

**An outcomes evaluation of the ‘differentiated care’
antiretroviral therapy delivery in South African urban
township**

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**A thesis presented in partial fulfilment for the degree of Master of
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DECLARATION

I Tebogo Tebeila declare that this research report entitled ‘An outcomes evaluation of the ‘differentiated care’ antiretroviral therapy delivery in South African urban township’ is my unaided work. I have acknowledged, attributed, and referenced all ideas sourced elsewhere. I am hereby submitting it in partial fulfilment of the requirements of the degree of Master of Management (Public sector monitoring and evaluation) at the University of the Witwatersrand, Johannesburg. I have not submitted this report before for any other degree or examination to any other institution.



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ABSTRACT

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With the high prevalence and massive expansion of antiretroviral therapy (ART), alternative ART delivery models are needed in scaling up, delivering ART, and maintaining high-quality services to people living with HIV. Various differentiated care ART delivery models were implemented in health facilities across South Africa, notable results from the literature suggest that differentiated care ART delivery models were piloted and implemented at scale, nevertheless, there is little evidence on the scale-up of these models on patients’ outcomes in South African urban townships. Ultimately, the research seeks to assess the outcomes of the differentiated care ART delivery models in a South African urban township called Tembisa in the Ekurhuleni Metropolitan Municipality.

The research is a quantitative, retrospective cohort analysis. Logistic regression and Chi-square tests were used to determine rates of retention and factors associated with loss to follow-up. Behavioural theories were used to interpret the research findings.

The research findings revealed that rates of retention were at 91.8 per cent and loss to follow-up was at 8.2 per cent. Furthermore, health facility, age at enrolment and duration on ART were associated with the probability of being lost to follow-up, nonetheless, there was no difference in sex and no association with modality.

The finding from the study confirms that alternative ART care models are important in scaling up and delivering ART within an urban township setting, although there was poor viral load specimen collection at the scheduled clinic appointment good rates of retention in care and viral load suppression were achieved. Overall, the implementation of the intervention in a similar setting should be customised to patients aged between 18-24 years or younger, and those with a duration on ART of fewer than 24 months at enrolment differentiated care ART delivery models to reduce the probability of being lost to follow up after enrolment.

Keywords: HIV/AIDS, differentiated care models, antiretroviral therapy, retention in care, viral load suppression and loss to follow-up.

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1. INTRODUCTION TO THE RESEARCH

1.1 Background

In general, this research evaluates the outcomes of the ‘differentiated care’ antiretroviral therapy delivery models in South African urban townships. This chapter introduces the background to the research problem statement (Section 1.2.1), consequently, the purpose of this research (Section 1.2.2), the research questions and the accompanying hypothesis (Section 1.2.3), we briefly introduce the terms and concepts that we have used in conceptualising this research. Section 1.1.1 introduces, in brief, the overview of the burden of the HIV epidemic globally, in sub-Saharan Africa as well as in South Africa. Section 1.1.2 introduces the ‘differentiated care’ antiretroviral therapy delivery model, origins of the programme, implementation, and outcomes. Section 1.1.3 introduces Tembisa to the research setting.

1.1.1 The overview and description of the HIV Epidemic burden, in brief

The HIV epidemic has been a challenge around the world, causing devastation to humans. According to UNAIDS (2019) by the end of 2018, it was estimated that about 37.9 million people were living with HIV (PLHIV) globally of which 23.3 million people were accessing antiretroviral therapy, with 1.7 million newly infected with HIV worldwide decreased from 2.1 million in 2015, 770 000 people died from AIDS-related illnesses in 2018. AIDS-related mortality has declined by 33 per cent since 2010 an estimated 800 000 people acquired HIV in Eastern and Southern Africa in 2018: a decrease of 28 per cent from the number of new HIV infections in 2010 (UNAIDS, 2019). Victoria, Granich, Gilks, Gunneberg, Hosseini, Were & De Cock (2009) agree that Sub-Saharan Africa continues to be predominantly severely impacted region in the world, accounting for approximately two-thirds of all incident and prevalent HIV infections and three-quarters of all AIDS deaths and nearly 90 per cent of African children have HIV.

In South Africa, it is projected that 7.1 million people are living with HIV (PLHIV), with approximately 4.1 million people accessing ART (NDOH, 2017). With nearly 270 000 new infections in 2016, this reflects a prevalence rate of 12.8 per cent among the population (NDOH, 2017). South Africa has one of the largest HIV programmes in the

world. Provincially, the high prevalence of HIV is concentrated in eThekweni in KwaZulu-Natal and Ekurhuleni in Gauteng followed closely by Buffalo City in the Eastern Cape. The City of Tshwane and the City of Johannesburg have an HIV prevalence that is slightly lower than the national average, but not significantly so (Shisana et al., 2015).

1.1.2 The ‘differentiated care’ antiretroviral therapy delivery model

In the past decades, countries with limited resources have made substantial efforts to scale up ART to those who need it the most to reduce HIV-associated mortality and morbidity, while attempting to improve retention in care and viral load suppression (Gabillard, Lewden, Ndoye, Moh, & Segal, 2013). South Africa is no different. In 2015, the World Health Organisation (WHO) released new guidelines recommending that HIV treatment be provided to all HIV-positive regardless of their CD4 count (WHO, 2016). Which prompted the National Government to make policy amendments in response to the high HIV epidemic and expansion of the ART programme to scale up access to HIV care and further modify models of ART delivery (NDOH, 2016). In 2016, the National Department of Health introduced Differentiated care ART delivery models as part of the National Adherence Strategy which is implemented in all health facilities (NDOH, 2016). Differentiated ART delivery models are an innovative way to deliver ART, focus, and adapt how stable patients access HIV care (Care, 2019). The focus has always been on testing and initiating patients on ART, however, adherence to ART and long-term retention in care is critical in attaining optimum viral load suppression. It is envisaged that differentiated care ART models will improve the quality and access to care, which will increase the levels of adherence and empower patients to take responsibility for their chronic illness (Care, 2019). The study is based on an outcome evaluation, which is a component of summative evaluation. Therefore, a summative evaluation assesses the intervention outcomes and documents the intervention processes to facilitate informed decisions about the overall effectiveness of the intervention.

1.1.3 An introduction to Tembisa in Ekurhuleni Metropolitan Municipality

Tembisa is an urban township located in the vibrant Gauteng Province situated in the North of the City of Ekurhuleni about 17 kilometres from Kempton Park (Kadozo, 2009). The township is located between Pretoria and Johannesburg, with Olifantfontain, Midrand and Kempton Park, surrounding it with an estimated population size of 511 655 in 2015 (Masuku et al., 2018 & Massyn, 2018). The area has one regional hospital (Tembisa Hospital) with up-and-down referral pathways and support from 2 CHC and 15 clinics (Massyn, 2018), where people living with HIV access their treatment and care.

1.2 TOWARDS AN OUTCOMES EVALUATION OF THE ‘DIFFERENTIATED CARE’ ANTIRETROVIRAL THERAPY DELIVERY MODEL IN SOUTH AFRICAN URBAN TOWNSHIP

1.2.1 The research problem statement

In sub-Saharan Africa, South Africa has one of the utmost HIV prevalence and a huge ART programme in the world. ART is a ‘holistic’ treatment approach that aims to prolong life expectancy and enhance the quality of life of people living with HIV. Considering that ART interventions have evolved over the years, with the introduction of “test and treat” and massive expansion of ART there is a notable increase in ART cohorts, which places huge pressure on the health care system and presents challenges with, maintaining high-quality services to ART patients. This, places healthcare at a great disadvantage, since most healthcare systems in developing countries are only geared towards the management of acute disease rather than providing chronic disease management (Bemelmans et al.; 2014). Consequently, this also contributes to high rates of attrition resulting in deteriorating retention in care reported through ART programmes (Fox & Rosen, 2010; Kranzer et al., 2012).

Bemelmans et al. (2014) stated that continued adaptation in models of ART delivery that closely represent people’s lives is required to deal with the challenges of scaling up to those who need it and improving retention in care for those who are on ART. It is imperative for patients to adhere to treatment and be retained in care to enable them to attain viral load suppression. Adherence is a key determining factor of both outcomes (Gast & Maths, 2019 & Jobanputra, Parker, Azih, Okello, Maphalala, Kershberger et al., 2015).

Patient-centred models of care are needed, to address widely divergent requirements of the patient and increase access points to receive care, more especially for stable patients that do not need regular care or visits. In response to the high HIV epidemic and expansion and scale-up of the ART programme, differentiated care ART delivery models were introduced by the National Department of Health and are being rolled out in all health facilities as part of the National Adherence Strategy (NDOH, 2016). In addition, in efforts to provide effective health care and bring medication nearer to the people who need it the most, the City of Ekurhuleni has established 21 chronic

medications pick up points which have reduced long queues and waiting periods at the clinics (City of Ekurhuleni, IDP, 2018).

In the context of public health studies and chronic disease management, retention in care and viral load suppression are immediate outcomes to measure the differentiated models of care. Alternative care models such as the differentiated care ART delivery model are implemented at scale in South Africa; however, there is little evidence of the scale-up of these model outcomes in South Africa's urban townships (Tembisa). In addition, authors like Barker et al. (2017), Prust et al. (2017) & Wilkinson et al. (2016) identified that although there is evidence of implementation of differentiated care at scale, the patient's characteristics, and outcomes because of these types of models were not evaluated. Therefore, given the results presented by the literature, it is evident that there is a need to evaluate the impact of these models on patient's outcomes thoroughly. For that reason, the study will evaluate the outcomes of the differentiated care ART delivery model to understand and monitor retention in care and viral load suppression since enrolment in Tembisa, especially when implemented at scale (Wilkinson et al., 2016).

1.2.2 The research purpose statement

The purpose of the research study is to assess the outcomes of the differentiated care antiretroviral therapy delivery models in a South African urban township (Tembisa), which is situated in the North of Ekurhuleni Metropolitan Municipality. This was achieved by determining the rates of retention of stable patients on differentiated care antiretroviral therapy delivery model for 24 months. To identify factors associated with loss to follow-up over 24 months since enrolment on differentiated care ART delivery models, and to determine the proportion of stable patients with a viral load completion and viral load suppression on differentiated care antiretroviral therapy delivery model for 24 months.

First, we review the literature to contextualize the research setting and understand the physical research context. Second, we review the literature to better understand and describe the context and history of the Human Immunodeficiency Virus (HIV1) epidemic, key determinants of HIV transmission, as well as root causes and consequences of HIV. In addition, we review the literature to understand the research

problem and determine the knowledge gap. Third, we entrench the study within the public health field of study, with a focus on preventive medicine, tertiary prevention, and finally chronic disease management as subcomponents of public health relevant to this research. The academic field of study provides a theoretical context to the research, more specifically it provides a backbone for the variables such as retention in care, viral load suppression, and loss to follow-up, which are key outcomes of this research. We develop a theoretical framework utilizing public health frameworks to interpret the research findings. Forth, we conceptualize a vigorous result chain displaying the relationship between inputs, activities, output, outcomes, and impact of the intervention. Firth, we interrogate similar past, and recent studies to identify and recommend a quantitative research strategy, a longitudinal research design, research procedure, and methods appropriate to evaluate the efficacy of the intervention in Tembisa. Sixth, we collect and analyse data on the outcomes of the differentiated care ART delivery models. Lastly, based on the findings, we will use the Information-Motivation- Behavioural Skills Model and The Health Belief Model for health and other behavioural theories to interpret the research findings. We use the theoretical framework, and result chain to explain and show the fundamental relation between the intervention and anticipated outcomes. In addition, this will help us determine whether the outcomes were influenced by the intervention. We hope that this research will benefit healthcare workers in understanding the outcomes of differentiated care ART delivery models in an urban township setting.

1.2.3 The research questions

1.2.3.1 What are the rates of retention in the care of stable patients on the differentiated care antiretroviral therapy delivery model for 24 months?

Null hypothesis: There is no difference in rates of retention in care among stable patients on the differentiated care antiretroviral therapy delivery model for 24 months.

Research hypothesis: There is a high rate of retention among stable patients on the differentiated care antiretroviral therapy delivery model for 24 months.

1.2.3.2 What are the factors associated with loss to follow-up among stable patients on differentiated care antiretroviral therapy delivery model for 24 months?

Null hypothesis: There are no factors associated with loss to follow-up amongst stable patients on differentiated care antiretroviral therapy delivery model for 24 months

Research Hypothesis: Various factors are associated with loss to follow-up amongst stable patients on differentiated care antiretroviral therapy delivery model for 24 months.

1.2.3.3 What is the proportion of stable patients with viral load completion and viral load suppression on differentiated care antiretroviral therapy delivery model for 24 months?

Null hypothesis: There is no difference in the proportion of stable patients with viral load completion and viral load suppression on the differentiated care antiretroviral therapy delivery model for 24 months.

Research hypothesis: There are high proportions of stable patients with viral load completion and viral load suppression on the differentiated care antiretroviral therapy delivery model for 24 months.

1.3 Delimitations of the research

Differentiated care ART delivery models are an extension of the ART programme. As part of the HIV continuum of ART care, outcomes include viral load suppression and retention in care. Literature has shown when patients adhere to treatment, they are more prone to retain in care and substantially improve viral load suppression (NDOH, 2016). Therefore, it is essential to implement patient-centred approaches intended to improve adherence to treatment, retention in care, and viral load suppression. The focus of the research is on the outcomes of the differentiated care delivery model concentrating on retention in care, viral load suppression and loss to follow-up. Moreover, the study is a summative evaluation, nested in public health studies, focussing on preventive medicine with an emphasis on tertiary prevention, therefore introducing chronic disease management and paying special attention to that immediate outcome's retention in care and viral load suppression. Although the researcher is aware of the recent changes in the Adherence guideline, the study will use the 2016 National Adherence guidelines, the set inclusion and exclusion criterion, including the viral load suppression threshold of less than 400 copies/ml. ultimately, this study is a retrospective cohort analysis, and it will be best to utilize the 2016 guidelines.

1.4 Justification of the research

Given the evolution and expansion of ART programmes, in a country with one of the largest ART programmes. The scale-up of ART delivery models is necessary to meet the needs of people living with HIV (WHO, 2016). Differentiated care ART delivery models have been implemented at scale in health facilities across the country to mitigate challenges around the provision of ART to those who need it the most and maintain quality care for those who are already on ART. According to Mody et al. (2018), alternative ART delivery models, such as differentiated care can bring about effectiveness and enhancements in the general quality of ART service delivery arrangement. Be as it may, it is unclear why poor retention in care is reported across the country (Fox & Rosen, 2010; Kranzer et al., 2012). Moreover, there is expanding evidence of differentiated care models for ART delivery, but there is limited evidence of how these models impact ART outcomes, especially when implemented at scale (Barker et al., 2017; Prust et al., 2017 & Wilkinson et al., 2016). Subsequently, there are inadequate studies that have evaluated the scale-up of these models and their impact on ART outcomes in urban townships like Tembisa, in this type of setting evidence of factors associated with loss to follow-up within these models of care are scarce. The study is based on an outcome evaluation of differentiated care ART delivery models. Literature put forward, key outcomes of the intervention are retention in care, loss to follow-up and viral load suppression, which hinges on patients being adherent to treatment, scheduled clinical appointments and /or pick-up points, and having a viral load test done at appropriate intervals. (Bemelmans et al., 2014). In the end, this research seeks to examine the outcomes of the differentiated care ART delivery model in an urban township, namely, Tembisa in Ekurhuleni District. The focus of this study is to assess the outcomes of the differentiated care ART delivery model, derive a conceptual framework to guide the process and interpret the outcomes of intervention with emphasis on retention in care, viral loads suppression trends, and identify factors associated with loss to follow up. This study will provide recommendations that may influence new developments in the ART programme and generate new evidence that will enhance the understanding of the differentiated ART delivery model outcomes and factors that affect retention in care within these models.

1.5 Preface to the research report

Chapter 1: Introduction to the research

Overall, there are six chapters in this report. Chapter 1 of the research study provides the introduction and background, the rationale of the research, the problem statement, the purpose statement and the research question and the accompanying hypothesis. This chapter introduces the overview of the burden of the HIV epidemic globally, Sub-Saharan Africa as well as South Africa; introduces the differentiated care antiretroviral therapy delivery model and further introduces Tembisa in Ekurhuleni metropolitan municipality as the research setting. This chapter reflects on the research conceptualisation towards the outcome's evaluation of the differentiated care ART delivery model in urban townships. The research questions were coined to assess the outcomes of the intervention, moreover, this chapter explains the delimitation, scope, and boundary of the study. Most importantly, it explains the justification of the study, and why it is important to assess the outcomes of the intervention.

Chapter 2: Reviewing literature to derive the conceptual framework

Following this introductory chapter 1, chapter 2 sets out the literature review that systematically discusses concepts, models, and theories by firstly having a specific and detailed discussion on the research context. The discussions start by describing the history and description of Ekurhuleni district in Gauteng Province and zoom in to Tembisa as the research context. Secondly, then discuss the challenges of the HIV epidemic and ineffective HIV interventions, systems, root causes, and consequences. In addition to this discussion the differentiated care ART delivery model conceptualisation and implementation. Thirdly, this chapter discusses the knowledge gap analysis based on the reviewed similar evaluations focusing on aspects related to the intervention outcomes and paying attention to the limitations of the past and current studies, forth the charter discusses public health studies, with specific reference to preventative medicine, tertiary prevention, and chronic disease management. A theoretical framework for the interpretation of research findings was developed. Lastly, a conceptual framework was conceptualised and summarised to offer a roadmap detailing how the research was embarked on.

Chapter 3: Research strategy, design, procedure, and methods

This chapter discusses the chosen research strategy, design, and procedures based on the literature review of the past and current studies in chapter 2. The research is a quantitative research study, retrospective cohort analysis. An inclusion and exclusion criterion were utilised to select the research target population, purposive sampling was used to select the health facilities and stratified random sampling was used for the selection of participants. The secondary data were from the electronic clinical record and extracted to an excel file, coded, imported, and analysed utilising STATA corp.2019, finally, the chapter imparts the reliability and validity measures and drawbacks of the research design.

Chapter 4: Presentation of research results

Chapter 4 set out to present the research results on the outcomes of the differentiated care ART delivery model intervention and share all matters raised in the posed research questions and further compare the research results with other similar studies and offer a conclusion to the research results. Rates of retention were found to be high among stable patients in differentiated care ART delivery models, furthermore, health facility, age at enrolment and duration on ART before enrolment were statistically significant while there was no association by sex, modality and viral load suppression, the research further highlights poor viral load uptake within 28 days of the scheduled visit. On the contrary for those who had a viral load completed, high viral load suppression was achieved.

Chapter 5: Discussion of research finding

Chapter 5 presents and deliberates on the findings in chapter 4, based on the theoretical framework to reinforce the interpretation of the research findings. The information, motivation and behavioural skills models and health belief models were used to interpret the research results, in addition to this grounded by the patients' characteristics the social-ecological theory and the theory of planned behaviour were further used to interpret the research findings. The results chain shows that the intervention has

achieved its intended outcomes, therefore we can conclude that the differentiated care delivery models were successful in attaining the desired outcomes in a South African urban township setting.

Chapter 6: Summary, Conclusions, limitations, and recommendations

Finally, Chapter 6 displays the knowledge gained from embarking on the research to assess the outcomes of the differentiated care ART delivery models. This chapter begins by summarising the research study, highlighting the research problem, and extensively discussing the HIV epidemic, it provides a condensed discussion on reviewed past and current studies to establish the knowledge gap. From these discussions, the chapter highlights the research strategy, design, procedure, and methods. In addition, key research results and findings were discussed and interpreted from the viewpoint of public health studies utilising behavioural theories. Moreover, the chapter presents the limitations of the study what was done and what the research could not attain. Most importantly the research provides recommendations towards the outcome's evaluation of the differentiated care ART delivery models from the perspective of South African urban townships and paves a way for future studies to be conducted.

2 REVIEWING LITERATURE TO DERIVE THE CONCEPTUAL FRAMEWORK

This chapter reviews the literature that underpins the research title. Firstly, we begin by describing the research context setting (section 2.1). Section 2.2 shows the understanding of the research problem that requires the conceptualisation of the study by discussing the context and history of the Human Immunodeficiency Virus (HIV1) epidemic, key determinants of HIV transmission, provision, and access to health care furthermore highlight the symptoms, root causes, and consequences. In addition to this, we discuss the differentiated care antiretroviral delivery model conceptualisation and implementation. Section 2.3 reviews the literature on the purpose of the study, method, findings, and conclusions from various reviewed studies that have conducted comparable evaluations focusing on aspects related to the study's results. The research pays attention to the limitation of reviewed studies to identify the knowledge gap and in addition propose the appropriate research strategy, research, design procedure, and methods for the study. The knowledge that we have acquired (section 2.4) discusses the broad field of public health, focussing on the key components, preventive medicine, tertiary prevention, and chronic disease management and the process that is outcome evaluation. To measure the outcomes of the intervention. Section 2.5 defines the attributes and variables in public health key to the efficacy of the outcome's evaluation. In Section 2.6, we discuss the theoretical framework that this study derives from and identified the Information- Motivation- Behavioural Skills Model and The Health Belief Model as the most suitable interpretive framework for the study and supported by other health behavioural theories. The last section 2.7 is a conceptual framework that provides a roadmap of how this research plans to measure the outcomes of the differentiated care antiretroviral delivery models.

2.1 The history and description Ekurhuleni Metropolitan Municipality in Gauteng Province

This section describes the research context/setting to understand the physical research context. This will assist in contextualising the research discussions that underpin the research problem as encountered in the research setting. It will further contribute towards understanding the research questions, knowledge gap, limitations, and

justification of the research. This was accomplished by reviewing literature that highlights the history and description of Ekurhuleni Metropolitan Municipality which includes its population and socio-economic status. The research will also expand on the demographics, economic status, provision, and access to health care in the City of Ekurhuleni, with a specific focus on the research setting Tembisa.

2.1.1 History of Ekurhuleni Metropolitan Municipality

Ekurhuleni Metropolitan (metro) Municipality is one of the big three (3) big metros in Gauteng located in the east of the province. It is one of the six districts in the province; and is further divided into three sub-district, namely East, North, and South (Global Insight SA, 2008 & Tshabalala, 2012). The city was founded over nineteen years after the restructuring of nine cities and townships into one local government in early 2000, formally known as East Rand (City of Ekurhuleni, 2018, Global Insight SA, 2008 & Gumbi, 2015).

The city of Ekurhuleni is an urban and semi-urban Municipality, and it is classified as a category A (category A is a Metropolitan Municipality that is solely governed by the executive and legislative authority in its area) (Tshabalala, 2012 & Massyn, Tanna, Day & Ndlovu, 2018). The following towns were amalgamated in the new Metropolitan Municipality Alberton, Benoni, Boksburg, Brakpan, Edenvale/Lethabong, Germiston, Kempton Park/Tembisa, Nigel and Springs, along with the Kyalami Metropolitan council and the Eastern Gauteng services council (City of Ekurhuleni, IDP, 2018). According to the City of Ekurhuleni, IDP (2018) & Ekurhuleni Metropolitan Municipality (2005) the municipality occupies a surface region of approximately + - 2000 square kilometres with an estimated population of 3 379 104 in 2016, this represents 28 per cent of Gauteng's population and make up 5.6 per cent of the national population.

The report further states that the municipality is one of the most densely populated regions in the province and country, with just about 1 250 people per square kilometre. One of the significant characteristics of the population growth is the clear migration in Ekurhuleni, along with Tshwane and Johannesburg; these cities are the main biggest

receivers of in-migration in South Africa (City of Ekurhuleni, IDP, 2018). The city's name is of Tsonga origin meaning a "place of peace".

Figure 1: shows Ekurhuleni service regions, which consist of eastern, southern, and northern service delivery regions. The study setting, Tembisa is situated in the northern service delivery region, about 17 Kilometres North of Kempton Park.

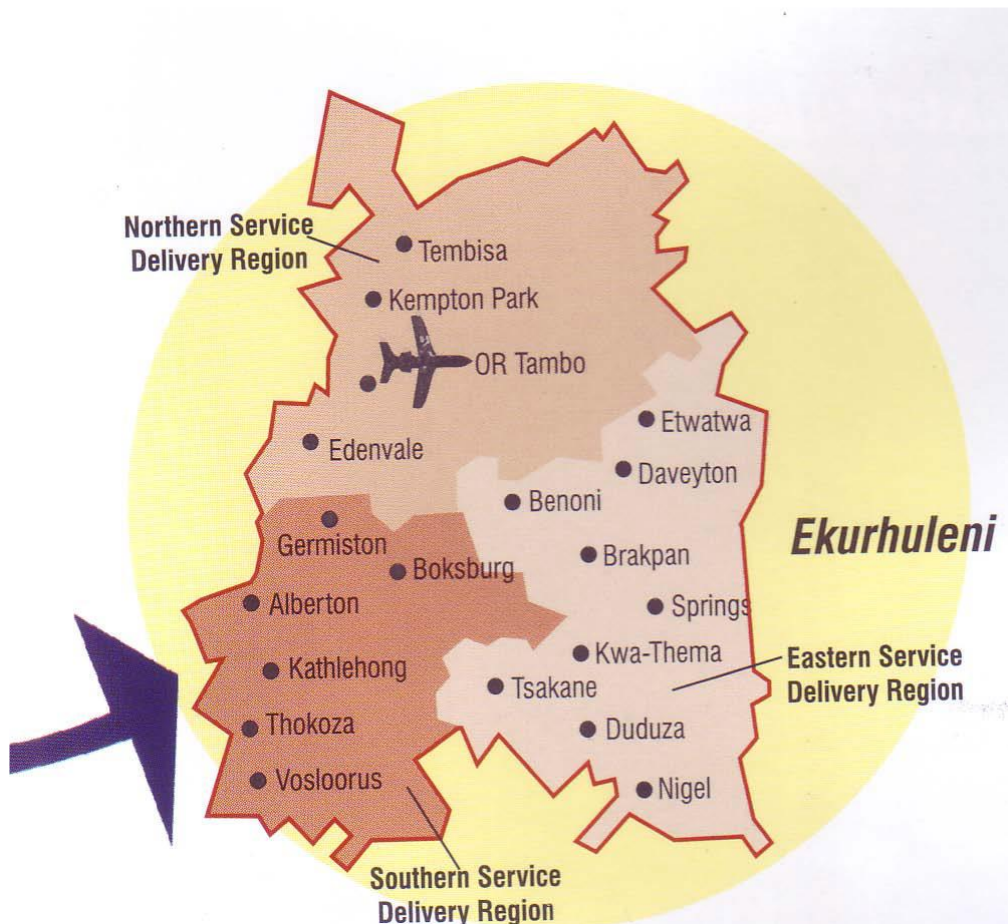


Figure 1: Ekurhuleni Regional Map

Source: Ekurhuleni integrated development plan Adopted from Ndhambi, M.A (2012)

As part of the background of the research setting figure2, shows Ekurhuleni's organisational structure of the office of the chief whip and figure3 the Ekurhuleni Metropolitan Municipality Executive Mayor and Members of the Mayoral committee who oversee running the city and providing services in and around Ekurhuleni including surrounding townships.

Figure 2: Shows the Ekurhuleni Metropolitan Municipality Chief Whip Organisational Administrative Structure

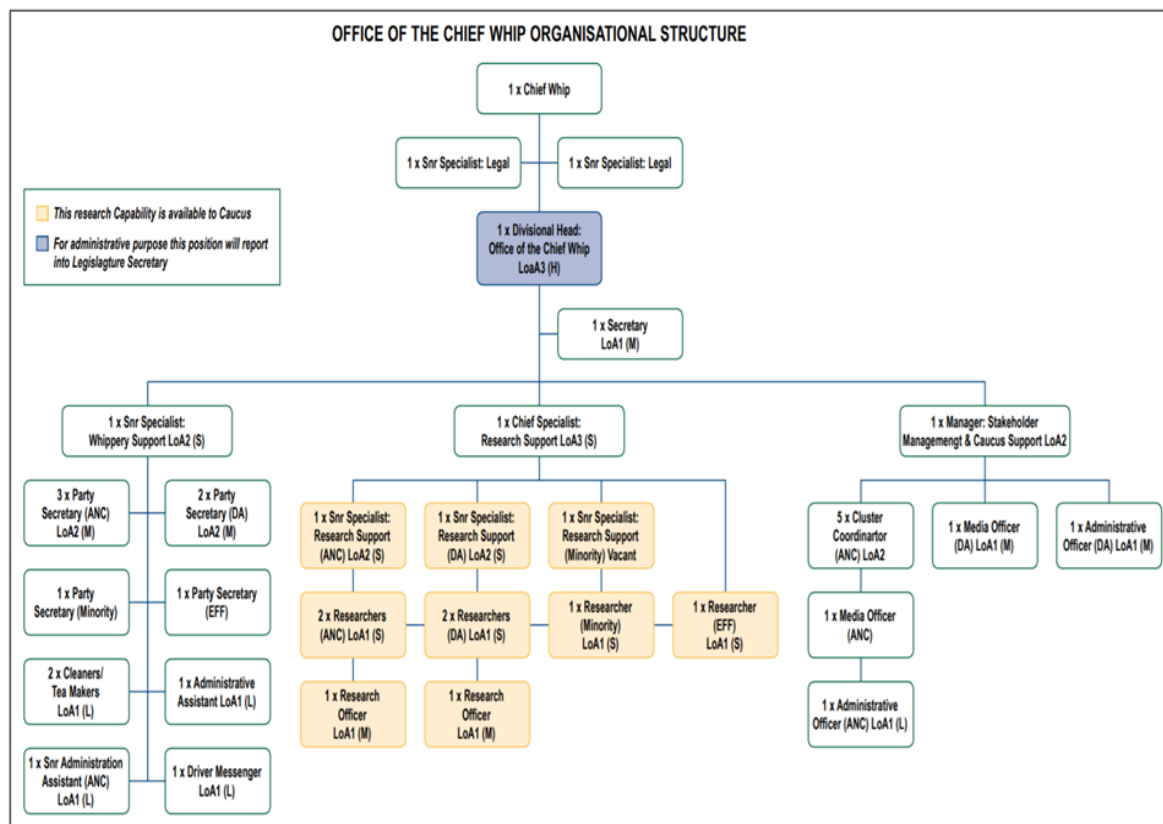


Figure 2: Office of the chief whip organisational structure

Source: City of Ekurhuleni Annual Report 2017/18

Figure 3: Shows the Ekurhuleni Metropolitan Municipality Executive Mayor and Members of the Mayoral committee



Figure 3: Executive Mayor and Members of Mayoral committee
Source: City of Ekurhuleni Annual Report 2017/18

2.1.2 Demographics and Socio-economic status

Ekurhuleni Metropolitan Municipality population is still relatively young, with an age median of 30 years (Ekurhuleni, IDP, 2018). The report highlights that bulk of the people are between the ages of 18-64, which constitutes 66 per cent of the overall population, 18 per cent of the population is below the age of 18 years and about 6 per cent of the population is above the age of 65 (Ekurhuleni, IDP, 2018). The Metro predominantly consists of IsiZulu-speaking people, followed by Sepedi, Sesotho, and English. Usually, people in the city are multilingual with all eleven South African languages spoken. Eighty (80) per cent, of the population, is African (Black) followed by white (14 per cent), Coloured (3 per cent), and Indian (2 per cent) respectively; the males account for 51 per cent and women are just about 49 per cent of the population (Global Insight SA, 2008; Gumbi, 2015 & Tshabalala, 2012).

Ekurhuleni is looked upon as one of the vibrant, eventful, and active business hubs in South Africa, the city had exceptional road networks; it is the home of OR Tambo international airport, and considering it is the transportation hub of South Africa with infrastructure that can compete abroad with those in Europe and America (Massyn et al. 2018). Ekurhuleni Metropolitan Municipality (2015) and Massyn et al. (2018) further state that the city has one of the varied and largest economies in comparison with smaller African countries, as well as all the countries in southern Africa.

The four main sectors are manufacturing, finance and business services, community, and general government, and trade and hospitality at a minimum scale (City of Ekurhuleni, IDP, 2018). In addition, Gumbi (2015) affirms that manufacturing accounts for approximately 20 per cent of the GDP in the province. Regardless of the city, having an enormous economy there are high rates of unemployment (34 per cent) and underemployment with 30 per cent of the local population living in poverty (Kadozo, 2009). Moreover, Kadazo (2009) stipulates that there is a high demand for technical skills; however, the population has low skills that do not meet or fit the demand of the local economy.

In addition, the household survey (2016) stipulates that the city of Ekurhuleni has 1 299 490 households, which constitute a quarter of Gauteng households and roughly 10 per cent of the country's households, of these, 18.7 per cent represents informal dwellings (City of Ekurhuleni, IDP, 2018). Overcrowding is an issue in the city of Ekurhuleni, which results in the dilapidation of the environment; furthermore, the municipality does not have adequate land to deal with the housing backlogs (City of Ekurhuleni, IDP, 2018).

2.1.3 Provision and access to health care

Access to health care services in Ekurhuleni Metropolitan Municipality is inequitable. According to Masuku, Mophosho & Tshabalala (2018) & Ekurhuleni Metropolitan Municipality (2005) social determinates of health are also linked with poverty, therefore, poor communities experience high levels of HIV/AIDS and other poverty-related diseases, as a result of community development, healthcare and poverty are inseparable. Regardless of this primary health care is extremely accessible. According to the City of Ekurhuleni, IDP (2018) report, about 96 per cent of babies were delivered in a clinic

setting in 2016 as compared to 83 per cent in 1998. More babies are born alive due to the assistance of skilled healthcare workers.

Moreover, the report further states that the burden of primary health care is gradually assigned to the municipality; as a result, local government endures most of primary health care expenditure. (City of Ekurhuleni, IDP, 2018).

The Ekurhuleni Health District plan (2018) reports that health care service in the city of Ekurhuleni is provided through four regional hospitals, one central tertiary hospital, nine Community Health Centres, and eighty-four clinics. The city of Ekurhuleni, IDP (2018) report affirms the strides that the city has made in improving provision and access to health care, currently, eleven clinics are operating 24 hours that provide crucial services that are rendered mostly in hospitals: thus, reducing the cost of travelling during emergencies, therefore, overloading the burden on hospitals and EMS services. In addition to this, in efforts to provide effective health care and bring medication nearer to the people who need it the most, the city has established 21 chronic medications pick-up points which will, in turn, reduce queues and waiting periods at the clinics (City of Ekurhuleni, IDP, 2018). By June 2017 six health facilities were constructed, which will service about 300 000 people, in addition to this, three clinics were opened, namely Khumalo, Tshietsi, and Dukathole clinic. (City of Ekurhuleni, IDP, 2018).

2.1.4 Tembisa

Tembisa the research context is a township situated in the north of the City of Ekurhuleni about 17 kilometres from Kempton Park (Kadozo, 2009). The township is located between Pretoria and Johannesburg, with Olifantfontain, Midrand, and Kempton Park, surrounding it, Tembisa occupies 42.8 square kilometres with an estimated population size of 511 655 in 2015 (Masuku et al. 2018 & Massyn, 2018). In early 2000, the township was amalgamated into Ekurhuleni Metropolitan Municipality (Kadozo, 2009).

The area has one regional hospital (Tembisa Hospital) with up-and-down referral pathways and support from 2 CHCs and 15 clinics (Massyn, 2018). Gumbi (2015) reports that Tembisa is predominately black with 35 per cent of people speaking Sepedi, 25 per cent Zulu and 12 per cent speaking Tsonga. Like most townships in South

Africa, the people living in Tembisa are facing poverty, high unemployment, poor service delivery, inequitable health care, and inadequate housing (Masuku et.al, 2019).

According to Kadozo (2019), South African History Archives, (2019) & Masuku, (2019) Tembisa was founded in 1957 as black people were relocated from Alexandra and other areas such as Edenvale, Germiston, Midrand, and Kempton Park when the apartheid regime was enforcing the segregation policies with the sole purpose of establishing a local township to serve Pretoria and Germiston. In addition, Mr J.H.M. Meyer, and Mrs M.W.Z. van Wyk formally owned the farm, which Tembisa was developed, and the land was purchased with funding from the National Housing Commission government loans (SAHA, 2019). In terms of the Black Local authority Act of 1982 parliament endorsed and assigned Tembisa municipal status, subsequently, councillors were elected in 1983 however, the community was not pleased with the Black Local Authority Act as it was meant to continue with apartheid (Kadozo, 2009). Tembisa originates from Nguni meaning promise or hope (SAHA, 2019).

The above background provides context and sets the next section to discuss in detail the challenges of HIV, inefficient HIV interventions, symptoms, root causes, and consequences.

2.2 The challenge of HIV, inefficient HIV interventions; symptoms, root causes, and consequences

In this section, the researcher seeks to analyse the research problem with the view to understanding the challenges, and description of the HIV epidemic, and inefficient HIV programmes. Section 2.2.1 outlines the history and derivation of HIV in brief. More emphasis of the study is on the epidemiology of HIV globally, in sub-Saharan Africa and in South Africa. The research explicitly investigates the key determinants of HIV, the root causes, and the consequences of the HIV epidemic. The analysis and evaluation are done by reviewing academic and non-academic literature to highlight the symptoms, root causes, and consequences of HIV. This will enable us to show the history, trends over time and how widespread is the problem. This section further looks at the differentiated care ART delivery model and constructs a result-chain and result framework of the intervention.

2.2.1 The History and description of the Human Immunodeficiency Virus (HIV1) epidemic

Human immunodeficiency virus (HIV 1) suppresses the immune system and triggers immunodeficiency in infected patients thus leading to Acquired Immune Deficiency Syndrome (AIDS). There are various debates on the origins of HIV, however, according to literature AIDS was formally detected in 1981 in a homosexual male patient who had sex with men in the United States of America (Sharp & Hahn, 2010; De Cock, Jaffe & Curran, 2012). In South, Africa HIV was identified and diagnosed among homosexual white men who had visited America in 1982 (Ras, Simon, Anderson, Prozesky & Hamersma, 1983). HIV is highly transmissible. Sharp et al. (2010); De Cock et al. (2012) believe that HIV developed from a type of chimpanzee virus found in the West of Africa, and cross-species transmitted to humans through contact with infected blood and caught the virus. However, most of the AIDS-related cases were among homosexual or bisexual males, drug addicts, Haitian immigrants to the USA, and haemophiliacs (Ras, Simon, Anderson, Prozesky & Hamersma, 1983).

The HIV epidemic has been a challenge around the world, causing devastation to humans. According to UNAIDS (2019) by the end of 2018, it was estimated that about 37.9 million people were living with HIV (PLHIV) globally of which 23.3 million people were accessing antiretroviral therapy, with 1.7 million newly infected with HIV worldwide down from 2.1 million in 2015, 770 000 people died from AIDS-related illnesses in 2018. AIDS-related mortality has declined by 33 per cent since 2010 an estimated 800 000 people acquired HIV in eastern and southern Africa in 2018: a decrease of 28 per cent from the number of new HIV infections in 2010 (UNAIDS, 2019). Victoria, Granich, Gilks, Gunneberg, Hosseini, Were & De Cock (2009) agree that Sub-Saharan Africa continues to be predominantly severely affected region in the world, accounting for three-quarters of all AIDS deaths and nearly 90 per cent of African children are infected with HIV.

South Africa has one of the highest prevalence in the world. It is estimated that 7.1 million people are living with HIV (PLHIV), with nearly 270 000 new infections in 2016, reflecting a prevalence rate of 12.8 per cent among the population, with approximately, 4.1 million people accessing ART (NDOH, 2017). In 2015, HIV prevalence amongst women who attended antenatal care was 30.8 per cent this is the highest point prevalence observed in the last 5-year period (NDOH, 2017).

Provincially, the high prevalence of HIV is concentrated in eThekweni in KwaZulu-Natal and Ekurhuleni in Gauteng followed by Buffalo City in the Eastern Cape respectively. In the City of Tshwane and the City of Johannesburg's HIV prevalence is a little lower than the national average, but not considerably so (Shisana et al., 2014).

Figure 4: HIV prevalence and 95% CI among antenatal women for 2015 by province. The results from the National Antenatal Sentinel HIV& Syphilis Survey show that Kwazulu-Natal had the highest prevalence among antenatal women, with Limpopo, North Cape, and Western Cape with the least prevalence.

Figure 4: HIV prevalence and 95% CI among antenatal women for 2015 by Province
(Source: NDOH, 2017)

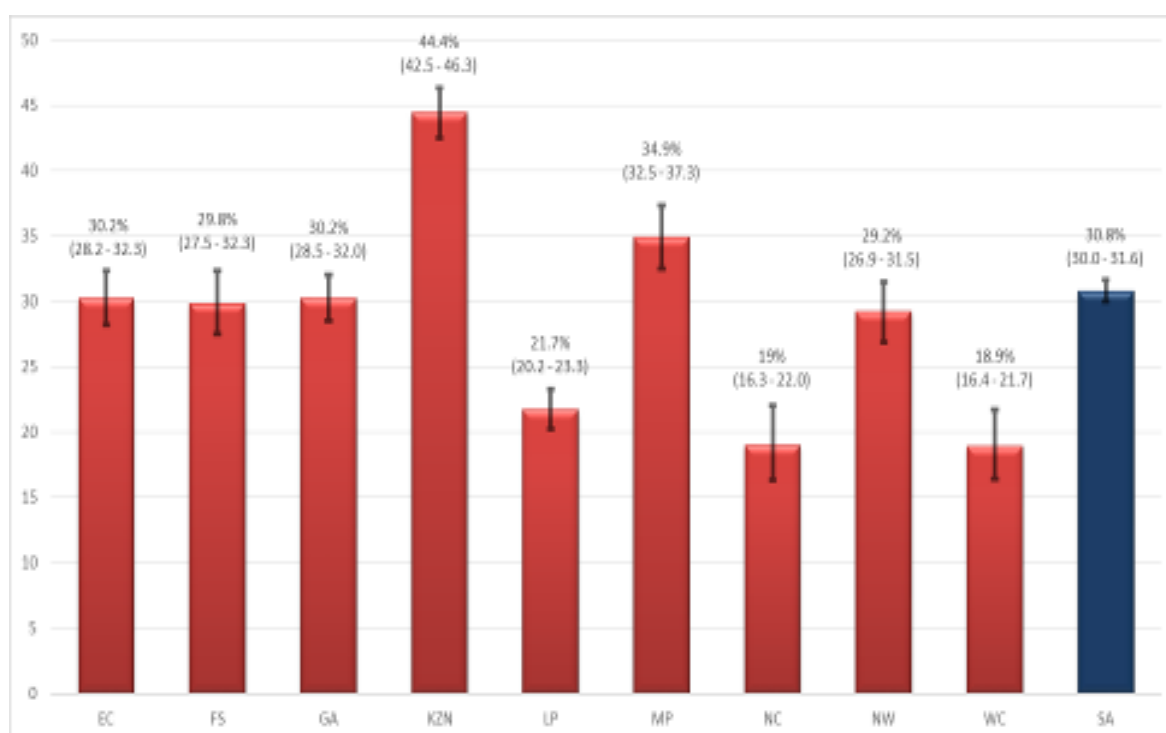


Figure 5: below shows a 5-year trend of HIV prevalence among antenatal women by province, KwaZulu-Natal (KZN), Gauteng (GP), Eastern Cape (EC) and Mpumalanga (MP) have the highest prevalence, with Limpopo (LP), Western Cape (WC) and Northern Cape (NC) with the lowest respectively. Free State (FS), MP has shown a decline in prevalence since 2014. Overall, since 2014 South Africa has shown a slight increase in HIV prevalence among antenatal women from 30.0 per cent to 30.8 per cent in 2015.

Figure 5: HIV prevalence by province 5-year trend

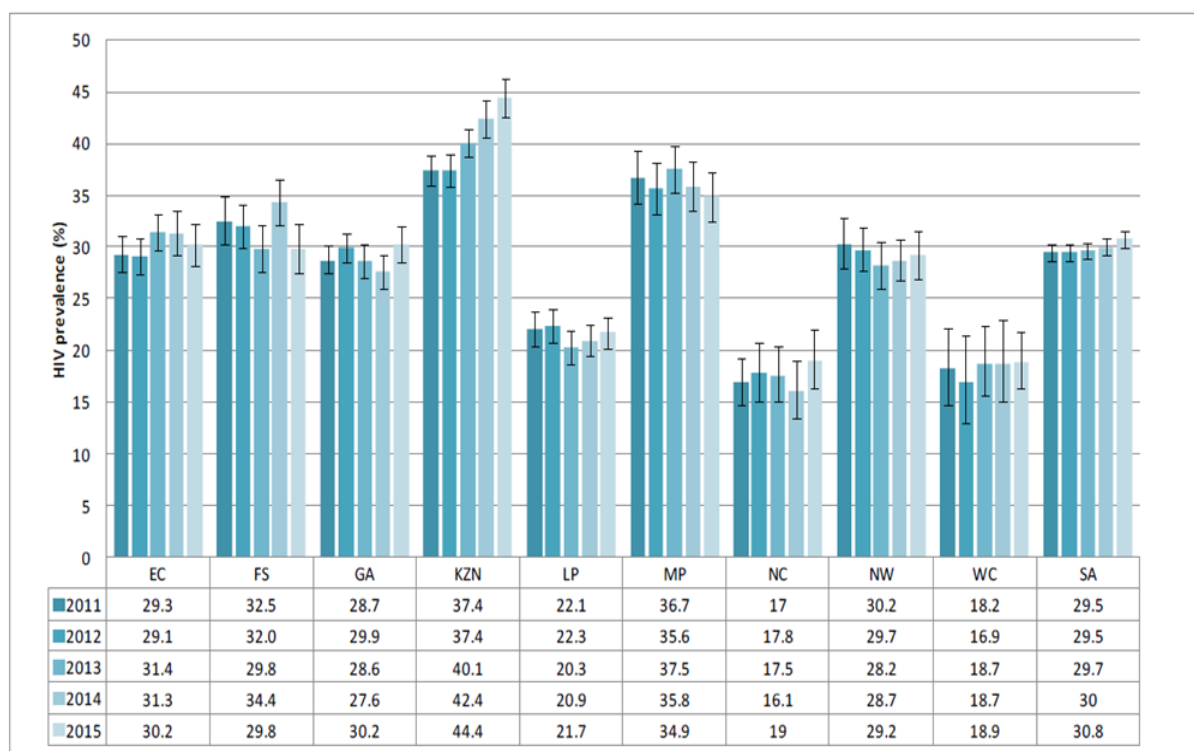


Figure 5: HIV prevalence by province 5-year trend

(Source: NDOH, 2017)

An estimated one-quarter (25 per cent) of new infections were among key populations and their sexual partners and young women (aged 15–24 years) accounted for 26 per cent of new HIV infections in the region (UNAIDS, 2019). In addition, Thurlow, Gow & George (2009) affirmed that HIV prevalence affects working-age Africans, especially younger females (20 to 34 years) and slightly older males (35 to 49 years). In comparison with their male counterparts, young women were considerably more likely to be infected with HIV.

2.2.2 Key determinants of HIV transmission

There are key determinants of HIV Transmission. HIV can be transmitted in various ways such as being in contact with contaminated blood and blood products, through blood transfusion and injectable drug use, from mother to child transition (during

pregnancy, labour, and after birth through breastfeeding, most frequently, through either vaginal or anal intercourse (Victoria et al., 2009; Cohen et al., 2008; Denning & DiNenno, 2010). Heterosexual transmission is the main mode in which HIV is spread, whereas male-to-male transmission also predominated in Western Europe (De Cock et al., 2012; Shisana et al., 2014). HIV has evolved from affecting only MSM to a global pandemic threatening different populations around the world. Having multiple sex partners predisposed a person to acquire HIV and thus people who practice such behaviours should refrain from blood donation (De Cock et al., 2012). In addition, young girls and women are physiologically vulnerable to HIV owing to the inability to negotiate the use of condoms (Shisana et al., 2014; Langen, 2007).

Men who have sex with men, commercial sex workers, injecting drug users, and are among the risk population that experience HIV in low epidemic areas (Victoria et al., 2009). Furthermore, in South Africa, various factors predispose people to HIV transmission biological risk factors owing to lack of circumcision and HIV infection with high viral load and STI (Shisana et al., 2014). Socio-behavioural factors having multiple sex partners and having unprotected sex. In addition, Shelton, Cassell & Adetunji (2004) state that sexual networking is also an underlying factor in the high prevalence of HIV, and perpetuates HIV transmission, once a person with multiple sex partners is HIV positive everyone becomes at high risk. Because more people are, more often exposed to the virus, as recently infected individuals during the window period have higher viral loads, and are much more infectious (Shelton et al., 2004).

2.2.3 Root causes and Consequences of HIV

The literature review found that the various root causes substantiate challenges faced with the HIV epidemic and interventions. Such root causes include age disparities, over the years older men have been associated with increased HIV infection amongst women, and older men having relationships with young women contributes to the spread of HIV1 (Gregson et al., 2002). Literature shows that indeed age disparities play a major role in HIV transmission, through power imbalances in partnerships/relationships where male dominance prevails, such as in patricidal societies (Magadi, 2011; Langen, 2007). Various authors agree that gender power imbalance significantly affects women's ability to suggest condom use to their partners; on the other hand,

wealthy older men obtain sex from young females in exchange for money and gifts (Drimie, 2002). Older men are more likely to be infected with HIV and will frequent demand-unprotected sex (Ghanotskis, Peacock & Wilcher, 2012). Magadi (2012) affirmed that in sub-Saharan Africa HIV, prevalence is much higher amongst young women aged between 15-24 years as compared to males of the same age group; this is partly due to women having older sex partners who are more sexually exposed than they are and are more inclined to have multiple sex partners. Therefore, due to the age-power imbalance, women are unable to negotiate safer sex, faithfulness and condom use thus protecting themselves against HIV infection (Ghanotakis et al., 2012; Gregson et al., 2002). Younger women and older men dynamics are also fuelled by cultural factors that demand and expect that women should marry younger and earlier than men, as such, many young women become vulnerable to HIV infections (Gregson et al., 2002).

Several Studies attest that in Sub-Saharan Africa many people live in poverty. Poverty can be defined as a lack of money, asset, and skills; people living in poverty feel deprived, constrained choices and have unfulfilled capabilities therefore people struggle to get basic needs thus partake in risky behaviours such as commercial sex to make ends meet (Mbirimtengerenji, 2007; Gregson et al., 2002). Poverty seems to be the root cause that drives the spread of HIV infection as it is concentrated amongst the poor of the poorest. Several authors suggest that poverty and lack of economic opportunities are commonly stated as significant contributors to the AIDS pandemic (Drimie, 2002; Shelton, 2004; Mbirimtengerenji, 2007). Moreover, poverty can increase the vulnerability to HIV infection through poverty-driven sex work or sexual transactions, which carry the risk of unprotected sex (Mbirimtengerenji, 2007).

Literature around the world emphasises that poverty is a driving force in the sexual transmission of HIV in sub-Saharan Africa (Drimie, 2002). Drimie (2002) believe that poor HIV-positive people are more prone to sickness and die earlier than the rich due to poor health, and lack of health care and medicines. Furthermore, PettjKleinschmidt, Steffenson et al. (2005) confirms that young girls are also forced into early marriages due to their poverty-stricken backgrounds, which further puts them at risk of acquiring HIV. Cultural practices such as polygamy are not helpful as they catalyse the pandemic, and poverty appears to be a vital element in the spread of HIV/AIDS (Drimie, 2002). Drimie (2002) agrees that HIV/AIDS experienced at the individual household's level and community level will probably increase the level of

poverty among the poor, thrust the working class into poverty and others into impoverishment. Moreover, poverty can fast-track the onset of HIV/AIDS and inclines to aggravate the effect of the epidemic (Drimie, 2002).

On the other hand, Mbirimtengerenji (2007) suggest that in communities characterised by social inequality, many women involuntary turn to prostitution and sexual transaction to acquire money for necessities, moreover wealthy men take advantage and procure sex from young women in exchange for money and gifts. Numerous authors agree that gender inequality makes women and young girls vulnerable and are not able to protect themselves from HIV, this also affects their ability to control their fertility (Lagen, 2005; Ghanotakis et al., 2012). Mahadi (2011) further agrees that women cannot negotiate condom use with their partners, which takes away their right to safe sex thus making them vulnerable to HIV infection is further aggravated by their inability to negotiate safe sex through condom use. In the past twelve months in South Africa, intimate partner violence has been on the rise. In addition, UNAIDS (2019); Ghanotakis et al. (2012) explain that gender inequality leads to intimate partner violence. Gender-based violence is extensive and increases the risk of HIV infection in women, therefore men who commit gender-based violence are more likely to indulge in transactional sex have multiple partners and have STIs including HIV thus contributing to an increased HIV infection amongst vulnerable women.

HIV stigma is associated with the spread of HIV infection. UNAIDS (2019); Fatoki (2016) argues that people who go through stigma and discrimination daily feel side-lined and are made more susceptible to HIV, while those living with HIV are more vulnerable to experiencing stigma and discrimination, the latter is associated with poor health outcomes, poor treatment adherence and indulging in unsafe sexual behaviours.

Furthermore, People living with HIV and AIDS (PLHA) who experience stigma or discrimination are unlikely to disclose their HIV status to their sexual partner, and non-disclosure was associated with transmission risk behaviour (Mahajan, Remien, Ortiz, Szekeres & Coates, 2008). On the other hand, Mahajan et al. (2008) suggest people who are negative or with known status tend to engage in high-risk behaviour due to their stigmatizing attitudes. HIV/AIDS stigma can be regarded as a barrier to effective HIV prevention and treatment programs. Moreover, low uptake of treatment and poor adherence to prevention and treatment services can be attributed to HIV/AIDS stigma (Fatoki, 2016; Mahajan et al., 2008). Migration seems to be a crucial factor in the spread of HIV /Aids. At the same time, authors like Mbirimtengerenji (2007) put forward that

the spread of the deadly HIV/AIDS is connected to the exploitation and disruption caused by the population movement.

People migrating because of poverty intensify the prevalence of HIV/AIDS. Literature in Africa also confirms patterns of human mobility are closely connected to high prevalence and patterns of the spread of infectious diseases, thus continuous movement of people is the root cause of the spread of HIV/AIDS (Drimie, 2002). In addition, Drimie (2002) further explains that truck drivers who are always on the road and frequent sex workers are more susceptible to HIV infection and become the major channel of sexually transmitted infections and HIV.

Adverse consequences of HIV are mortality and morbidity, this can also be attributed to non-Adherence to long-term ART which leads to poor health outcomes including increased viral load count, and resistance to treatment thus increasing care costs due to compromised treatment effectiveness (NDOH.2016). HIV/AIDS is particularly associated with high mortality because HIV leads to AIDS-related deaths (Victoria et al., 2009). Although strides have been made in previous decades, HIV still negatively impacts people who are left behind after death. AIDS-related death changes the structure of families, communities, and demographics of a country moreover; it leads to reduced life expectancy and increases infant and child mortality (Drimie, 2002; Victoria et al., 2009). Therefore, increased adult mortality disrupts families and leaves many children orphaned. Consequently, increased death, few births and reduced fertility will eventually affect population growth (Drimie, 2002).

On the other hand, HIV/ AIDS has devastating consequences on the economy by reducing labour supply through mortality and morbidity and productivity through sickness and absenteeism thus reducing exports and imports. (Dixon, McDonald & Roberts 2002). Another consequence of HIV/Aids is that it affects primary breadwinners, as they fall sick, require care, and eventually die, since the deaths occur mainly amongst people aged between 25 and 45 years in the prime of their working years who are most productive in the economy working hard to support their families. (Drimie, 2002). Drimie (2002) emphasises most of the wages earned will be going to healthcare, to bear the cost of treatment of HIV-related illness instead of savings. Because of the HIV epidemic, as people get sicker it overburdens the healthcare system and increases government expenditure on healthcare services.

In summary, HIV/ AIDS is a severe challenge to global public health, and it is one of the leading causes of death. South Africa continues to be the focal point of the HIV epidemic with women being more susceptible to HIV infection. The consequence of the HIV epidemic is devastating to rural and urban communities as they carry the burden of losing a breadwinner and looking after orphaned children. Moreover, hazardous sexual behaviours that affect the spread of HIV undermine HIV intervention and efforts made to deal with the impact of the epidemic. The conceptualisation and implementation of the differentiated care ART delivery model is discussed below along with the robust result chain and result framework.

2.2.4 The differentiated care ART delivery model intervention

Since the introduction of the antiretroviral treatment (ART) intervention, various pioneering strategies on how to provide HIV services comprehensively, efficiently, and effectively to scale up ART, and enhance retention and adherence to ART were considerably noted (Ministry of health, 2007). In 2015, the world health organisation released new guidelines recommending that HIV treatment be provided to all HIV-positive regardless of their CD4 count (WHO, 2016). South African government adopted the new guidelines to test and treat all, therefore in revising the ART guidelines the country was in line with achieving 90-90-90, which translates to 90 per cent of people knowing their status, 90 per cent of people of treatment, and 90 per cent of people retained in care.

Furthermore, in response to the high HIV epidemic and expansion and scale-up of the ART programme, the differentiated care ART delivery model was introduced by the NDOH and is being rolled out in all health facilities as part of the National Adherence Strategy (NDOH, 2016). Patients that meet the prescribed inclusion and exclusion criteria are enrolled in modalities of their choice these include Adherence clubs, External pick-up points i.e., CCMDD and Facility Pick-up points. Differentiated care models are central to the National Adherence Guidelines (AGL), which seeks to encourage stable, treatment adherent ART patients to take advantage of the delivery models that further support adherence and reduce defaulter rates by promoting more integrated and patient-centered health systems approach to increased access to appropriate services and interventions and addressing barriers to quality health care, including facility congestion, long waiting times and the lack of confidentiality.

Furthermore, by decongesting healthcare facilities, clinicians can focus on providing acute patients with adequate care and time. (NDOH, 2016.). The intervention is a patient-centered approach that is meant to improve retention in care and clinical outcomes of patients on chronic medications.

Similarly, Duncombe et al. (2015); Prust et al. (2017); Ministry of Health (2017); ICAP (2017) & NDOH (2016) are in agreement that differentiated care ART can be defined as a client-centred approach that is proposed to stable patients on ART treatment and makes it easier to adapt HIV services to address and reflect the preferences and expectations of diverse groups of people living with HIV (PLHIV) while reducing unnecessary pressures on the health system.

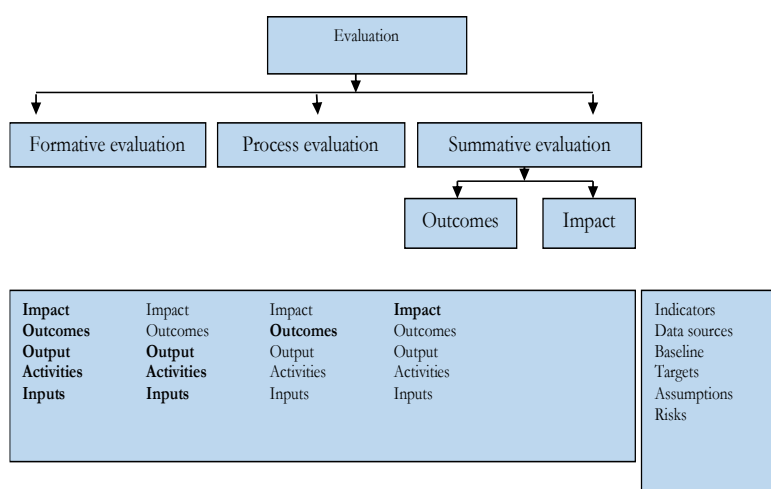
A clinician defines patient stability according to the clinical outcomes (NDOH, 2016). In the South African context, as stipulated in the adherence strategy an HIV-stable patient is a patient that meets the following eligibility criterion:

1. An Adult above 18 years
2. On the same regimen for more than 12 months and no adverse drug reaction that needs a regular check-up
3. No current TB or pregnancy
4. Most 2 current laboratory results
5. 2 consecutive viral loads undetectable thus a minimum of 12 months on ART
6. Mothers or caregivers of children on ART should not enrol on Differentiated care, especially if the child's pick-up point is different.

Various studies have highlighted that patient-centred approaches to ART care such as Differentiated care models can assist in improving adherence, retention, viral load suppression, and reducing loss to follow-up in resource-limited settings. These are the most important outcomes of implementing the intervention.

The study is an outcomes evaluation which is a component of summative evaluation. Moreover, summative evaluation focuses on the interventions that are in progress and it is also conducted when the intervention is completed, to determine the effectiveness of the intervention to target beneficiaries; it can either be outcome or impact evaluation. (Bhana & Govender, 2010). Therefore, a summative evaluation accesses the intervention outcomes and documents the intervention processes to facilitate informed decisions about the overall effectiveness of the intervention.

Figure 6: shows components and process of summative evaluation



The outcome evaluation for this intervention is nested within public health studies, Public health is a multidisciplinary field, which involves academic disciplines that includes biostatistics, epidemiology, social sciences, and management of health services with subfields such as behavioural health, community health, environmental health, health economics, public policy, mental health, occupational safety, health education, sexual and reproductive, health maternal health, and (Gouda and Powles, 2014). Public health is exceptional in its interdisciplinary approach and methods, it highlights preventative strategies, it is linked with government and political decision-making, and it is always on the top agenda of the government's raider (Turnock, 2016). Handler, Issel & Turnock (2001) also identified four other components of public health (i.e., structural capacity, system mission, processes, and outcomes in measuring public health system performance improvements in population health status for the public health system to function effectively.

Evaluation creates the feedback loop from the public health system's outcomes to planning (Turnock et al., 2016). Handler et al. (2001) and Turnock et al. (2016) ascertain that evidence-based approaches can provide a feedback loop through monitoring and evaluation of the implementation of various interventions, moreover, decision-making is informed by multidisciplinary evidence-based public health. Below we discuss the logic model or result chain and framework, the logic model is extensively utilised in contemporary public health, to show the linkages of how programs relate to each other

and achieve their intended results. The logic model for the intervention that shows relations to the inputs, activities, outputs, and outcomes, integrates the mission and function of public health.

2.2.5 Result-chain and Result framework

This section discusses the variables that describe the result chain (impacts, outcomes, outputs, activities, and inputs of the differentiated care ART delivery model as well as the result framework (indicators, baseline values, target values, means of verification, assumption, and risks).

The result chain is a program matrix that is used to measure performance; it defines the causal and effect linkages for an intervention that stipulates the necessary arrangements to achieve the anticipated results (UNDG, 2011). Starting with the inputs and showing how activities will lead to outputs and ending with outcomes that will eventually contribute to the impacts (UNDP, 2011). The result framework is underpinned by underlining assumptions and the theory of change. Indicators are measurable or tangible signs that something has been done, and indicators are used to describe performance (Parsons, Gokey & Thornton, 2013). On the other hand, according to Norad (1999), the logical framework is a methodical tool that is goal/ objective orientated. The logical model is usually developed in the planning phase when objectives and goals are set. The logic model should depict the assumption, which is positive in nature, and should describe conditions needed to be in place to achieve the result; the program might not directly control this (Norad, 1999 & UNDG, 2011). It also highlights risks that are negative in nature; they describe conditions that can hinder the achievement of results, normally not in control of the program (UNDP, 2011& UNDG, 2011).

Figure 7: Shows variables employed in the differentiated care ART delivery model

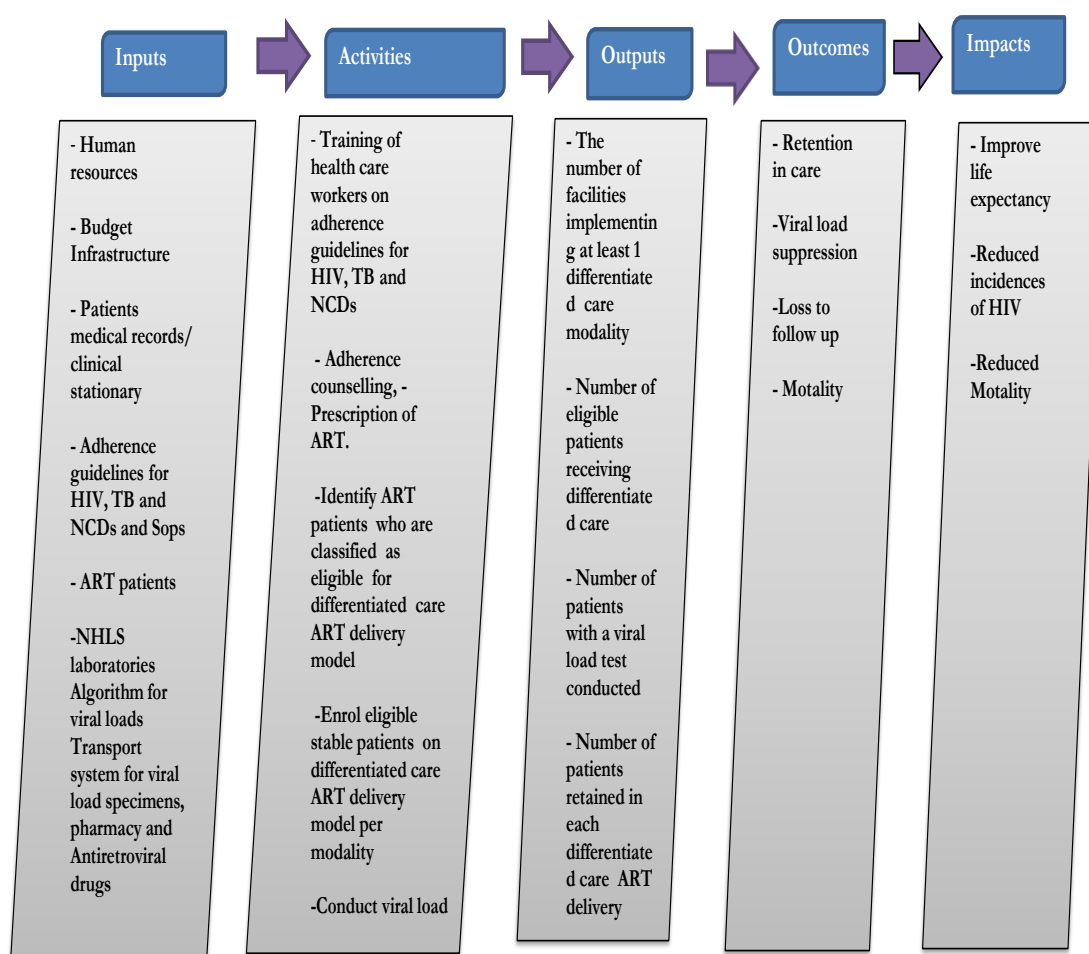


Figure 7: Variables or indicators employed in monitoring and evaluation of the differentiated care ART delivery model intervention.

2.2.5.1 The Inputs

In programme monitoring, inputs are an important element in the implementation process, the inputs that are required to implement a project includes (financial resources, policy, training material, guidelines human resource, etc. (UNDP, 2011). Inputs are used to execute a project, normally this is facilitated by project implementers. Ortengren (2004) poses that a comprehensive plan of all resource needs, should be articulated before the commencement of the project, additionally, according to Parson, Gokey & Thornton, (2013) an assessment must be done to ascertain if the necessary inputs are to execute the project. Parsons et al. (2013) further state the project can be derailed, if necessary, resources are not organised promptly.

The inputs for the differentiated care ART delivery model intervention are Human resources, Budget, infrastructure adherence guidelines for HIV, TB and NCDs and SOPs, ART patients, patients' medical records / clinical stationery, NHLS laboratories, the algorithm for viral loads, a transport system for viral load specimens, pharmacy, and Antiretroviral drugs.

2.2.5.2 The Activities

Activities are efforts and processes needed to realise specific outputs (Kresnaliyska, 2015). Ortengren (2004) concurs that activities are endeavours carried out by intervention implementers to realise results. Planned activities that are executed efficiently can have high returns (Ortengren, 2014). Parsons et al. (2013) argue that it is important to know how planned activities were executed to discover the encountered challenges and problems during the implementation phase, therefore providing a link between set activities and accomplished output results.

In the context of this research, activities for the differentiated Care ART delivery intervention are the training of healthcare workers on adherence guidelines for HIV, TB, and NCDs, Adherence counselling prescription of ART, identifying ART patients who are classified as eligible for enrolment in the differentiated care ART delivery model, enrol eligible stable patients in the differentiated care ART delivery model per modality, conduct viral load tests at specified intervals (Reidy, Rabkib, Soywai, et al., 2018). According to the NDOH Adherence guidelines (2016), all patients should be counselled and allowed to choose which modality is of preference according to the patient's need, the guideline further recommends that patients on differentiated care should be prescribed six-month worth of medication, with the collection every two months (NDOH, 2016).

2.2.5.3 The Outputs

Outputs are actual end results produced by the activities executed (Ortengren, 2014). Parsons et al. (2013) highlight those outputs are quantifiable, program efficiency is measured by employing inputs, and activities, to produce output results, thus showing an association between programme results and resources. Outputs are immediate results, which propels the realization of programme outcomes (UNDP, 2009). Reidy, Rabkib, Soywai et al. (2018) stated that the most important output for the differentiated care ART delivery model is the number of facilities implementing at least 1

differentiated care modality, number of eligible patients receiving differentiated care, number of patients with a viral load test done and number of patients picking up medication in the different differentiated care ART delivery model modalities. The data source for the outputs are medical records, Synch, and the Tier.net system at the facility.

2.2.5.4 The Outcomes

Outcomes are short –medium-term results, which shows preferred intermediate changes before the impact is realised impact, it presents how issues transform over time (Crawford et al., 2003 & UNDP, 2011). Parsons et al. (2013) further state outcomes are a consequence of outputs. Therefore, there is an association between programme outputs and outcomes. At the beginning of a programme, programme managers are responsible for implementing and monitoring the results. Monitoring includes implementation, monitoring, and management of resources to ensure that outcomes are attained (Kusek and Rist, 2004).

According to literature, the key outcomes of the Differentiated care ART delivery model are 1) Retention in care. 2) Viral load suppression and 3) Loss to follow-up 4) decongestion of health facilities thus decreasing the load on health care workers and patients (NDOH, 2016). The study will concentrate on the following outcomes, retention in care and viral load suppression, and loss to follow up.

2.2.5.5 The Impacts

Impact focuses on the overall goal of the intervention; impacts are normally positive or negative with the intended or unintended results; impact is the result of achieving specific outcomes of an intervention to change people's lives. (Lamhauge, 2012; UNDP, 2011; UNDG, 2011). In the context of the Differentiated Care ART delivery model intervention, the impact variables are improved life expectancy, reduced incidences of HIV, and reduced mortality. Data for impact indicators can be collected from the survey such as Demographic Health Survey.

Figure 8: illustrate the result chain of the Differentiated Care ART Delivery Model. The figure emphasises the link from the intervention ‘s inputs right through to the impact. This study focuses on outcomes.

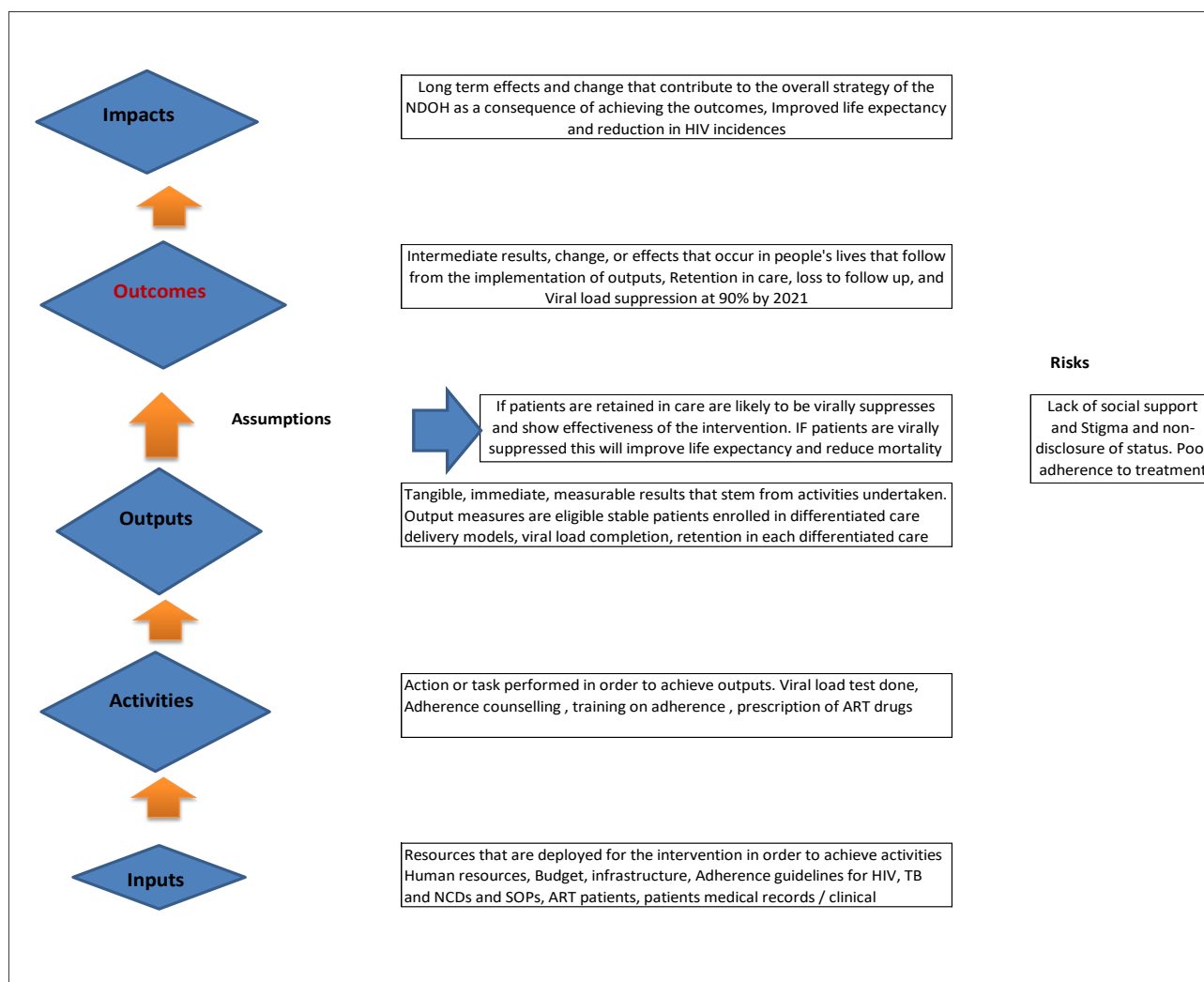


Figure 8: Result chain of the differentiated dare ART delivery model intervention, showing the link between inputs and impact.

With the understanding of the research problem, and intervention we go forth to interrogate past and present studies that have attempted to unpack and evaluate the outcomes of the differentiated care ART delivery models, paying special attention to the limitation of the reviewed studies.

2.3 Methods, data, findings, and conclusions studies and evaluations of the efficacy of interventions

In this section, we review literature that seeks to describe the methods, data, and findings conclusions of past and recent studies that have attempted to study the outcomes of differentiated care ART delivery models. This will assist in understanding the different types of methods, designs, along with sight with the research results, findings, and conclusion of various studies conducted to identify and propose the most suitable research strategy, design, procedure, methods, and interpretative framework that this current study can employ as part of developing the conceptual framework. Furthermore, this will contribute towards identifying the knowledge gap, pinpointing what was done around the topic, the limitation, and justification of the research. Moreover, it will contribute towards the body of knowledge around the outcomes of the differentiated care ART delivery models.

This will be done by firstly, describing the methods finding, conclusions of similar studies that were conducted globally, Sub- Saharan Africa, and in South Africa; to illustrate the limitations of the studies and highlight the knowledge gap for the research. Second, we summarise the various studies that have concentrated on differentiated care ART delivery models, followed by retention in care and viral load suppression as the intervention's outcomes.

Prust et al. (2017) conducted a study looking at multi-month prescriptions, fast-track refills, and community ART groups to accomplish the ambitious treatment goals. The Malawi government employed differentiated models of care. The process evaluation study in Malawi was a mixed-methods study using a cross-sectional design. The study was conducted between February and May 2016, data were collected by reviewing patient records, conducting interviews with facility managers, focus groups, surveys, visit time observations, and questionnaires for facility information. A heterogeneity sampling was specifically used to achieve diversity in the sample based on the model of differentiated care offered, region, patient volume, facility owner, facility type, and implementing partner support. Analysis was conducted using Stata 13. In determining the extent to which ART patients in Malawi are differentiated based on

clinical stability and describing the characteristics and costs associated with the models of differentiated care offered. The analysis revealed that a criterion Fast-tracking and community AG was applied, 77.7% of eligible patients at selected facilities offering the model were registered in the FT program, 6.0% were enrolled in a CAG, and at their last appointment 42.3% received MMS, while 31.4% were enrolled in the FTR programme, and 5.6% were enrolled in a CAG. Malawian Ministry of health's standard of care throughout Malawi has improved indicating substantial reductions in the cost of ART for patients and facilities. In addition, the findings recommend that more improvements can be done to strengthen the implementation of MMS as a differentiated care modality. Moreover, increasing the accuracy of patients receiving differentiated care through MMS. This will improve the quality of care, and increase the effectiveness of MMS (Prust et al., 2017). The further result suggests that monitoring the models should be strengthened to generate evidence of implementation since gaps were identified in the employment of differentiated care ART delivery models. In conclusion, patient outcomes associated with participation in the three modalities were not assessed, this needs further probing to ascertain the difference in patients' outcomes participating in these models. Improvements in adherence and viral load suppression might reduce the long-term costs to the health system.

Wilkinson et al. (2016) conducted a study in the Cape Metro district examining the scale-up of Adherence Clubs (AC) as a model of differentiated care ART delivery throughout health facilities between January 2011 and March 2015. The authors sought to understand the Adherence Club model of care for stable antiretroviral therapy patients has expanded. Data was collected using monthly aggregated AC attendance registers, reports, and electronic monitoring system, this was a cohort analysis study where an inclusion and exclusion criterion was applied and HIV-positive patients who are responding well immunological and virological and above 18 years were selected for the study. AC data based was used to obtain retention in care and this was expressed by the number of people in AC who had a scheduled visit recorded in the last two months. The total retention in the ART cohort was described as ART patients who had a clinic visit in the last 90 days. The data was obtained from the electronic medical record. The results from the findings show that there was significant growth in AC ART cohorts by 7.3 per cent from providing ART treatment, care, and support by the end of 2011 to 25 per cent by March 2015. There was an increase in patients participating in Adherence

clubs. At least, 54% of the ART cohort were receiving their medication in a facility ACs in December 2011, the percentage grew to 92.3% by March 2015 which is a substantial growth (Wilkinson et al.; 2016). The number of patients in each ACs were constant throughout the study period from 24 to 27 patients per club (Wilkinson et al.; 2016).” The findings show that AC was up rapidly over the study period by transferring 255 ART cohorts to the Differentiated ART delivery for stable patients. Moreover, 90% of ART patients received care in facility adherence clubs by March 2015 (Wilkinson et al., 2016). In South Africa, this study was a pioneer in describing the execution of differentiated ART delivery models at scale. However, other pilot studies demonstrated promising outcome results, but there is still little evidence of the scale-up of the differentiated care ART delivery model since the department of health adopted the intervention as a standard of care. The study also failed to report on patient outcomes and characteristics. One observed limitation is that the patient-level data was not utilised, and the use of tally sheets might introduce human error in aggregating data (Wilkinson et al., 2016). In conclusion, further research is required to determine the outcomes and patients’ views on the quality of care provided by AC and other differentiated models of ART delivery especially when implemented at scale. It would be advantageous for the ART program to report on how time impacts ART when enrolled into the differentiated care ART delivery model, duration spend in the model, retention in care, and viral rebound since enrolment.

Luque-Fernandez et al. (2013) conducted a study to evaluate the effectiveness of adherence clubs compared to primary healthcare facilities care in improving long-term retention in care and virological suppression. The study was a quantitative study using a retrospective observational evaluation entrenched in an ongoing cohort study. Data were collected from clinical patient records completed by clinicians and Electronic medical records systems used in HIV clinics were captured daily by data captures from the structured medical record and club registers completed by club facilitators. An inclusion and exclusion criterion were applied. The target population were adults who were on ART for at least 18 months with a CD4 of 200 cells/ml and were virological suppressed. Patients’ characteristics were summarised in percentages for categorical variables and interquartile ranges and median for the continuous variable for each outcome. The approximation of hazard ratio (HR) club participation against routine clinic-based care was determined by using a weighted pooled logistic regression model.

Data were analysed using statav.12. the study showed that patients' longer duration on ART was associated with the high virological rebound, but low rates of death or lost to follow up and the virological rebound was similarly high in patients participating in Adherence clubs. It was also noticeable that patients with higher CD4 counts at enrolment displayed an increased CD4 count during follow-up. However, during the study period, there was a shift in ART delivery for stable patients on long-term ART from nurse-driven individual consultation to group consultation driven by community workers s. Although this resulted in an improved retention rate but decreased virological rebound rates were noted. This could be attested to gaps or delays in medication collection, pre-packaging patients' medication during the club could reduce gaps in treatment collection.

Reif, Bertrand, Rivera, Joseph, Anglade, Fitzgerald, and McNairy (2017) conducted a study at the GHESKIO Adolescent HIV Clinic in Port-au-Prince evaluating community cohort care as a model for HIV service delivery to improve assessment for and initiation of ART, retention, and viral suppression among adolescents. This was a quantitative study comparing outcomes among adolescents in community cohort care to a historical cohort of adolescents receiving standard care. The study employed a cohort analysis using routine program data. The target population consisted of adolescents between the ages of 10- 20 years in community cohort care, who newly tested HIV+ between November 2014 and October 2015 at the GHESKIO Adolescent HIV Clinic and agreed to participate in cohort care. Adolescents for Historical cohort: ages 13-19 years who newly tested HIV+ between January 2009 and December 2012 at the same clinic were stratified by age group 10-15 and 16 -20 and were grouped in cohorts of 5-8 teens (Reif et al., 2017). Statistical analysis was conducted, the incidence of retention at 12 months from HIV testing was estimated utilising Kaplan-Meier methods. Looking at retention and viral suppression, community cohort care exhibited 86 per cent of participants were retained in care after 12 months of HIV testing. Twenty-six per cent were virally suppressed among those with a viral load measurement 6-12 months from ART initiation. In comparison to the Historical cohort, it was found that 66 per cent of adolescents were retained in care 12 months after HIV testing and viral load was not routinely measured before 2012. In conclusion, the retention rate in community cohort care significantly improved, however, it was noted that viral suppression remained poor and efforts to increase adherence amongst adolescents are warranted (Reif et al., 2017).

Another study by Bekolo, Diallo, Philips, Joseph-Desire, Di Stefano, Drèze, Mouton, Koita, and Tiomtore (2017) assessed six-monthly appointment spacing for clinical visits as a model for retention in HIV Care in Conakry-Guinea a quantitative study utilising a retrospective cohort study. Data was collected employing TIER.Net® 1.9.2.3 electronic medical record software developed by the University of Cape Town in South Africa. Data were analysed utilising Stata® 14. The principal outcome was retention in care. The rates of retention were 90 per cent after 18 m beyond in the R6M group; however, in the controlled group considerably higher retention, more than the 75 percent was observed, moreover; the strategy saw a reduction of 60 per cent in attrition rates as compared to standard care. In conclusion, it was realised that R6M could ease attrition from ART care for stable patients in Conakry regardless of restriction in access to health care due to the EVD that was transported in Guinea. R6m can be utilised as a strategy of care for stable patients thus reducing staff overload and improving retention in care.

Mody, Roy, Sikombe, Savory, Holmes, Bolton-Moore, Padian, Sikazwe, and Geng (2018) conducted a study in Zambia evaluating improvements in retention with 6-Month spacing for stable HIV-positive patients. This is a quantitative study employing cohort analysis, the authors looked at the relationship between assigned appointment intervals and how patients adhere to their next clinical visit in a group of facilities in Zambia in a public health setting in sub-Saharan Africa, the authors further illustrate how appointment scheduling trends effect on successive retention in care. Data were extracted from the countries' (Smart Care) electronic medical record systems used in health care facilities in Zambia. Cohort analysis was conducted on adult HIV-positive patients (aged >18 years) who were stable on ART from 1 January 2013 to 31 July 2015 and reported for routine HIV care visits at clinics in Lusaka Province, Zambia. Data were analysed using Stata version 14.2 (Stata Corp LP, College Station, Texas). A multilevel mixed-effects linear regression model was used to estimate the time to the next scheduled appointment and the actual visit attended as the outcome was developed. The result demonstrated that in stable HIV – infected patients six-month clinic returns intervals seemed to be related to decreased missed appointment, gaps in medication, and loss to follow up thus may signify an encouraging approach to cut patient workload and decongest clinics. Furthermore, 6-month intervals are best in improved retention, this is significantly found to be related to extended appointments

among stable HIV –infected patients. The researchers noticed high retention rates (97 per cent at 12 months) and a decline in mortality was observed in patients participating in the programme (Mody et al., .2018). In conclusion, as with the ART expansion the adoption of differentiated care models with being crucial in meeting patients' needs. In addition, further studies are warranted to ascertain the impacts on viral suppression and safety in increasing the interval from 6 months to a year.

A quantitative study was conducted by Agaba, Genberg, Sagay, Agbaji, Melon, Dadem, Kolawole, Okonkwo, Kanki, and Ware (2018) in North Central Nigeria to compare patient retention in treatment facilities looking at various measures analysis for a regionalized HIV care and ART programmes. A longitudinal cohort study was employed, this study was conducted following patients between January 2008 and December 2012. Electronic medical records were used to extract data which included baseline information on demographic characteristics, baseline clinical status, laboratory ART initiation dates, and next scheduled clinical appointment. The findings from the study showed that good retention rates outcomes decentralized sites. Although viral suppression is the aim for patients and programs, inadequately completed viral loads were noted therefore were eliminated from the analysis. Patient retention and treatment adherence are essential to achieving suppression; thus, viral suppression can be used as an alternative measure of both. In addition, further studies of retention in HIV care, which include multiple measurements, will be useful in Sub –Saharan Africa. Considering the ambitious 90-90-90 targets, the inclusion of viral suppression as a variable will assist with the evaluation of this imperative outcome in resource-limited settings effectively.

Ssonko, Gonzalez, Mesic, da Fonseca, Achar, Safar, Martin, Wong, and Casas (2017) performed a quantitative study in MSF programmes in the central African region, focusing on challenges and achievement of implementation of differentiated HIV care and ART methods to augment the variety of care. The study was a cohort analysis of ART programmes in CAR, DRC, and RoSS between 2010 and 2015. Data were collected from the routine data collection system and patients' medical records. An epidemiologist collected all the data and analysed using Stata 13 (STATA13.0, Stata Corp, TX). The results from the study showed that retention in care was 77.3% and 81% in 2013 and 2014 respectively at 24 months. In conclusion, further studies need to

be conducted scrutinising further long-term follow-up of these patients as other studies have indicated retention rates decline as a program is scaled up. However, this study has shown that high retention rates (92.3 per cent) can be achieved in HIV ART programs being implemented in rural resource-limited areas. Due to the nature of retrospective studies utilising routinely collected data, it was illustrated that data completion was low.

Another quantitative study was conducted by Wringer et al. (2018) in rural Malawi with three-monthly fast-track drug refills and six-monthly clinical visits examining stable ART patients for long-term retention utilising a retrospective cohort analysis with data collected from patients' records and electronic databases. The target population were HIV-positive adult stable patients on ART on the first-line regimen for more than 12 months with a CD4 count of more than 300cell/ml. The results illustrate that retention in care was higher (97 per cent) amongst patients 12 months after enrolment in SMCC. Further results show that the decentralisation of ART to community health workers with an SMCC and three-monthly interval ART refills in Rural Africa signifies a practical and actual strategy for providing ART.

In conclusion, the study was unable to explore virological outcomes amongst patients in SMCC given that the government only introduced viral load testing gradually in 2013. Further analysis that includes viral loads as an outcome is warranted to determine and understand the implications of SMCC on adherence, furthermore, it was noted that measuring mortality as an outcome seems to be a challenge as true statuses of lost to follow-up patients are unknown. Patients can either be self-transferred or dead or defaulters.

Rich et al. (2012) conducted another quantitative study in rural Rwanda examining exceptional clinical and high retention in care amidst HIV-positive adults in the community-based program, intending to describe patient outcomes commencing the community-based ART programme that was implemented in June 2005. The study followed a retrospective cohort study with data collected from paper-based records and electronic medical records based on an open Medical Records system. The target population for the study were HIV-positive patients commencing community-based ART Treatment between June 1, 2005, and April 30, 2006. The primary outcome was retention in care 24 months after commencing community-based ART. Furthermore, StataSE/10.0(college station, TX) was used to analyse retention in care conducted using

logistic regression. The following results were found retention in care after 24 months of community base ART was 92.2 per cent, with 5 per cent of the patients having died a further 2.7 per cent were lost follow-up or defaulted on treatment. at the commencement of community-based ART, there were 1041 of these 961 were retained in care and of the once retained in care only 275 had a virological test done at 24 months of these only 232 84.4 per cent have a suppressed viral load. In conclusion, the findings show that ART programs in rural resource-poor areas of Africa can have high retention rates (92.3%) after 2 years of care.

Assefa, Alebachew, Lera, Lynen, Wouters, and Van Damme, (2014) used a mixed-method approach to try and understand the retention in care when ART is scaled up in Ethiopia. Routine patient data was used to understand the scale-up ART while improving patient retention in care. Data was collected through conducting in-depth interviews and focus groups. EPI-Info 2005 version 3.3.2 statistical software was used to analyse retention in care data. It was noted that better retention outcomes were achieved through community-based models and peer support, Poor documentation was sighted as one of the limitations. Although short-term results show improvement in retention care more studies are needed to improve and sustain retention in care long term, especially when ART is scaled up.

Another study by Achieng, Musangi, Ong'uti, Ombegoh, Bryant, et al. (2012) conducted a prospective, observational cohort study in East Africa that did not involve an intervention to understand adherence and retention in HIV programs. Kaplan-Meier analysis was used to estimate the duration of treatment for each facilitator and multivariate analysis using the Cox Proportional Hazards Model was used to determine the comparative effects of the facilitators (Achieng et al; 2012). This study found that patient pill count and decentralisation through community-based models were related to better clinical outcomes adherence and long-term retention.

Mutevedzi, Lessells, Heller, Bärnighausen, Cooke & Newella, (2010) conducted a longitudinal study to ascertain whether the scale-up of decentralised HIV programmes has an impact on patients' outcomes. Categorical data were analysed using logistical regression, Kaplan–Meier survival analysis was used to assess trends in duration on treatment and detectable viral load, and Cox regression to assess determinants of viral suppression and retention outcomes. The results from this study show that there are

high rates of unsuppressed viral loads, and this is a cause of concern as it can undermine treatment goals. The study did not explore outcomes beyond 12 months; the study could have missed long-term outcomes, such as viral load suppression and retention.

A study by Okoboi, Ding, Persuad, Wangisi, Birungi, Shurgold, Kato, Nyonyintono, Egessa, Bakanda, Munderi, Kaleebu, and Moore, (2015) conducted a retrospective cohort analysis looking at program retention amongst ART patients in rural Uganda which facilitated the distribution of ART through community-based ART delivery model since 2004. To determine factors associated with virological failure univariate and multivariate logistic regression analysis was used and bivariate analysis was used to analyse patients with and without viral load variables of <1000 ml copies. To compare patients who remained active in care throughout the study period bivariate analysis was conducted using Kruskal-Wallis and Chi-square tests using Stata ver.16. Cox Proportional Hazard Modelling was used to estimate factors associated with outcomes LTFU and mortality. In conclusion, the finding found that patient-centred approaches can yield high retention rates when implemented in rural, resource-limited locations

Overall, the above-reviewed studies employed a quantitative research study to evaluate various differentiated care ART delivery models. Most of the studies used a longitudinal research strategy, and retrospective cohort analysis in their evaluations. Predominantly descriptive analysis was conducted using programmatic data, a logistic regression model to determine factors associated with the retention, and Chi-square test to determine rates of retention and viral load outcomes. It is eminent that an inclusion and exclusion criterion was utilised when selecting the target population for the studies. All studies' target population were HHIV-positive stable patients more than 18 years on the first-line regimen for more than 12 months, where viral loads counts were not available CD4 count was used to determine eligibility for participation in different differentiated care ART models such as adherence clubs, multi-month scrips, and community-based adherence groups. The reviewed studies showed that longer durations on ART were associated with higher rates of virological rebound and higher retention rates were similarly reported.

According to Mody et al. (2018), alternative ART delivery models, such as differentiated care can bring about advancement and efficiency in overall quality in the ART service delivery facilities. The outcomes from various studies demonstrate that

high retention rates can be achieved in ART programs in rural resource-poor areas of Africa, furthermore, other studies highlighted good retention rates but with poor viral load suppression (Ssonko et al., 2017). There is a robust relationship between virological suppression and delays in medication collection. Club participation (patients collect pre-packaged medications during the club) is associated with effortless medical collection. In another study, the results indicate that in this rural African district SMCC represents a viable and efficient strategy for providing ART distributed by community health workers. This strategy yielded high rates of retention 86% at 12 months and 97% at 24 months respectively (Rich et al., 2012).

Retention and viral load suppression are deemed the most important measures of this intervention. The differentiated care ART delivery model was piloted with promising results; however, there is inadequate evidence on the scale-up of differentiated care ART delivery model outcomes in South Africa's townships. Moreover, previous studies have also failed to measure the outcomes and impact of alternative delivery frameworks (Duncombe et al., 2015). Wilkinson et al. (2016) have also noted that there is expanding evidence of differentiated models of ART delivery, but there is limited evidence of the scale-up of these models. In addition, authors like Barker et al. (2017), Prust et al. (2017) & Wilkinson et al. (2016) identified that although there is evidence of implementation of differentiated care at scale, the patient's characteristics, and outcomes as a result of these type of models were not evaluated. Wringe et al. (2018) stated that further analysis that includes viral loads as an outcome is warranted to determine and understand the implications of SMCC on adherence, furthermore, it was noted that measuring mortality as an outcome seems to be a challenge as true statuses of lost to follow up patients are unknown. Patients either can be self-transferred or have died or defaulters, furthermore, incomplete data was noted to be a challenge in the reviewed studies.

There are inadequate studies that assessed the outcomes of differentiated care ART delivery models in urban townships like Tembisa in Ekurhuleni municipality that evaluate the scale-up of differentiated care models and the impact of these models on retention in care and viral load suppression. Moreover, most if not all the reviewed studies did not use an interpretive framework or theoretical framework to interpret their results. This study proposed the use of quantitative strategy and employing longitudinal research design looking at retrospective cohort analysis to determine retention rate, viral load completion, and suppression rates of stable patients on differentiated care antiretroviral therapy delivery model after 24 months. Moreover, factors associated with

loss to follow-up. Data will be extracted from patient folders and electronic systems using a questionnaire and will be analysed using

There is a need to address the highlighted limitations to understand the outcomes of the intervention which is retention in care and viral suppression; therefore, to comprehend this we introduce and contextualise public health as the academic field of study for this research in the next section.

2.4 Introduction to Public Health studies and its components and processes

Given the information acquired from the previous sections, which set out, the research context setting, research problem analysis, and understanding of the methods, data collection tools, and subsequent findings and conclusion. Past and recent studies have attempted to establish a knowledge gap on the outcomes of the differentiated care ART delivery model. This section broadly introduces the concept of public health and the theories and model that pertain to its evolution. We review the literature on public health and (2.4.1) outlines public health and its purpose. The research will in part highlight (2.4.2) facts and issues around public health studies, consider various (2.4.3) components of public health, and (2.4.4) in addition processes applied in public health to understand differentiated care ART delivery model in the context of public health studies. We use systematic and thematic reviews of various sources to discuss these themes. Therefore, the breakdown of components and processes is effortless in determining and understanding the variables key to this study. The discussion of these themes is the highlight of this section and is briefly explored below.

Figure 9: below depicts the public health studies and their components

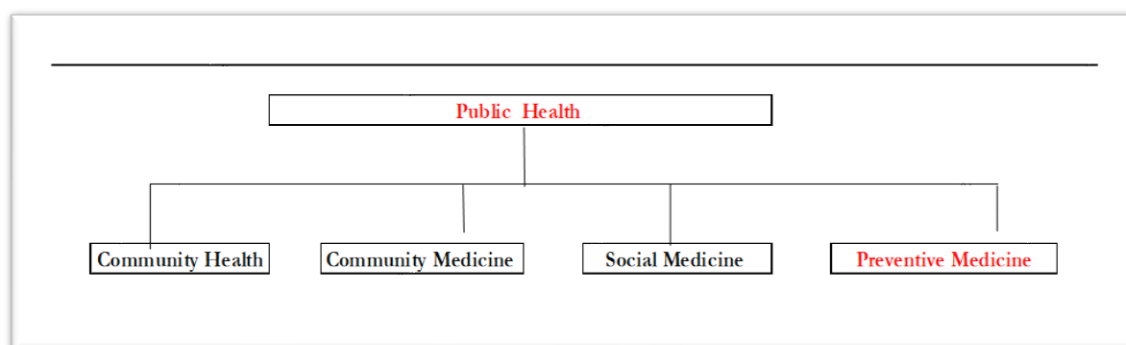


Figure 9: Components of the public health studies

2.4.1 Describing Public health and its purpose

The concept of public health has been around for a century and its definition has evolved over time. The purpose of public health is to improve and promote health amongst the population rather than focusing on individuals' health (Binns and Low, 2015). Various authors have described the concept of public health and all these definitions stems from Winslow's description of public health as the "Art and science of preventing disease, promoting health, and prolonging life, through the organized effort of society (Binns and Low, 2015)". Subsequently, authors who have written extensively about public health among others Carr, Unwin & Pless-Mulloli (2007); Tumock (2016); Tulchinsky & Varavikova (2014); Orme, Bowell, Taylor, and grey (2007) and Lucas & Gilles (2003) have all used the same definition. The latter authors went further to include the social science aspect in the description of public health in addition to the art and science aspect from the original definition. They also see public health as joint acts for sustaining the population's health, by promoting, protecting the health of the population and communities where they live, work and play; usually, through organised community efforts rather than individuals and improving and sustaining the well-being of the population at large (Carr et al., 2007). When organised communities collectively work together to curb the spread of diseases there is evidence that suggests the joint collaborative effort by communities thus enhances methods to prevent communicable infections, education on individual personal hygiene and sanitation of the environment, early diagnosis, and prevention of diseases. All these efforts mentioned above result in the improvement of standards of living, health, longevity, and society having an informed choice, respectively (Turmock, 2016).

In addition, Binns et al. (2015) includes the recovery and rehabilitation aspects in the definition of public health as activities to improve health.

Building from the key definitions outlined above, it has emanated that, public health intends to advance the population's quality of life through the promotion, prevention, and treatment of medical conditions. Stemming from Carr et al. (2007), Kass (2001), and Binns et al. (2015) earlier formulations they further solidify the concept of public health as a science that is concerned with the overall population health by protecting, assessing, and improving the population's health and prevention and promoting equity

among the population thereby asserting its purpose. The issue of equality is also emphasised by Orme et al. (2007) that public health seeks to distribute equitable health care to the overall population, by providing medical care to impoverished populations.

2.4.2 Some facts and issues in Public Health studies

Public health is a multidisciplinary field, which involves academic disciplines that includes biostatistics, epidemiology, social sciences, and management of health services with subfields such as behavioural health, community health, environmental health, health economics, public policy, mental health, occupational safety, health education, sexual and reproductive, health maternal health, and (Gouda and Powles, 2014). Public health is exceptional in its interdisciplinary approach and methods, it highlights preventative strategies, it is linked with government and political decision-making, and it is always on the top agenda of the government's raider (Tumock, 2016). According to Kass (2001) & Carr et al. (2007), disease being preventable is the focal point of public health, nowadays public health professionals use various tools to ensure that people are healthy and remain healthy for longer. This also encompasses epidemiology, community health, etc. to accomplish their work of focussing mainly on the population and preventing illnesses prospectively and finding approaches to improve health.

Supplementary, Orme et al. (2007) stated that public health is a societal enterprise, which seeks to have the utmost impact on the health status of the population by maximising and extending the benefits of current knowledge. There are links between public health information and public health action. Moreover, an initial public health programme was put together on the societal and environmental approaches grounded on political and social activists dedicated to the provision of clean water, sanitation, better standard of housing, and improving the environment mainly at local levels of government (Orme et al., 2007 & Lucas & Gilles, 2003).

Public health studies are concerned with improving the health of communities; modern spectators have contended that numerous improvements in public health were from early public health reforms than anything achieved successively by the NHS (Orme et al., 2007). Furthermore, Goude et al, (2014) argue that initial epidemiology was dominated by infectious diseases, however, no infectious cause of the disease was seen at the beginning of the twentieth century. Although epidemiology has made tremendous

contributions in unscrambling intricate relationships of risk factors, nevertheless failed to consider the social and environmental determinants of health behaviour. Another author maintained that epidemiologists have not prioritised the measurement of the burden of disease, in addition to suitable methods for widespread assessment of morbidity (Carr et al., 2007).

2.4.3 Components of Public Health

There are various components of public health, and this section will outline each and briefly discuss their relationships and interconnectedness. Four dimensions of public health are Community medicine, Preventive medicine, Community Health, and Social Medicine (Lucas et al. (2003). In addition to the four dimensions, Handler, Issel & Turnock (2001) also identified four other components of public health (i.e., structural capacity, system mission, processes, and outcomes in measuring public health system performance improvements in population health status for the public health system to function effectively. Above all, proper structures, and capacity (inputs) need to be in place. The inputs will be utilised to carry out processes that in turn lead to outputs that manifest into outcomes, which measure the improvements in the health status of the population. Policymakers used qualitative and quantitative data to determine the appropriate policy intervention and outcomes (Ross et al., 2009). Potential impacts of the policy are documented, this is important as it supports evidence-based policy, therefore evaluating policy is essential in the identification of the impact of policies on behavioural changes at community and individual levels (Ross et al., 2009 & Orme et al., 2007).

2.4.4 Processes of Public Health

Public health includes core functions such as policy development, assessment, and assurance (Turnock, 2016 & Brownson, Chiriqui & Stanatakis, 2009). These functions are almost the same as the ones that are normally recognised in disease management in the medical care system (Turnock, 20016). Furthermore, Public health system processes are evidence-based. According to Handler et al. (2001), the public health cycle begins with identifying a health problem and then investigating the problem. The processes from on-set will include community mobilisation, education, and awareness campaigns, which will ultimately lead to policy development and plans being put in place to

implement the intervention. These plans will be turned into activities that will translate into outputs of the public health system. Another author focussed on retrospective evaluations and observation studies to measure intervention outcomes and to test if outcomes improvements are due to change or implemented interventions (Orme et al., 2007). On the other hand, the logic model is extensively utilised in contemporary public health, to show the linkages of how programs relate to each other and achieve their intended results. The logic model for programs that shows relations to the inputs, activities, outputs, and outcomes, integrates the mission and function of public health Evaluation creates the feedback loop from the public health system's outcomes to planning (Turnock et al., 2016). Handler et al. (2001) and Turmock et al. (2016) ascertain that evidence-based approaches can provide a feedback loop through monitoring and evaluation of the implementation of various interventions, moreover, decision-making is informed by multidisciplinary evidence-based public health. Furthermore, Turnock et al. (2016) state that those public health systems that are evidence-based should be able to assess risks of failure, urge monitoring of outcomes, be able to mitigate the failures, and take corrective action to ensure that continuous improvement of the evidence base to inform future decisions. Based on the discussions above one can appreciate the practical details of public health and how it has evolved over time, this provides substance and context to this research and paves a way for the next section to discuss and understand variables key to the efficacy of the intervention.

2.5 Attributes/variables in public health studies key to the efficacy of interventions

This section builds on the concept of public health where its components were established. Some of the components mentioned in the preceding section will be broken down into subcomponents and variables that are mostly used in the outcome evaluation of the differentiated care ART delivery model.

In brief, the objective of this section is to establish and discuss the quantitative research variables that are key to the intervention. These variables intertwined with public health studies provide us with the theoretical context for the research. We will accomplish this by first selecting the component that is relevant to public health as an academic field of study. Which is preventive medicine and discuss it extensively through the six themes

[i.e. (i.) description of the component, (ii) purpose of the component, (iii) Established facts, (IV) the issues and debates (v) components of components and process in the component]. Secondly, we review literature from both international and local textbooks and journals. Thirdly, we discuss (2.5.1) preventive medicine component, with emphasis on tertiary prevention, paving the way to introduce the (2.5.2) concept of chronic disease management and therefore, emphasise the (2.5.3) inputs, (2.5.4) outputs, and (2.5.5) outcomes of the intervention, paying special attention to immediate outcomes retention in care, loss to follow up and viral load suppression. Lastly, we conclude the section by providing the sources of the quantitative variables that will be used to collect the data.

Figure 10: illustrate a schematic representation of public health field components and subcomponents and variables

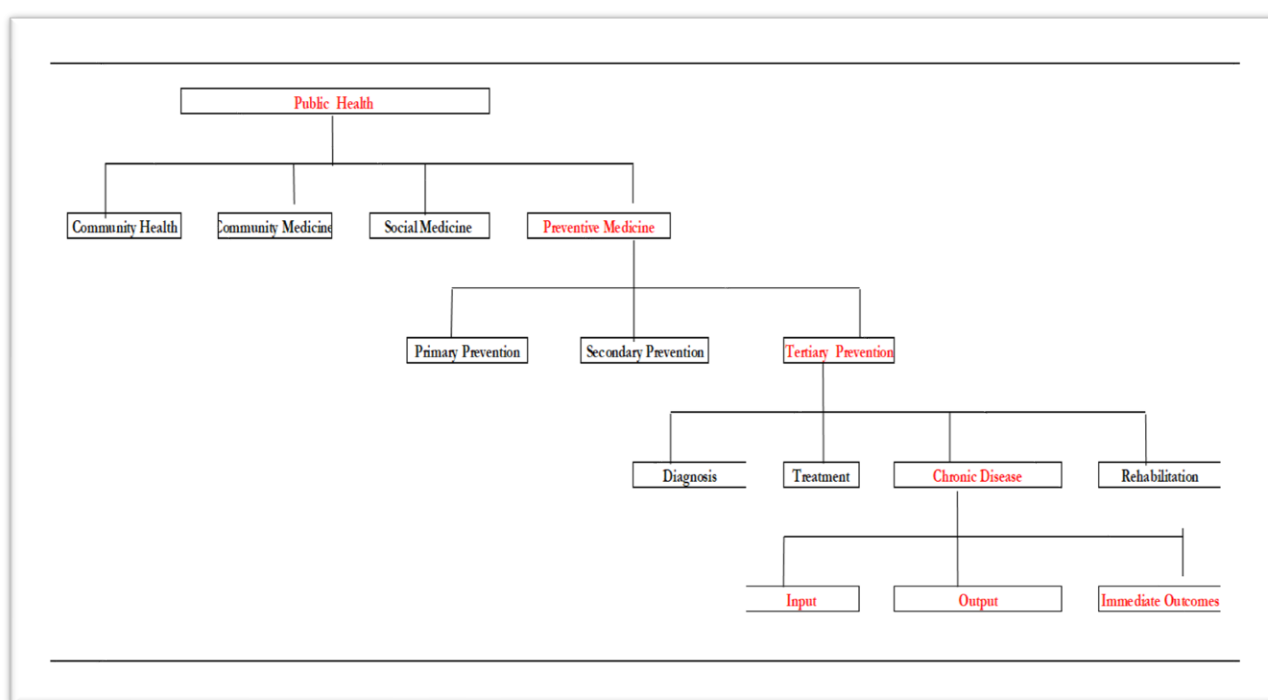


Figure 10: Schematic representation of public health field components and subcomponents and variables

2.5.1 Preventive medicine

Preventative medicine is one of the components of public health, the others being community medicine, social medicine, and community health which were mentioned in the previous section (2.4). Preventive medicine focuses on preventive measures to regulate the progression of disease at any stage (Clarke, 1974). The first principle of

preventive medicine is prevention first, authors like Lucas, (2003) & Jadotte, (2008) have ascertained that prevention is better than cure. In addition, within preventive medicine, we find other components of public health such as community medicine and epidemiology. Jadotte (2008); McKenzie, Pinger, and Kotecki (2011) & Lucas & Gilles (2003) state that preventive medicine seeks to prevent disease, promote health; prolong life in the affected communities, moreover, preventive medicine will reduce morbidity and curb mortality rates amongst the affected/defined populations.

Furthermore, Lucas & Gilles (2003), Clarke (1974) & Jadotte (2008) establish that preventive medicine aims to prevent advanced disease, treat the sick and reduce the impact of the disease for those who already have been diagnosed. Furthermore, protect, promote, and maintain health to avert disability and restore function.

Preventative medicine needs a holistic approach, where governmental organisations, primary care physicians, and patients work together to tackle diseases with a view to ultimately achieve the absence of disease, especially those whose disease has advanced, the collaboration means that these efforts are required to maintain people's wellness (Ali and Katz, 2015 & McKenzie et al., 2005).

Preventative medicine also comprises primary prevention, secondary prevention, and tertiary prevention. Primary prevention is deemed as putting measures to avert the occurrence of the disease (Clarke, 1974). The process involves assessing risk factors and anticipating the onset of a disease before the disease process begins. In most instances, primary prevention is accomplished through health promotion, health education, nutrition, immunization, and other wellness services amongst other strategies that can be employed for people to be healthy (Loeppke, 2008; Ali & Katz, 2015; Outwater, Leshabari & Nolte, 2017 & Clarke, 1974).

On the other hand, secondary prevention describes the early detection/ diagnosis of a disease, and the treatment of the disease before it advances and becomes severe to avert disability (McKenzi et al., 2005; Wood, Vaughan & de Glanville, 1981 & Loeppke, 2008).

Risk factors should be managed efficiently at this stage. Screening has been identified as the most important component of secondary prevention. The aim is not to prevent diseases but to detect the disease, along with other measures such as health education & mentoring, testing, and early initiation of treatment (McKenzie et al., 2005 & Loeppke, 2008). Advanced or clinical manifestation of the disease and delay in the

consequences of diseases can be prevented by implementing these measures through therapy and rehabilitation; health restoration can be attained (Clarke, 1974).

Lastly, tertiary prevention can be explained as disease management, prevention of disability and death. Disease management is an important component of tertiary prevention, it is imperative to manage the disease after diagnosis to slow progression. Loeppke (2008); Wood et al. (1981) & Outwater (2017) agree that tertiary prevention is mostly concerned with reducing suffering and complication, with treatment and rehabilitation mostly directed at complex chronic diseases. Furthermore, according to McKenzi et al. (2005), tertiary prevention aims to re-educate, retrain, and rehabilitate patients who have a chronic disease/ have incurred a disability. The main objective of these strategies is to minimise any suffering, cure the disease completely and prevent disability, in those that cannot be cured such as HIV patients. Disease management will be imperative in avoiding opportunistic infections, resistance to medication, and other issues that might lead to morbidity and mortality (Wood et al., 1981 & Outwater et al., 2017). Improved quality of life is the goal of tertiary prevention.

In addition, Wood et al. (1981); Outwater et al. (2017) & Loeppke (2008) also emphasise that the purpose of tertiary prevention is to eliminate or reduce disability, manage the chronic disease to minimize the impact of advanced disease or progressed disease by ensuring minimal suffering is felt and improve the quality of life of the patients. At this stage diagnosis and treatment becomes imperative in an ill patient, on the other side epidemiologically tertiary prevention intends on reducing the impact of complications through therapy and rehabilitation (Outwater, 2017).

Tertiary prevention is concerned with chronic disease management, screening to diagnose, and treating illness. This is based on the management of disease, disability management, and vocational rehabilitation (Loeppke, 2008). All these tertiary prevention strategies can reduce the impact of destructive disabling complications of serious medical conditions that can hamper the daily quality of life (Outwater et al., 2017).

Patients' education and motivation are key in the preventive medicine process. Patients should be self-motivated and have the discipline to control the risk factors of the illness, which are revisable and can affect the patient's health (Woods et al., 1981 & Clarke,

1974). Furthermore, through health education, patients turn to value their health, knowing and understanding the disease makes the patient to be encouraged to take responsibility for their disease and utilise health services at their disposal (Woods et al., 1981). By attending follow-up visits, clinicians can assist patients with their personal goals to mitigate risk factors of the disease, and once risk factors are established it is the patient responsibility to reduce the risk (Clarke, 1974). With the combination of health education and self-management skills, patients can understand and value the different screening, treatment, and management procedures. Furthermore, through tertiary prevention patients cooperate with clinicians and understand how to carry out their treatment properly; within this cooperation, patients can visualise the risk and certainly discuss their results with the practitioner (Clarke, 1974). On the other hand, processes in tertiary prevention are based on patients knowing and understanding their illnesses. Patient education is deemed the foundation of all disease management (Loeppeke, 2008 & Outwater, 2017). Patient health education can assist patients in understanding the disease and better cooperate with healthcare providers to effectively treat the disease. This individualised approach to problems will present and show personal risks and come up with a plan to reduce risk factors and put the patient on the right track to improve and manage their disease properly furthermore chronic illnesses have benefited positively from the patients' health education (Loeppeke, 2008 & Outwater, 2017).

2.5.2 The concept of chronic disease management

Chronic disease management is a multi-disciplinary approach that is geared towards improving patient outcomes and cost-effectiveness, as a result, enhancing the quality of care for patients suffering from chronic conditions (Singh, 2008). Chronic disease management can be described as the means to achieve the uppermost degree of functioning, through the implementation of explicit systematic population-based approaches that aid in the diagnosis, treatment intervention and measure clinical and other outcomes (Krumholz, Currie, Riegel, Phillips, Peterson, Smith & Faxon, 2006). Singh (2008); Clark (2003) & Krumholz et al. (2006) indicated that chronic disease management is further recognised as a systematic optimal approach for providing healthcare with the aim to tackle disease/ illness with maximum effectiveness and efficiency regardless of where the treatment setting is located, therefore improving adherence to treatment plans and guidelines.

The core purpose of disease management is to improve patient outcomes and the quality of care received. This is achieved by keeping the condition under control; preventing deterioration and clinical manifestation of the disease (Clark, 2003 & Krumholz et al., 2006). In addition, patients with chronic diseases need to be followed up routinely and high-risk patients should be case managed to manage the complex disease (Singh, 2008). Moreover, patient self-management has always been advocated for patients with low risk or who are stable. Chronic disease requires a management plan with adequate medical intervention, it is more of a patient-centred approach rather than a clinician driven, in addition, chronically ill patients can obtain early improvements in outcomes if only the clinical system is concerned with addressing the needs and problems (Singh, 2008 & Clark, 2003). Krumholz et al. (2006) agree that chronic disease management requires a long-term care plan, and patients will often receive guidance to promote self-management medication adherence and access to health care services. Hamine, Gerth-Guyette, Faulx, Green & Ginsburg (2015) stress that patients must adhere to chronic disease management to achieve health outcomes and improve their quality of life.

In chronic disease management, it is critical to identify patients' chronic illness and assess the level of risk, provide health education and counselling to promote medication adherence and reinforce behaviour change (Clark, 2003 & Wagner, 1998). The enforcement is made of self-management support; it provides patients with the confidence skills to manage their illness and should be able to sustain follow-up visits, therefore, enhancing chronic management to benefit the population that is affected by the given chronic disease (Wagner, 1998).

Healthcare systems around the world seem to be dominated by the agenda to effectively control chronic diseases. The partnership between the clinician/health care provider and the patient is essential to chronic disease management (Clark, 2003). Moreover, the clinician encourages and supports the patients to effectively manage their disease. According to Hamine et al. (2015) & Krumholz et al. (2006), various approaches are incorporated into the management of chronic diseases, such as patient education, an integrated approach to care, and ultimately the collection of outcomes data to continuously monitor the chronic disease. Patient outcomes are critical to the management of chronic disease and are often specific to each intervention (Wagner, 1998). Looking at the multidisciplinary approaches of chronic disease management, a

clear process needs to be meticulously in place to manage chronic diseases. Patient-centred approaches need to be adopted to effectively manage the patient illness; furthermore, appointments and follow-ups that are centred on chronically ill patients make it easy for them to access clinical services (Wagner, 1998) & (Clark, 2003). Moreover, standard procedures and guidelines need to be developed and implemented; this will be achieved by fostering patient education, patient motivation skills, and patient reminders that are needed for effective management. As a result, empowering the patient with the knowledge to manage their diseases turns to change patients' behaviour leading to improved outcomes (Wagner, 1998).

2.5.3 The inputs

In programme monitoring, inputs are an important element in the implementation process, the inputs that are required to implement a project includes (financial resources, policy, training material, guidelines human resource, etc. (UNDP, 2011). Inputs are used to execute a project, normally this is facilitated by project implementers. The inputs for the differentiated care ART delivery model interventions are Human resources, Budget, infrastructure adherence guidelines for HIV, TB and NCDs and SOPs, ART patients, patients' medical records / clinical stationery, NHLS laboratories, the Algorithm for viral loads, a transport system for viral load specimens, pharmacy, and Antiretroviral drugs

2.5.4 The outputs

Outputs are actual end results produced by the activities executed (Ortengren, 2014). Parsons et al. (2013) highlight those outputs are quantifiable, and program efficiency is measured by employing inputs, and activities, to produce outputs results, thus showing an association between programme results and resources. Outputs are immediate results, which propels the realization of programme outcomes (UNDP, 2009). Reidy, Rabkib, Soywai et al. (2018) stated that the most important output the for differentiated care ART delivery model is the number of facilities implementing at least 1 differentiated care the modality, number of eligible patients receiving differentiated care, the number of patients with a viral load test done and number of patients picking up medication in differentiated care ART delivery model modalities. Viral load should be monitored frequently to check the level of the virus in the body. Viral load in an HIV

patient is an imperative indicator of how the body responds to treatment (NDOH, 2019). In addition, all patients on antiretroviral therapy should have a viral load done at six, twelve months then annually, however for this intervention viral load will be measured on annual basis after enrolment on the Differentiated care ART delivery model. The data source for the outputs will be medical records, Synch, and the Tier.net system at the facility.

2.5.5 The outcomes

In this study, patient health outcomes are important to the intervention. Outcomes are short –medium-term results, which show preferred intermediate changes before the impact is realised impact, it presents how issues transform over time (Crawford et al., 2003 & UNDP, 2011). Parsons et al. (2013) further state outcomes are a consequence of outputs. According to the literature the immediate outcomes of the Differentiated Care ART delivery model is (1) Retention in care (2) Viral Suppression (NDOH, 2016) which both fall in the 3rd 90 of the UNAIDS 90-90-90 HIV strategy. In all chronic disease management programmes, it is important to retain patients in care. According to Mwale, (2016) & Rollins et al. (2014), it is thought that patients who retain care are more likely to adhere to medication and therefore become virally suppressed.

Retention in care is described as being able to adhere to continuing and receiving appropriate care at a given time point, this includes but is not limited to attending regular follow up appointments, scheduled laboratory tests such as viral loads (Mwale, 2016, Giordano et al., 2007 & Geng et al., 2010). Moreover, retention in care is seen as patients known to be alive and receiving ART at their follow-up visit. Another author Geng et al. (2010) suggests that current retention can be determined by the last scheduled follow-up appointment attended. For monitoring and evaluation, it is presumed that patients that are lost to follow-up and are not taking their medication have consequently stopped treatment. Therefore, Shepherd, Blevins, Vaz, Moon, Kipp, José, & Vermund. (2013) described the loss to follow-up as the absence of clinic visits within 180 days prior to the scheduled clinic appointment (180 days, clinic visit, last time a patient was seen with any drug pickup) (Shepherd et al.; 2013).

Similarly, those retained in care are assumed to be taking their medication as prescribed (Rollins et al., 2007). On the other hand, viral suppression is described as an undetectable viral load of < 50 copies/ ml (NDOH, 2019) in addition to this viral load suppression indicates a reduced functioning and replication of the virus in the body. Therefore, when a patient is on antiretroviral therapy, it is deemed successful if it reduces a patient viral load (HIV-1 RHA) to undetectable levels (Elul, Basinga, Nuwagaba-Biribonwoha, Saito, Horowitz, Nash, Mugabo, Mugisha, Rugigana & Nkunda, 2013). Viral load suppression in this study is regarded as a viral load HIV-1 RHA lower than detectable limits / < 400 copies /ml this shows that the patient is responding well to antiretroviral therapy. Data for both outcome variables will be collected from patient medical records, Electronic medical information systems, and Synch. The other descriptive variables can be explained in terms of clinical characteristics such as baseline enrolment information, ART start date, treatment history, duration on ART, TB status, and demographics such as age and gender. Based on the established variables, we can now pinpoint the theoretical frameworks that are appropriate in interpreting the research result on the efficacy of the intervention. The variables are embedded in health behavioural theories, for an individual to be retained in care one needs to be educated and understand their chronic disease, with the knowledge acquired be self-motivated to manage the disease to avert disease progression and effect behavioural change to improve the quality of life thus increasing life expectancy. The next section discusses health behavioural theories, models, and frameworks relevant to this research.

2.6 Public Health frameworks for interpreting empirical results on the efficacy of interventions

Many academics have invested enormously in the development of health behavioural theories, frameworks, and models. These frameworks are utilised to comprehend and interpret behavioural change. Studies and interventions should be grounded in theory. This is the same for the differentiated care ART delivery model intervention. This HIV intervention is nested and contextualised in the public health academic field of study. We previously established and discussed (2.4) the components and accompanying sub-components, we further discussed the (2.5) variables that are key to the intervention.

This section describes and discusses the various interpretive frameworks used to understand health behavioural change, most importantly we show links between the research variables and theoretical frameworks. Moreover, this subsection provided a framework for interpreting anticipated empirical results to figure out the role of the differentiated care delivery model on retention in care and viral load suppression. The interpretive framework is discussed using various themes, the origins of the theory, development, and purpose of the theory, description of the theory, potential usefulness, and limitations of the theory. There are several theories in public health used to understand behavioural change. These include the information- Motivation- Behavioural Skills model (Fisher & Fisher, 1992), the Health belief model (Rosenstock, 1974), the Theory of planned behaviour (Ajzen, 1975), Aids Risk reduction model (Catania, Kegels & Coates, 1990), Change Theory (Lewin, 1951) Social cognitive theory (Bandura, 1961), Social-ecological model of behaviour change (Panter-Bricks et al., 2006) and Transtheoretical Model (Prochaska & DiClemente, 1983). For the outcomes evaluation of the differentiated care ART delivery model, we use the Information- Motivation- Behavioural Skills model and Health belief model to explain the causal link between the intervention and outcomes.

Antiretroviral therapy will suppress the viral load in an HIV-positive person only when the person is religiously taking their medication as directed by the health care professional. Therefore, patients must adhere to treatment and be retained in care to enable them to attain viral load suppression, thus improving the quality of life and reducing mortality and morbidity rates. According to Gast & Maths (2019) “Adherence is a multifactorial phenomenon”, numerous factors affect adherence, such as disease-related factors, social factors, patient factors, economic factors, health care system factors (Gast & Maths, 2019), patient beliefs, demographics & comorbidities (Yeaman, Tan, Kwan, Fanning & Seng, 2018). To further comprehend the effects of these characteristics on the outcomes of the differentiated care ART delivery model intervention, Social-cognitive theories were revised to conceptualise ART adherence and retention in care. The health belief model and the information-Motivation- Behavioural skills will be used to explain the finding of the study.

2.6.1 Social Ecological Model

Social-Ecological Model started as a model in the 1970s, (Bronfenbrenner, 1977) and the 1980s, Bronfenbrenner. advanced and formalised it into a theory. The model assists

in understanding behavioural factors that influence human behaviour. Furthermore, it provides a context for developing effective behaviour change interventions that take into cognisance external factors that mould human behaviour in social and physical settings (Mchroy, Bibeau, Sterkler, and Glanz, 1988).

Contextually the social cognitive model is constructed on the child's biological and psychological structure. According to Glanz et al. (2008), Bronfenbrenner (1977), and DiClemente et al. (2002) the model asserts that a conducive environment should exist to effect change, therefore making it easy to adopt healthy behaviour. Multiple levels that influence social-ecological theory are interpersonal, individual, organisational, community, and public policy and the notion that behaviour is shaped by the social environment, similarly, behaviour shapes the social environment.

Figure 11: below shows multiple levels of the social-ecological model

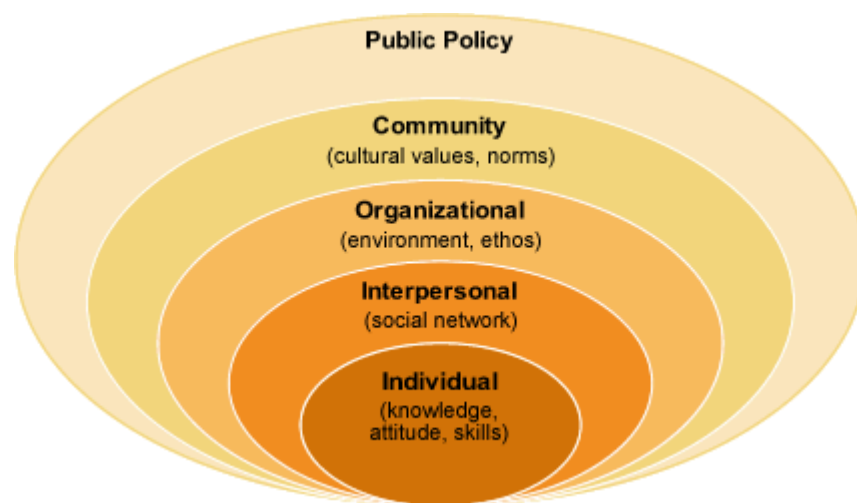


Figure 11: Multiple levels of social-ecological model

Adapted from: Bronfenbrenner, U. (1977). 'Toward an experimental ecology of human development. *American Psychologist*, 32(7), 513-531.

According to Sallis, Owe, Fisher (2008), and Bronfenbrenner (1977), the ecological models of health behaviour propose four core principles:

- 1) Multiple levels of factors influence health behaviours.
- 2) Influences interact across levels
- 3) Multi-level interventions should be most effective in changing behaviour
- 4) Ecological models are most powerful when they are behaviour-specific

2.6.2 Transtheoretical model/stages of change

The transtheoretical model is one of the behavioural theories used widely in public health to understand and explain why certain high-risk individuals might not accept or attempt to change health behaviours relative to their disease (Prochaska & DiClemente, 1983), moreover the theory is used to enhance health counselling. Six constructs are notable in this model 1) stages of change, 2) processes of change, 3) levels of change, 4) self-efficacy and 5) decisional balance, and 6) Temptation. James Prochaska & Carlo di Clemente alongside other colleagues pioneered the Transtheoretical model in 1977 and the model is embedded in psychology theories (Prochaska & DiClemente, 1983). According to Glanz et al. (2008), Prochaska & DiClemente (1983), Prochaska & Velinck (1997) and Prochaska, Redding & Everss (2008) stage of change describes that for behaviour change to be successful an individual must go through a series of sequence stages stage 1) pre-contemplating, stage 2) contemplating, stage 3) preparation, stage 4) action and stage 5 Maintenance. As explained in Table 1

Figure 12: Depicts the sequential stages of change.

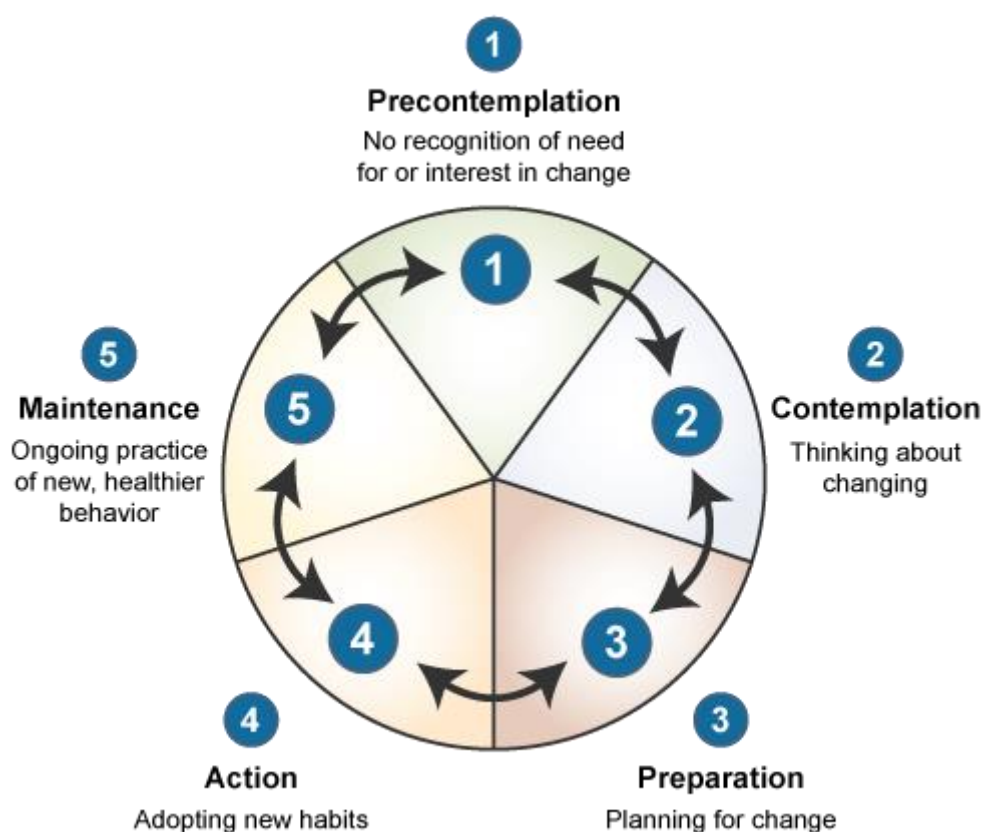


Figure 6: Transtheoretical Model/Stages of Change.

Source: Prochaska, J. O. & Di Clemente, C. C., (1982). Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy: Theory, Research and Practice*, 19(3), 276-288. Figure 2, p. 283.

Table 1: Behaviour Change Stages and Their Characteristics

Behaviour Change Stages and Their Characteristics	
Pre-contemplation	No recognition of the need for or interest in change (in the next six months)
Contemplation	Thinking about changing (in the next six months)
Preparation	Planning for change (generally within the next month)
Action	Adopting new habits (for at least six months)
Maintenance	The ongoing practice of new, healthier behaviour (over six months and chances to return to Old behaviour are few)

Individuals do not always follow or implement behavioural change in sequence, however often patients relapse therefore repeating and recycling stages (Prochaska & Velence, 1997), which hinges on their self-efficacy and motivational levels. Although the

Transtheoretical model is implemented in a variety of behaviours and different population, its greatest weakness is that the model does not stipulate how long a person spend in the various stages (time factor).

2.6.3 Social Cognitive Theory

Social cognitive theory is extensively used in a variety of sectors, such as psychology, education, and communication amongst others. A Canadian Psychologist Albert Bandura (1977) developed the Social Cognitive theory a Canadian psychologist in the 1960s, the theory is amongst the most popular behavioural theories, it was progressed from the social learning theory (Bandura,1986). The theory is grounded in cognitive, behaviouristic, and emotional models of behaviour change. Moreover, it combines concepts and processes to implement and advocate for disease prevention and management.

Bandura (1986), Glanz & Bishop (2010) & DiClemente et al. (2002) state that Social cognitive theory seeks to explain how people develop human behaviour. furthermore, it asserts that human behaviour is influenced by one's environment, people s behaviour is modelled by the environment they live in and further assumes that people learn by observing and interacting with one another in their environment which influences the outcome of their behaviour (Bandura, 1986; Fertman & Allensworth, 2010; Burney, 2008). Human behaviour is explained through a dynamic reciprocal model, which is illustrated in Figure 13: below; whereby personal factors, environmental influences and behaviour continually interact with one another (Bandura, 1986).

The model was conceptualised on key determinants of behavioural change, which are relevant in predicting health behavioural change 1) observational learning, 2) reinforcement and 3) self-control and self-efficacy.

Figure 13 illustrates the Social Cognitive theory dynamic reciprocal model

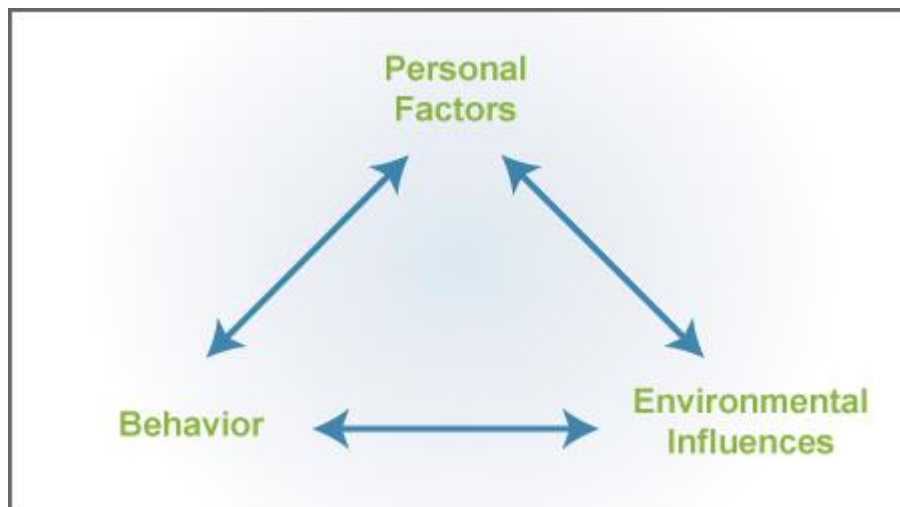


Figure 7: Social Cognitive Theory. Adapted from: Bandura, A. Social Foundations of Thought & Action: A Social Cognitive Theory, first Edition, 1986.

Glanz et al., (2008) highlight the advantages of the SCM, the model is a useful comprehensive conceptual framework that is well supported by literature to understand factors that influence human behaviour, moreover, it offers insight into a variety of health issues, and its greatest advantage is that it can be applied across diverse public health interventions. Several weaknesses were identified, the social cognitive theory is broad in its nature thus lacking a combined structure and it is loosely organised. Bandura (1986) states that behaviour is learned, however, authors like Pinker (1997) argue that emotions play a role in how an individual will respond to a particular situation (emotional response), which is largely attributed to biological factors, that has nothing to do with observations. In addition, the theory ignores the fact that as human beings people mature and change over time as they evolve and navigate through life (DiClemente et al., 2002).

2.6.4 Theory of Planned Behaviour

The theory of planned behaviour is one of the cognitive theories in psychology, founded by Ajzen (1988). The theory advanced from the Theory of reasoned action pioneered by Fishbein and Ajzen (1975). The theory of planned behaviour is one of the behavioural theories widely used in theoretical frameworks to understand and predict human behaviour; it links a person's beliefs with their behaviour. In addition, the theory

was developed to complement the theory of reasoned action and improve predictive power by incorporating perceived behaviour control (Ajzen, 1988).

Key variables of the Theory of Planned behaviour are attitude (behavioural beliefs), Subjective/social normative perception (normative norms beliefs) and perceived behavioural control (control beliefs) to predict individual behavioural intentions and behaviours (Ajzen, 1991, Glanz et al., 2008).

Figure 14: Show the Theory of Planned Behaviour

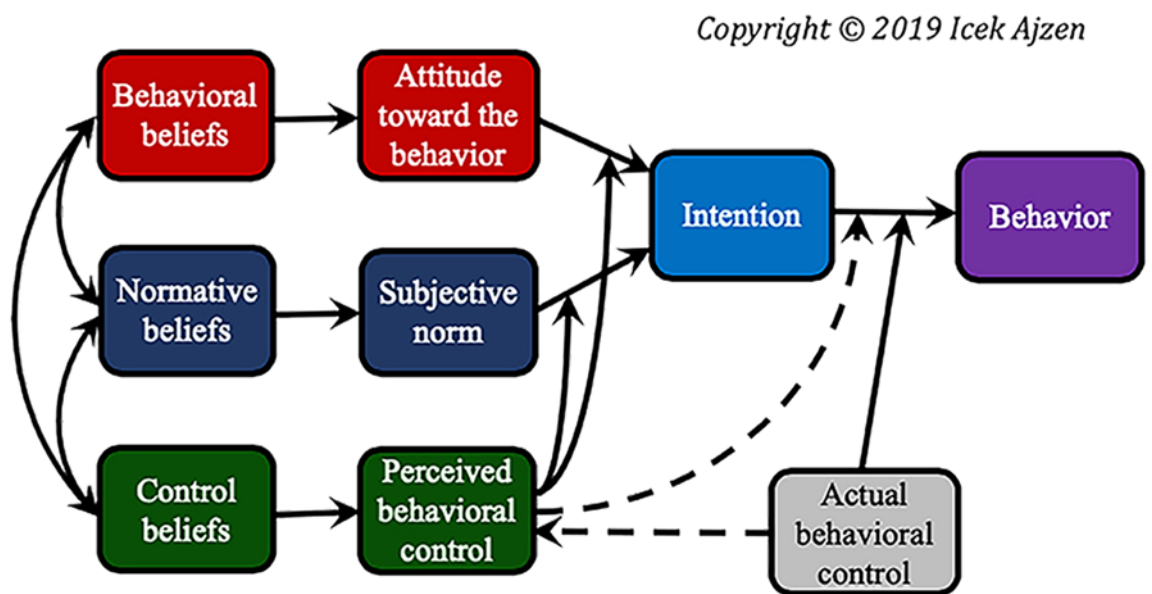


Figure 14: Theory of Planned Behaviour

Adopted from Ajzen, 2019

Fisbein & Ajzen (1975) states that behavioural belief describes a person's belief about the outcome of behaviour whether negative or positive, which influences a person's attitude towards the behaviour. Normative belief describes a person's perception; the way the person perceives how society will judge their behaviour, which produces a subjective norm. On the other hand, control belief describes how a person perceived to have control over their behaviour linked to perceived behaviour control (Sutton, 1997).

The theory of planned behaviour illustrates behavioural intentions by predicting how people will accomplish behaviour (Armitage & Conner, 2000), which can be influenced by attitudes, subjective norms, and perceived behavioural control. The theory of planned behaviour assumes that when a person is highly motivated and shows the intention to perform a behaviour, therefore the more the person has a positive attitude,

the more likely the person will implement that behaviour (Ajzen, 1991). The model is advantageous because it can be used to understand human behaviour and why certain people choose to engage in particular health behaviour. The theory does not only concentrate on people's beliefs, however, takes into cognisance other factors that might influence a person's behaviour. Furthermore, it can be implemented through various social disciplines, including health-related behaviours. Lastly, the theory is also stringent with its construct, therefore making it easy to understand and implement (Armitage & Conner, 2004).

Like any other theory, the theory of planned behaviour has drawbacks and is subjected to criticism. The theory of planned behaviour ignores emotional determinates of behaviour (Armitage & Conner, 2000). In addition, the model assumes the behaviour is rational, thus excludes, fear, threat, and anxiety. However, people do not always act rationally, and that behaviour is planned.

2.6.5 The Information Motivation Behavioural Skills

The Information Motivation Behavioural skills (IMB) model is one of the most prevalent Social Psychological models in the sphere of HIV prevention and ART adherence. It is a theoretical model for health behaviour change that was developed by Fisher and Fisher (1992) to change HIV/AIDS hazardous behaviour and to predict HIV prevention and ART adherence. Since then, the model has evolved and can be applied to a diversity of health promotion behaviours, which also encompasses medical adherence, retention in care, breast self-examination and motorcycle safety among different populations (Fisher, Fisher & Harman, 2003). The IMB construct serves as a critical element for the prediction and promotion of health behaviour, with massive support from reviewed literature (Fisher, and Harman, 2003; Sharma, 2012; Osborn et al, 2010; Fisher, Kelly, Melnyk, and Belyea, 2012).

The IMB model is conceptualised on three main factors necessary for the adaptation of health-related behaviour: information, motivation, and behavioural skills (Fisher and Fisher, 1992). These constructs can be addressed individually or collectively in health intervention. However, the IMB model assumes that there is a causal link between the constructs, therefore when an individual is well-informed and motivated to act thus there is an assumption that essential behavioural skills are needed to effect change,

which will ultimately lead to initiating and maintaining health endorsement behaviours to promote and practice positive health outcomes (Fisher, Fisher & Harman, 2003). Moreover, it can be used to translate the model to health intervention. On the other hand, if an individual is not well informed, not motivated to act and does not have the necessary behavioural skills to effect behavioural change, they will most definitely participate in risky behaviours with a negative experience health outcome (Fisher, Fisher & Harman, 2003; Fisher, Fisher, Amico & Harman, 2006).

Figure15: Information-Motivation-Behavioural Skills Model of Health Behaviour

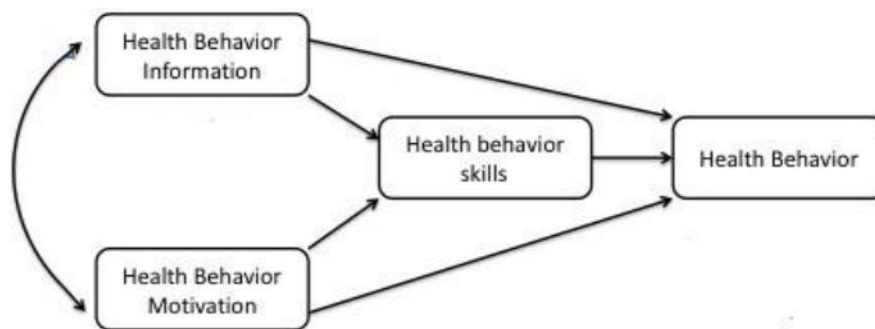


Figure 15: Information-Motivation-Behavioural Skills Model of Health Behaviour
Adapted from Fisher and Fisher (1992).

The IMB model postulates that to embrace healthy behaviours it is essential to have health-related information, motivation, and behavioural skills (Fisher et al., 2003). Information, the IMB model concentrate on a set of information pertaining to preventive information that affects how health behaviour is carried out. According to the IMB model. Information should be completely relevant to introduce and promote behaviour and the individual can perform this in their social ecology (Fisher et al., 2003). Motivation is based on individuals' personal attitudes (personal motivation) and social motivation (perceived social support to perform behaviour change). These two motivations are imperative components to influence health-related behaviours. Social motivation is seen as social support for achieving health-related behaviour, and perception of personal vulnerability. Personal motivation attitude and perception towards health-related behaviour (Fisher & Fisher, 1996; DiClemente, Crosby & Kegler,

2002). Moreover, to the other constructs, Behavioural skills capacitate people to implement health behaviour change objectively. We see Behavioural skills as an additional critical element that will determine whether informed people and highly motivated people have the capacity to enact health-related behaviour effectively. (Fisher, & fisher, 1996) In addition, the IMB highlights people's objective abilities and self-efficacy in the accomplishment of the behaviour. According to Fisher et al. (1996), Fisher et al. (2006) & Sharma (2012) Self-efficacy is the ability of persons to implement health-related behaviour confidently. Furthermore, the social cognitive theory was influenced by this construct; therefore, self-efficacy is widely supported by various studies around the world to carry out diverse health-related behaviours, such as medication adherence, breast, and testicular self-examination etc. (Fisher, Fisher, and Harman, 2003; Glanz, Rimer, and Viswanath, 2008).

The model is advantageous in that it can be generalised across numerous populations of interest and various health fields. However, the model states that the content should be specific to the population of interest in health-related behaviour for information, motivation, and behavioural skills (Fisher et al., 1992 & fisher et al., 1996). The model is understood to be stingy in the fact that it consists of only three constructs, however, this is seen as an additional advantage because it is simple to operationalise the model (Sharma,2012). Furthermore, the model was systematically tested with high passable predictability and has demonstrated multivariable correlation evidence, which supports the IMB model's assumptions in determining HIV preventive behaviour. (DiClemente, 2002) Finally, as a theoretical framework, the IMB model can be applied to various health behaviours (Sharma, 2012 & Ndebele et al., 2012).

As a behavioural intervention model, various studies have discussed the IMB models extensively. The IMB's failure to maintain behavioural change over an extended period is because most studies were short-term. Another limitation is that one of the construct information, is weak to predict behaviour on its own, thus there is a co-dependency with the other two constructs to effect behavioural change (Sharma, 2012. Fisher et al., 2006 & Ndebele et al., 2012).

2.6.6 The Health Belief Model

The health belief model is one of the first social-psychological health behavioural change models. The health belief model was developed in the 1950s by Irvin M

Rosenstock a social psychologist alongside other social scientists in the department of public health services in the US, to enhance health education programmes and explain and predict health behaviours (Rosenstock, 1974). At the time, it was evident that there was a widespread failure in the uptake of health services particularly prevention, screening test and diagnostic test for to detection of asymptomatic diseases (Janz & Becker, 1984). The model was based on the desire to understand why there was a low uptake of free health services, such as tuberculosis (TB) X-ray screening to some extent cervical cancer and later polio and influenza (Rosenstock, 1974).

The HBM has been employed to predict response to a variety of health behaviours like preventative screening measures for people who show no symptoms for early detection of disease and receive immunisations. Most recently, the model was applied systematically to patients to check their response, compliance/adherence to medication and chronic illness behaviour, which need to be monitored long term to see behavioural change. (Rosenstock, 1974; Janz et al., 1984). Health problems caused by lifestyle have propelled a shift from a treatment and prescriptive healthcare system to a patient-centred system, which is based on prevention, motivation, and promotion of health behaviour (Orji, Vassileva, & Mandryk, 2012).

The HBM is the most utilised theory / conceptual framework worldwide to explain health behaviours, it borrows its origin from cognitive psychology. As one of the first theories to explain health changes and maintenance of health behaviour, it also serves as a guiding framework for interventions related to health behaviour. (Janz et al., 1984). Furthermore, a key characteristic of the model focuses on an individual's ability to take action and believe that they have an illness. The HBM is built or conceptualised on the following constructs to predict people's action to prevent, screen and seek treatment, control medical conditions, (1) perceived susceptibility perceived severity, perceived benefits, perceived barriers cues to action and self-efficacy (Rosenstock, 1974; Janz et al., 1984; Semin et al., 1996; & Glanz et al., 2008). Additionally, HBM emphasises two characteristics of individual prediction and health behaviour: threat perception and threat evaluation. The model assumes that when people hold appropriate beliefs, health behaviour can be activated by cues action.

Figure 16: Health Belief Model

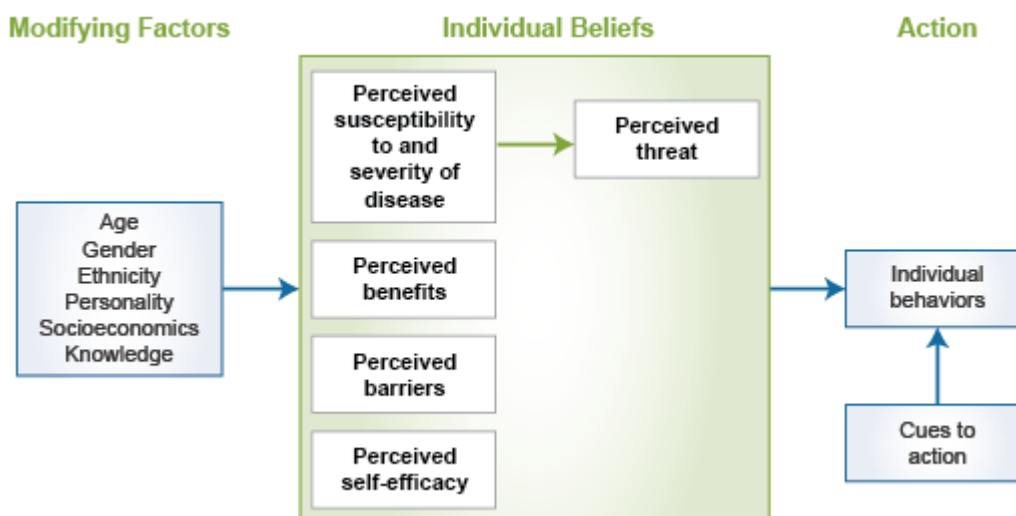


Figure 16: Health Belief Model

Source: Glanz K, Rimer BK, Viswanath K, eds. 2008. Health Behaviour and Health Education: Theory, Research, and Practice (4th ed). San Francisco: Jossey-Bass.

The greatest strength of the HBM is that it can successfully be used to design various health interventions and remain the most behavioural model used to predict health-related behaviours. HBM can be applied to a variety of populations; HBM can be used to influence interventions to increase susceptibility and perceived severity of a health illness, by educating patients on the illness, risk, and consequences of the disease (Manu & Sriran, 1999; Semin & Fiddler, 1996). One of the most advantages of the model is that it is flexible and has increased screening and diagnosis of disease. (Orji, Vassileva, & Mandryk, 2012; Glanz, Rimmer & Viswarath, 2008). There is mounting evidence that supports self-efficacy, as it is imperative in accounting for the preliminary and maintenance of behavioural change (Rosenstock, Strecher & Becker, 1988). The model is flexible and adaptable to a variety of health interventions such as predicting and framing cancer screening and HIV prevention behaviours (Glanz et al., 2008).

To explain the disparities in people's beliefs and attitudes, the HBM attempts to predict health-related behaviours, but it does not take into consideration other factors that can influence behaviour (Rosenstock et al., 1988). Like any other theoretical model, the HBM is exposed to critiques. The model generally neglected the cues to action and health motivation when the empirical test was conducted, secondly, many studies that have applied the HBM have noted that poor operational of the model has failed to check the validity and reliability of constructs; this was highlighted as a considerable setback. (Ayers et al., 2007). Thirdly, an additional limitation is that the HBM is not a

cognitively based model and does not take into consideration the emotional aspect of behaviour. Forth the model fails to include positive aspects of health-impaired behaviours in patients for example smokers may disregard health risks because they enjoy smoking) and social influences (Semin et al.,1996). Finally, the model disregards the inclusion of self-efficacy/ perceived control as factors that influence behaviour (Rosenstock et al., 1988).

In summary, behavioural theories are immersed in extensive cognitive literature, which makes them relatively easy to apply to any health intervention and population. Therefore, health behavioural theories are used in many conceptual frameworks to predict, explain, and interpret human behavioural change. Jointly the information-motivation- Behavioural skills and the health belief model will assist to interpret the research result of the differentiated care ART delivery model. All of this stems from using a suitable theory or theories; it starts with identifying the problem, purpose, research questions and accompanying hypothesis. Then the theory should be nested in the appropriate academic field of study (Public Health). Furthermore, the study show links between the research problem, purpose statement, research questions and hypothesis that are interlinked with the six subcomponents of deriving a conceptual framework.

After interrogating the literature, we proposed the use of the health belief model and information-motivation-behavioural skills aimed at health behavioural change for the intervention, to assess whether the intervention influenced changes that have occurred and further explain factors that affect behavioural change and maintenance of behaviour in the management of chronic diseases. This will come in handy to explain why certain people take charge of their chronic illness, adhere to their medication, most of all retain in care thus achieving optimum viral load suppression. We propose the use of a result chain to evaluate the intended outcomes, show a causal link between the intervention and anticipated outcomes (from inputs to outcomes) and whether the outcomes were influenced by the intervention.

2.7 Assessing outcomes evaluation of the ‘differentiated care’ antiretroviral therapy delivery model in South African townships, a conceptual framework.

The research aims to determine the outcomes of differentiated care ART delivery models, along with factors that influence the failure to achieve these intended outcomes in the context of Tembisa, an urban township in Ekurhuleni. In this section, we conceptualise how we intend to carry out the research. Specifically, we develop the research conceptual framework, that will direct the empirical part of the research beyond the literature review, which was the main outcome of conducting the literature review. With the assistance of the diagram, we summarise the literature that was reviewed in the previous sections and discuss the six components of a conceptual framework extensively, moreover, showing links between the various components (2.1-2.6). (1) The research setting/context analysis Tembisa, in Ekurhuleni Metropolitan Municipality. (2) In The research problem analysis, we discussed the challenges of HIV, its history, symptoms, root cause and consequences, which drives the research. (3) Research knowledge gap analysis determining the knowledge gap and showing why we need to pursue the research to determine the retention in care and viral load suppression as outcomes of the programme. Furthermore, we demonstrated that there is a literature and contextual gap, lastly, this also assists in identifying the research strategy, and methods employed. (4) Establishing and discussing the academic context and its key components. The research is embedded in public health studies, with Preventive medicine, public policy, Tertiary prevention, and chronic disease management as sub-components that are relevant to this research. (5) Establishing and discussing the key research variables and/or attributes, we discussed viral load suppression, retention in care and loss follow-up as variables of the differentiated care ART delivery model that are highly linked with the academic field of study. (6) Establishing and discussing the interpretive framework for the research.

Ultimately, based on the literature review this section will systematically summarise these six components to develop a conceptual framework. The framework is accompanied by a schematic diagram that visualises summaries of the literature reviewed in this research, furthermore, we propose how we intend to carry out the empirical part of the research based on the literature reviewed. Most importantly how we are going to collect data,

analyse, present results and conclusions that are drawn, interpret the findings and highlight the limitation of the procedure and methods.

A conceptual framework is the heart of the research, there are various definitions of what constitutes a conceptual framework; therefore, a conceptual framework is a summary of key components that are derived through a literature review that plans how the research will proceed. The conceptual framework contextualises the research (Rocco & Plakhotnik 2009). The authors further distinguish between a literature review, theoretical framework, and conceptual framework; these concepts are used interchangeably even though they have similar characteristics, and they are so different in their explanation and use. (Rocco & Plakhotnik 2009) state that a conceptual framework documents narrative components, empirical research, and relevant theories to advance knowledge systematically and identify knowledge gaps in the literature, which justifies the research. In addition, authors like Imenda (2014) posit that a framework provides the structure that guides the research in refining the purpose of the research, and research questions, substantiates the research strategy method and process that provides an integrated way of looking at the research problem. Rivitch & Riggaan (2012) agree with the previous authors and put forward another element to the conceptual framework as a learning tool that assists in refining the four pillars of research. Figure 18 is a graphical presentation of summaries based on a literature review to conceptualise a conceptual framework for this study.

Primarily, Tembisa is the physical research setting, an urban township situated in the North of Ekurhuleni Metropolitan Municipality. The Municipality is a vibrant, eventful business hub in South Africa, 30 per cent of the local population is living in poverty, with inequitable access to health care. Tembisa has the same characteristics as any township in Ekurhuleni, South Africa; the township is predominantly black, with people living in poverty, facing high unemployment, poor service delivery and inequitable health care (Masuku et al., 20019). According to Municipality (2005), and Masuku et al, (2008), it is not surprising that social determinants of health are linked with poverty, therefore, poor communities experience high levels of HIV/Aids and other poverty-related diseases

Second, we reviewed the literature and analysed the research problem which shows that the HIV epidemic has been a challenge around the world, with South Africa having one of the highest prevalence and ART programs in the world.

Poverty seems to be the root cause that drives the spread of HIV infections, as it is concentrated among the poor of the poorest, alongside age disparities, social and gender inequalities. Similarly, HIV Stigma is associated with the spread of HIV infection.

UNAIDS (2019), Fatok (2016) posit that people who go through stigma and discrimination daily feel side-lined and are more susceptible to HIV, while those living with HIV are more vulnerable to experience stigma and discrimination, the latter is associated with poor health outcomes, poor treatment adherence and are likely to indulge in unsafe sexual behaviours. HIV stigma can be regarded as a barrier to effective HIV prevention and treatment programs (Fatok,2016), Mahajan et al., 2008).

Adverse consequences of HIV are mortality and morbidity; this can also be attributed to non-adherence to long term ART, which leads to poor health outcomes including increased viral load count, and resistance to treatment thus increasing care costs due to compromised treatment effectiveness (NDOH, 2016). To mitigate these factors, patient centred approaches intended to improve adherence to treatment, retention in care, and viral load suppression of patients on chronic medication are warranted.

The study is based on an outcome evaluation of differentiated care ART delivery models. Literature put forward, key outcomes of the intervention are retention in care, viral load suppression, which hinges on patients being adherent to treatment, scheduled clinical and /or pick-up points and having a viral load test done at appropriate intervals. When patients are adherent to medication, they are likely to remain in care and have an improved viral load suppression, therefore, when optimum suppression is achieved this will improve the quality of life thus increasing life expectancy, reducing incidents of HIV, and reducing mortality and morbidity.

Figure 17: Summary of past and current studies of the differentiated care ART models

Similar past and current studies reviewed for research knowledge gap analysis	Mutevedzi et al. (2010) and Agba et al. (2018) Wilkinson et al. (2016), Prust et al. (2017), Luque-Fernandez et al. (2013), Reif, Bertrand, Rivera, Joseph, Anglade, Fitzgerald, McNairy (2017), Bekolo et al. (2017), Mody et al. (2018), Agaba et al. (2018), Ssonko et al. (2017), Rich et al. (2012), Okoboi et al. (2015)
Aims and objectives	The studies reviewed determined retention on ART amongst stable patients in differentiated care models to ascertain whether the scale-up of decentralised HIV programmes has an impact on patients' outcomes, understand the retention in care when ART is scaled up
Research strategies, design, procedure, and method	Most of the reviewed similar studies have employed quantitative research strategy and a few employed mixed methods. With a preconceived notion of retrospective cohort analysis to ascertain whether the scale-up of differentiated care ART delivery models has an impact on patients' outcomes. It was eminent that an inclusion and exclusion criterion is used in the selection of the target population. Predominantly descriptive analysis is performed using programmatic data, jointly with the logistic regression model, bivariate and multivariate to determine factors related to retention, loss to follow-up, and viral load suppression this assists in determining the relation between the intervention and outcomes.
Results they presented	Almost all the studies agreed that a longer duration on ART was associated with higher rates of virological suppression and higher retention rates
The key discussions and conclusions	In conclusion, it was realised that differentiated care models could ease attrition from ART care for stable patients, these models can be utilised as a strategy of care for stable patients thus reducing staff overload and improving retention in care.

Source: Author

We identified four dimensions of public health community medicine, social medicine, preventive medicine, and community health. The focus is on preventive medicine, with an emphasis on tertiary prevention, rather than primary and secondary prevention.

Preventive medicine emphasises preventive measures to regulate the progression of disease at any stage (McKenzi et al., 2005 & Loeppke, 2008), while tertiary prevention can be described as disease management, prevention of disability and death.

Tertiary prevention paves a way to introduce chronic disease management with specific reference to inputs, outputs and outcomes of the intervention paying special attention to

the immediate outcome's retention in care and viral load suppression. Therefore, the two outcomes are considered the most important for the intervention.

In addition, we have three questions to address the intervention.

1. What are the rates of retention in care for stable patients on the differentiated care ART delivery model after 24 months?
2. What is the proportion of stable patients with viral load completion and viral load suppression on the differentiated care ART delivery model after 24 months?
3. What are the factors associated with loss to follow-up among stable patients on the differentiated care ART delivery model for 24 months? The research wants to understand what influences retention in care. The variables will be sourced from electronic medical records extracted from TIER.net

After interrogating the literature, this research put forward the Information- Motivation-behavioural skills model, the health belief model, the social-ecological theory, and the theory of planned behaviour aimed at health behavioural change as theoretical frameworks to interpret the anticipated empirical results of the differentiated care ART delivery model intervention as an extension of the HIV intervention.

Furthermore, the study will also refer to the developed result chain to access the achievement of intended outcomes, show fundamental relations between the intervention and anticipated outcomes and whether the outcomes were influenced by the intervention

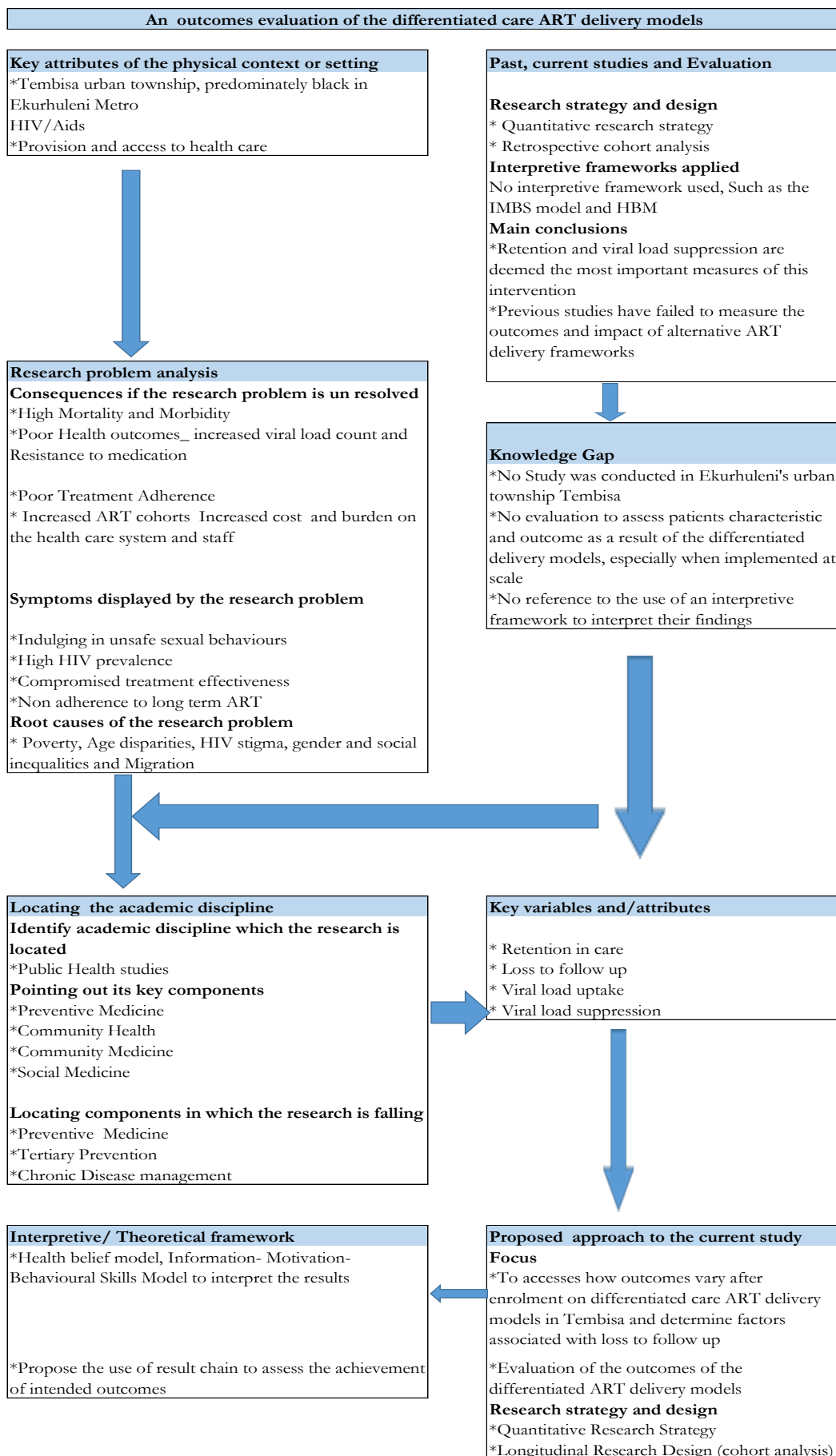


Figure 18: proposes a conceptual framework for evaluating the outcomes of the differentiated care ART delivery model

Like most reviewed studies, we proposed the employment of a quantitative research strategy, a longitudinal research design looking at retrospective cohort analysis, we used a fully structured interview schedule and derived a questionnaire to collect data from electronic medical records to determine viral load completion, suppression, and retention rates for stable patients on the differentiated care ART delivery model. Moreover, determine factors associated with loss follow-up among stable patients on differentiated care ART model for 24 months since enrolment in the context of Tembisa. The data collected were analysed using descriptive statistics, chi-square test and regression analysis were used to test the hypothesis.

In conclusion, this systematic summary of components maps out the process of this research undertaking and decision-making on the literature review is responsible for establishing a conceptual framework for this assessment. Chapter 3 discusses in detail the approaches highlighted above and why it is deemed appropriate for outcome evaluation study.

3 RESEARCH STRATEGY, DESIGN, PROCEDURE AND METHODS

This chapter seeks to identify, describe, and earmark a research strategy, design, procedures, and methods that the study used. These sections clearly outline and describe the research strategy, research design, and research procedure methods which discuss how the researcher collected, processed, and analysed the data. This is highly linked to what we have proposed in the conceptual framework on how to collect, collate and process and analyse empirical research data, we accomplished this by interrogating empirical data from published academic literature to understand each component and concept and what it provides for this research. We committed and then detailed the most appropriate option, and most importantly; we reviewed studies that have applied these options to assist with the justification and application of the selected options practically. Firstly, (Section 3.1) describes different types of research strategies based on the fundamental paradigms that guide the research. We reviewed the literature to allow us to commit, further detail and support the chosen strategy. Secondly, (Section 3.2) introduces and describes the different research designs, a research design offers an idea of how the researcher is going to bring together the research, and which method was applied to collect and analyse data. The study draws from reviewed past studies that have conducted the same research.

Third, (Section 3.3) apporions key procedures and methods that the research applies to assess the outcomes of ‘differentiated care’ antiretroviral therapy delivery models, the data collection instrument, target population, sampling, and ethical considerations. Finally, this chapter also describes the reliability, and validity (Section 3.4) and (Section 3.5) presents the technical and administrative boundaries of the research study.

3.1 Research Strategy

Research strategy is described by Bryman (2012) as a choice that one makes to carry out one’s research project; the decision made should demonstrate a relationship between research and the theory, and the theory in research is underpinned by the paradigm that guides the researcher in the choices he applies. On the other hand, the research strategy shows various measurements and, how these measurements will be utilised in the research procedure. In addition to this, the research approach includes a theoretical framework on how data will be collected and analysed (Bryman, 2012; Wagner,

Kawulich, & Garner, 2012). Creswell (2014) ascertains that research approaches are plans and actions that a researcher employs to collect analyse and report results. The nature of the research purpose and questions play a major role in the type of research strategy that one uses. Literature has distinguished three types of research strategies that can be employed, namely quantitative, qualitative, and mixed methods (Wagner et al., 2012; Bryman, 2012). The researcher used a quantitative research approach for the research project, as was pointed out in section 2.3, most reviewed studies used a quantitative research approach.

Bryman (2012) describes quantitative research strategy as a strategy that accentuates the quantification of data during collection and analysis data, in a quantitative study we use data that is collected to prove or disprove a theory. Wagner et al. (2012) further define quantitative research as a portrayal of the social marvel by using a numerical instrument, analysed using statistics. In addition, Creswell (2014) further highlights that quantitative research is an approach where objective theories are tested by exploring the connections between the variables that can be measured and analysed statistically. Simply, in describing social phenomena, quantitative research accentuates quantification when collecting, handling, and analysing data to test the relationships between variables and it is deductive by nature and draws from positivist theory. This strategy has been investigated in numerous previous similar studies as highlighted below.

A study by Mody et al. (2018) Scrutinising relationships between assigned appointments and the ability of patients to return for follow-up to ensure retention in care used a quantitative research strategy for variability and to estimate the impact of scheduling visits on patient outcomes. This will enable us to determine the cause-and-effect relationship in this study theoretical assumptions are based on the developed theoretical framework. The research approach will assist in answering the research question and testing the hypothesis.

Wriger et al. (2018) conducted a study to assess long-term retention in care among clinically stable ART patients attending six-monthly clinical consultations and further examine associated risk factors for attrition with three monthly fast-track prescribed scripts dispensed by facility-based community health workers. A quantitative research strategy was used with the rationale of showing causal links between long-term retention and spacing out drug refills and clinic consultations to examine how it reduces attrition. The authors tested the relationship and showed causal links between the variables in the study.

3.2 Research design

Research design offers a specific way to navigate the type of investigation one seeks to undertake (Creswell, 2014). According to Bryman (2012), & Wagner et al. (2012) a research design offers a rough idea of how the researcher is going to carry out the research, and which method will be applied to collect and analyse data. A research design is a way the data is going to be collected. The literature points out that five research designs can be utilised, Experimental, Longitudinal, Cross-sectional, Comparative research design and Case study (Bryman, 2012). Neuman (2014); and Bryman (2012) describe the longitudinal study as the collection of data from a sample at two different time points during the study. In this study, the researcher employed a longitudinal research design concentrating on cohort study to assess the retention rate, factors associated with loss to follow-up, viral load specimen collection within scheduled clinic visit appointments and viral load suppression of patients choosing to enrol on differentiated care ART delivery models.

Prior studies that assessed the same phenomenon as in this study utilised longitudinal research design looking at retrospective cohort analysis. A study by Agaba et al. (2018) assessing retention in differentiated care: looking at several measures of analysis for regionalized HIV care and comparing patient retention in central vs decentralised treatment sites. Using longitudinal research design, the study surveyed patients between January 2008 and December 2011 to fully examine longitudinal retention. The advantage of using this type of research design, it assists the researcher to assess retention for the duration of the study. This is beneficial to my study in assessing how retention in care and viral load varies over time; in addition, it will assist in determining factors associated with failure to retain in care.

Mody et al. (2018) investigated the relationship between assigned appointments and the ability of patients to return for follow-up visits and be successfully retained in care. Longitudinal research design observing retrospective cohort analysis was used, a retrospective cohort study allows the researcher to review data that was previously collected in the health facilities and allows the researcher to follow the same group of people who enrolled on the differentiated ART care models at the same time to describe and compare changes in patient outcomes at a given interval.

3.3 Research procedure and methods

The research procedure and method section seeks to specify and detail the processes that the research followed, the structure, data collection methods, collation, and analysis of the research results. In this section, we follow an algorithm roughly to examine and detail the six sub-components of the research procedure and methods (Section 3.3.1) data and information collection instruments, (Section 3.3.2) the target population and sampling of participants. (Section 3.3.3) the ethical considerations during data collection, (Section 3.3.4) data collection and storage, (Section 3.3.5) data processing and analysis as well as (Section 3.3.6) narrate the background of the research participants who took part in this research project.

3.3.1 Research data and information collection instrument(s)

In conjunction with selecting the research design, the researcher should also examine various data collection instruments. Data collection instruments are described as tools used to collect data; this can be in a form of interviews, questionnaires, direct readings, and observation (Bryman, 2012). According to the literature data, collection instruments are used to collect data from the research participants to answer the research question and draw conclusions (Kumar and Singh, 2015). Therefore, it is important to ensure that the data collection tool used is valid and reliable. Creswell (2014) agrees that the reliability and validity of the study depend on the suitable data collection tool used. There are two kinds of data collection instruments an interview schedule and an observational schedule (Wagner, Kawulich & Garner, 2012). This study is a longitudinal study concentrating on a retrospective cohort study, for this reason, the researcher used secondary data retrospectively, furthermore, there are three essential data collection instrument structures, namely fully structured, semi-structured and unstructured, (A Bryman, 2012; Kumar and Singh, 2015, & Wagner et al., 2012). A fully structured data collection instrument is described as a formal interview with the same questions asked in the same sequence to all respondents; it is systematically compiled with instructions on how to fill it in, also known as a questionnaire (Bryman, 2012; Kumar and Singh, 2015, & Wagner et al., 2012). A fully structured data collection sheet was developed to provide structure and guide the extraction of data. For this study, a questionnaire was used to collect secondary data from patients' electronic medical records (Integrated 3 Tier System) without interacting with the actual patients. A questionnaire contains

predetermined questions to gather information from respondents in a standardised manner, usually in a closed format where the respondents will not be able to elaborate on the answers and often used in surveys, experiments, and other observations (Leedy and Ormrod, 2015, Bryman, 2012; Kumar and Singh, 2015, & Wagner et al., 2012). The questions in the questionnaire mirrored the patient medical record used in South African health facilities. The questionnaire consisted of the following components (1) Patient demographic variables, (2) Treatment history (3) Continuing ART in Differentiated Care (4) Viral load monitoring.

The study interrogated previous studies that used the same data collection instrument in their respective research. A study by Mody et al. (2018) scrutinising relationships between assigned appointments and the ability of patients to return for follow-up visits and be retained in care. The study used a fully structured medical record to investigate factors associated with retention in care and the ability of patients to adhere to follow-up visits. A clinician uses the patient form (medical record) which is standardised collected data. This will ensure that the same data is collected for each patient with the same variables captured into the clinic database. In this study, we designed a questionnaire that mirrors the structured electronic medical record to assist with the extraction of data.

A similar study by Rich et al. (2012) describes patient outcomes commencing community-based ART in rural Rwanda. The study used a questionnaire to abstract data that was collected from paper-based registers and electronic medical records, the same questions will be asked in the same order. This is a retrospective study utilising secondary data with the advantage that data is already collected and just needs to be abstracted, assessed, and analysed. The studies above confirm that it is suitable to use a questionnaire also known as a data abstraction form to abstract the data from the patient electronic medical records (Tier.net) to evaluate the outcomes of the differentiated care ART delivery models. Most importantly, it was beneficial for the study to use a fully structured questionnaire to guide the extraction and transfer of data from the electronic medical records, this made it makes easy to code, and process data.

3.3.2 Research target population and selection of respondents

3.3.2.1 Research target population

A target population can be defined as a large group of people in which research findings can be generalised (Babbie, 2015 & Leavy, 2017). Bryman, (2012); & Neuman, (2013) shared the same sentiments in describing the target population/ sample frame as a list of many cases from a population, which one draws their sample, and the researcher should be able to generalise the result from the selected sample. An inclusion and exclusion criterion were applied to determine the target population of the study as predefined by the adherence guideline, the target population for this study was all eligible HHIV-positive adult patients on antiretroviral treatment enrolling on differentiated care ART delivery models from January 2017 to December 2017. According to the adherence guideline (2016) the eligible patients should be stable on ART, adults >18 on the same antiretroviral treatment regimen for at least 12 months, with the two most recent laboratory results being normal. These patients will be monitored over a period of 24 months after enrolment on differentiated care ART delivery models retrospectively. Previously reviewed studies that have applied the same inclusion and exclusion criterion as the research understudy, authors like Luque-Fernandez et al. (2013) evaluating the effectiveness of adherence clubs in maintaining and improving long-term retention in care and virological suppression. An inclusion and exclusion criterion were applied as per the guideline; the target population was defined as clinically stable adult patients who have been on ART for at least 18 months. The guideline further recommends that patients should have had a CD4 count of more than 200 cells in the previous six months and have a sustained viral load.

A study by Wringer et al (2018) assessed related risk factors for attrition with the three-monthly fast-track drug refills and six-monthly clinical visits for stable ART patients in long-term ART. An inclusion and exclusion criterion was applied in selecting the target population. All HIV patients who are stable (aged >18) on first-line regimen ART for >more than 12 months, with a CD4 count equal to 300 cells without opportunistic infections, not pregnant or breastfeeding we eligible for SMCC with three monthly drug refills dispensed by a community health worker.

The advantages of using an inclusion and exclusion criterion are that the target population is pre-defined by the guidelines, for participation in differentiated care models. Therefore, this study used an inclusion and exclusion criterion as defined in the

adherence guidelines (2016), we followed the same group of patients enrolled on Differentiated care models over time to enable the researcher to examine retention and viral load outcomes and consequently generalise the result to the target population.

3.3.2.2 Sampling or selecting respondents from the target population

Sampling is expressed as the process of selecting a sample from many cases in which you want to participate or include in the study (Wagner et al., 2012 & Leavy, 2017). (Bryman, 2012) also, describe sampling as a selection of a sample from a list of people in the population which will be studied. Fundamentally research can be based on non-probability sampling or probability sampling. In quantitative research strategy probability sampling or non-probability is used, this is dependent on the aims and objective of the research, sample size and what the researcher wants to achieve. (Leavy, 2017) There are four types of probability sampling methods namely, systematic sample, simple random sample, multi-stage cluster sampling, and stratified random sampling. Probability sampling has been advanced to minimise sampling error and the sample should be representative of the population (Bryman, 2012).

Purposive sampling was used to sample four health facilities, namely Ethafeni clinic, Esangweni CHC, Erin Clinic and Tembisa main Clinic based on the total number of patients remaining in care and the total number of patients decanted in each health facility. Stratified random sampling was used to sample patients enrolling on differentiated care ART delivery models into a 3-in-1 starter to cover the modalities within differentiated care. Stratified random sampling is whereby the target population is categorised into subgroups and the participants are randomly generated, every individual with a subgroup of the target population has an equivalent chance to be included in the selection (Bryman, 2012; Neuman, 2014; & Wagner et al., 2012). Previous studies that used the same sampling technique as committed in this research understudy, a study by Agaba et al. (2018) investigating retention in differentiated care looking at various measures analysis for decentralised treatment sites, probability sampling utilising stratified random sampling was used, the advantage that stratified random sampling provides greater precision, requires small sample and it is cost-effective, this will benefit the study by enhancing reliability.

3.3.2.3 Sample Size

The sample size should be large enough to produce reliable results that can be attributed to the population. This study is embedded in a continuous cohort monitoring routine outcome, the enrolment period was extended from January 2017 to December 2017 to increase the sample size of stable patients enrolling on differentiated care ART delivery models. Morgan & Krejcek (1970) scale table for determining a sample size from a given population was used to calculate the sample size of 1,465 across the four facilities, out of 1,465 records 181 records were excluded 15 who died and 166 who were transferred out of the selected facilities to receive care at other health facilities. A total of 1,284 participants were included in the final analysis.

3.3.3 Ethical considerations when collecting research data

Neuman (2014) defines ethics as what is not or what is sincere to do when undertaking research, it is concerned with the proper procedure involved in conducting research and what predicaments the research might involve him/ herself in. This research is solely conducted as partial fulfilment for a Master of Management degree (specialising in public development sector Monitoring and Evaluation), moreover, the study is conducted without any sponsor or organization funding.

The researcher will deliberate on the importance of ethical research, which comprises assurance not to harm participants, informed consent, and privacy.

- Assurance not to harm respondents

The researcher is obliged to ensure no harm in any form arises because of partaking in the study (Wagner et al., 2012). According to Bryman (2012), there are various aspects of harm, which amongst others include physical harm, emotional, stress and dented reputations. Ideally, participants should benefit from the study and not be harmed in any way during the research process (Babbie, 2015).

The study is a retrospective cohort study analysing routine monitoring data, the researcher was not required to engage with any patients to obtain additional data. Consequently, patients were not opened to experiencing any physical harm, emotional or psychological harm.

- Self-declaration

Self-declaration is highly linked with informed consent and deception, it is important to value and respect participants as highlighted by Bryman (2012) the research should not intentionally mislead and falsely represent their study, Polit & Beck (2012) agrees that self-declaration is imperative, and the researcher is fully obliged to disclose the nature and purpose of the study.

- Informed consent

Wagner et al. (2012) view informed consent as participants having full knowledge of the study, the aim, length, and possible uses of the research, moreover, have the ability to accept or decline the offer and one should not feel pressured to participate in the study. Bryman (2012) further emphasizes giving participants sufficient information to make a well-versed decision to partake or not partake in the research study. Participants should also be informed that even though they have consented to partake in the study, they still have a right to withdraw or decline to provide any additional information. In this research project, individual informed consent was not mandatory, data was not directly collected from the actual patients in the study, only patients' medical records were reviewed.

- Privacy

Wagner et al. (2012, p.64) state that "Privacy and confidentiality" involve concealing and protecting the identity of participants and the research location from unauthorised parties by keeping their details anonymous (Wagner et al.; 2012, p.64). The researcher was determined to protect the privacy and confidentiality of patients, numerous efforts were made to achieve this, the researcher requested an anonymised data extract from the electronic system (the 3 TIER integrated system) used in health facilities, with no patient identifiers.

The researcher applied to the school of Governance for ethical clearance and subsequently had to apply to the Human research ethic committee (medical), the ethics committee granted permission and an ethical clearance certificate. Permission to conduct and use routine monitoring patient data was granted by the Ekurhuleni District Health Research Committee and the Aurum Institute Data Committee. The research report will be shared with the Ekurhuleni Health District and will be resourceful to health care workers.

3.3.4 Data collection and storage

The data collection process uses a variety of tools to collect data. Bryman, (2012); Wagner et al. (2012) refer to data collection as the process of systematically collecting and evaluating information based on the purpose, objectives of the study, which will enable the researcher to answer specific research questions, test hypotheses, and assess outcomes. Data can be collected through the following means: Participant observation, non-participant observation, interviews, focus groups, experimental data, and secondary/document review (Kumar et al., 2015; and Wagner al., 2012).

The research understudy used secondary data, data were collected by reviewing the electronic clinical medical record, which was extracted from a dispatch file in TIER .net. Clinicians (Nurses and Doctors) complete the structured clinical stationery and club facilitator completes the adherence club's registers, and the patient's scheduled visits are subsequently updated at each visit, the clinical stationery is aligned to the Tier.net (electronic medical record system), the data capture captures and updates what is in the clinical stationery to the electronic medical record system used in primary health facilities.

Subsequently to obtaining the University of Witwatersrand ethical clearance certificate and permission to conduct the study from the Ekurhuleni Health District, I applied to the Aurum Institute Data Access Committee to request access to the data and assist with the extraction of the data. With the assistance of a Senior Business Intelligence Developer data was extracted, assessed for eligible patients enrolling on Differentiated care delivery models from January 2017 and December 2017, with the end period January 2020. The inclusion and exclusion were applied, and subsequent visits were estimated as any visit occurring a month before and a month after the scheduled visit (within 28 days).

Previous studies that evaluated the same topic used secondary data, by reviewing medical records (Luque-Fernandez et al, 2013). A retrospective study by Rich et al, (2012) made use of routine data collected from medical records the data was already collected thus making the process of collecting data easy and cost-effective. The researcher used a data collection form to assist and guide the data extraction process.

Data storage

The data was extracted to an excel file and the file was password-protected, the data were subsequently stored on Microsoft one drive and the folder was also protected by a password.

3.3.5 Research data and information processing and analysis

3.3.5.1 Research data and information processing

Data processing is described as a process of transforming, manipulating categorized data to produce significant information (Neuman, 2014). In quantitative research, this encompasses several steps to make sense of the data and narrate what is noted about the hypothesis. Prior to data analysis. Raw data is unstructured; to do this data needs to be categorised, cleaned to eliminate data entry errors, missing values etc. This process involves coding and data entry, deduplication, and cleaning (Kumar et al., 2015; and Babbie, 2015). This will be described below:

In quantitative research, we begin data processing by coding the unstructured information to compress and categorise the research variables in preparation for data analysis. Data coding is described by Bryman (2012), and Wagner et al (2012) as a process in which data is categorised and classified to aid in data analysis. Bryman (2012) posit that coding breaks down variables into various components to allow categorisation of data, assigning group numbers to each group attributes to make it easy to process on a computer. Moreover, it facilitates how data is converted, measured, and compared. This study used a quantitative research strategy, data were extracted on an excel file, before the data extraction all patient identifiers were removed as per the data access agreement, the patients' records were transferred vertically, and the variables were transferred horizontally. There were 1465 records on the excel file, the data was coded using the lowest number (0). The modalities were updated to reflect the current description of modalities i.e. (Adherence clubs, Facility pick up point, and External pick-up points, prior to this, the researcher visited Erin clinic and Esangweni CHC to ascertain the different types of modalities employed in each facility and the codes used

to capture the modalities on the system. Data was scrutinised and cleaned, the researcher discovered that the age variable was missing, this was rectified with the Senior Business Intelligence Developer.

3.3.5.2 Research data and information analysis

Data analysis consists of scrutinizing and interpreting data by applying statistical methods to describe and make sense of the data (Wagner et al., 2012) to answer the research question and draw conclusions on the theoretical assumption that underpin the study (Babbie, 2015). In quantitative research, there are numerous methods that one can employ during data analysis, such as regression analysis, discriminant analysis, structural equation modelling, univariate analysis, bivariate analysis, and multivariate analysis (Bryman, 2012; Newman, 2014). This study utilised descriptive statistics, person's Chi-square test, logistic regression, univariable analysis and multivariable analysis.

Descriptive statistics such as percentages and frequency tables were conducted to categorise and describe patients' cohort characteristics at the time of enrolment in Differentiated models of care. Bryman (2012) & Creswell (2014) defined Multivariable analysis as the analysis of more than two data variables at the same time to establish the relationship, for this study univariable analysis and multivariable analysis was employed to determine whether there was an association between the loss to follow up over the 24 months, health facility, age at enrolment in differentiated models of care and duration on ART at enrolment of differentiated models of care.

In statistical modelling, regression analysis is a process of forecasting change, where we have two variables, the independent or predictor variable, x , and the dependent or response variable y . The independent variable influences the outcomes of the y (dependent variable). More explicitly, regression analysis contributes to the understanding of how the characteristic value of the dependent variable is impacted by the changes, in the least one of the independent variables are wide-ranging, while the other independent variables are stable (Wegner, 2016). Analysis assists in predicting the relationship between the x and y variables Regression shows how strong the relationship is between the variables; it is also used in predicting the effects of the changes.

Moreover, we get to understand the impact of change of the dependent variable when the independent variable changes. In this study, The Chi-Square test was used to compare proportions of patients who retained in care and those who were lost to follow up by 24 months on differentiated care stratified by the study variables, we conducted

logistic regression to examine factors associated with failure to achieve retention in care (loss to follow up) over 24 months from the date of enrolment in differentiated care. In addition to retention in care, the study also focused on the timeliness of viral load specimen collection at the scheduled clinic visit appointment. The analysis methods used assisted in identifying predictors of retention, adherence to viral load specimen collection scheduled visits, viral load suppression and examining the relationship between the study variables. The analysis was performed using STATA Corp. 2019 STATA statistical software: version 16. College Station T.X. Stata Corp LLC., as it was relevant to compute quantitative results.

Below we looked at similar studies that have applied the same data analysis methods in answering similar research questions

Numerous studies that conducted similar studies as mine have effectively used regression analysis such as logistic regression for data analysis. Authors like Rich et al. (2012) investigated a study describing patient outcomes commenting community-based ART programmes and further compared patients' outcomes between models of care regression analysis consist of evaluating cause and effect relationship between the independent variable and dependent variable, most important variables were evaluated to establish relationships. Logistic regression was utilised to analyse factors associated with retention data was analysed using Stata to assist in building models, identify significant predictors of retention, and examine the relationships between the variables.

Another study by Bekolo et al. (2017) assessed six-monthly appointment spacing for clinical visits as a model for retention in HIV Care in Conakry-Guinea a quantitative study utilising a retrospective cohort study. Regression analysis was used to describe the pattern in the number of clinical visits over time. A study by Okoboi et al. (2015) conducted a retrospective cohort analysis looking at program retention amongst ART patients in rural Uganda. Univariate and multivariate logistic regression analysis was used to determine factors associated with virological failure and bivariate analysis was used to analyse patients with and without viral load variable of <1000 ml copies. To compare patients who remained active in care throughout the study period bivariate analysis was conducted using Kruskal-Wallis and Chi-square tests using Stata ver.

3.3.5.3 Description of the research respondents

The research respondents are participants of a study from whom the researcher gathers information (Babbie, 2015). The data were abstracted from electronic clinical records with no interaction with patients. The participants in this study were described as HIV positive Adults >18 years of age and should be stable on ART and the same regimen for at least 12 months with no adverse drug reaction that needs regular check-up, TB asymptomatic and most recent viral load laboratory results being normal. Patients who were pregnant and had TB were excluded from the study.

Table 2 Cohort characteristics at the time of enrolment in differentiated models of care

	Total included in analysis N = 1284	
Facility	n	%
Erin Clinic	197	15.3
Esangweni CHC	423	32.9
Ethafeni Clinic	328	25.6
Tembisa Main Clinic	336	26.2
Sex		
Male	395	30.8
Female	889	69.2
Age at decanting		
18-24	46	3.6
25-34	359	28.0
35-44	568	44.2
45+	311	24.2
Modality		
Adherence Club	1092	85.1
Facility PUP	119	9.3
External PUP	73	5.7
Duration on ART at decanting		
12-23 months	212	16.5
24+ months	1072	83.5
Virologically suppressed at decanting		
No	37	2.9
Yes	1239	96.5
Missing	8	0.6

Source: Author

A total of 1284 participants were included in the final analysis, of which 889 (69.2%) were female and 395 (30.8%) were male. The bulk of patients were between the ages of 35- 44 (44.2%) and 426 were from Esangweni CHC. Most of the patients were enrolled in Adherence clubs (85.1 per cent).

Enrolment characteristics such as age, sex, facility, date of ART initiation, modality, duration on ART and virological suppression were extracted to describe cohort characteristics at the time of enrolment in differentiated models of care.

3.4 Research strengthens—reliability and validity measures applied

Reliability is related to replicability and consistency of research results, if the same instrument was repeated would the same result be obtained (Wagner et al., 2012).

Additionally, Validity is a process of checking whether the researcher is measuring what he intended to measure (Bryman, 2012). In conducting a study, it is important to ensure the instrument used, accurately to measure the indicators to guarantee reliable result, this validity is very important when conducting research.

To guarantee consistency in the data, the research tool should be tested and retested to estimate the amount to which the same result will be obtained if the tool was repeated for the same measurement of variables. In addition to this, to enhance data quality, routine quality controls and continual data cleaning was employed.

There are four principal forms of validating research, which are external validity, internal validity, ecological validity, and measurement validity.

1) Measurement validity

According to (Bryman, 2012; & Neuman, 2014) Measurement validity refers to the degree to which the measurement of an indicator truly calculates the indicator.

2) Internal validity

Bryman (2012) & Wagner et al. (2012) describe internal validity as the extent to which results from the study, which shows causal relationships between two variables, can be reasonably determined. (Fatti et al., 2010) stated that to measure whether the results are reliable, sensitive analysis of baseline factors associated with virological suppression at 12 months was performed using multivariable logistic regression. In this study, we performed a multivariable analysis on retention and loss to follow over 24 months, stratified by cohort characteristics at enrolment in differentiated care.

3) External validity

As specified that purposive sampling was used in selecting health facilities external validity will be limited since the results will only be generalised to the urban township setting like the Tembisa population.

4) Ecological validity

Ecological validity looks at generalising research findings in the real setting or context and concentrates beyond the study population (Leavy, 2017; Wagner et al., 2012); moreover, it speaks to the trustworthiness of the study (Neuman, 2014).

3.5 Research weaknesses—technical and administrative limitations

During the study, we came across the following technical limitations. Firstly, this study is a retrospective cohort study using routinely collected data from patients' medical records, completeness of viral load monitoring data was minimal. Secondly, purposive sampling was used to select the high-volume ART facilities based on total clients remaining in care and the number of patients enrolled in differentiated care models; this has limitations, external validity was limited, External validity is the extent of generalising research results to the target population and beyond the study context (Bryman 2012). The selected facilities might not represent other health facilities beyond urban townships like Tembisa, in Ekurhuleni District. Third, the evaluation was only conducted in a few high-volume facilities in Tembisa, therefore, the research finding will only be generalised to the research population and setting and might not be generalizable in other contexts or settings. Forth the study used a questionnaire that does not capture participants' real-life experiences in their daily social setting, thus lacking ecological validity. Due to time constraints, the researcher was unable to test the data collection form before extracting data from Tier.net.

4 PRESENTATION OF RESEARCH RESULTS

The purpose of the research project is to assess outcomes of the differentiated care ART delivery models in South African township (Tembisa). The principal objective of the study is to determine the rates of retention for stable patients on differentiated care antiretroviral therapy delivery model after 24 months, identify factors associated with loss to follow-up on differentiated care antiretroviral therapy delivery model over 24 months since enrolment, lastly, is to determine the proportion of stable patients with a viral load completion and viral load suppression on differentiated care antiretroviral therapy delivery model documented at 12 months and 24 months. This chapter is set out to present results and compare results to other similar studies, thus far no study has evaluated the outcomes of the differentiated care ART delivery models in south African urban township (Section 4.1) presents empirical results for the first question - What is the rates of retention in care for stable patients on the differentiated care antiretroviral therapy delivery model after 24 months?, (Section 4.2) exhibits results of the second question what the factors are associated with loss to follow up among stable patients on differentiated care antiretroviral therapy delivery model for 24 months. (Section 4.3) presents results from the third question – What is the proportion of stable patients with a viral load completion and viral load suppression on differentiated care antiretroviral therapy delivery model at 12 and 24 months? these sections further discuss the associated hypotheses, also compare results from previous studies. Finally, the last section 4.4 provides the conclusion of the answers to the three questions.

4.1 Rates of retention in care for stable patients on differentiated care antiretroviral therapy delivery model for 24 months

This study aimed at evaluating outcomes of the differentiated care ART delivery models in South African township (Tembisa), in conducting the study a research question was posed: what are the rates of retention in care for stable patients on differentiated care antiretroviral therapy delivery model for 24 months?

This section presents the empirical results to determine the rates of retention in care for stable patients on differentiated care antiretroviral therapy delivery model for 24 months.

4.1.1 Presentation of empirical results

4.1.1.1 Descriptive statistics

Differentiated models of care are patient-centred approaches that are meant to improve retention in care and other clinical outcomes of patients on chronic medications (NDOH, 2016). About 105 (8.2%) patients were lost to follow-up over the 24 months, while (91.8%) were acknowledged to be retained in care. Looking at the facility variable

	Lost to follow-up by 24 months of decanting N=1284				Chi-square p-value
	No n=1179 (91.8 %)		Yes n=105 (8.2%)		
Facility	n	%	n	%	
Erin Clinic	192	97.5	5	2.5	<0.001
Esangweni Clinic	363	85.8	60	14.2	
Ethafeni Clinic	309	94.2	19	5.8	
Tembisa Main Clinic	315	93.8	21	6.2	
Sex					
Male	362	91.7	33	8.3	0.88
Female	817	91.9	72	8.1	
Age at enrolment on differentiated care models					
18-24	33	71.7	13	28.3	<0.001
25-34	322	89.7	37	10.3	
35-44	532	93.7	36	6.3	
45+	292	93.9	19	6.1	
Missing					
Modality					
Adherence Club	994	91.0	98	9.0	0.04
Facility PUP	114	95.8	5	4.2	
External PUP	71	97.3	2	2.7	
Duration on ART at enrolment of differentiated care models					
12-23 months	174	82.1	38	17.9	<0.001
24+ months	1005	93.8	67	6.2	
Virologically suppressed at enrolment of differentiated care models					
No	37	100	0	0.0	0.04
Yes	1136	91.7	103	8.3	
Missing	6	75.0	2	25.0	

Table 3: illustrate the differentiated care enrolment characteristic of patients who were retained in care and those who were lost to follow-up.

majority of patients were lost to follow up at Esangweni Clinic (14.2 per cent), and (85.8 percent) were not lost to follow up, Erin Clinic has the least patients who were lost to follow up (2.5 per cent) with (97.5 per cent) retained in care.

According to the empirical results above, there is no variance in retention in care between males and females. Age at enrolment plays a role in people being retained in care, amongst the age groups, people aged 25 and above were more prone to be retained in care than people in the age group 18- 24; with a loss to follow up rate of almost (30 per cent). There were no significant differences in retention in care amongst people who participated in the different modalities (Adherence clubs, Facility PUP, and External PUP). Duration on ART was associated with long-term retention, patients who were 24 months and above on ART prior to enrolment on differentiated care models, were (93 per cent) more likely to be retained in care than patients who were 12- 23 months on ART. Furthermore, there were 37 patients with unsuppressed viral loads at baseline and over the 24 months (100 per cent) were retained in care, with (91.7 per cent) retention rates among those who had a suppressed viral load at baseline.

4.1.2 Statistical hypothesis testing

Pearson Chi-square was used to test they hypothesis:

Null hypothesis (H0): There is no difference in rates of retention in care among stable patients on the differentiate care antiretroviral therapy delivery model for 24 months.

Research hypothesis (Ha): There is a high rate of retention among stable patients on the the differentiated care antiretroviral therapy delivery model for 24 months.

The Chi- square results for assessing rates of retention among stable patients on the differentiated care ART delivery model in table 4 generally, shows that there were no significant variances between retention in care rates and the sex of participant (p-value = 0.88), Modality (p value= 0.04) and viral load suppression at enrolment (p-value =0.04). This means that the sex, modality, and viral load suppression at enrolment in differentiated care ART delivery models has no influence on patients being retained in care, thus the null hypothesis for the variables is not rejected. However, there was a strong association with the health facility, age at enrolment, and duration of ART at

enrolment (p value= 0.001) amongst patients who were retained in care and those who were lost to follow-up. Therefore, the null hypothesis is rejected.

The overall results illustrate that there is statistically significant evidence that retention rates are high for stable patients enrolled on differentiated care ART delivery models for 24 months.

4.1.3 Comparison of the results to other similar studies

Bekolo et. al (2017) observed similar results that show retention rates of 96% at 24 months in a multi-month prescription, with the current study depicting 91.7% retention rates, LTFU was recorded at 4.9 %. While the study LTFU was recorded at 8.2%. Similar outcomes were reported in a study by Rich et al. (2012), over 24 months, patients who enrolled in community-based adherence clubs as a form of differentiated care had a 92.3% retention rate and with 2.7% of patients being LTFU/ had defaulted. Although our study found that there was no difference in LTFU between males and females, results from Rich et. al (2012) showed sex (gender) played a significant role in patients being retained in care, especially if there were more than 50 years of age at enrolment of treatment.

Another study conducted in Myanmar; Xangon by Mesic et al. (2017) displayed great patient outcomes for stable patients on ART enrolled in differentiated models of care. Retention rates for stable patients were at 98.4% and LTFU rates of 0.9% (Mesic et al.; 2017).

4.2 Factors associated with loss to follow up in stable patients on differentiated care antiretroviral therapy delivery model over 24 months.

4.2.1 Presentation of empirical results

The evaluation of outcomes of the differentiated care ART delivery model interventions has established factors associated with loss to follow up in stable patients on differentiated care ART delivery model over 24 months.

4.2.1.1 Descriptive statistics

This section presents the research result on factors associated with loss to follow up in stable patients on differentiated care ART delivery models over 24 months. 4.2.1.1 describe descriptive statistics and testing of the hypothesis, then we conclude by a comparison of results similar results.

Table 4: below describes factors associated with loss to follow-up over 24 months since enrolment on the differentiated care ART delivery models. virologic suppression at enrolment of differentiated care ART delivery model was excluded as an explanatory variable because all the unsuppressed patients at enrolment were retained over 24 months. Since the outcome of interest did not vary in this sub-group, it was excluded from the model.

In a univariable analysis, health facility, age at enrolment in differentiated care models, and duration on ART at enrolment in differentiated care models were associated with loss to follow over 24 months. Patients from Esangweni CHC were six times more prone to be lost to follow-up compared with patients from Erin Clinic. However, there were no differences between patients at Erin Clinic, and those enrolled at Ethafeni Clinic and Tembisa Main Clinic.

With regards to age, patients in age categories from 25 years and above at enrolment of differentiated care, had a 70 per cent-80 percent lower probability of being lost to follow-up, compared with patients aged 18-24 years. Lastly, patients who were on ART for 24 months at enrolment of differentiated care models, had a 70 per cent lower probability of being lost to follow-up compared to patients who were enrolled on differentiated care ART delivery models after being on treatment for 12-23 months.

There was weak evidence suggesting that patients in facility PUP and External PUP were less likely to be lost to follow-up compared to patients in adherence clubs ($p=0.08$). There were no differences in loss to follow up by patient's sex.

Table 4: Factors associated with loss to follow-up over 24 months since enrolment on differentiated care ART delivery models

Health Facility	Unadjusted OR; 95% CI	p-value	*Adjusted OR; 95% CI	p-value
Erin Clinic	Ref		Ref	
Esangweni Clinic	6.3 (2.5–16.1)	<0.001	4.7 (1.7–13.0)	0.003
Ethafeni Clinic	2.3 (0.9–6.4)	0.09	2.3 (0.7–6.9)	0.15
Tembisa Main Clinic	2.6 (0.9–6.9)	0.06	2.6 (0.9–7.6)	0.08
Sex				
Male	Ref		Ref	
Female	1.0 (0.6–1.5)	0.88	0.8 (0.5–1.3)	0.34
Age at enrolment in differentiated care models				
18-24	Ref		Ref	
25-34	0.3 (0.1–0.6)	0.001	0.3 (0.1–0.7)	0.004
35-44	0.2 (0.1–0.4)	<0.001	0.2 (0.1–0.5)	<0.001
45+	0.2 (0.1–0.4)	<0.001	0.2 (0.1–0.6)	0.001
Modality				
Adherence Club	Ref		Ref	
Facility PUP	0.4 (0.2–1.1)	0.08	0.7 (.2–2.0)	0.49
External PUP	0.3 (0.1–1.2)	0.08	0.6 (0.1–3.0)	0.55
Duration on ART at enrolment in differentiated care models				
12-23 months	Ref		Ref	
24+ months	0.3 (0.2–0.5)	<0.001	0.5 (0.3–0.7)	0.001

Multivariable analysis

After adjusting for all factors included in the univariable analyses, health facility, age at enrolment, and duration on ART at enrolment retained their association with loss to follow over 24 months. Patients from Esangweni Clinic were almost five times more probable to be lost to follow-up compared with patients from Erin Clinic. However, there were no variances between patients at Erin Clinic, and those decanted at Ethafeni and Tembisa. With regards to age, patients in age categories from 25 years and above at the time of decanting, had a 70-80 per cent lower likelihood of being lost to follow up, compared with patients aged 18-24 years. Lastly, patients who had been on ART for 24 months at the time of decanting, had a 50% lower likelihood of being lost to follow-up compared to patients who were decanted after being on treatment for 12-23 months.

4.2.2 Statistical hypothesis testing

Regression analysis assist in predicting the relationship between the x and y variable, it shows how strong the relationship is between the variables, it is also used in predicting the effects of the changes. Moreover, we get to understand impact of change of the dependent variable when the independent variable changes. For factors associated with loss to follow up, we hypothesised:

Null hypothesis (H₀): There are no factors associated with loss to follow up amongst stable patients on the differentiated care antiretroviral therapy delivery model for 24 months

Research Hypothesis (H_a): Various factors are associated with loss to follow-up amongst stable patients on the differentiated care antiretroviral therapy delivery model for 24 months.

Regression analysis hypothesis test was used to examine the factors associated with loss to follow-up amongst stable patients on the differentiated care ART delivery models for 24 months. The analysis methods used will assist to identify predictors of loss to follow-up and examine the relationship between the study variables.

Based on the regression analysis above (table 4) there is a significant relationship between health facility and loss to follow-up amongst stable patients on the differentiated care antiretroviral therapy delivery model for 24 months. Patients in Esangweni clinic are more likely to be loss to follow up 6.3 (95% CI: 2.5–16.1), p value <0.001. However, there were no variances between patients at Erin Clinic, and those decanted at Ethafeni and Tembisa.

When looking at the age at enrolment variable, there is a significant relationship between age category 25 years and above at enrolment and loss to follow up amongst stable patients on differentiated care antiretroviral therapy delivery model for 24 months age category 25-34 0.3 (95% CI: 0.1–0.6), p value 0.001, age category 35-44 0.2 (95% CI: 0.1–0.4), p value <0.001-, age category 45+, 0.2 (95%CI: 0.1–0.4), p value<0.001. lastly, there is a significant relationship between duration on ART at enrolment, lost to follow-up, patients who had been on ART for 24 months at the time of enrolment on the differentiated care models had lower likelihood of being lost to follow-up compared to patients who were enrolled after being on treatment for 12-23 months 0.3 (95% CI: 0.2–0.5), p value <0.001.

In conclusion, the null hypothesis is rejected for health facility, age at enrolment and duration on ART at enrolment, however, the null hypothesis was not rejected for the

modality variable (p value. 0.08) and sex variable (p value, 0.88), there is no statistical significance between these variable and loss to follow up.

4.2.3 Comparison of the results to other similar studies

A comparable study by Wringe et.al (2018) examined retention in care among clinically stable ART patients attending six-monthly clinical consultation. In an unadjusted Cox model, males were associated with high attrition rates, and those aged between 18-24 years and 25- 34 years, those who had a shorter duration on ART, and advanced stage of HIV.

In the adjusted model, patients aged 18-24 years had the likelihood of being LTFU 2.6, 95% CI: 1.9-3.4) and 25-34 years 1.3, 95% CI: 1.1-1.5 compared to those aged above 35 years.

Another comparable study by Wekesa et.al (2020) in central Kenya, looking at factors associated with loss to follow-up (LTFU) and mortality outcomes found factors associated with LTFU in a multivariate analysis. The younger age group have the probability to be lost to follow than the older generation, moreover male gender patients aged 20-35 using 36-50 years as reference were associated with high rates of LTFU.

4.3 Proportions of stable patients with a viral load completion and viral load suppression on differentiated care antiretroviral therapy delivery model for 24 months.

This section presents results from the third question – What is the proportion of stable patients with viral load completion and viral load suppression on differentiated care antiretroviral therapy delivery model at 12 and 24 months?

4.3.1 Presentation of empirical results

4.3.1.1 Descriptive statistic

Table 5: describes viral load completion proportions for stable patients in differentiated care models, it is important that viral load specimens are collected on time at prescribed intervals, the above tables illustrate proportions of patients who had a viral load specimen collected and documented within 28 days of scheduled clinical appointment at

12 months and 24 months, of the N=1284 patients enrolled in differentiated care ART delivery models, about less than 50% of stable patients N=509 (proportion of viral load specimen collected 39.6; 95% CI: 37.0-42.3) had a viral load specimen collected and documented with 28 days of scheduled clinic appointment at 12 months clinic visit, and at 24 months clinic visit only N=414 (proportion of viral load specimen collection 32.2; 95% CI: 29.7-34.9) had viral load collected and documented on time. Furthermore; 223 (proportion of viral load specimen collected 17.4; 95%CI: 15.3-19.6) meaning less than a quarter of stable patients had a viral load specimen collected and documented at both 12 months and 24 months within the stipulated time frames.

Table 5: Viral load specimen collection within 28 days of scheduled clinic appointment at 12 and 24 months

	Total included in the analysis N=1284		95% CI
Documented viral load collection within the 28-day window at:			
12 months	509	39.6	37.0–42.3
24 months	414	32.2	29.7–34.9
12 & 24 months	223	17.4	15.3–19.6

Viral load suppression is a good indicator that shows that antiretroviral therapy is working by successfully reducing the functioning and replication of the virus in the body (Elul et. al, 2013). Table 4 describes viral load suppression proportions among patients with a viral load specimen collected with 28 days window of scheduled visits at 12 and 24 months of the N=509 who had a specimen collected at 12 months in differentiated care ART delivery models, the results show 98% had achieved viral load suppression (98.0; 95% CI: 96.4-99.1) with 2% who failed to realize viral load suppression.

Table 6: Viral load suppression among participants with viral load specimens collected within the 28-days window at 12 and 24 month scheduled visits.

	VL done (denominator)	Suppressed (numerator)		
	n	n	%	95% CI
Documented viral load suppression at				
12 months	509	499	98.0	96.4–99.1
24 months	414	406	98.1	96.2–99.2
Suppressed at both 12 and 24	223	211	94.6	90.8–97.2

Similarly, at 24 months of taking treatment in Differentiated care ART delivery models, (98.1%) of stable patients managed to achieve viral load suppression (98.1;95% CI: 96.2-99.2), therefore, there is no variation in viral load suppression at 12 and 24 months. furthermore, for those who had a viral load specimen collected and documented at both intervals, only 94.6% had realized viral load suppression (94.6; 95% CI: 90.8-97.2), while (5.4%) failed to realize viral load suppression.

4.3.2 Comparison of the results to other similar studies

A similar study by Bock et al.(2019) describing clinical outcomes among ART patients enrolled in community-based adherence clubs as a form of differentiated care, experiences of adherence clubs, and perception amongst patients and health care workers found that proportions of patients with a viral load completion rates at six, twelve and twenty-four months were low similar to the results of this study 40.6%, 36.95 and 62.9% respectively, with viral loads suppression rates at 12 months(90.3), and 97.5 % at 24 months for patients enrolled in adherence clubs.

Tsondai et al. (2017) conducted a study in Cape Town, South Africa describing patient outcomes after scale-up of ART adherence clubs, had higher proportions of viral load completion at prescribed intervals (4, 16, and 28) months, than in this study, with viral load completion rates of about 86.5%, 84.7%, and 79.7% respectively. However, similar results were obtained when looking at viral load suppression at a comparable VL threshold of <400ml/copies, out of those patients who had a viral load done 96.9% 95.7% 94.1% at 4, 16, 28 months respectively, with a viral suppression after enrolment in adherence clubs.

Another study by Wringer et al (2018) found that about 38% of patients had a viral load done of this 93% had a viral load suppression at a VL threshold of <1000 copies /ml which is higher than the threshold used in this study.

Although this was not part of the study the table:7 below shows timeliness to the clinic visit attendance

Table 7 Clinic visit attendance within 28 days of scheduled clinic appointment (timely visit)

	Total included in the analysis N=1284		95% CI
Documented clinic visits at:			
6 months	1107	86.2	84.2–88.1
12 months	1122	87.4	85.4–89.2
18 months	841	65.5	62.8–68.1
24 months	694	54.1	51.3–56.8

4.4 Conclusions

The research results show that 91.8 per cent of stable patients in differentiated care ART delivery models in south African urban township Tembisa were retained in care, while 8.2 per cent were lost to follow up, there was no significant variance in the retention in care and the sex of the participants, modality, and viral loads at baseline. Health facility, age, and duration on ART at enrolment in differentiated care ART delivery models were associated with lost to follow-up over 24 months, especially patients from Esangweni clinic, patients aged 18-24 years, and patients who have been on ART for 12-23 before enrolment were more likely to be lost to follow up. Generally, there are poor viral load completion rates within 28 days of scheduled clinic appointment at 12 and 24 months, however, for those patients with a completed viral load, an average of 94 per cent had a viral load suppressed.

5 DISCUSSION OF RESEARCH FINDINGS

This chapter shows the interpretation of the research findings, that was outlined in chapter 4, based on the theoretical framework developed in Section 2.6 to reinforce the interpretation of the research findings. Alternative care models such as the differentiated care ART delivery model are implemented at scale in South Africa; however, there is little evidence on the scale-up of these model outcomes in South Africa's urban townships (Tembisa). In addition, authors like Barker et al. (2017), Prust et al. (2017) & Wilkinson et al. (2016) identified that although there is evidence of implementation of differentiated care at scale, the patient's characteristics, and outcomes because of these types of models were not evaluated. Therefore, the study intended to assess outcomes of the differentiated care ART delivery models in South African urban townships. The interpretation is centred around the three research questions posed by the study. Section 5.1 discusses the rates of retention in care for stable patients on the differentiated care antiretroviral therapy delivery model for 24-months, section 5.2 discusses factors associated with loss to follow-up in stable patients over 24 months, section 5.3 discusses proportions of stable patients with a viral load completion and viral load suppression on the differentiated care ART delivery model for 24 months. The interpretation of the research findings is executed by describing the theoretical framework that is used in the interpretation of the research findings, followed by the research findings, supporting literature and suggestions.

5.1 Rates of retention in care for stable patients on differentiated care antiretroviral therapy delivery model for 24 months

This section put forward the interpretation of research results highlighted in the previous section 4.1 and discusses the rates of retention in care for stable patients on the differentiated care ART delivery model for 24 months. The results show that there are high rates of retention in care in stable patients enrolled on the differentiated care ART delivery model for 24 months in selected facilities around Tembisa in Ekurhuleni Metropolitan Municipality. The outcome is supported by theoretical constructs derived from the Information, Motivation and Behavioural skills model. The Information Motivation Behavioral skills (IMB) model is one of the most prevalent Social

Psychological models in the sphere of HIV prevention and ART adherence and forms the foundation of the IMB model of Care Initiation and Maintenance for chronic medical conditions (Smith, Fisher, Cunningham and Amico, 2012). The model has evolved and can be applied to a variety of health promotion behaviors, which also encompasses medical adherence, retention in care, breast self-examination and motorcycle safety among different populations (Fisher, Fisher & Harman, 2003). The IMB model was conceptualized on three main factors necessary for the adaptation of health-related behaviour: information, motivation, and behavioural skills (Fisher and Fisher, 1992). Furthermore, the IMB model assumes that there is a causal link between the constructs, therefore when an individual is well informed, motivated to act, thus there is an assumption that essential behavioural skills are needed to effect change, which will ultimately lead to initiating and maintaining health endorsement behaviours to promote and practice positive health outcomes (Fisher, Fisher & Harman, 2003). On the contrary, if an individual is not well informed, not motivated to act and does not have the necessary behavioural skills to effect behavioural change, they will most definitely participate in risky behaviours with a negative experience health outcome (Fisher, Fisher & Harman, 2003; Fisher, Fisher, Amico & Harman, 2006). In addition to this, the result-chain is a program matrix that is used to measure performance; it defines the causal and effect linkages for an intervention that stipulates the necessary arrangements to achieve the anticipated results (UNDG, 2011).

Differentiated care models are central to the National Adherence Guidelines (AGL), which seeks to encourage stable, treatment adherent ART patients to take advantage of the delivery models that further support adherence and reduce defaulter rates by promoting more integrated and patient-centred health systems approach increased access to appropriate services and interventions and addressing barriers to quality health care, including facility congestion, long waiting times and the lack of confidentiality. Furthermore, by decongesting healthcare facilities, clinicians can focus on providing acute patients with adequate care and time.

The assumption is that stable patients enrolled in differentiated care ART delivery models are more likely to be retained in care. As highlighted in the previous section 4.1, the results show that roughly the rates of retention in stable patients enrolled on the differentiated care ART delivery models for 24 months were at 91.8 per cent. The

results further show that there is significant relationship between retention and the study variables health facility, age at enrolment, and duration of ART at enrolment (p value = 0.001), therefore, the null hypothesis was rejected. However, there was no significant relationship between retention in care rates and the sex of participant (p -value = 0.88), Modality (p value = 0.04) and viral load suppression at enrolment (p -value = 0.04). This means that the sex, modality, and viral load suppression at enrolment in differentiated care ART delivery models has no influence on patients being retained in care, thus the null hypothesis for the variables is not rejected.

When the IBM model is applied to retention in care, would assume that stable patients who are well informed, highly motivated will have sufficient skills to activate patients' behaviour that is required to achieve long-term retention in care over time, thus stable patients will be motivated and become self-sufficient, to self-sustain retention in care, with the information and motivation acquired stable patients will be able to enact the behavioural change that is required, thus self-sustain the retention in care (Smith, Fisher, Cunningham and Amico, 2012). Moreover, patients' education and motivation are key in the preventive medicine process. Patients should be self-motivated and have the discipline to control risk factors of the illness, which are revisable and can affect the patients' health (Woods et al., 1981 & Clarke, 1974).

Patient education is deemed the foundation of all disease management (Loeppeke, 2008 & Outwater, 2017). Information- it is important for stable patients enrolling on differentiated care ART delivery models to have information related to retention in care, such as the reasons why they are enrolling on Differentiated care models, how long is their treatment prescribed, how often do they pick up their medication at different pick-up points, the importance of adhering to the scheduled appointment, why it is important to monitor viral load at the different interval and what is the significance of the viral load values and meaning. Therefore, patient health education can assist patients in understanding the disease and better cooperate with health care providers to effectively treat the disease. This individualised approach to problems will present and show personal risks and come up with a plan to reduce risk factors and put the patient on the right track to improve and manage their disease properly furthermore chronic illnesses have benefited positively from the patients' health education (Loeppeke, 2008 & Outwater, 2017).

Motivation for retention in care- patients' attitude and beliefs are important in achieving motivation to be self-sufficient, attending to clinical visits for prescription of ART, viral load monitoring, being interested in self-care and knowing the results. Prioritizing schedule appointments over competing activities (Smith et al.; 2012).

Moreover, patients on differentiated care have the privilege to choose to receive their treatment within the facility or outside the facility and pick up their medication at times that are most appropriate to one's schedule. All these factors combined should be sufficient to bring about behavioural change and be retained in care.

Furthermore, the results showed that 8.2 per cent of stable patients failed to achieve retention in care and are thus lost to follow up. Overall, the intervention was not one hundred per cent effective in achieving the desired outcome. However, the intervention showed that through appropriate information, motivation, and behavioural skills then one can achieve desired results, through the reinforcement of the result chain, the intervention shows that the intended outcome in an urban township setting has been attained.

In efforts to comprehend the dynamic of patient's retention in HIV care continue to evolve, the application of scrutinizing health behaviour change models will ultimately be valuable to health care workers looking to target and increase retention in care amongst stable patients on differentiated care ART delivery models.

5.2 Factors associated with loss to follow up in stable patients on differentiated care antiretroviral therapy delivery model for 24 months

This section demonstrates the interpretation of the research results linked to the second research question what factors are associated with loss to follow up in stable patients on differentiated care ART delivery model for 24 months. The discussions revolve around baseline patient characteristics at enrollment in the differentiated care ART delivery models. Social- Ecological model, social cognitive theory and theory of planned, health belief model behaviours are used to interpret the results of factors associated with loss to follow up in stable patients on the differentiated care ART delivery models for 24 months.

Social-Ecological Model was founded as a model in the 1970s (Bronfenbrenner, 1977), Bronfenbrenner advanced and formalised the model to a theory in the 1980s. The model assists in understanding behavioural factors that influence human behaviour. Furthermore, it provides a context for developing effective behaviour change interventions that take into cognisance external factors that mould human behaviour in social and physical settings (McLeroy, Bibeau, Sterkler and Glanz, 1988).

Bandura (1986), Glanz & Bishop (2010) & DiClemente et al. (2002) states that Social cognitive theory seeks to explain how people develop human behaviour. Furthermore, the theory asserts that human behaviour is influenced by one's environment, people's behaviour is modelled by the environment they live in and further assumes that people learn by observing and interacting with one another in their environment which influences the outcome of their behaviour (Bandura, 1986; Fertman & Allensworth, 2010; Burney, 2008). DiClemente et al. (2002) the model asserts that a conducive environment should exist to effect change, therefore making it easy to adopt healthy behaviour. Multiple levels that emphasise influence social-ecological theory are interpersonal, individual, community and public policy, organisational, and the notion that behaviour is shaped by the social environment, similarly, behaviour shape the social environment.

The research findings in section 4.2 show that health facility was associated with loss to follow-up over 24 months. Stable patients from Esangweni were six times more likely to be lost to follow-up as compared with stable patients from Erin clinic, 6.3 (95% CI: 2.5–16.1), p value < 0.001 . However, there were no variances between patients at Erin Clinic, and those decanted at Ethafeni and Tembisa. Thus, the null hypothesis was rejected, it is assumed that one's environment plays a major role in moulding people's behaviours. Therefore, patients from Esangweni CHC may share the same personal characteristics, experiences, and social environmental factors that influence their behaviour and choices.

The study further demonstrated that age at enrollment of the differentiated care ART delivery model was a risk factor in being lost to follow-up. Stable patients aged between 18-24 years have the probability of being lost to follow-up than patients aged above 25 years and older. age category 25-34 0.3 95% CI: 0.1–0.6), p value 0.001, age category 35-44 0.2 (95% CI: 0.1–0.4), p value < 0.001 -, age category 45+, 0.2 (95% CI: 0.1–0.4), p value < 0.001 . This finding is explained through the lens of the health belief model, The

health belief model is one of the first social-psychological health behavioural change models, the model was applied systematically to patients to check their response, compliance/adherence to medication and chronic illness behaviour, which need to be monitored long term to see behavioural change. The model is used to describe health changes and the upkeep of health behaviour (Janz et al.,1984), it further states that an individual has the ability to take action and believe that they have an illness. Moreover, the model assumes that when people hold an appropriate belief, health behaviour can be activated by cues action (Rosenstock et al., 1988). The findings of the study are compatible with a similar study by Wekesa et al. (2020) which found that patients aged between 18- 24 years are inclined to be less adherent to scheduled visits and ART, this can be attributed to stigma and discrimination. UNAIDS (2019); Fatoki (2016) argues that people who go through stigma and discrimination daily feel side-lined and are made more susceptible to HIV, while those living with HIV are more vulnerable to experiencing stigma and discrimination, the latter is associated with poor health outcomes, poor treatment adherence and indulging in unsafe sexual behaviours. Furthermore, HIV/AIDS stigma can be regarded as a barrier to effective HIV prevention and treatment programs. Additionally, low uptake of treatment and poor adherence to prevention and treatment services can be attributed to HIV/AIDS stigma (Fatoki, 2016; Mahajan et al., 2008).

Contrary to this study, a study conducted in Nigeria by Aliyu, Adelekan, Andrew, Ekong, Dapiap, Murtala-Ibrahim, & Dakum, P. (2019) shows that LTFU was associated with increased age, especially amongst the elderly. This could be due to misclassification of patients who have died or self-transferred to other health facilities. The recording of attritions within differentiated care is not as consistent as it should be. Patients aged between 18-24 years lack self-efficacy, self-efficacy is imperative in accounting for preliminary and maintenance of behavioural change (Rosenstock, Strecher & Becker, 1988). Consequently, the findings suggest that exertions should be made to strengthen the implementation of the adherence guidelines, during the clinic visit and as soon as a patient misses their appointment, they should be actively traced and re-engaged back into care and provided with enhanced adherence counselling until the patient is stable and adherent again in addition health care workers should strengthen recording of exits in differentiated care models.

As shown in section 4.2 that duration on ART before enrolment in differentiated care models was significantly associated with loss to follow up, patients who had been on ART for 24 months at the time of enrollment in the differentiated care ART delivery model, had a 70 per cent lower likelihood of being lost to follow-up compared to patients who were enrolled on differentiated care ART delivery models after being on treatment for 12-23 months. Therefore, the theory of planned behaviour is used to explain the research finding, the theory of planned behaviour is one of the behavioural theories widely used in theoretical frameworks to understand and predict human behaviour; it links a person's beliefs with their behaviour. In addition, the theory was developed to complement the theory of reasoned action and improve predictive power by incorporating perceived behaviour control (Ajzen, 1988). The theory of planned behaviour illustrates behavioural intentions by predicting how people will accomplish behaviour (Armitage & Conner, 2000), which can be influenced by attitudes, subjective norms, and perceived behavioural control. The theory of planned behaviour assumes that when a person is highly motivated and show intention to perform a behaviour, therefore the more the person has a positive attitude, the more likely the person will implement that behaviour (Ajzen, 1991). Fisbein & Ajzen (1975) The theory of planned behaviour identifies that to predict individual behavioural intentions and behaviours, a person must have belief whether positive /negative attitude towards the outcome of behaviour, which will influence one's attitude towards the behaviour. Normative belief describes one's perception, the way a person sees how society will judge their behaviour, which provides subjective norms. Furthermore, a person is seen to have control over their behaviour linked to perceived behaviour control. Long duration on ART is believed to be associated with retention in care It is assumed that the cohort of patients perceive that they have improved health after commencement of ART (Mpinganjira, Tchereni, Gunda and Mwapasa, 2020) and the notion that they have been on ART for a long time and are no longer motivated to manage their chronic disease. However, that's not the fact in this study for patients who were enrolled on Differentiated care after being on ART between 12-23 months. The theory shows that they lack the precise attitude and perceived behaviour controls to be adherent and retained in care. This finding highlight that it is essential that patients who are on ART for less than 24 months should have intensified counselling before enrolling on differentiated care models. Enhanced Adherence counselling should be enhanced at each clinic visit, more

importantly, be reminded of the consequences of being non-adherence to long term ART.

There is no statistical significance between the modality variable (p value. 0.08), sex variable (p value, 0.88), and loss to follow up, thus the null hypothesis is not rejected. This an interesting finding as it shows that selection of pick-up points and the sex of the patient has no bearing on whether patients will be lost to follow up or not. Therefore, patients should be managed and treated the same regardless of where their medication is delivered. On the contrary there is a preconceived notion amongst health care workers that males are less likely to adhere to treatment and retain in care, however the result of the study says otherwise, thus we hope that the research findings will influence the change in health worker's perspective on the matter.

5.3 Proportions of stable patients with a viral load completion and viral load suppression on differentiated care antiretroviral therapy delivery model for 24 months.

This section demonstrates the interpretation of the research associated with the proportions of stable patients with viral load completion and viral load suppression in differentiated ART delivery models for 24 months. The results show proportions of stable patients who had a viral load completion within 28 days of scheduled clinical appointment at 12 months, 24 months, and at both intervals were 39.2 percent, 32.2 percent, and 17.4 percent, respectively. Viral loads suppression is a good indicator that shows that antiretroviral therapy is working by successfully reducing the functioning and replication of the virus in the body (Elul et al.; 2013). Of those who had a viral load completed at 12 months, 24 months, and at both intervals 98 percent, 98.1 percent, and 94.6 percent had achieved viral load suppression. While 5.4 percent failed to realize viral load suppression. This outcome is also reinforced by the information, motivation, and behavioural skills model. According to the model when stable patients have the right information about viral loads, why it is important to monitor viral loads at different intervals, the significance of the viral load values, and meaning, more importantly adhering to clinical appointment for blood specimen collection. Stable patients will be motivated and have the precise attitude to enact self-sufficiency, being

able to prioritize attendance of scheduled clinic visits over other competing attitudes, therefore the combination of these factors should be sufficient to influence behaviour change. The research findings show poor viral load completion at scheduled clinical appointments for stable patients, this might be due to patients not being motivated to attend clinic visits however, we concede that other factors could be at play., such as clinicians not collecting the viral load specimen.

On a lighter note, the results chain shows that the intervention has achieved its intended outcome with the rate of suppression being above 94 percent at each interval for those who had a viral load completed. The finding indicates that the employment of the differentiated ART delivery models can bring about incredible outcomes. Although the intervention was not effective for all stable patients who had a viral load completion, conclusions can be made that differentiated care ART delivery models were successful in attaining the desired outcomes in urban township settings.

6 SUMMARY, CONCLUSIONS, LIMITATIONS, AND RECOMMENDATIONS

This section summarises the research project (6.1), highlighting the research problem, extensively discussing the HIV epidemic, it provides a condensed discussion on reviewed past and current studies to establish the knowledge gap. From these discussions, the chapter highlights the research strategy, design, procedure, and methods. In addition, key research results and findings were discussed and interpreted from the viewpoint of public health studies utilising behavioural theories. Moreover, the chapter shares conclusions (6.2) of the research findings, present limitations of the study what was done and what the research could not attain. (6.3) Most importantly the research provides recommendations towards the outcome's evaluation of the differentiated care ART delivery models in the perspective of South African urban townships and paves a way for future studies to be conducted. (6.4).

6.1 Summary

With the high prevalence and massive expansion of ART, alternative ART delivery models are needed in scaling up, delivering ART, and maintaining high-quality services to people living with HIV. Various differentiated care ART delivery models were implemented in health facilities across South Africa, Notable results from the literature suggest that differentiated care ART delivery models were piloted and implemented at scale, nevertheless, there is little evidence on the scale-up of these models on patients' outcomes in South African urban townships. The research study aims to evaluate the outcomes of the differentiated care ART delivery model in a South African urban township. Literature put forward, key outcomes of the intervention are retention in care alongside loss to follow up, viral load suppression, which hinges on patients being adherent to treatment, scheduled clinical and /or pick up appoints and having a viral load test done at appropriate intervals.

To understand the physical research context, the study discusses the history and description of Ekurhuleni Metropolitan Municipality, with a specific focus on Tembisa. The study is situated in Tembisa, an urban township located in Gauteng province North of the city of Ekurhuleni. The township is located between Pretoria and Johannesburg. The Municipality is a vibrant, eventful business hub in South Africa, 30 percent of the local population are living in poverty, with inequitable access to health care. Tembisa

has the same characteristics as any township in Ekurhuleni, South Africa; the township is predominantly black, with people living in poverty, facing high unemployment, poor service delivery and inequitable health care (Masuku et al., 20019). According to Municipality (2005), Masuku et al, (2008), it is not surprising that social determinants of health are linked with poverty, therefore, poor communities experience high levels of HIV/Aids and other poverty-related diseases. Even though there are these disparities, the municipality has made strives to improve provision and access to health care by bringing medication closer to the people who need it the most. The city established 21 chronic medications pick up points, which will, in turn, reduce queues and waiting periods at the clinic.

Differentiated care models are central to the National Adherence Guidelines (AGL), which seeks to encourage stable, treatment adherent ART patients to take advantage of these alternative care models and access appropriate HIV care outside the facility, that further support adherence and reduce defaulter rates by promoting more integrated and patient-centred health systems approach increased access to appropriate services and interventions and addressing barriers to quality health care, including facility congestion, long waiting times and the lack of confidentiality. Furthermore, by decongesting healthcare facilities, clinicians can focus on providing acute patients with adequate care and time. (NDOH, 2016.). The intervention is a patient-centred approach that is meant to improve retention in care and clinical outcomes of patients on chronic medications. The study is an outcomes evaluation which is a component of summative evaluation. Summative evaluation focuses on the interventions that are in progress and it is also conducted at the completion of the intervention to determine the effectiveness of the intervention to target beneficiaries; it can either be outcome or impact evaluation. (Bhana & Govender, 2010). Therefore, a summative evaluation accesses the intervention outcomes and documents the intervention processes to facilitate informed decisions about the overall effectiveness of the intervention.

There is limited literature that evaluated the outcomes of these models of care in an urban South African township. Therefore, the research seeks to answer three research questions.

- (1) What are the rates of retention in care of stable patients on the differentiated care antiretroviral therapy delivery models for 24 months?

- (2) What are the factors associated with loss to follow up among stable patients on the differentiated care antiretroviral therapy model for 24 months?
- (3) What are the proportions of stable patients with viral load completion and viral load suppression on differentiated care antiretroviral therapy for 24 months.?

The study embarked on problem analysis and discussed the challenges of the HIV epidemic and ineffective HIV interventions, systems, root causes, and consequences, the HIV epidemic has been a challenge around the world, with South Africa having one of the highest prevalence and ART programs in the world. Poverty seems to be the root cause that drives the spread of HIV infections, as it is concentrated among the poor of the poorest, alongside age disparities, social and gender inequalities. Similarly, HIV Stigma is associated with the spread of HIV infection. UNAIDS (2019), Fatok (2016) posit that people who go through stigma and discrimination daily feel side-lined and are more susceptible to HIV, while those living with HIV are more vulnerable to experience stigma and discrimination, the latter is associated with poor health outcomes, poor treatment adherence and are likely to indulge in unsafe sexual behaviours. HIV stigma can be regarded as a barrier to effective HIV prevention and treatment programs, in the same token low uptake of treatment, poor prevention and treatment services are attributed to HIV/Aids Stigma (Fatok, 2016), Mahajan et al., 2008).

Past and current studies were reviewed to identify the knowledge gap focusing on aspects related to the intervention outcomes and paying attention to the limitations of the past and current studies, methods, data, findings, and conclusions. This paved a way for the study to employ a quantitative research strategy, with a preconceived notion of a retrospective cohort analysis, reviewing secondary data from electronic clinical medical records, data collection instrument was developed to guide the data extraction process, an inclusion and exclusion criterion were applied as per the Adherence guidelines to select the target population, stratified random sampling was applied to patients enrolling on the differentiated care ART delivery models, however, purposive sampling was used to select health facilities based on the total number of patients remaining in care and the total number of patients enrolled on the differentiated care models in each facility.

The study utilised descriptive statistics to describe patients' characteristics, Pearson's chi-square test to determine rates of retention and compare patients who were retained in care and those who were lost to follow up over 24 months logistic regression to examine the factors associated with loss to follow up among stable patients over 24 months from the date of enrolment on the differentiated care. The analysis was performed using STATA Corp. 2019 STATA statistical software: version 16. College Station T.X. Stata Corp LLC., as it was relevant to compute quantitative results.

Most if not all the studies do not refer to the use of an interpretive /theoretical framework to interpret the research results, this shows a gap in the research. Therefore, the outcome evaluation for this intervention is nested within public health studies, the key purpose of public health is to improve the population's quality of life through promotion, prevention, and treatment of medical conditions (Orme et al., 2007). Moreover, public health is a multidisciplinary field, which involves academic disciplines that includes biostatistics, epidemiology, social sciences, and management of health services with subfields such as behavioural health, community health, environmental health, health economics, public policy, mental health, occupational safety, health education, sexual and reproductive, health maternal health, and (Gouda and Powles, 2014). Public health is exceptional in its interdisciplinary approach and methods, it highlights preventative strategies, it is linked with government and political decision-making, and it is always on the top agenda of the government's raider (Turnock, 2016). Preventative medicine, tertiary prevention, and chronic disease management were identified as subcomponents of public health studies Handler, Issel & Turnock (2001) also identified four other components of public health (i.e., structural capacity, system mission, processes, and outcomes in measuring public health system performance improvements in population health status for the public health system to function effectively.

Evaluation creates the feedback loop from the public health system's outcomes to planning (Turnock et al., 2016). Handler et al. (2001) and Turnock et al. (2016) ascertain that evidence-based approaches can provide a feedback loop through monitoring and evaluation of the implementation of various interventions, moreover, decision making is informed by multidisciplinary evidence-based public health. Policymakers used the qualitative and quantitative data to determine the appropriate policy intervention and

outcomes (Ross et al., 2009). Potential impacts of the policy are documented, this is important as it supports evidence-based policy, therefore evaluating policy is essential in the identification of the impact of policies on behavioural changes at community and individual levels (Ross et al., 2009 & Orme et al., 2007).

Tertiary prevention paves a way to introduce chronic disease management with specific reference to inputs, outputs and outcomes of the intervention paying special attention to the immediate outcome's retention in care, loss to follow up, and viral load suppression.

HIV is a social, health and behavioural issue, theoretical frameworks were reviewed to understand and interpret the research results. The following behavioural theories were deemed fit to interpret the research findings of the differentiated care ART delivery model intervention as an extension of the HIV intervention, the Information-Motivation-behavioural skills model, the health belief model, social cognitive theory, and theory of planned behaviour aimed at health behavioural change. To interpret the research results, rates of retention and viral load suppression were interpreted from the viewpoint of the IMB model. The factors associated with loss to follow up among stable patients was interpreted using the social-cognitive theory, theory of planned behaviour and health belief model. Moreover, the result chain was roped in to assess the outcomes of the intervention. Ultimately, based on literature section (2.7) systematically summarise the six components to develop a conceptual framework to offers a roadmap detailing how the research was embarked on, and show how the different components interrelate.

Lastly, the research results in chapter 4 and the research findings in chapter 5 were presented and discussed based on the research question and hypothesis and subsequently to a certain extent were compared to similar studies. This section summarises the research findings

- **Rates of retention in care for stable patients on the differentiated care antiretroviral therapy delivery model for 24 months**

The study shows that there are high rates of retention in care in stable patients enrolled on the differentiated care ART delivery models for 24 months in selected facilities in Tembisa. 91.8 per cent of stable patients were retained in care, while 8.2 per cent of stable patients were lost to follow up. The finding supports the hypothesis: *There is a high rate of retention among stable patients on the differentiated care antiretroviral therapy delivery model for 24 months.* Looking at the study variables the findings were statistically significant at the

facility clinic, Age at enrolment and duration on ART, however, there were no significant variances between retention in care rates and the sex of participant (p-value = 0.88), Modality (p value= 0.04) and viral load suppression at enrolment (p-value =0.04). This means that the sex, modality, and viral load suppression at enrolment in differentiated care ART delivery models has no influence on patients being retained in care, thus the null hypothesis for the variables is not rejected.

- Factors associated with loss to follow-up in stable patients on the differentiated care antiretroviral therapy delivery model over 24 months.

The research findings support the research hypothesis: *Various factors are associated with loss to follow-up amongst stable patients on differentiated care antiretroviral therapy delivery model for 24 months.*

The health facility was found to be a risk factor associated with loss to follow-up, therefore, people's environment plays a major role in moulding people's behaviour, as it was seen in the selected health facilities, patients from Esangweni clinic share the same personal characteristics, experience and environmental factors that influence their behaviour and choices. Age at enrolment in the differentiated care is associated with the probability of being lost to follow up, particularly stable patients aged between 18-24 years. When looking at the age at enrolment variable, there is a significant relationship between age category 25 years and above at enrolment and loss to follow up amongst stable patients on differentiated care antiretroviral therapy delivery model for 24 months age category 25-34 0.3 95% CI: 0.1–0.6), p value 0.001, age category 35-44 0.2 (95% CI: 0.1–0.4), p value <0.001-, age category 45+,0.2 (95%CI: 0.1–0.4), p value<0.001. Most notably stable patients who were enrolled in differentiated care models after being on treatment for 12- 23 months have a higher likelihood to be lost to follow up. Moreover, there is a significant relationship between Duration on ART at enrolment, lost to follow up, patients who had been on ART for 24 months at the time of enrolment on differentiated care models had lower likelihood of being lost to follow-up compared to patients who were enrolled after being on treatment for 12-23 months 0.3 (95% CI: 0.2–0.5), p value <0.001.

On the contrary, there was weak evidence from the comparison of modalities and the likelihood of being lost to follow up, thus these factors were not statistically significant.

In conclusion, the null hypothesis is rejected for health facility, Age at enrolment and duration on ART at enrolment, however, the null hypothesis was not rejected for the modality variable (p value. 0.08) and sex variable (p value, 0.88), there is no statistical significance between these variable and loss to follow up.

- **Proportions of stable patients with a viral load completion and viral load suppression on differentiated care antiretroviral therapy delivery model for 24 months.**

The findings from the study, show that there is low uptake of viral load specimen collection and documentation within 28 days of scheduled clinic visit appointment, however, there was significant high viral load suppression among those who had a viral load completion rate at 12 and 24 months, with a viral load suppression rate of 98 percent.

6.2 Conclusions

The findings from this study confirm that alternative ART care models are important in scaling up and delivering ART, within an urban township setting, bearing in mind that South Africa has one of the largest HIV programs in the world. Most importantly the study shows that the outcomes of the differentiated care ART delivery models can be achieved in a South African urban township setting and can be successfully implemented in urban townships across the country. In addition to this, the study shows that high rates of retention can be achieved within the intervention, with a low loss to follow up rate for 24 months.

The findings further demonstrate that the younger age group between 18- 24 years need more intensified targeted interventions and enhanced adherence counselling before enrolment in differentiated care models. Strengthen youth-friendly services, adolescents, and youth clubs to provide appropriate information, motivation, and behavioural skills to enact behavioural change to achieve the desired results and built self-efficacy among this age group. Additionally, stable patients who were enrolled on the differentiated care models after being on treatment for 12-23 months were associated lost to follow up, it is presumed that this cohort of patients perceive that they have improved health after commencement of ART (Mpinganjira et al., 2020) and have the tendency not to adhere on ART, therefore, Enhanced Adherence Counseling should be enhanced at each clinic

visit, more importantly, patients should be reminded of the aftermaths of non-adherence to long term ART and that alternative care models are a privilege.

Lastly, the research findings show there is poor viral load specimen collection at scheduled clinical appointments, however, we concede that other factors could be at play. Inconsistent documentation of viral loads done, and results add another dimension to the completion of viral loads. In contrast for those who had a viral load specimen collected at the scheduled clinical appointment, excellent viral load suppression was realized. Overall, the finding indicates that the employment of differentiated ART Delivery models can bring about incredible patient outcomes. Although the intervention was not effective for all stable patients who had a viral load completion, conclusions can be made that differentiated care ART delivery models were successful in attaining the desired outcomes in urban township settings.

6.3 Limitations

This study has numerous limitations, firstly the study is a retrospective cohort study data was collected routinely from patients' electronic medical records, completion of viral load monitoring data was low. Second, missed viral load specimen collection within the scheduled clinic appointment and inconsistent documentation was a limitation, the research result might be dissimilar if all the patients who were enrolled on differentiated care had a viral load completed and documented at the prescribed interval.

At the commencement of the programme, there were implementation issues with aligning clinic visits and ART prescription, this poses a challenge in interpreting this variable further, due to lack of additional information.

Loss to follow up was described based on the recorded outcomes in the data set, gaps in documentation present the possibility of underreporting or overestimating of loss to follow up and there was no opportunity to verify the variable.

The study lacks external validity; therefore, the research findings might not be generalisable beyond the urban township setting.

6.4 Recommendations

Based on the research findings, there is a need to strengthen the implementation of adherence guidelines in the context of differentiated care ART delivery models, enhanced adherence counselling should be implemented before and during differentiated care ART delivery models participation. Patients should be provided with the appropriate information on the importance of adhering to long term ART and the importance of adhering to scheduled clinic visits for viral load specimen collection, furthermore, patients should be empowered to take ownership for their chronic illness to improve clinical outcomes

Health care workers should ensure that viral loads specimens are collected at appropriate intervals.

Health care workers should ensure that scheduled clinical appointments are aligned with the ART prescription and the patient cohort, which is based on the ART start date.

A process should be in place to monitor viral loads and ensure that pending results are cleared and documented in the patient medical record.

Emphasis should be placed on the younger generation and patients who are less than 24 months on treatment before enrolling on differentiated care models. It was noted that the guidelines were amended to decrease the duration of ART to 6 months before enrolment on differentiated care, these patients require closely monitoring to lower loss to follow up rates, which was identified as a risk factor among this group of patients.

The study further highlights areas for futures research that can be followed to enhance knowledge of the outcomes of the differentiated care ART delivery models:

- A study should be conducted to understand patients' experience and challenges in differentiated care ART delivery models and to understand how differentiated care influences engagement in HIV Care for stable patients.
- A qualitative study should be conducted to understand behavioral change amongst patients who were enrolled in differentiated care ART delivery models with a duration on ART of less than 24 months alongside with age group between 18-24 months
- To further understand retention in care, a study should be conducted to measure retention and the impact of adhering to timely scheduled clinic visits on retention in care.

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7 APPENDICES

8 APPENDIX 1.1: DATA COLLECTION INSTRUMENT

DATA COLLECTION INSTRUMENT			
Patient retention and viral load Monitoring			
1. DEMOGRAPHIC CHARACTERISTICS			
Facility Name	Clearly		
Age (in years)			
Sex:	Male		
	Female		
Residential area	Rural	Semi-Urban	Urban
2. TREATMENT HISTORY			
ART start date:			
ART Regimen at enrolment			
Viral load Measure at (DMOC) enrolment			
Differentiated Model of Care (DMOC)	Adherence Club	Facility Pick Up Point	External Pick Up Point
Date of first enrolled on DMOC			
TB infection	Yes	No	
3. CONTINUING ART IN DMOC			
Scheduled period of time at 6months			
Did the patient adhere to scheduled visit?	Yes	No	
Prescription renewal Date(six months clinical review date			
Months prescribed			
Prescription renewed	Yes	No	
Next Scheduled visit			
Differentiated Model of Care (DMOC)	Adherence Club	Facility Pick Up Point	External Pick Up Point
Outcomes	At 6 Months		
Loss to follow up			
Died			
Retained in Care			
Transfer out			
Scheduled period of time at 12 Months			
Did the patient adhere to scheduled visit?	Yes	No	
Prescription renewal Date(six months clinical review date			
Months prescribed			
Prescription renewed	Yes	No	

Next Scheduled visit			
Differentiated Model of Care (DMOC)	Adherence Club	Facility Pick Up Point	External Pick Up Point
Outcomes	At 12 Months		
Loss to follow up			
Died			
Retained in Care			
Back to main stream care			
Transfer out			
Scheduled period of time at 18 Months			
Did the patient adhere to scheduled visit?	Yes	No	
Prescription renewal Date(six months clinical review date			
Months prescribed			
Prescription renewed	Yes	No	
Next Scheduled visit			
Differentiated Model of Care (DMOC)	Adherence Club	Facility Pick Up Point	External Pick Up Point
Outcomes	At 18 months		
Loss to follow up			
Died			
Retained in Care			
Back to main stream care			
Transfer out			
Scheduled period of time at 24 months			
Prescription renewal Date clinical review date			
Months prescribed			
Prescription renewed	Yes	No	

Next Scheduled visit			
Differentiated Model of Care (DMOC)	Adherence Club	Facility Pick Up Point	External Pick Up Point
Outcomes	24 months		
Loss to follow up			
Died			
Retained in Care			
Back to main stream care			
Transfer out			
Current outcome			
4. VIRAL LOAD MONITORING			
Months	Viral load done date	Viral load Measure (copies/ml)	
12 Months			
24 Months			

9 APPENDIX 1.2: SHORT BIO OF THE RESEARCHER

I, Tebogo Patience Tebeila a Master of Management (specialising in Public Development Sector Monitoring and Evaluation) student from the University of the Witwatersrand, School of Governance

I am carrying out this research to measure the outcomes of the differentiated ART delivery in South African urban township Tembisa, Ekurhuleni Metropolitan Municipality as a partial fulfilment for my degree. Under the supervision of University of the Witwatersrand this is exclusively my research.

This study is conducted without any sponsor or organisation funding. The research will not harm to any patients, this is a retrospective, cohort analysis reviewing patient electronic medical record, therefore, and data will be abstracted from patient electronic medical records anonymously observing the protection of personal information act. The researcher obtained ethical clearance from the human and ethics committee and permission to conduct the study by Ekurhuleni Department of Health research ethics committee. Research findings will be share with the Ekurhuleni Department of Health.

10 APPENDIX 1.3: HUMAN ETHICS CLEARANCE CERTIFICATE AND RELEVANT STUDY APPROVALS

 UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG	HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
---	--

Office of the Deputy Vice-Chancellor (Research and Postgraduate Affairs)

TO: Ms T Tebeila
School of Governance
Faculty of Commerce, Law and Management
University

E-mail: 1491409@students.wits.ac.za

CC: Supervisor: Mr K Wotela
<Kambidima.Wotela@wits.ac.za>
and <HREC-Medical Research Office@wits.ac.za>

FROM: Mr Iain Burns
Human Research Ethics Committee (Medical)
Tel: 011 717 1252
E-mail: Iain.Burns@wits.ac.za

DATE: 2021/05/13

REF: R14/49

PROTOCOL NO: **M210301** (This is your ethics application reference number. Please quote it in all enquiries, oral or written, relating to this study.)

PROJECT TITLE: *An outcomes evaluation of the 'differentiated care' antiretroviral therapy delivery in a South African urban township*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to Government funding of the University.



MSWorks2000/Iain0007/Clearscan.wps

R49 Ms T Tebeila

**HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M210301**

NAME: Ms T Tebeila
(Principal Investigator)

DEPARTMENT: School of Governance
Faculty of Commerce, Law and Management
University

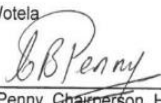
PROJECT TITLE: *An outcomes evaluation of the 'differentiated care'
antiretroviral therapy delivery in a South African
urban township*

DATE CONSIDERED: 2021/03/26

DECISION: Approved unconditionally

CONDITIONS:

SUPERVISOR: Mr K Wotela

APPROVED BY: 
Dr CB Penny, Chairperson, HREC (Medical)

DATE OF APPROVAL: 2021/05/13

This Clearance Certificate is valid for 5 years from the date of approval. An extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office secretariat on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report.** When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **March** and therefore reports and re-certification will be due in the month of **March** each year. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).



Signature of Principal Investigator

2021/05/17

Date



EKURHULENI HEALTH DISTRICT RESEARCH PERMISSION

Research Project Title: An outcomes evaluation of the 'differentiated care' antiretroviral therapy delivery in South African urban township"

NHRD No: GP_202010_063

Research Project Number: 07/12/2020-08

Name of Researcher(s): Mrs Tebogo Tebeila

Division/Institution/Company: University of Witwatersrand

Date of review by the EHDRC: 07 December 2020

DECISION TAKEN BY THE EKURHULENI HEALTH DISTRICT RESEARCH COMMITTEE (EHDRC)

- This document certifies that the above research project has been reviewed by the EHDRC and permission is granted for the researcher(s) to commence with the intended research project.
- Facilities approved for the research: Erin clinic, Esangweni CHC, Ethafeni clinic and Tembisa CHC.
- Participants' rights and confidentiality must be maintained throughout the study period and when disseminating the findings.
- No resources (financial, material and human resources) from the health facilities will be used for the study. Neither the district nor the health facilities will incur any additional cost for the study.
- The study will comply with Publicly Financed Research and Development Act 2008 (Act 51 of 2008) and its related regulations.

Title: An outcomes evaluation of the 'differentiated care' antiretroviral therapy delivery in South African urban township"

- The EHDRC must be informed in writing before publication or presentation of research findings and a copy of the report/publications/presentation must be submitted to the EHDRC
- The district must be acknowledged in all the reports/publications generated from the research.
- The researcher will be expected to provide the EHDRC with
 - Six monthly progress updates including any adverse events
 - The final study report in electronic format
 - Present the final research findings at the annual Ekurhuleni research conference if possible.
- The EDHRC reserves the right to withdraw the approval, if any of the conditions mentioned above have being breached
- The research committee wishes the researcher(s) the best of success.

THEMBANI MASINA Masina
DEPUTY CHAIRPERSON: CITY OF EKURHULENI

Dated: 15/12/2020.

De. R. Kelleman Melleu
CHAIRPERSON: GAUTENG DEPARTMENT OF HEALTH (EKURHULENI HEALTH DISTRICT)

Dated: 15/12/2020



NPC
Registration No.
1998/009355/08
041-083-NPO

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08 July 2021

Authorization Letter: Use of Company Data (Information)

To whom it may concern,

This letter permits the receiving party **Ms Tebogo Tebeila** to make use of the Confidential Information granted to her by The Aurum Institute.

The agreement in this letter is subject to the employees' signature / confirmation to The Aurum Confidentiality Disclosure Agreement.

N.B: The Confidentiality Disclosure Agreement contains the entire agreement of the parties (The Organisation and the receiving party) with respect to the subject matter of this agreement and supersedes all prior agreements between the parties, whether written or oral, with respect to the subject matter of this agreement.

Also, the Confidentiality Disclosure Agreement records the terms and conditions upon which each. (The Organisation and the receiving party) shall disclose confidential information to the other, which Terms and conditions shall constitute a binding and enforceable agreement between the parties and their agents.

Should the receiving party be not aware of the **OR** has not signed the Confidentiality Disclosure Agreement, there of this Authorization letter is to be deemed invalid.

This authorization letter is valid for one year from this date unless specified otherwise.

Yours Faithfully,

Signed by: Michael Charles McMillan
Signed at: 2021-07-21 12:16:33 +02:00
Reason: I approve this document

Michael McMillan
HR Director
(For and on behalf of Aurum Institute)