufficient information to really make informed decisions to actually cover those type of areas, where we say that we need mobile vehicles.”* **PPS1**

*“So, there is no separate money that is set aside for operating clinic vehicles except for the lease payments of the vehicles that are leased from government garage and that is also serviced in the same way and that is paid from the transport budget. But no there is no separate money that is available for the mobile service and again that just indicates the, you know the lack of funding that is available for rendering mobile services.”* **APDM**

### Pre-determined use of donated and government sponsored mobile clinic vehicles

Study participants referred to the pre-determined use of donated and government sponsored mobile clinic vehicles. One participant referred to mobile clinic vehicles that



were received as donations to augment the EPI mobile services to rural communities. APDM mentioned that in the JTG and Zwelentlanga Fatman Mgcawu (ZFM) districts mining companies had donated many mobile clinic vehicles to fulfil their social responsibility mandate towards those communities where their mines are located. In addition, the North West University in Potchefstroom donated a vehicle to Frances Baard district, for the purposes of implementing mobile clinic services to the sub-district of Phokwane. PN3 attested that government-sponsored vehicles, is primarily reserved to offer specified services such as school health services. The Pixley district, which is an NHI pilot site, received vehicles solely for the purpose of NHI school health initiatives and outreach programmes. Due to COVID-19 the NC department of health with the aid of the government's Solidarity fund had availed additional mobile clinic vehicles for COVID-19 testing and related health service needs.

*“This is now Kumba mines specifically, they've purchased two mobile vehicles converted these suitably and then they have donated these to the department.” APDM*

## Communication

Routine visits of mobile clinics to a remote rural area that have poor connectivity requires effective communication methods. Compliance to EPI schedules requires the commitment and trust of the community members to ensure its successful sustainability.

## Community expectations from primary care services

PN1, PN2 and PN3 who render services from fixed and mobile clinics, expressed that in rural areas the community would prefer access to a mobile clinic rather than travel for many hours to access either a satellite or fixed clinic. APDM articulated that the community sometimes have unrealistic expectations namely, for the mobile clinic to arrive every second day to the area. Following the use of inappropriate vehicles to support continuation of clinic services, PPS2 and APDM stated that they were aware of the patients' grievances relating to the lack of confidentiality.

## Lack of community dialogue

In some districts mobile clinic services were discontinued as the department of health had introduced new policies. Such unilateral decision-making on policy implementation excluded engagement with the community, as their community representatives were not consulted. PPS1, PN3 and ADHD explained that the department of health's terminated

services either by decommissioning mobile clinic vehicles or making insufficient resources and funds available. Patients were expected to adapt to the absence of services, without providing an alternative to access EPI and other health care services that were previously offered. Of concern, was the lack of community dialogue that was highlighted as one of the main reasons for the department of health not being held accountable for their withholding of primary care services to rural areas.

*“Whereas opposed to if a clinic is closed, it will be a big hoo-ha where communities will want to toitoi, because why is the clinic closed, but I never heard of people toitoi for example that the mobile clinic didn't come around.” PPS1*

*“So negative would be probably inadequate resources so if there's not enough money to run the mobile the mobile could just stop and they will just it'll probably be a decision made at a higher level to say no sister we need you to work at the fix clinic the volume is more here so those patients must just come whether they have money to get there or if there is transport to get to the clinic.” PPS1*

*“Because we see that should we do outreach communities will much rather or much easier access the mobile facility then going to fixed facilities.” “We have never explored that option because, remember the only way that health can communicate with communities is through community dialogue, and community dialogue is not very successful except for complaining about the quality of service.” PN3*

### Decision-making in the department of health

The department of health is expected to set targets for the provision of EPI services, and often the professional nurses work arduously to meet such pre-determined targets, at times under conditions where the service quality is questionable. Further, the department's delay in securing appropriate vehicles could lead to discontinuation of EPI services. Five participants (PPS2, PPS1, ADHD, PN3 and APDM) concurred that the department of health stakeholders perceive the mobile clinic to be less important than mainstream service delivery that is offered from fixed and satellite clinics yet, the much-needed mobile services are beneficial because it is easily accessible to the rural community.

In some districts, mobile clinic services were effortlessly discontinued without any regard for those patients who were dependent on health care and EPI services. PPS1 indicated that when a mobile clinic vehicle is decommissioned following the treacherous road conditions it had travelled to reach remote rural areas, motivating for a replacement



mobile clinic vehicle would become difficult, as health performance indicators are a key deciding factor. Against the backdrop of the community's resource constraints and with lack of access to public transport, sourcing reliable transport becomes a challenge. As a result, depending on their work schedule, farmers would offer to transport patients to the nearest clinic. Participants PPS1 and APDM indicated that the funding for mobile clinic services is not considered a priority, even though patients lack access to public transport and are required to travel long distances to reach the nearest clinic.

*"I am talking about government officials look at this, they treat the mobile service as a so by the way for example if the mobile clinic is not going go out, there is not many people that is going to make a fuse about it." PPS1*

*"So, I think it's a misconception that any vehicle can be utilized as a, vehicle suitable for rendering mobile services." "And in my opinion, there's an underestimation as to the realities that are faced not only professionals by professionals but also by communities in terms of, rendering mobile services." APDM*

## Coordination of mobile clinic visits with the community

The professional nurses PN1 and PN2 indicated that the mobile clinic visits to a particular area is scheduled every four weeks. Based on seasonal changes, the farm workers often relocate to different districts or provinces to secure job opportunities. As a result, PN1 and PN2 stated that coordinating the number of patients expected to be immunised may vary and tracking relocated patients becomes seemingly impossible. The road to health booklet is especially important for vaccination catch-up of babies especially among relocated farm workers. They added that communication of scheduled visits is well coordinated in some of the districts, where a roster is provided at the beginning of the year via pamphlets and posters. PN1 and PN2 explained any deviation from the scheduled visits would be communicated to the farmer's wife and community health care workers who would subsequently inform the community. In contrast, APDM alluded to instances where patients would have walked long distances with their babies only to find that the mobile clinic did not arrive.

*"It's opportunity for catch up, because in areas there is a lot of seasonal workers, very often there comes mothers with babies that been you know, only be here for six months or so." PN1*

*"I think it does more harm for a mother that has to maybe walk an extra kilometre or two to get a child to the mobile servicing point and then having to come to a closed or not*

*even a closed door, but the sister not having pitched or the sister not being there. I think that is something that we will seriously have to reconsider and plan more carefully to avoid, you know, the issue of trust in the in the service that we render.” APDM*

## Monitoring of the immunisation system

The stock visibility system allows the district pharmacists to monitor the stock levels of vaccines at the facilities. The professional nurses render the immunisation service, and documents the patients' vaccination schedule, in the road to health booklet. To review the patient history and capture patient information during mobile clinic visits, the professional nurses first collect the patient folders which are filed away either at the fixed or satellite clinics for those patients whom they would expect to consult at the mobile clinic visit. According to participants CHS, PN2, and PN1 if patients had missed a vaccination, the nurse would rely either on homebased carers or community health care workers and at times dieticians, to locate such patients and advise them to attend the next mobile clinic visit. PN1, PN2 and PPS2 referred to the movement of seasonal workers, to be a challenge as such patients could often not be traced after relocation, as there was no means to contact them. PN1 and PN2 explained that it was their hope that when relocated patients visit a health care facility located either in the district or at provincial level, they would present their road to health booklet. In that way the infant would be able to receive a catch-up dose of their missed vaccine schedule. The professional nurses had also indicated that in operating the mobile clinic, they have targets which are monitored monthly, the stats are discussed at quarterly meetings and compared to the previous quarter. Such meetings assist the district's health department in identifying programmatic or systemic issues relating to service delivery challenges that professional nurses would have encountered.

*“The problem is we can't make a copy of the card and it is too much to write down when the baby is due and by that time they are working on another farm. So, the thing is really you do every baby that comes that day and you don't send them away and give another date.” PN1*

*“The problem is that we have seasonal workers, so many of them don't, but some of them live in the area, a lot of them still doesn't live in the area, so we only see them once in our lives.” PN2*

### 4.3 Summary

This chapter unpacked the study participants experiences and perceptions in the EPI operational process within the NC's districts and sub-districts. The themes and subthemes that have emerged have assisted in identifying several systemic, organisational and community level factors that influence the sustainability of EPI mobile clinic service delivery to the rural areas of the NC.

The poor road infrastructure, absence of cell phone connectivity, lack of direct funding to maintain vehicles and inadequate staff resources hampers sustainability of the EPI mobile services to remote rural areas. The sub-optimal cold chain maintenance of vaccines incurs wasteful expenditure, while the use of inappropriate vehicles impedes patient privacy during consultation. The link to a fixed or satellite clinic and indirect access to two independent budget streams that is required to accommodate the operational and maintenance costs of the EPI delivery mobile clinic service, overshadows its priority status within the health department, thereby weakening its long-term sustainability.

Relocation among seasonal workers delays vaccine tracing of drop-out patients thereby inhibiting adherence to EPI schedules. Nursing staff who single-handedly offer the dual clinic (fixed or satellite) and mobile services claim to undertake an excessive workload. The continuity of EPI mobile clinic service delivery is under-resourced with professional nurses, drivers and vehicles. The lack of dialogue between the health department's management and the community especially when mobile EPI services are discontinued to the area denotes poor accountability and denial of their right to basic health services.

## CHAPTER 5

### Discussion and Conclusion

The aim of this study is to identify the inhibitory factors that influence the sustainability of EPI mobile clinic service delivery to the rural areas of the NC. Given the province's low population density and difficult terrain, access to mobile clinic services for marginalised communities is a challenge. The discussion focuses on the barriers associated with the suitability and maintenance of mobile clinic vehicles, EPI vaccine supply, funding, staff resources. The need for improved decision-making among stakeholders in the department of health and more effective communication with the community, the demanding role of frontline nurse practitioners and the difficulties experienced with coordinating visits and monitoring of EPI immunisation schedule are also highlighted in this chapter.

#### 5.1 Interpretation of the results

Based on themes identified several direct and indirect themes were identified amongst role players regarding sustainability of EPI

Table 5: Direct and indirect factors affecting sustainability of EPI services via mobile clinics

<b>Factors directly affecting the sustainability of EPI services via mobile clinics</b>	<b>Factors indirectly affecting the sustainability of EPI services via mobile clinics</b>
<b>Suitability and maintenance of mobile clinic vehicle</b>	
Lack of timeous vehicle maintenance	Sub-optimal vehicle specifications
<b>The availability of vaccines: EPI and COVID-19 vaccine supply</b>	
Poor adherence to stock management principles for vaccines	Hot weather conditions affect adherence to cold chain maintenance which results in loss of vaccine integrity
Inadequate cold chain maintenance of vaccines by mobile clinic nurses on mobile clinic vehicles	
<b>Staff resources and expectations of nursing in the demanding role of frontline nurse practitioners</b>	
EPI mobile services cannot be rendered due to limited resources which are shared with fixed and satellite clinics	Professional nurses are required to have a Code 10 licence to drive a mobile clinic vehicle
<b>Funding</b>	
Lack of funding for mobile clinic vehicles	Mobile clinic services are an extension of the fixed and satellite clinics, its operation is thus

	dependant on the resources available at fixed and satellite clinic
<b>Communication with the community</b>	
The lack of engagement with rural communities evades accountability and masks efforts to address the social determinants of health	Lack of communication network signal in remote areas
<b>Decision-making in the department of health</b>	
Misconceptions among decision makers in the department of health regarding the importance of mobile clinic EPI delivery to remote rural areas	Poor data collection and inaccurate reporting from department of health is used as a basis for forecasting the budget allocation
<b>Remote rural terrain</b>	
Geographical inaccessibility due to harsh terrain of remote rural areas affects vehicle lifespan	Infrastructure: Underdeveloped roads
<b>Coordination of visits and monitoring of EPI immunisation schedule</b>	
Suboptimal coordination of mobile clinic visits due poor communication networks	Relocation of farm workers associated with short-term employment due to seasonal changes, prevents children attaining the EPI schedules

### *Suitability and maintenance of mobile clinic vehicle*

Mobile clinic vehicles would need to be customised to endure the harsh geographical landscape, requiring off-road capability in many areas of NC (Bosman et al., 2013). Due to the unfavourable road conditions that the mobile clinic vehicle must travel to reach remote areas, sensitive weighing equipment often cannot be used because it requires constant recalibration. Many of the vehicles would reach their life span within an unexpectedly short period, and a replacement vehicle would not be provided as funding is perceived to be unsustainable and financially unlucrative (Stephanie et al., 2017). All participants expressed their concern that the lack of timeous vehicle maintenance would either result in discontinuation or prolonged absence of EPI services. Furthermore, there are misconceptions among health care professionals and management within the NC department of health that any vehicle can be used to deliver mobile clinic services. In times of emergency, the back-up vehicles that are made available are not acceptable because of the lack of patient privacy. It could be surmised that EPI service provision is rather aimed at meeting the target indicator, highlighting a trade-off of efficiency for equity, which contrasts with patient consultations offered at fixed and satellite clinics (Gaede & Versteeg, 2011). Due to the sub-optimal vehicle specifications of mobile clinic and back-up vehicles the absence of a consultation area and toilet facilities, do not provide adequate privacy required to conduct invasive tests such as breast exams, pap

smears and urine sample collection. If such services are not conducted due to privacy constraints, patients would have to wait another four weeks for the next mobile clinic visit. The mobile clinic vehicle is expected to meet the requirements stated in the Good Pharmacy Practice South African Pharmacy Council guidelines (2010) for the provision of pharmaceutical services (South African Pharmacy Council, 2010). Stemmet's study regarding the mobile clinic environment in the Western Cape (2016) described many cases where the dignity of patients was overlooked, such as using poor lighting to examine patients, or sending patients into the bushes to produce urine samples (Stemmet, 2016), consequently violating the patient's dignity and right to quality service provision (National Patients' Rights Charter, 1999).

### *EPI vaccine availability and supply*

The availability of EPI vaccines relies on the nursing and pharmacy personnel to efficiently manage stock levels. Fixed and satellite clinics could use all the stock before supplying the mobile clinic, if stock is not managed optimally. Limited human resources place strain on the stock management of vaccines, as nurses are required to adhere to "first in first out" and "first to expire first out" principles, to avoid vaccine wastage as a result of overordering and expiration. During the interview the deputy manager of provincial pharmaceutical services explained that vaccines are one of the most expensive medicines on the ABC analysis expenditure report. The ABC analysis considers the pharmaceutical management cycle and categorises medicines according to the percentage of the total medicine procurement budget allocated to that product (Sharma et al., 2020). EPI does not have a ring fenced budget and in the event of budgetary constraints, the department of health would ensure that vaccines are funded based on its priority status. A key concern is that the disruption in EPI funding and the delay of payments to vaccine suppliers results in a postponement in vaccine delivery, as suppliers would suspend vaccine supply until outstanding payments are made. As a result, stock outs of vaccines occur, interrupting the of continuity of EPI service provision.

### *The effect of COVID-19 on EPI services*

The COVID-19 pandemic has disrupted EPI services by placing strain on health care resources. Some districts in the NC have availed their mobile clinic vehicles to be used primarily for COVID-19 testing and health care services associated with COVID-19 complications. In addition individuals are unwilling to leave home in fear of contracting the COVID-19 virus, while lock down policies, restrictions limiting movement and interruptions of public transportation have inhibited patients in receiving their routine EPI vaccines (Hamid et al., 2020). A UNICEF report revealed that lockdown measures have delayed immunisation



services in low and middle income countries, and increased the risk of vaccine prevented diseases of approximately 80 million children below the age of 1 years old (Hamid et al., 2020). Community engagement is key in removing the barriers to accessibility so that preventative health seeking behaviour can be promoted (Fadda et al., 2020).

The COVID-19 vaccine rollout will require additional measures to ensure safe delivery of vaccines to all areas of South Africa. Mobile clinics would be utilised to expedite vaccine delivery with emphasis on the national regulation of vaccines and equitable distribution (Rodrigues & Plotkin, 2020). Cold chain management will be challenged by the storage requirements of the available COVID-19 vaccines especially, given the harsh weather conditions in the NC (Jamil et al., 1999).

### *Cold chain maintenance of vaccines*

The professional nurses in Frances Baard district stated that vaccines have been discarded due to heat exposure because of the NC's soaring summer temperatures. Such vaccine wastage underscores the lack of adequate refrigeration and that cooler boxes and cold chain boxes are an inadequate way to store vaccines on a mobile clinic vehicle. Vaccine wastage decreases the availability of vaccines and hampers the already limited essential medicines budget. To maintain vaccine integrity on mobile clinics, adherence to effective cold chain management guideline approaches and adequate cold chain infrastructure is critical (National Department of Health, 2015). In the Western Cape temperature, humidity and light exposure of medicines are constantly fluctuating, within mobile clinic vehicles decreasing the cold chain integrity (Stemmet, 2016). Similarly, in the NC mobile clinics that lack air conditioners, fridges and/ or power supply to operate fridges pose a challenge to maintain vaccine integrity (Bosman et al., 2013).

### *The demanding role of frontline EPI nurse practitioners*

In the NC professional nurses are expected to intervene in the absence of vehicle drivers. The professional nurse along with their clinical duties is required to pack the mobile vehicle with stock and equipment in preparation of mobile clinic visits, then unpack and clean the vehicle after returning to the clinic. Similarly, in Namibia the mobile clinic nurse undertakes many roles namely patient diagnosis, prescribing, and as a multipurpose driver (Aneni et al., 2013). A systematic review of the advances in childhood immunisation in South Africa stated that one of the key challenges to EPI is staff shortage and high staff turnover (Wiysonge et al., 2012). Many participants raised their concerns regarding the compromised quality of service when inappropriate vehicles have been used as a back-up vehicle, and the lack of contingency when

a nurse is absent from work. Service delivery via mobile clinics is restricted by the recruitment and retention of staff who are primarily willing to work selflessly and bear the risks associated with travelling to remote rural areas (Stephanie et al., 2017). Limited network coverage in rural areas imposes a communication challenge especially during vehicle breakdown, emergencies or injury on duty, which is a health and safety risk. The EPI mobile clinic service is completely dependent on the service of a professional nurse, and without their dedication and sacrifice the service can be easily halted. A study on the Tshwane district of Gauteng Province, revealed that vaccine stock outs are associated with the absence of a pharmacist or pharmacist assistant (Ngcobo & Kamupira, 2017). The general practice of allocating pharmacist assistant's tasks to nursing assistants has been identified as an EPI shortcoming; not only has it resulted in poor stock management, but also created job dissatisfaction (Bateman, 2016). Studies conducted on developing countries indicated that health care staff did not perceive immunisation as a priority within their scope of practice (Jacob et al., 2015). In rural areas like the NC where accessibility and utilisation of health services are low, every point of contact with a health facility provides an opportunity for vaccination (Jacob et al., 2015). Nursing staff therefore need support to ensure that opportunities for immunisation are not missed (Jacob et al., 2015).

### *Funding*

District health services fund the health care provision section of service delivery as an extension of the fixed or satellite clinic, to which the mobile clinic is linked. Without funding the mobile clinic services cannot operate. In some districts the government garage leases the vehicles to district health services and in other districts vehicles have been donated by universities and mining companies. More recently the government donated some mobile clinic vehicles as a COVID-19 relief initiative. The UNICEF South Africa health budget brief (2018) states that primary health care programme spending is dependent on the population size and density (UNICEF, 2018). While it may not be feasible to allocate a large proportion of the budget to service the health care for a few people in rural areas, it is still the constitutional right of all individuals to have access to primary health care (Visagie & Schneider, 2014).

The assistant pharmaceutical district manager explained that in the JTG district, containers were converted into consulting rooms which were transported between nearby towns using trucks, however depending on the routes covered, such initiatives which mining companies sponsor, are costly to sustain. Partnerships with mining companies and the district health service could be mutually beneficial, since mining companies are in a position to sponsor the mobile clinic vehicle, while the district health services provide the EPI operational framework.

Such a public private partnership operational framework could be closely monitored with decision-makers receiving real-time data to make informed decisions. An independent budget allocation is essential to determine forecasting for prioritisation of mobile clinic service delivery requirements, rather than operating on uncertainty based on funding from fixed and satellite clinics. In the USA underserved communities have access to mobile health clinics that are transitory due to shortage of funding, the inconsistent accessibility of mobile health clinic services has decreased the trust gained from the community (Stephanie et al., 2017).

### *Remote rural terrain*

In the NC it would take many hours of travel by mobile vehicles to reach urban areas. The roads leading to farming areas are underdeveloped making driving a challenge. Some areas are completely sand terrain like that observed in the Namaqualand district while others have rocks and stone roads such as JTG. The professional nurses who are dedicated in offering mobile clinic services expressed that they do not feel fearful when traveling alone, but only do so when driving in areas where the towns are a long distance away from each other. In the Western Cape, mobile clinics can use two-way radios to communicate which have the same frequency as the ambulances, however nurses still reported feeling anxious and abandoned given the current South African climate where gender based violence (Stemmet, 2016) is regarded as a 'pandemic'. In areas where there are no mobile clinics, farmers who offer seasonal farm workers transportation may either only co-ordinate their clinic visits with the collection of agricultural goods or would not be willing to transport the workers. Overall, decision-makers might overlook such factors when considering access to health care services. There is a decreased probability of health facility attendance when patients have no access to transport to receive basic health services such as immunisation, resulting in potential non-compliance to their EPI schedules (McLaren et al., 2013). Geographical disparities in incomplete childhood vaccination and the inequities in vaccination access, must be considered when planning and implementing interventions to improve vaccine coverage (Ndwandwe et al., 2020).

### *Coordination of visits and monitoring of EPI immunisation schedule*

In the Phokwane sub-district of Frances Baard, the professional nurses providing mobile clinic EPI services have a harmonious and trusted relationship with the community which emanated from their long-standing service. When professional nurses are either on sick leave or assigned to a training schedule, the absence of replacement staff to provide the mobile clinic services on the designated days, can demotivate parents to bring their children for their EPI vaccines, leading to a potential decrease in compliance to the vaccine schedule.

The re-engineering of primary health care strategy promotes community-based care which factors the social determinants of health in its approach (Ramukumba, 2020; Sepúlveda et al., 2006). Community health care workers are recognised as an extension of the primary health care nurses and monitor drop-out children who have not received routine vaccinations (Jinabhai et al., 2015). As frontline workers they serve as the eyes and ears of the nurses, providing an intervention or referring patients to primary health care clinics (Ramukumba, 2020). Nursing staff could be assisted by task shifting some of their responsibilities to community health care workers who could be skilled as vectors of EPI delivery. Community health care workers can become the bridge between the needs of the community and the nurses, thereby becoming an important health intervention for the rural population and EPI sustainability.

In the NC the seasonal workers, would relocate among several farms based on employment opportunities. Migration of farm workers inhibits the tracing of vaccine dropouts, as mobile clinic nurses rely on patients to present their road to health booklet at the health care facility in the relocated area. The road to health booklet is important to the vaccinator to determine which vaccines are outstanding for the child. Unfortunately, the professional nurses working in the mobile clinics are required to manually record patient information either in a register or patient folder. The road to health booklet cannot be photocopied as the mobile clinic vehicles do not have computers, scanners or copy machines due to lack of electrical power source and space constraints. The head of provincial pharmaceutical services mentioned that clinic data is at times unreliable or inadequate to make informed decisions. Solely tending to patients after a very long drive to reach rural areas can be demanding on a professional nurse who is expected to produce accurate patient records and registers. The South African Demographic and Health Survey (2016) reported that immunisation coverage under the age of 1 year for the NC was 64.9% whereas the DHIS presented 90.8% indicating that assessing an indicator that is based on the completion of a regime such as EPI is complex and requires sufficient allocation of technological resources to capture real-time patient data to achieve accurate reporting (Gray & Vawda, 2019). In addition a study regarding the impact of vaccine stock-outs on infant vaccination coverage suggested that if electronic data capturing systems were utilised it could assist in automatically flagging missed vaccinations to provide immunisation (Burnett et al, 2018).

### *Communication with the community*

Professional nurse 3 and the acting district health director stated that in areas such as Pixley which was one of the NHI pilot districts, mobile clinics are no longer operational, as vehicles donated to the province for the provision of school health are rarely utilized. Professional nurse 3 stated that policy makers removed the existing mobile clinic to replace it with fixed or satellite clinic within 5km radius of communities, however this was not implemented, and an impact assessment was not undertaken. Since the mobile clinic was not reintroduced, and in absence of public transport, community members were expected to rely on the farmers to shuttle them to the nearest health facility. One of the contributory factors was the lack of community dialogue, which contrasts with the government's strategic plan (2015-2020) that underscores accountability for quality health care services (Gray & Vawda, 2019). Community-clinic linkages promotes self-management of patient health resulting in cost-effective prevention and disease management approaches (Stephanie et al., 2017). NC farm dwellers have limited access to information, therefore they remain elusive to their health rights (South African Human Rights Commission, 2003). Contingencies for discontinuation of mobile clinics should be a priority with the understanding that mobile clinics in the NC may be costly to maintain but are still needed to meet the constitutional right of every individual's access to primary health care.

### *Decision-making in the department of health*

A study done in the Eastern Cape identified that immunisation is not always available to infants in rural areas despite impressive immunisation policies and strategies such as the "Re-engineering of Primary Health Care" which has been introduced (Le Roux et al., 2016). The same is experienced in the NC which places unnecessary burden on rural women and children and places the rural community at risk of a potential preventable disease outbreak (Le Roux et al., 2016). Currently the fragmented way in which EPI services are allocated is not sufficient to sustain herd immunity by only conducting outreach programmes every few months in a district. During the online interviews it became apparent that the communities in rural and remote areas would prefer access to a mobile clinic, rather than walk far distances, and stand for a long duration in a queue at the fixed and satellite clinics. The lack of reliable data to make informed decisions relating to the infant population on which vaccination coverage decisions need to be made (Bateman, 2016), and forecasting and strategic budget allocation cannot be achieved optimally.



## *Efficiency and effectiveness*

The fragmented operating framework of mobile clinics inhibits the effectiveness of the services that are rendered. Literature regarding ineffective programme management on the delivery of health infrastructure projects supports the study's finding as participants reiterated that, accountability in the management structure is vertical, with no visible cross-functional collaboration or reporting mechanisms (Mabona & Shakantu, 2016). Inefficiencies and lack of accountability of stakeholders at both provincial and district department of health remain poor, leaving communities in the periphery where they are assumed to understand the bureaucracy of the health care system and make peace with their circumstances (Gaede & Versteeg, 2011). Farmers who assist in bringing their employees to the nearest clinics, bear the costs by offering their own vehicle, fuel, time, and the labour for the day so that they can accommodate the health care needs of their employees. Therefore, the farmers inevitably absorb the health care cost in ensuring that their workers have access to health care. Health performance efficiency is often assessed according to the cost incurred per patient, with mobile services only catering to a small population whereby the high cost of running and maintaining a mobile clinic is deemed to be inefficient (Gaede & Versteeg, 2011).

## *Equity*

In NC areas where the mobile clinics are not available, health provision has shifted from those who need the service to those that can access the service, by finding their own mode of transport to the fixed and satellite clinics. A study on primary health care in rural areas of South Africa found that ensuring equity and quality of service provision is based on the degree of involvement of community members in the health care services (Visagie & Schneider, 2014). The allocation of resources cannot only be based on efficiencies alone but needs to address the health service inequity of rural communities through policies such as the re-engineering of primary health care and NHI (Gaede & Versteeg, 2011).

An 'ideal clinic' is stated to be a clinic that has a good infrastructure relating to proper implementation of policies, guidelines and protocol and reliable administrative processes of clinics (Hunter et al., 2017). Ideal clinics are adequately staffed and resourced, with sufficient medicine and supplies to ensure quality health care services reach the community (Hunter et al., 2017). Results of the South Africa Ideal Clinic Realisation and Maintenance Programme peer-review process (2015/2016) as reported in the South African health review (2017) revealed that in the NC only 3 out of 32 facilities assessed could be categorised as ideal clinics (Hunter et al., 2017). The percentage of ideal clinics compared with the percentage of clinics without a dedicated manager per province (2015/2016) further reported that in the NC the total



number of primary health care clinics was 164 and almost half (47%) are without dedicated managers (Hunter et al., 2017), underpinning the critical human resource shortage in the health service.

## 5.2 Study limitations

Despite the rich source of information provided, data saturation was not adequately reached due to time limitations of participants because of the impact of the COVID-19 pandemic on their workload. Consequently, it was not possible to recruit additional health care workers for an online interview. District managers and district directors from each district should have been interviewed to compare differences in the inhibitory factors facing NC districts in EPI service provision via mobile clinics. Virtual interviews with rural community members could not be conducted due to the lack of connectivity and accessibility to electronic applications.

## 5.3 Recommendations

- Currently operating as an extension of the fixed and satellite services, mobile clinics should ideally operate independently, by offering a comprehensive primary care service to rural communities. Through public private partnerships, consisting of department of health, companies (or organisations) and community representatives a co-operative relationship could be established.
- The budget allocation to accommodate professional and support staff such as a pharmacist assistant and community health workers could improve the quality of care. A contingency plan should be established in the event of the nurse's absence so that mobile clinic visits could be re-scheduled.
- Community health empowerment programmes are required. Feedback mechanisms from the community to decision-makers should be established so that service delivery challenges are identified and addressed imminently, for example, hosting regular meetings with the community, service providers and district managers to ensure transparency and accountability.
- Most small towns in South Africa have access to an agricultural co-operative (AGRI SA) which could collaborate with the department of health to improve the communication and coordination of mobile clinic visits.
- The suitability of the mobile clinic vehicle determines the quality of the service and patient privacy is paramount. Vehicle maintenance requires close monitoring to ensure roadworthiness and timeous return to continue EPI service delivery. Solar power or generators required for fridges, computer and printer applications would assist with real-time data capturing and monitoring of road to health booklet information. Semi-fixed structures and containers could be used as an alternative to mobile clinics to reduce the delays and costs associated with maintenance; and they could assist with transitioning towards providing consistent access to health care as the population size in an area increases.

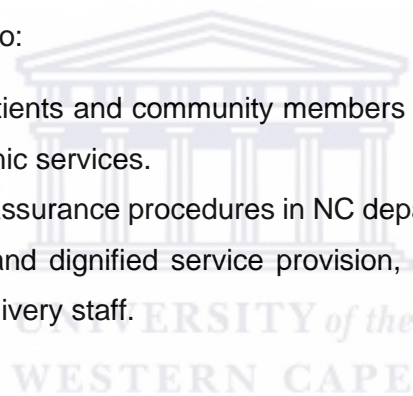
## 5.4 Conclusion

The EPI role-players shared valuable insight into the challenges affecting rural communities in sustaining EPI delivery via mobile clinics. Preventative health care services such as EPI plays a crucial role among rural communities as the first 1000 days of life is critical to a child's survival. Government's commitment to improve the road infrastructure and promote access to public transport underpins equitable access to primary care services for remote rural communities. Sound leadership accompanied by stewardship and community engagement is vital to the success of sustaining EPI delivery via mobile clinics.

Based the on experiences at the NC's department of health management and community level, multiple stakeholders are required to coordinate optimal COVID-19 vaccine roll out. To accommodate the rural setting the COVID-19 vaccine programme would need to consider the sustainability and availability of mobile clinics, staff resource, co-ordination of visits, funding, community dialogue and available of cold chain dependant vaccines.

Further research is required into:

- The perspectives of patients and community members from rural areas in the NC on the quality of mobile clinic services.
- Assessment of quality assurance procedures in NC department of health to determine compliance to ethical and dignified service provision, and the work environment of mobile clinic service delivery staff.



## REFERENCES

- Alston, M., 2007. Globalisation, rural restructuring and health service delivery in Australia: policy failure and the role of social work?. *Health & social care in the community*, 15(3), pp.195-202.
- Analytics, G., 2019. Evaluation of Phase 1 implementation of interventions in the National Health Insurance (NHI) pilot districts in South Africa. *Johannesburg: Genesis Analytics*. [online] Available at: [https://www.hst.org.za/publications/NonHST%20Publications/nhi\\_evaluation\\_report\\_final\\_14%2007%202019.pdf](https://www.hst.org.za/publications/NonHST%20Publications/nhi_evaluation_report_final_14%2007%202019.pdf) [Accessed 24 March 2021].
- Andre, F.E., Booy, R., Bock, H.L., Clemens, J., Datta, S.K., John, T.J., Lee, B.W., Lolekha, S., Peltola, H., Ruff, T.A. and Santosham, M., 2008. Vaccination greatly reduces disease, disability, death and inequity worldwide. *Bulletin of the World health organization*, 86, pp.140-146. [online] Available at: <https://apps.who.int/iris/handle/10665/270129> [Accessed 24 March 2021].
- Aneni, E., De Beer, I., Hanson, L., Rijnen, B., Brenan, A.T. and Feeley, F., 2013. Mobile primary healthcare services and health outcomes of children in rural Namibia. [online] Available at: <https://www.researchgate.net/publication/256478531> [Accessed 25 October 2020].
- Baker, L., 2014, Immunisations–New Vaccines. Schedules, Catch-ups and Contra-indications, 5. Immunisation MIMS handbook. [online] Available at: [http://www.paediatrics.uct.ac.za/sites/default/files/image\\_tool/images/38/Immunisation\\_MIMS%20Handbook%202014.pdf](http://www.paediatrics.uct.ac.za/sites/default/files/image_tool/images/38/Immunisation_MIMS%20Handbook%202014.pdf) [Accessed 23 December 2020].
- Barron, P., Gouws, H., Loots, B., Mwinga, M., Schneider, H., Snyman A., van Esch A., van Nieuwenhuizen K., 2009, Northern Cape Department of Health Report of the Integrated Support Team. [online] Available at: <https://section27.org.za/wp-content/uploads/2010/09/Northern-Cape.pdf> [Accessed 09 January 2021].
- Bateman, C., 2016. Vaccines: SA's immunisation programme debunked. *SAMJ: South African Medical Journal*, 106(4), pp.318-319. [online] Available at: [http://www.scielo.org.za/scielo.php?script=sci\\_arttext&pid=S0256-95742016000400005](http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S0256-95742016000400005) [Accessed 20 March 2021].
- Bloom, D.E., Canning, D. and Weston, M., 2005. The value of vaccination. *WORLD ECONOMICS-HENLEY ON THAMES*, 6(3), p.15. Available at: <https://lnct.global/wp-content/uploads/2017/10/David-E-Bloom-The-value-of-vaccination.pdf> accessed 03 January 2021
- Bosman, H., de Villiers, B., Froede, E. and Lewis, B., 2013. Design of the next generation mobile health clinic for the Western Cape South Africa. [online] Available at: [http://www.erickfroede.com/uploads/1/1/7/3/11733894/design\\_of\\_the\\_next\\_generation\\_healthcare\\_clinic.pdf](http://www.erickfroede.com/uploads/1/1/7/3/11733894/design_of_the_next_generation_healthcare_clinic.pdf) [Accessed 08 October 2020].
- Braun, V. and Clarke, V., 2006. Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), pp.77-101. [online] Available at: <https://psychology.ukzn.ac.za/?mdocs-file=1176> [Accessed 24 March 2021]
- Burnett, R.J., Mmoledi, G., Ngcobo, N.J., Dochez, C., Seheri, L.M. and Mphahlele, M.J., 2018. Impact of vaccine stock-outs on infant vaccination coverage: a hospital-based survey from South Africa. *International health*, 10(5), pp.376-381. [online] Available at: <https://www.sciencedirect.com/science/article/pii/S0264410X1200549X?via%3Dihub> [Accessed 04 July 2021].

- Castleberry, A. and Nolen, A., 2018. Thematic analysis of qualitative research data: Is it as easy as it sounds?. *Currents in Pharmacy Teaching and Learning*, 10(6), pp.807-815.
- DeJonckheere, M. and Vaughn, L.M., 2019. Semi-structured interviewing in primary care research: a balance of relationship and rigour. *Family Medicine and Community Health*, 7(2). [online] Available at: <https://fmch.bmj.com/content/7/2/e000057> [Accessed 24 March 2021].
- Deogaonkar, R., Hutubessy, R., Van Der Putten, I., Evers, S. and Jit, M., 2012. Systematic review of studies evaluating the broader economic impact of vaccination in low and middle income countries. *BMC public health*, 12(1), pp.1-9. [online] Available at: <https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-12-878> [Accessed 03 January 2021].
- Dlamini, N.R. and Maja, P., 2016. The Expanded Programme on Immunisation in South Africa: A story yet to be told. *South African Medical Journal*, 106(7), pp.675-677. [online] Available at: <http://www.samj.org.za/index.php/samj/article/view/10956> [Accessed 24 March 2021].
- Ehreth, J. 2003. The global value of vaccination. *Vaccine* 21, 596–600. [online] Available at: [https://www.researchgate.net/publication/10948246\\_The\\_global\\_value\\_of\\_vaccination/link/59dfc3e0aca272386b631fec/download](https://www.researchgate.net/publication/10948246_The_global_value_of_vaccination/link/59dfc3e0aca272386b631fec/download) [Accessed 30 December 2020].
- Fadda, M., Albanese, E. and Suggs, L.S., 2020. When a COVID-19 vaccine is ready, will we all be ready for it?. [online] Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7288619/> [Accessed on 31 December 2020].
- Feilden, R., Nielsen, O.F. and World Health Organization, 2001. *Immunization and health reform: making reforms work for immunization: a reference guide* (No. WHO/V&B/01.44). World Health Organization. [online] Available at: [https://apps.who.int/iris/bitstream/handle/10665/69617/WHO\\_V-B\\_01.44\\_eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/69617/WHO_V-B_01.44_eng.pdf) [Accessed 24 March 2021].
- Fine, P., Eames, K. and Heymann, D.L., 2011. "Herd immunity": a rough guide. *Clinical infectious diseases*, 52(7), pp.911-916. [online] Available at: <https://pdfs.semanticscholar.org/de8a/5945b07ba073c68e492e32f52ff777bb740b.pdf? ga=2.218040342.1422918047.1560763939-356825747.1560763939> [Accessed 17 June 2019].
- Gaede, B. and McKerrow, N.H. 2011. Outreach Programme: Consultant visits to rural hospitals. *Continuing Medical Education* 2011;29(2):54-58. [online] Available at: <http://www.cmej.org.za/index.php/cmej/article/view/2010> [Accessed 24 March 2021].
- Gaede, B. and Versteeg, M., 2011. The state of the right to health in rural South Africa. *South African health review*, 2011(1), pp.99-106. [online] Available at: <https://rhap.org.za/wp-content/uploads/2013/11/Chap-9-State-of-right-Rural-Health-pgs-99-106.pdf> [Accessed 24 March 2021].
- Gao, S.S., Yon, M.J.Y., Chen, K.J., Duangthip, D., Lo, E.C.M. and Chu, C.H., 2019. Utilization of a mobile dental vehicle for oral healthcare in rural areas. *International journal of environmental research and public health*, 16(7), p.1234. [online] Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6480282/> [Accessed 18 January 2021].
- Ghaljaie, F., Naderifar, M. and Goli, H., 2017. Snowball sampling: A purposeful method of sampling in qualitative research. *Strides in Development of Medical Education*, 14(3). [online] Available at: [https://www.researchgate.net/publication/324590206\\_Snowball\\_Sampling\\_A\\_Purposeful\\_Method\\_of\\_Sampling\\_in\\_Qualitative\\_Research](https://www.researchgate.net/publication/324590206_Snowball_Sampling_A_Purposeful_Method_of_Sampling_in_Qualitative_Research) [Accessed 24 March 2021].
- Gray, A. and Vawda, Y., 2019. Health legislation and policy. *South African Health Review*, 2019(1), pp.3-16. [online] Available at: <https://journals.co.za/doi/pdf/10.10520/EJC-1d2a9f1960> [Accessed 17 October 2020].



- Hamid, H., Mallhi, T.H., Naseer, M.S., Younas, I., Rashid, M.A., Pervaiz, A. and ul Ain, N., 2020. The COVID-19 pandemic threatens the Expanded Program on Immunization: recommendations for sustaining vaccination goals. *Drugs & Therapy Perspectives*, 36(11), pp.523-525. [online] Available at: <https://link.springer.com/article/10.1007/s40267-020-00774-2> [Accessed 24 March 2021].
- Hinshaw, A.S., 2013. The childhood immunization schedule and safety: stakeholder concerns, scientific evidence, and future studies. [online] Available at: <https://www.nap.edu/read/13563/chapter/4#28> [Accessed 16 January 2021].
- Hlabangane S., 2017. Eskom Mobile Clinics Reach Learners in Rural Northern Cape. [online] Available at <https://ehealthnews.co.za/eskom-mobile-clinics-northern-cape/> [Accessed: 02 October 2018].
- Hunter, J.R., Chandran, T.M., Asmall, S., Tucker, J.M., Ravhengani, N.M. and Mokgalagadi, Y., 2017. The Ideal Clinic in South Africa: progress and challenges in implementation. *South African health review*, 2017(1), pp.111-123. [online] Available at: <https://journals.co.za/doi/abs/10.10520/EJC-c80fcc8dc> [Accessed 24 March 2021].
- Jacob, N. and Coetzee, D., 2015. Missed opportunities for immunisation in health facilities in Cape Town, South Africa. *South African Medical Journal*, 105(11), pp.917-921. [online] Available at: <http://www.samj.org.za/index.php/samj/article/view/10194/6984> [Accessed 04 July 2021].
- Jamil, K., Bhuiya, A., Streatfield, K. and Chakrabarty, N., 1999. The immunization programme in Bangladesh: impressive gains in coverage, but gaps remain. *Health policy and planning*, 14(1), pp.49-58. [online] Available at: <https://academic.oup.com/heapol/article/14/1/49/595115> [Accessed 29 December 2020].
- Jinabhai, C.C., Marcus, T.S. and Chaponda, A., 2015. Rapid appraisal of ward based outreach teams. Pretoria: Albertina Sisulu Executive Leadership Programme in Health. [online] Available at: <https://www.up.ac.za/media/shared/62/COPC/COPC%20Reports%20Publications/wbot-report-epub-lr-2.zp86437.pdf> [Accessed 27 December 2020].
- Joubert, P., 2009. Nurse shortage in South Africa. *Solidarity Arbeids forum*, 5, pp.1-19. [online] Available at: [http://us-cdn.creamermedia.co.za/assets/articles/attachments/21373\\_solidarity.pdf](http://us-cdn.creamermedia.co.za/assets/articles/attachments/21373_solidarity.pdf) [Accessed 22 March 2021].
- Lake, L., Shung-King, M., Hendricks, M., Heywood, M., Nannan, N., Laubscher, R., Bradshaw, D., Mathews, C., Goga, A., Ramraj, T. and Chirindavi, W., 2019. Prioritising child and adolescent health: A human rights imperative. *Child and adolescent health*, 3, p.32. [online] Available at: [https://www.researchgate.net/profile/Trisha\\_Ramraj/publication/337973440\\_Prioritising\\_child\\_and\\_adolescent\\_health\\_A\\_human\\_rights\\_imperative/links/5df8a47392851c83648324d5/Prioritising-child-and-adolescent-health-A-human-rights-imperative.pdf#page=32](https://www.researchgate.net/profile/Trisha_Ramraj/publication/337973440_Prioritising_child_and_adolescent_health_A_human_rights_imperative/links/5df8a47392851c83648324d5/Prioritising-child-and-adolescent-health-A-human-rights-imperative.pdf#page=32) [Accessed 30 January 2021].
- Le Roux, K., Akin-Olugbade, O., Katzen, L.S., Laurenzi, C., Mercer, N., Tomlinson, M. and Rotheram-Borus, M.J., 2017. Immunisation coverage in the rural Eastern Cape—are we getting the basics of primary care right? Results from a longitudinal prospective cohort study. *South African Medical Journal*, 107(1), pp.52-55. [online] Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5659717/> [Accessed 04 July 2021].
- Lehohla, P., 2013. Use of health facilities and levels of selected health conditions in South Africa: Findings from the General Household Survey, 2011 (p. 114). Pretoria: Statistics South Africa. [online] Available at: <http://www.statssa.gov.za/publications/Report-03-00-05/Report-03-00-052011.pdf> [Accessed 23 March 2021].

- Lockett, B., 2016. The perceptions of carers regarding non-adherence to immunisation schedule (Doctoral dissertation, Stellenbosch: Stellenbosch University). [online] Available at [https://scholar.sun.ac.za/bitstream/handle/10019.1/100180/lockett\\_perceptions\\_2016.pdf?isAllowed=y&sequence=1](https://scholar.sun.ac.za/bitstream/handle/10019.1/100180/lockett_perceptions_2016.pdf?isAllowed=y&sequence=1) [Accessed 22 March 2021].
- Mabona, L.G. and Shakantu, W., 2016. Ineffective programme management on the delivery of health infrastructure projects: A case of the Northern Cape. *Acta Structilia*, 23(1), pp.70-98. [online] Available at : [http://scholar.ufs.ac.za:8080/xmlui/bitstream/handle/11660/4726/struct\\_v23\\_n1\\_a3.pdf?sequence=3](http://scholar.ufs.ac.za:8080/xmlui/bitstream/handle/11660/4726/struct_v23_n1_a3.pdf?sequence=3) [Accessed 20 January 2021].
- Massyn, N., Barron, P., Day, C., Ndlovu, N. and Padarath, A., 2020. District Health Barometer, 2018/19. Durban: Health Systems Trust. [Online] Available at: <https://www.hst.org.za/publications/District%20Health%20Barometers/District+Health+Barometer+2018-19+Web.pdf> [Accessed 26 June 2021].
- Massyn, N., Padarath, A. and Peer, N., 2017. *District health barometer 2016/17*. Health Systems Trust. [online] Available at: <https://www.hst.org.za/publications/District%20Health%20Barometers/District%20Health%20Barometer%202016-2017.pdf> [Accessed 30 September 2018].
- Massyn, N., Pillay, Y. and Padarath, A., 2019. District health barometer 2017/18. *Durban: Health Systems Trust*. [online] Available at: <https://www.hst.org.za/publications/District%20Health%20Barometers/DHB+2017-18+Web+8+Apr+2019.pdf> [Accessed 26 March 2021].
- McKenzie, A., Schneider, H., Schaay, N., Scott, V., and Sanders, D., 2017. Primary health care systems (PRIMASYS): Case study from South Africa. Geneva: World Health Organisation. [online] Available at : [https://www.who.int/alliance-hpsr/projects/alliancehpsr\\_southafricaprimasys.pdf?ua=1](https://www.who.int/alliance-hpsr/projects/alliancehpsr_southafricaprimasys.pdf?ua=1) [Accessed 30 January 2021].
- McLaren, Z., Ardington, C. and Leibbrandt, M., 2013. *Distance as a barrier to health care access in South Africa*. [online] Available at: [http://www.opensaldru.uct.ac.za/bitstream/handle/11090/613/2013\\_97.pdf?sequence=1](http://www.opensaldru.uct.ac.za/bitstream/handle/11090/613/2013_97.pdf?sequence=1) [Accessed 23 March 2021].
- Meno, F.O., Makhado, L. and Matsipane, M., 2019. Factors inhibiting implementation of integrated management of childhood illnesses (IMCI) in primary health care (PHC) facilities in Mafikeng sub-district. *International Journal of Africa Nursing Sciences*, 11, p.100161. [online] Available at: <https://www.sciencedirect.com/science/article/pii/S2214139118300428> [Accessed 14 March 2021].
- Moravcsik, A., 2020. Transparency in qualitative research. SAGE Publications Limited. [Online] Available at: <https://www.princeton.edu/~amoravcs/library/TransparencyinQualitativeResearch.pdf> [Accessed 23 June 2021].
- Moses, E. and Yu, D., 2009. Migration from the Northern Cape. [online] Available at: [http://www.caps.uct.ac.za/bitstream/handle/11090/23/2009\\_32.pdf?sequence=1](http://www.caps.uct.ac.za/bitstream/handle/11090/23/2009_32.pdf?sequence=1) [Accessed 14 March 2021].
- National Department of Health., 2015. Cold Chain and Immunisation Operations Manual: Guidelines for Handling Temperature Sensitive Vaccines and Pharmaceuticals. Department of Health. Pretoria, South Africa.
- National Patients' Rights Charter, 1999. Department of Health, Pretoria. [online] Available at: <https://www.idealhealthfacility.org.za/docs/Posters/PATIENTS%20RIGHTS%20CHARTER%20-%20Eng.pdf> [Accessed 25 October 2020].



- Ndwandwe, D., Nnaji, C.A., Mashunye, T., Uthman, O.A. and Wiysonge, C.S., 2021. Incomplete vaccination and associated factors among children aged 12–23 months in South Africa: an analysis of the South African demographic and health survey 2016. *Human Vaccines & Immunotherapeutics*, 17(1), pp.247-254. [online] Available at: <https://www.tandfonline.com/doi/full/10.1080/21645515.2020.1791509> [Accessed 04 July 2021]
- Newcomer, K.E., Hatry, H.P. and Wholey, J.S., 2015. Conducting semi-structured interviews. *Handbook of practical program evaluation*, 492. [online] Available at: [https://www.researchgate.net/publication/301738442\\_Conducting\\_Semi-Structured\\_Interviews](https://www.researchgate.net/publication/301738442_Conducting_Semi-Structured_Interviews) [Accessed 24 March 2021].
- Ngcobo, N.J. and Kamupira, M.G., 2017. The status of vaccine availability and associated factors in Tshwane government clinics. *South African Medical Journal*, 107(6), pp.535-538. [online] Available at: <http://www.samj.org.za/index.php/samj/article/view/11914> [Accessed 24 March 2021].
- Ngcobo, N.J., 2008. The impact of the immunisation programme on vaccine-preventable diseases in South Africa: A review of progress over a 10-to 15-year period. *Southern African Journal of Epidemiology and Infection*, 23(1), pp.9-13. [online] Available at: <https://www.tandfonline.com/doi/pdf/10.1080/10158782.2008.11441292> [Accessed 24 March 2021].
- Northern Cape Municipalities. [online] Available at: <https://municipalities.co.za/provinces/view/7/northern-cape> [Accessed 22 March 2021].
- Noy, C., 2008. Sampling knowledge: The hermeneutics of snowball sampling in qualitative research. *International Journal of social research methodology*, 11(4), pp.327-344.
- Ramukumba, M.M., 2020. Exploration of Community Health Workers' views about in their role and support in Primary Health Care in Northern Cape, South Africa. *Journal of Community Health*, 45(1), pp.55-62.
- Reidpath, D.D., Olafsdottir, A.E., Pokhrel, S. and Allotey, P., 2012, June. The fallacy of the equity-efficiency trade off: rethinking the efficient health system. In *BMC Public Health* (Vol. 12, No. 1, pp. 1-5). BioMed Central. [online] Available at: [https://www.researchgate.net/publication/230884187\\_The\\_fallacy\\_of\\_the\\_equity-efficiency\\_trade\\_off\\_Rethinking\\_the\\_efficient\\_health\\_system](https://www.researchgate.net/publication/230884187_The_fallacy_of_the_equity-efficiency_trade_off_Rethinking_the_efficient_health_system) [Accessed 24 March 2021].
- Rispel, L.C., Shisana, O., Dhali, A., Dudley, L., English, R., Grobler, G.P., Masilela, T.C., Patel, R.H., Puren, A., Rensburg, R. and Stewart, J., 2019. Achieving high-quality and accountable universal health coverage in South Africa: A synopsis of the Lancet National Commission Report. *South African Health Review*, 2019(1), pp.69-80. [online] Available at: <https://journals.co.za/doi/abs/10.10520/EJC-1d2ab57a7e> [Accessed 24 March 2021].
- Rodrigues, C.M. and Plotkin, S.A., 2020. Impact of Vaccines; Health, Economic and Social Perspectives. *Frontiers in microbiology*, 11. [online] Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7371956/> [Accessed 22 March 2021]
- SANRAL., Hello Northern Cape 2020. [online] Available at: <https://www.nra.co.za/download/79/hello-provincial-series/2601/hello-northern-cape-2020.pdf> [Accessed 30 January 2021].
- Scott, V., Schaay, N., Schneider, H. and Sanders, D., 2017. Addressing social determinants of health in South Africa: the journey continues. *South African health review*, 2017(1), pp 77-88. [online] Available: [https://www.hst.org.za/publications/South%20African%20Health%20Reviews/8\\_Addresssing%20social%20determininants%20of%20health%20in%20South%20Africa\\_the%20journey%20continues.pdf](https://www.hst.org.za/publications/South%20African%20Health%20Reviews/8_Addresssing%20social%20determininants%20of%20health%20in%20South%20Africa_the%20journey%20continues.pdf) [Accessed 24 March 2021].

- Semali, I.A., Tanner, M. and de Savigny, D., 2005. Decentralizing EPI services and prospects for increasing coverage: the case of Tanzania. *The International journal of health planning and management*, 20(1), pp.21-39.
- Sepúlveda, J., Bustreo, F., Tapia, R., Rivera, J., Lozano, R., Oláiz, G., Partida, V., García-García, L. and Valdespino, J.L., 2006. Improvement of child survival in Mexico: the diagonal approach. *The Lancet*, 368(9551), pp.2017-2027.
- Setia, S., Mainzer, H., Washington, M.L., Coil, G., Snyder, R. and Weniger, B.G., 2002. Frequency and causes of vaccine wastage. *Vaccine*, 20(7-8), pp.1148-1156.
- Sharma, S., Tandlich, R., Docrat, M. and Srinivas, S., 2020. Antibiotic procurement and ABC analysis for a comprehensive primary health care clinic in the Eastern Cape province, South Africa. *Southern African Journal of Infectious Diseases*, 35(1), p.7. [online] Available at: <https://sajid.co.za/index.php/sajid/article/view/134/424> [Accessed 04 July 2021].
- Shen, A.K., Fields, R. and McQuestion, M., 2014. The future of routine immunization in the developing world: challenges and opportunities. *Global Health: Science and Practice*, 2(4), pp.381-394. [online] Available at: <http://www.ghspjournal.org/content/2/4/381> [Accessed 06 August 2019].
- Songane, M., 2018. Challenges for nationwide vaccine delivery in African countries. *International journal of health economics and management*, 18(2), pp.197-219.
- South African Human Rights Commission, 2003. Final report on the inquiry into human rights violations in farming communities. August 2003. [online] Available at: [https://www.sahrc.org.za/home/21/files/farming\\_inquiry\\_2003.PDF](https://www.sahrc.org.za/home/21/files/farming_inquiry_2003.PDF) [Accessed 15 November 2020].
- South African Pharmacy Council, 2010. Good pharmacy practice in South Africa pp. 47 [online] Available at: <https://www.pharmcouncil.co.za/Media/Default/Documents/Good%20Pharmacy%20Practice%20Manual%20and%20Associated%20SAPC%20rules.pdf> [Accessed on 24 January 2021].
- South African Pharmacy Council., 2015. Board Notice 50 of 2015. Amendments to the Rules relating to Good Pharmacy Practice. 27 February 2015.
- Stats SA., 2015. Measuring household expenditure on public transport. [online] Available at: <http://www.statssa.gov.za/publications/Report-03-20-11/Report-03-20-112013.pdf> [Accessed: 03 January 2021].
- Stats SA., 2020. Mid-year population estimates, 2020 (Statistical release P0302). [online] Available at: <http://www.statssa.gov.za/publications/P0302/P03022020.pdf> [Accessed: 30 January 2020].
- Stemmet, C.L., 2016. Perceptions and experiences of nurses about the mobile clinic work environment (Doctoral dissertation, Stellenbosch: Stellenbosch University). [online] Available at: <https://scholar.sun.ac.za/handle/10019.1/98767> [Accessed: 12 October 2020].
- Stephanie, W.Y., Hill, C., Ricks, M.L., Bennet, J. and Oriol, N.E., 2017. The scope and impact of mobile health clinics in the United States: a literature review. *International journal for equity in health*, 16(1), pp.1-12. [online] Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5629787/> [Accessed: 01 September 2018].
- Subedar, H., 2011. Provincial guidelines for the implementation of the three streams of the PHC re-engineering. *Guideline. Pretoria: Department of Health*, 10. [online] Available at: <http://policyresearch.limpopo.gov.za/bitstream/handle/123456789/882/Provincial%20Guidelines%20for%20the%20implementation%20of%20the%20three%20Streams%20of%20PHC%20Re-engineering.pdf?sequence=1> [Accessed 30 December 2020].

Tanser, F., Gijsbertsen, B. and Herbst, K., 2006. Modelling and understanding primary health care accessibility and utilization in rural South Africa: an exploration using a geographical information system. *Social science & medicine*, 63(3), pp.691-705.

The National Department of Health., 2015. *Vaccinator's Manual "Immunisation That Works" Expanded Programme on Immunisation in South Africa (EPI-SA)*. [online] Available at:

[https://www.westerncape.gov.za/assets/departments/health/vaccinators\\_manual\\_2016.pdf](https://www.westerncape.gov.za/assets/departments/health/vaccinators_manual_2016.pdf) [Accessed 22 March 2021].

Travis, P., Bennett, S., Haines, A., Pang, T., Bhutta, Z., Hyder, A.A., Pielemeier, N.R., Mills, A. and Evans, T., 2004. Overcoming health-systems constraints to achieve the Millennium Development Goals. *The Lancet*, 364(9437), pp.900-906.

UNICEF, 2017. First 1000 days: The critical window to ensure that children survive and thrive. [online] Available at :

<https://www.unicef.org/southafrica/sites/unicef.org.southafrica/files/2019-03/ZAF-First-1000-days-brief-2017.pdf> [Accessed January 2021].

UNICEF, 2018. Health Budget Brief South Africa 2018/19. [online] Available at:

<https://www.unicef.org/esa/sites/unicef.org.esa/files/2019-03/UNICEF-South-Africa-2018-Health-Budget-Brief.pdf> [Accessed 20 March 2021].

Visagie, S. and Schneider, M., 2014. Implementation of the principles of primary health care in a rural area of South Africa. *African Journal of Primary Health Care & Family Medicine*, 6(1), pp.1-10.

Welman, C., Kruger, F. and Mitchell, B., 2005. *Research Methodology (Third Edit)*. Cape Town: Oxford University Press Southern Africa (Pty) Ltd, pp.165-167.

Wiysonge, C.S., Ngcobo, N.J., Jeena, P.M., Madhi, S.A., Schoub, B.D., Hawkrigde, A., Shey, M.S. and Hussey, G.D., 2012. Advances in childhood immunisation in South Africa: where to now? Programme managers' views and evidence from systematic reviews. *BMC Public Health*, 12(1), pp.1-9.

World Health Organization, 2005. Department of Child, Adolescent Health, World Health Organization and UNICEF, 2005. *Handbook IMCI: integrated management of childhood illness*. World Health Organization. [Online] Available at :

<https://apps.who.int/iris/bitstream/handle/10665/42939/9241546441.pdf?sequence=1&isAllowed=y> [Accessed 14 March 2021].

World Health Organization, 2015. *Regional strategic plan for immunization 2014-2020*.

World Health Organization. Regional Office for Africa. [online] Available at:

<https://apps.who.int/iris/bitstream/handle/10665/204373/9789290232780.pdf> [Accessed 26 March 2021]

World Health Organization, 2018. Quality, equity, dignity: the network to improve quality of care for maternal, new born and child health: strategic objectives. [online] Available at :

<https://apps.who.int/iris/bitstream/handle/10665/272612/9789241513951-eng.pdf?ua=1> [Accessed 28 January 2021].

World Health Organization, 2019. Revising global indicative wastage rates: a WHO initiative for better planning and forecasting of vaccine supply needs. Concept note. 8 April 2019. [online] Available at:

[https://www.who.int/immunization/programmes\\_systems/supply\\_chain/resources/Revising\\_Wastage\\_Concept\\_Note.pdf?ua=1](https://www.who.int/immunization/programmes_systems/supply_chain/resources/Revising_Wastage_Concept_Note.pdf?ua=1), [Accessed 07 July 2021].

World Health Organization, 2021. Urgent health challenges for the next decade. [Online]

Available at: <https://www.who.int/news-room/photo-story/photo-story-detail/urgent-health-challenges-for-the-next-decade> [Accessed 22 June 2021].

Zaffran, M., Vandelaer, J., Kristensen, D., Melgaard, B., Yadav, P., Antwi-Agyei, K.O. and Lasher, H., 2013. The imperative for stronger vaccine supply and logistics systems. *Vaccine*, 31, pp.B73-B80.



## Appendices

### Appendix 1: University of the Western Cape Humanities and Social Science Research Ethics Committee approval



UNIVERSITY of the  
WESTERN CAPE



15 May 2020

Ms J Losper  
School of Pharmacy  
Faculty of Natural Sciences

**Ethics Reference Number:** HS20/3/9

**Project Title:** Exploring the factors influencing the sustainability of mobile clinics for delivery of the expanded programme on immunisation, to the rural areas of the Northern Cape.

**Approval Period:** 14 May 2020 – 14 May 2023

I hereby certify that the Humanities and Social Science Research Ethics Committee of the University of the Western Cape approved the methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

**Please remember to submit a progress report by 30 November each year for the duration of the project.**

The Committee must be informed of any serious adverse event and/or termination of the study.

*Ms Patricia Josias*  
Research Ethics Committee Officer  
University of the Western Cape

NHREC Registration Number: HSSREC-130416-049

Director: Research Development  
University of the Western Cape  
Private Bag X 17  
Bellville 7535  
Republic of South Africa  
Tel: +27 21 959 4111  
Email: [research-ethics@uwc.ac.za](mailto:research-ethics@uwc.ac.za)

FROM HOPE TO ACTION THROUGH KNOWLEDGE.





UNIVERSITY of the  
WESTERN CAPE



25 May 2020

Ms J Losper  
School of Pharmacy  
Faculty of Natural Sciences

**Ethics Reference Number:** HS20/3/9

**Project Title:** Exploring the factors influencing the sustainability of mobile clinics for delivery of the expanded programme on immunisation, to the rural areas of the Northern Cape.

**Approval Period:** 25 May 2020 – 25 May 2023

I hereby certify that the Humanities and Social Science Research Ethics Committee of the University of the Western Cape approved the methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

**Please remember to submit a progress report by 30 November each year for the duration of the project.**

The Committee must be informed of any serious adverse event and/or termination of the study.

*Ms Patricia Josias  
Research Ethics Committee Officer  
University of the Western Cape*

NHREC Registration Number: HSSREC-130416-049

Director: Research Development  
University of the Western Cape  
Private Bag X 17  
Bellville 7535  
Republic of South Africa  
Tel: +27 21 959 4111  
Email: [research-ethics@uwc.ac.za](mailto:research-ethics@uwc.ac.za)

FROM HOPE TO ACTION THROUGH KNOWLEDGE.



## Appendix 2: Northern Cape Department of Health Ethics approval



**DEPARTMENT OF HEALTH**  
**LEFAPHA LA BOPHELO BO BOTLE**  
**DEPARTEMENT VAN GESONDHEID**  
**ISEBE LEZEMPILO**

### OFFICE OF THE HOD

Executive Offices  
Northern Cape Department of Health  
Private Bag X5049  
KIMBERLEY, 8300  
Tel: 053 830 2134  
Email: [BMashute@ncpg.gov.za](mailto:BMashute@ncpg.gov.za)

Enquiries:  
Dipatlisiso:  
Imibuzo:  
Navrae :

Mr. B Mashute

Date:  
Leshupelo:  
Umbila:  
Datum:

24 June 2020

Reference:  
Tshupelo:  
Isalathiso:  
Verwysing:

NC\_RP01\_06

**Ms. Julia Losper**  
**School of Pharmacy**  
**Faculty of Natural Science**  
**University of the Western Cape**

**Project Title: Exploring the Factors Influencing the Sustainability of Mobile Clinics for Delivery of the Expanded Programme on Immunisation, to the Rural Areas of the Northern Cape.**

The application for permission to conduct the above-mentioned research study in the Northern Cape Province, was received and reviewed by the Northern Cape Department of Health.

Decision: Approval is granted to conduct this research project in the Northern Cape Province as indicated in the research proposal.

The reference number for this research project is NC\_RP01\_06, and please use this reference with all your communication with the Research Coordinator.

#### **Please note the following:**

1. This approval is valid for a period of one year from the date of approval.
2. The researcher is requested to make all the necessary arrangement with the each District Director, so that the provision of healthcare services is not affected by this research project.




We are committed to achieving our vision through a decentralized, accountable, accessible and constantly improving health care system within available resources. Our caring, multi-skilled, effective personnel will use evidence-based, informative health care and maturing partnerships for the benefit of our clients and patients.

**Please note the following conditions:**

1. This research project must be conducted at no cost to the Northern Cape Department of Health.
2. The approval is limited to the research proposal as submitted on the application.
3. There must be no modification or amendments on the research project.
4. The Research Unit may monitor this research project at any time.
5. At the completion of this research project, a copy of the final report must be submitted to the Research Unit.
6. The Northern Cape Department of Health Senior Management must be briefed on the outcome of the study prior publishing.

  
Dr Deon Thyse  
Acting Head of Department  
Northern Cape Province  
Department of Health

  
Date



## Appendix 3: Semi-structured guide

### Semi-structured Questionnaire



**Faculty of Natural Science**  
School of Pharmacy  
University of the Western Cape  
Robert Sobukwe, Bellville, Cape  
Town, 7535

**Study title:** Exploring the factors influencing the sustainability of mobile clinics for delivery of the Expanded Programme on Immunisation, to the rural areas of the Northern Cape.

**Date:** \_\_\_\_\_

#### Role and Responsibility

1. Describe your role/position in the delivery of EPI in the Northern Cape?
2. In your current role what are your objectives for EPI delivery via mobile clinics?
3. Describe the current state of mobile clinics which provide EPI and how your role has impacted to sustain the initiative?
4. In your opinion what are key the factors that negatively affects the sustainability of EPI mobile service delivery to the rural communities?
5. What are the misconceptions that influence the sustainability of EPI via mobile clinics?

#### Description of EPI Mobile service

1. In your experience what fixed, mobile and outreach programmes are in existence across the Districts of the Northern Cape?
2. Describe the provision of EPI service via Mobile Clinics?
3. How would you describe the current status of mobile clinics in meeting the needs of EPI to rural communities?
4. How are the performances of the Mobile Clinic delivery monitored?
5. What in your opinion are the main factors which influences optimal access to EPI via Mobile Clinics?
6. For those mobile clinics that had stopped offering EPI services, in your view, what factors might have led to such closure?
7. How is stock controlled and managed for mobile clinics?
8. Probe: how is stock shortages mitigated? For example, if Hexaxim<sup>®</sup> was out of stock, how would that situation be managed at the medicine depot? Driver of mobile clinic vehicle? Nurse?

### **Schedule of visits**

1. How are mobile clinic visits scheduled to rural communities?
  - Probe: Contact person? Role in the community? Reliability of contact person?
2. How are scheduled and unscheduled visits by the mobile clinic communicated with the community?
  - Probe: If services are not able to be provided on scheduled days how are they communicated to the community?

### **Tracing of Drop out**

1. Describe the recording and tracking process for children intending to receive immunization?
3. Who records and captures the patient's clinic information?
  - Probe: Is it done by the same person administering the vaccine?
2. Are there active systems to trace the drop out of children who do not return for 2<sup>nd</sup> or 3<sup>rd</sup> doses of vaccination? Describe the system in place?

### **Funding**

1. How much does it cost to approximately maintain EPI services via mobile clinics?
  - One mobile clinic for a month
2. How are mobile clinics and EPI currently being funded?
3. Is the current funding for mobile clinics and EPI enough to maintain and sustain existing mobile clinics?
4. How has access to funding affected the sustainability of mobile clinics and the provision of EPI?
  - Probe: Have mobile clinics stop delivery of EPI due to lack of funding?
5. If funding was made available, in your view, what might an ideal mobile clinic look like in optimising EPI services?

## Appendix 4: Study information sheet

### Study Information sheet



#### Faculty of Natural Science

School of Pharmacy

University of the Western Cape

Robert Sobukwe, Bellville, Cape Town, 7535

**17 July 2020**

Dear Health service provider

**Study title:** Exploring the factors influencing the sustainability of mobile clinics for delivery of the Expanded Programme on Immunisation to the rural areas of the Northern Cape.

I am a postgraduate student pursuing my Masters in Pharmaceutical Science and Policy Regulation at the School of Pharmacy at the University of the Western Cape, contact number 0836692238. To fulfill course requirements I am undertaking a research study titled: Exploring the factors influencing the sustainability of mobile clinics for delivery of the expanded programme on immunisation (EPI) to the rural areas of the Northern Cape.

As a health service provider in EPI Each invited participant of this study plays a significant role, and thus I ask that you please read the provided information form carefully and are welcome to ask any questions you may have prior to considering participating in this study. The information sheet and informed consent form will be made available to the interviewees and discussed extensively prior to commencing of the interview to ensure clarity prior to signature/approval. The interviews will commence only after approval has been obtained from the participants. Your participation is of great importance to improving mobile primary health care service delivery to rural areas of the Northern Cape, South Africa.

#### **Purpose of the study**

The Northern Cape is not able to reach the target for EPI in order to maintain herd immunity, due to the vast distances the rural community needs to travel to gain access to immunisation services. This research study aims to identify the enabling and inhibitory factors that influence mobile clinics in the provision of access to the expanded programme on immunization by delivery of vaccinations, to the remote rural areas in the Northern Cape.

#### **Procedure**

After obtaining informed consent from participants, the researcher will conduct an hour-long interview, the responses will be recorded and documented in writing, to optimally analyse the



data and verify the responses obtained from participants. A semi-structured questionnaire will be used to probe on the respective EPI roles and responsibilities and identify the enabling factors and the challenges, misconceptions or misunderstandings, which influence the EPI operational processes associated with the mobile service delivery in the rural areas of the Northern Cape.

### **Data storage**

Participant responses will be transcribed and filed electronically on a password protected computer. The password will only be known to the researcher. Hard copies of the transcripts will be locked away in a cupboard at the School of Pharmacy, University of the Western Cape, with only the principal investigator having access to them. The analysed data will only be shared with the respective participants. Once the dissertation has been published the data will be destroyed.

### **Benefits to Participants**

Exploring the identified factors that influence the sustainability of mobile clinics for delivery of vaccinations a framework for the establishment of standards required to maintain optimal and consistent delivery of EPI could be obtained. The rural communities are dependent on mobile clinics to provide consistent, convenient and reliable immunisation services that will encourage adherence to vaccination schedules. By increasing access to immunisation, herd immunity will be promoted, which will reduce the health and financial burden of communicable diseases on the province's health system. The indirect benefit of participation may be that the individual has an opportunity to reflect on current practice patterns and identify opportunities towards optimising preventative care to rural community members.

### **Risks**

The risks to study participants are minimal as the anonymity protection will ensure confidentiality. No direct benefits for the study participants are anticipated.

### **Confidentiality**

All information provided by participants in response to the questionnaire will be kept strictly confidential. Names will not be written on the questionnaire, instead numerical and alphabetical identifier codes will be used for each participant. The identifier codes will only be known to the researcher. The information provided during the interview will not be identifiable or linked to any one of the participants. Participant identity will not be revealed when the study findings are either reported or published.

### **Voluntary Participation**

Participation is entirely voluntary. There is no obligation to answer any questions that you are not comfortable answering and you are free to withdraw from the study at any time.

### **Costs**

There will be no cost to you for participating in this study.



### **Questions**

If you have any question(s), you may please speak to Julia Losper at 0836692238. If you are unsatisfied with the response given then please speak to Professor Angeni Bheekie: 0219592977, Office K6, School of Pharmacy, University of the Western Cape, Bellville, Cape Town.

### **Ethics approval**

Ethics approval will be obtained from University of the Western Cape Humanities and Social Science Research Ethics Committee (HSSREC). Informed consent, anonymity and confidentiality will be ensured. Informed consent will be obtained, anonymity will be ensured using unique identifiers. Participant's personal information will be kept fully confidential, no information will be divulged to members of the public. Data collection tools and informed consent forms will be stored separately, safely and securely in the supervisor's office. Once the study is completed i.e. research reports and publications written, the electronic databases and paper data collection tools will be deleted and destroyed by the principal researcher.

### **Publication of Results**

Completed questionnaires will be analysed and used in writing a dissertation which will be available after the examination process. Results may also be published in an academic journal.

### **Contact information**

If you have any questions regarding the study, you may ask them now and for any further questions or concerns going forward please feel free to contact the following people:

#### **Researcher: Julia Losper**

Cell phone number: 0836692238

Email address: [julialosper@gmail.com](mailto:julialosper@gmail.com)

#### **Principal investigator: Prof Bheekie**

021-9592977; [abheekie@uwc.ac.za](mailto:abheekie@uwc.ac.za)

School of Pharmacy, Faculty of Natural Science

University of the Western Cape, Bellville, Cape Town.

#### **University of the Western Cape**

#### **Humanities and Social Sciences Research Ethics Committee (HSSREC)**

University of the Western Cape

Robert Sobukwe Road

Bellville, 7535

Tel: 021 959 4111

Email: [research-ethics@uwc.ac.za](mailto:research-ethics@uwc.ac.za)



## Appendix 6: Email request for ZOOM interviews

Gmail - Research Participation



Julia Losper <julialosper@gmail.com>

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### Research Participation

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**Julia Losper** <julialosper@gmail.com>  
To: participants email address

Date and time

Good day (Participants Name)

Telephonically discussed I would please like to request your participation in my research study entitled:

Exploring the factors influencing the sustainability of mobile clinics for the delivery of the Expanded Programme on Immunisation to the rural areas of the Northern Cape. Attached is the Northern Cape DOH approval letter, study information sheet and informed consent form. I would like to request the contact details for a platform for which we can conduct the interview ie ZOOM or Microsoft teams and a proposed date and time as to when you will be available to conduct an hour long interview? Your participation is greatly appreciated

Many thanks and kind regards  
Julia Losper  
Contact Number: 0836692238

#### 3 attachments

 **NC Research approval.pdf**  
86K

 **Informed Consent.docx**  
46K

 **Study Information sheet.docx**  
51K



Gmail - Msc Research Interview

UNIVERSITY of the  
WESTERN CAPE



Julia Losper <julialosper@gmail.com>

---

### Msc Research Interview

---

**Julia Losper** <julialosper@gmail.com>  
To: Participants email address

Date and time

Good day

Please find below the link and passcode to join the virtual interview scheduled for the day, month, time.

Join Zoom Meeting

<https://us04web.zoom.us/j/79019324856?pwd=YXNRN2F6RGY1bzkyeUpQMDIzYnAzZz09>

Alternatively login to meeting via provided password:

Meeting ID: 790 1932 4856

Passcode: 6XhsxV

Kind regards  
Julia Losper