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The consistency of DHIS data for antenatal care clients HIV testing services and factors affecting DHIS reporting in Vhembe district

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Public Health.

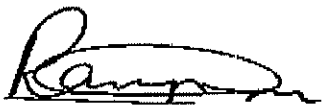
Johannesburg

Date: 20/10/2017

Supervisor: Professor Ian Couper

DECLARATION

I, Mashudu Rampilo, declare that this research report is my own work. It is being submitted for the degree of Master of Public Health in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other university.

Signature of candidate: 

Date: 20/10/2017

DEDICATION

I dedicate my dissertation work to my family and many friends. A special feeling of gratitude to my loving parents, for their support and words of encouragements.

I also dedicate this dissertation to my many colleagues who have supported me throughout the process.

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I wish to express my sincere gratitude to my family, friends, colleagues too numerous to mention who in one way or the other contributed to my success through the programme. In particular I would like to express my gratitude especially to the following;

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- The Limpopo provincial department of health for giving me permission to conduct the study.
- Vhembe District Executive Manager, for granting me permission to carry out this research
- All the facility managers who agreed to participate in the study and shared their documents

ABSTRACT

Background: A national programme to prevent mother-to-child transmission (PMTCT) of HIV was established in South Africa in 2002. A well-managed PMTCT programme is able to reduce infant, child, and maternal mortality, while improving mother and child health. Testing for HIV during pregnancy allows for prevention of vertical (mother-to-child) transmission and provides an opportunity for women living with HIV to access treatment for their own health. Enrolment of pregnant women on the PMTCT programme requires HIV status to be established and recorded as early as possible, preferably during the antenatal first visit. Health managers responsible for implementing PMTCT services utilize District Health Information System (DHIS) data to monitor the program performances. However, the quality of this data cannot be guaranteed. There are numerous factors associated with poor data quality, which include poor numeracy skills of the health care workers, poor understanding of indicators, lack of supervision and feedback, high staff turnover and unstandardized collection tools. This research aimed to determine the consistency of DHIS data and to understand the factors affecting its quality.

Methods: This is a descriptive and analytical study to describe the factors affecting data reporting and the quality of DHIS data in Vhembe district. Fifteen (15) facility managers completed a checklist with a series of questions on five essential Health Information System (HIS) components to determine its capability to produce good quality data by choosing either "Yes" or "No" on the questionnaire. Quality Score (QS) was used to measure the HIS weakness and strengths. The study also collected data on two indicators (First ANC client tested for HIV and First ANC client tested HIV positive) for February 2010, March 2011, August 2012 and November 2013 from source documents (HCT registers) and made comparison with the existing monthly DHIS report. Verification Factor (VF) was used to measure data consistency between data that was collected from HCT registers and monthly reports.

Results: The quality score obtained from Vhembe district HIS was 83.2%. Data between the facility source documents and the monthly summary reports was 95.9% consistent. All the facilities reported that they have indicator definitions and clear instructions on how to complete the data collection and reporting tools, however 80% reported that they use national standardized tools consistently. Only 46.6% of the facilities had the organizational structure showing data management positions, but those positions were occupied in 53.3%. Data management training plans were available in 66.6% of the facilities, while the staff trained on data management processes and tools were reported in 73.3% of the facilities. Supervisory visits were data quality is reviewed and the existence of a designated senior staff member responsible for validating data prior to the submission to the next level was reported in 86.6%.

Conclusions: Data collected and reported through DHIS in the PHC facilities in Vhembe District was accurate and reliable enough to be utilized for PMTCT program monitoring and evaluation. Standardised data management tools were available and utilised. Nevertheless, there was a shortage of data staff, and their positions were not well reflected on the facility organograms.

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ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immuno Deficiency Syndrome
ANC	Antenatal Care
CQI	Continuous Quality Improvement
DHIS	District Health Information System
DHMIS	District Health Management Information System
DoH	Department of Health
DQA	Data Quality Audit
GAVI	Global Alliance for Vaccines and Immunisation
HCT	HIV Counselling and Testing
HIS	Health Information Systems
HIV	Human Immunodeficiency Virus
HSS	Health System Strengthening
MDG	Millennium Development Goals
M&E	Monitoring and Evaluation
NDoH	National Department of Health
NSP	National Strategic Plan
PEPFAR	Presidential Emergency Plan for AIDS Relief
PHC	Primary Health Care
CHC	Community Health Center
PI	Principal Investigator
PRISM	Performance of Routine Information System Management
PMTCT	Prevention of Mother-to-Child Transmission
QS	Quality Scores
SA	South Africa
Stats SA	Statistics South Africa
STI	Sexually Transmitted Infection
SOP	Standard Operating Procedure
TB	Tuberculosis
VF	Verification Factor
WHO	World Health Organization
WSPH	Wits School of Public Health

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

The World Health Organization (WHO) and other international and national organizations stress the need for department of health managers and policy makers to base their decisions on good quality data (AbouZahr and Boerma, 2005). There is high demand for health data to inform policies, set priorities, allocate resources and monitor health programs (Garrib et al, 2008). As countries were measuring their progress towards the Millennium Development Goals (MDG) in 2015, health data has received serious attention, because reliable and timely data on key health indicators is required for accurate reporting (Rugg et al, 2009). Globally, initiatives such as the Data Quality Audits (DQA) are used by the Global Alliance for Vaccines and Immunisation (GAVI) to improve monitoring progress of health services (Bosch-Capblanch et al, 2009). In developing countries there are several initiatives to improve the quality of health data, including the Health Metrics Networks, and the Performance of Routine Information System Management (PRISM), which aims to assess the strengths and weaknesses of routine health information systems (Health Metrics Network 2008; Aqil et al, 2009; Hotchkiss et al, 2010). However, the Monitoring and Evaluation (M & E) systems in low-income countries are generally known to be weak and overwhelmed by data quality gaps (Hahn et al, 2013).

After 1994 the South African public health information systems were restructured to support the new Primary Health Care (PHC) approach aimed at transforming the health system. A free and open source District Health Information System (DHIS) Software was adopted in year 2000 as the official national standard system for the capture, storage, analysis, and reporting of routine data for public health facilities. There are standardised data collection tools such as tally sheets, registers (electronic or paper) which are used to collect raw data which is captured on DHIS to generate indicators that monitor the provision of health services routinely. Health care providers (nurses, doctors and other health professionals) are responsible to ensure high

quality data in individual patient clinical records and the routine data collection and collation tools. Information clerks or Data Capturers in health facilities are responsible for data collection and validation. There are efforts put in place by the National Department of Health (NDoH) to improve the quality of health data, including the District Health Management Information Systems (DHMIS) policy which was approved in 2011 (Department of Health, 2011a). The implementation of this policy was followed by the development of Standard Operating Procedures (SOPs), to provide guidance on the implementation process (Department of Health, 2012). The overall aim of the policy and SOP is to standardize data collection, reporting timelines, validation, sign off, responsible person and analysis at different levels of the health system.

Data for Antenatal care (ANC) services is collected using tally sheets and the HIV Counselling and Testing (HCT) register and it is then entered in the ANC register on a daily basis at facility level. Every month-end this data is summarized using a standardized monthly facility report, which is sent to the sub-district information office. At the sub-district level, the data is entered on DHIS from which the electronic export file is exported to the district information office. However, when this data is summarised in the monthly facility report for DHIS, there are many factors that affect its quality and consistency, including poor numeracy skills by the health care workers, poor understanding of indicators, lack of data feedback, high staff turnover and unstandardized collection tools (Garrib et al, 2008). The researcher was interested to determine the consistency of this data and also understand the factors affecting its quality.

1.2 PROBLEM STATEMENT

HIV/AIDS continues to claim millions of lives while affecting almost everyone negatively either directly or indirectly. One of the widely recommended intervention strategies to reduce new HIV infections is through the prevention of mother to child transmission. Pregnant women booking for antenatal care should receive HIV counselling and testing and those who test positive should be initiated on life-long antiretroviral treatment regardless of their CD4 count

or WHO stage. Health data which is reported through the District Health Information System (DHIS) is used to provide evidence-based progress reports towards reaching the world-wide ambitious goal of eliminating mother to child transmission of HIV. DHIS data collection in Vhembe is a complex process which is prone to several unknown factors that can affect the completeness and correctness of the reported figures and mislead the users. In Vhembe district, users of PMTCT data from DHIS lack understanding of the level of consistency of this data between the source documents and the summarised monthly reports. The purpose of this study is to assess the factors which are associated with the quality of reported data and the degree of its consistency between the registers and the summarised statistics.

1.2 MOTIVATION FOR THE STUDY

Many factors motivated this study. Vhembe is mainly rural, with high shortage of health workers including information officers. There are facilities operating without dedicated data capturers or operational managers, hence the quality of the data reported is not guaranteed. Data for HIV testing for ANC clients is mainly recorded by Lay Counsellors and nurses who perform HCT. Everyone doing HIV counselling and testing should have his/her own register. Summarizing this data can be very difficult, which may lead to errors. Immediately when the reported figures are incorrect, all the decisions taken based on that information are misleading. DHIS data is generated from a complex health information system (HIS) faced with many challenges, including poorly designed registers, multiple registers, unstandardized forms, lack of human resources, poor numeracy skills, poor communication, lack of feedback and high staff turnover (Garrib et al, 2008).

So far, no study has been done in Vhembe district to assess the consistency of PMTCT data from DHIS. In spite of this, studies conducted in other areas of South Africa indicated that PMTCT data from DHIS is not reliable (Mate et al, 2009; Mlambo et al, 2014). Assessing the quality of this data in Vhembe district with a view to influence intervention strategies may benefit the program implementers as well as the patients.

The results of this study will benefit the information officers, clinicians, patients and health program managers even beyond Vhembe district. Moreover, the findings of this study will serve as a motivation to replicate this type of research in other areas in strengthening the health information systems in order to improve the quality of health care services.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

Literature for this study was searched for using the following databases and search engines: PubMed, Cochrane reviews and Google scholar. The keywords used were: "PMTCT data quality audit", "PMTCT data consistency", "health information system assessment" and "Antenatal care DHIS data". The literature was assessed according to data quality assessments, PMTCT data quality in DHIS, significance of PMTCT data and the factors associated with DHIS data quality. Specific studies done in South Africa were of interest, with few studies done in sub-Saharan Africa. Similar studies conducted in other parts of the world were also reviewed.

2.2 THE SIGNIFICANCE OF PMTCT AND ANC SERVICES

Globally, approximately 370 000 children were newly infected with HIV in 2009, mostly due to mother to child transmission (Chetty et al, 2012). In United States, United Kingdom, Brazil, and Botswana, the rate of vertical transmission from mother to child has been reduced to less than 2% through the PMTCT program (Sprague et al, 2011). In South Africa PMTCT is offered in almost all health facilities (98%), and the percentage of HIV-positive pregnant women receiving ART to reduce MTCT has steadily increased from 83% in 2009 to 87.1% in 2012, and MTCT has decreased to 2.7% in 2011 (Department of Health, 2015). Successful implementation of the PMTCT program can eliminate the transmission of HIV from pregnant women before and after delivery. In 2014/15, MTCT went down to 1.5% in South Africa, indicating a significant decline from 2.0% from the previous years (Massyn et al, 2015). The implementation of revised PMTCT guidelines to initiate all pregnant women on ART after testing HIV positive irrespective of CD4 count has contributed to reducing the transmission.

A study investigating why children die in the rural areas of Mafikeng in North West province revealed that 61.9% of under-5 deaths were due to HIV/AIDS through mother to child transmission (Krug et al, 2004). It is estimated that in 2011, 70.4% of maternal deaths in South

Africa were associated with maternal HIV infection (Peter et al, 2013). However, significant progress has been made to ensure that newborn babies are not infected with HIV from their mothers. There is enough evidence that full access to ART including initiation of lifelong treatment during pregnancy and breastfeeding, can contribute to reducing HIV-related maternal mortality. An HIV-infected mother, who has been initiated on ART, has a significantly higher chance of survival (Ndirungu et al 2010). Her survival has a positive effect on her infected and non-infected children's survival (Sartorius et al, 2011). The PMTCT program can reduce maternal mortality where HIV is a major burden through testing women and starting treatment early.

In South Africa, all pregnant women are encouraged to enroll into antenatal care as soon as the pregnancy is confirmed. At first ANC visit, all pregnant women should be offered HCT, which is repeated every three month on those who test HIV-negative, until they deliver. HIV positive pregnant women should be given information on the availability of PMTCT interventions. The main aim of the PMTCT programme is to identify and promote the health of HIV-positive mothers and their HIV-exposed infants, including the diagnosis, management and prevention of opportunistic infections. The PMTCT programme aims to reach out to all women before and during pregnancy, through labour and delivery, and through the postnatal period up to 18 months (Department of Health, 2015). In 2010, around 30% of all pregnant women in South Africa were HIV-positive and half of all deaths in children younger than 5 years were associated with the virus (Peter et al, 2013). Within South Africa, there is evidence of increased infant mortality due to HIV in the first 2 years of life (in utero infection) as compared to the age group 2-5 years old (Bourne et al, 2009). The aim of the Millennium Development Goal (MDG) 4 was to reduce mortality of children younger than 5 years by two-thirds between 1990 and 2015. Most deaths occur in the first year and HIV affects this, so the PMTCT programs helps reduce it (Lawn et al, 2007). The HIV prevalence for individuals aged between 15 to 24 years is an indicator for MDG Goal 6, which is aimed at combating HIV/AIDS, Malaria and other diseases (Rugg et al, 2009). The baseline for this MDG indicator in 2001

was 23.1% compared to 20.7% in 2011 and the aim is to reduce it by 25% by 2015 from 1994 prevalence (Department of Health, 2011b).

2.3 DHIS DATA CONSISTENCY

The quality of health data can be assessed through the comparison of the reported figures versus the information contained in the original source documents. These audit processes can provide an estimate of the degree of over or under-reporting of data. The VF is used to express the accuracy of the facility reported data from its source documents. The range of accuracy that is commonly acceptable is between 95% and 105% (Makombe, 2008), although other studies accepted the range between 85% and 115% (Ronveaux et al, 2005; Glèlè Ahanhanzo et al, 2014).

The inconsistency in the data can result in either under-reporting or over-reporting, which can mislead managers into making decisions based on wrong data (Mavimbe et al, 2005; Otwombe et al, 2007; Ronveaux et al, 2005). Money, time and other resources can be wasted unnecessarily in addressing health problems which never existed if poor data quality was used to draw conclusions. A study conducted in KZN using six PMTCT indicators reported that DHIS data deviated on average by 75.2% from the data reconstructed from the same source documents, with around 19,8% data elements classified as consistent (Mate et al, 2009). If facilities can summarize and validate their data on a weekly basis, such deviation can be avoided. In the assessment of consistency of immunization data for DHIS conducted in Nepal, the source documents and the monthly report varied by 64.2% (Onta et al, 1998). Various reasons can lead to data inconsistency, such as inventing data and missing registers during a data collection period; however, there are simple intervention strategies which can be implemented to address those challenges. In one repeated study assessing ANC data consistency, it was found that the consistency between facility reports and DHIS data was 25% at first and then 65% after implementing interventions which included training on data collection, feedback to health information personnel and program managers, monthly data

reviews and data audits (Mphatswe et al, 2012).

Although it is not common to obtain 100% data accuracy when doing data quality audits, there are research findings which showed a deviation which was acceptably low. Studies that assessed the accuracy of routine maternal health services data described an over-reporting of 100.4% (total deliveries) and 101.3% (live births) in Ghana, and of 104.2% on live births across 19 hospitals in Kenya (Kihuba et al, 2014; Amoakoh-Coleman et al, 2015). An under-reporting of 94.6% was reported from a study that assessed the quality of data aggregated by antiretroviral treatment clinics in Malawi (Makombe, 2008). For a HIS to produce reliable data, it requires strong leadership and governance, to ensure that vacant positions are filled, data staff are well trained on data management and the availability of data recording and reporting tools. When facilities are using paper registers with manual data entry, it is rare to find a health information system that is able to produce consistent figures when data quality audits are conducted (Chen et al, 2014; Mutale et al, 2013; Bosch-Capblanch et al, 2009).

There are other data verification methods apart from testing its consistency/accuracy including the following:

- Completeness: Completeness means that all data elements/indicators from primary data source are completed/reported. It can be calculated by counting the reported data items on the reporting tool out of the total data items to be reported (Amoakoh-Coleman et al., 2015).
- Timeliness: Data is timely when it is up-to-date (current), and when the information is available on time. Timeliness of report submission is calculated by comparing the number of reports submitted on or before the due date and the total reports submitted (Gaies et al., 2016).
- Integrity: Data integrity refers to the process of maintaining and assuring the accuracy/consistency of data over its entire life-cycle. Integrity is when data generated by a program's information system are protected from deliberate bias or manipulation

for political or personal reasons. Information systems should have the ability to control, which users can have access to it and what information those users can view (Smith, et al., 2005).

- Reliability: The data generated by a program's information system are based on protocols and procedures that do not change according to who is using them and when or how often they are used (Brink, 1993).

2.4 HEALTH INFORMATION SYSTEM ASSESSMENT

There are various methods which are used to assess the strengths and weaknesses of the health information system (Chen et al, 2014; Batini et al, 2009). The commonly used method is based on a series of questions about presence of a range of requirements e.g. trained staff, structures, functions and capabilities, indicator definitions and reporting guidelines, data collection and reporting forms and tools, data management processes, and links with the national reporting system (Measure Evaluation, 2008; Ministry of Health Kenya, 2014). To perform this assessment, health information system indicators are assigned "0" for No and "1" for Yes to obtain the QS, which is calculated by dividing the sum of "1" answers by the total number of questions and then multiply it by 100 to convert it into percentage (Bosch-Capblanch et al, 2009).

The assessment of HIS in South Africa carried out by representatives from the Department of Health at national, provincial, district and facility level reported that the overall HIS indicators were found to be highly adequate at 76% (Statistics SA, 2009). It means that 24% of the items required for a functional HIS were missing. Poor data quality can be a result of various factors which cannot be addressed by information managers alone, such as finance, human resources and transport. Although the QS obtained from South African HIS by statistics SA were not satisfactory, in Malawi, the overall average QS obtained after assessing six components of the HIS was 58.2% (Ministry of Health Malawi, 2009). In another study done in Kenya, which also assessed five functional areas of HIS, they reported that the overall

average QS was 49.1% (Ministry of Health Kenya, 2014). Similar audit tool recommended by WHO which was used in Malawi and Kenya, will be adapted to assess Vhembe district HIS.

2.5 FACTORS WHICH AFFECT DHIS DATA QUALITY

Monitoring and Evaluation (M&E) Structure, Functions and Capabilities: Since M & E is a mechanism to try to ensure that there is good quality of data, an effective organizational structure showing M & E responsibilities is necessary in all health facilities (Moghaddasi et al, 2006). Studies have provided evidence that the availability of data staff can improve data quality. In Malawi, it was indicated that 91% of the facilities had a designated person for data management and the quality of their data was regarded as good (Moyo, 2005). Meanwhile, a study done in Kenya assessing the HIS in hospitals showed that only 47% of the positions for information officers were filled (Kihuba et al, 2014). Findings from the SA nationwide health information audit report indicated adequate presence of organizational charts in health facilities, but 35% of the positions were not occupied (Jon et al, 2008). Those results show that recruitment of data staff in South Africa is still a challenge which needs serious interventions, although there are many PEPFAR-funded organizations which are supporting the country to strengthen M&E systems.

For a HIS to produce good quality data, it is recommended that data staff are trained to collect, collate and report data, and correctly use standard health system reporting forms (Braa & Hedberg 2002; Whittaker et al, 2015). However, an assessment of the HIS in South Africa carried out by Statistics SA reported that between 25% and 49% of data staff were trained on DHIS (Statistics SA, 2009). Poor understanding of data tools is associated with poor data quality. In the assessment of the HIS in Kenya it was reported that 46% of staff working on HMIS tasks had no formal training and it was compromising the capacity of the institutions to generate reliable, up to date and timely information for policy, planning, monitoring and evaluation (Kibet et al, 2008). Another study that involved 43 health workers in Tanzania reported that 80% of them were never trained on HMIS (Nyamtema, 2010).

Indicator Definitions and Reporting Guidelines: When people are managing data without definitions, they are likely to make mistakes. Findings from the data quality assessment done by Measure Evaluation in Tanzania, showed that indicator definitions and reporting guidelines were available at 100% of the health facilities (USAID/PEPFAR, 2012). Results from the data quality audits conducted in Botswana reported mixed results, as some participants indicated that indicator definitions were present, while others reported not having these definitions (Ledikwe et al, 2014). It is possible that guidelines were provided to all facilities, but sometimes they get misplaced or completely lost.

Many studies have reported that standard operating procedures (SOP) for data management were completely absent (Amoakoh-Coleman et al, 2015; Health Metrics Network 2008; Kihuba et al, 2014). In Rwanda, Measure Evaluation also found that the health facilities did not have the SOP to address the management, use, and dissemination of information (Measure Evaluation, 2012). Ledikwe et al (2014) reported that in Botswana health facilities there was no government policy on how long data should be stored or how often it should be backed up to protect against loss. While only 57% of the participants in the assessment of the HIS in South Africa indicated the existence of instructions for completing data collection and reporting forms (Statistics SA, 2009).

Data-collection and Reporting Tools: Studies conducted in South Africa reported that health facilities do not always use standardized tools for DHIS reporting (Garrib et al, 2008; Mlambo et al, 2014; Mphatswe et al, 2012). Utilisation of unstandardized data tools happens when the registers are full, stationary is finished, improper planning, poor communication and shortage of transport. It is very important for the facilities to plan on time to avoid those shortages. More evidence is provided from the studies done in Mozambique and Cambodia showed that 93% and 80% of the respondents reported unavailability of data collection and collation tools during some months respectively (Lungo, 2003; WHO, 2012). In a hospital setting where the use of ANC registers was compulsory, it was reported that they were using mother and child health booklets as their only source of information (Hahn et al, 2013). When facilities use different

data tools, they are likely to report less or more of what is required. Shortage of stationary and compulsory reporting templates may lead people responsible for reporting to improvise unstandardized reporting tools which might not contain all required data elements resulting in under-reporting (Kihuba et al, 2014; Ledikwe et al, 2014). It was reported that sometimes health facilities provide services, which are not included in the reporting forms (Makuma, 2003). Hence, they create extra registers, which cannot be considered as standard source documents by the auditors (Bosch-Capblanch et al, 2009; Garrib et al, 2008). Data quality audits rely on the availability of source documents and summary reports, but in many cases those documents cannot be located (Amoakoh-Coleman et al, 2015; Hahn et al, 2013; Hotchkiss et al, 2010; Kihuba et al, 2014; Ronveaux et al, 2005). A study done in Kenya also reported that though the PMTCT register was the standard source document for indicators, some facilities used non-standard registers and old versions of the register as source documents (Ministry of Health Kenya, 2014).

Data Management Processes: A functional HIS should have a written set of procedures for data management including data collection, storage, cleaning, quality control, analysis and presentation for target audiences (Ndabarora et al, 2013; Statistics SA 2009). In the assessment of the HIS in South Africa 50% of the respondents indicated that data management processes were available and clear, although they were partially implemented (Statistics SA, 2009). The quality of data generated from a system which does not follow data management processes cannot be guaranteed. In the assessment of the national HIS of Mexico, data management processes scored 74%, which was considered adequate (Health System Information Center, 2006). However, different results were obtained in other studies conducted in Kenya and Sri Lanka, where 90% and 93% of the respondents respectively indicated that data management processes were poorly organized (Kibet et al, 2008; Ranasinghe et al, 2012). Poorly organized HIS activities and unavailability of guidelines for data quality management were reported in many studies from different settings (Bosch-Capblanch et al, 2009; Garrib et al, 2008; Ledikwe et al, 2013; Makombe 2008; Mate et al,

2009; Nyamtema 2010; Ronveaux et al, 2005). It is important for program managers to stipulate procedures required to optimally assess the performance of their programs through data analysis or reviews.

Providing facilities with regular feedback is a good data management practice. When managers conduct supervisory support visits, they are likely to correct mistakes on the registers on time (Kihuba et al, 2014). In a study done in Sri Lanka, 84% of the respondents indicated that they did receive management support visits, but it was either unsatisfactory or poor (Ranasinghe et al, 2012). Results from the PRISM assessment in Cote d'Ivoire showed that feedback to the facility level after supervisory visits was at 29% (Nutley et al, 2014), while an assessment study done in Iran indicated that no health facility received feedback from the district health information unit (Raeisi et al, 2013). When supervisors plan their support visits, they should analyze data first to determine which facilities to prioritise and understand what they will do when they get there. In Malawi it was reported that even though supervisory visits were being conducted on a regular basis to all facilities, they were not so helpful, as they did not seem to ensure that correct registers were completed accurately and that collected data was verified and sent on time (Ministry of Health Malawi, 2009). Tools which are used by supervisors when they visit the facilities should also incorporate data management activities.

Links with District Reporting System: Reporting data through a single channel on specific due date is a good practice for data management. A study that assessed data flow in HIS in Tanzania and Mozambique reported around 15 parallel reporting systems that were not coordinated centrally by HMIS existed (Lungo, 2003). Parallel systems that bypass the DHIS characterize a missed opportunity to strengthen the weak M&E capacity because they are not designed to improve the quality of the information system (Kawonga et al, 2012). In another study done in Kenya it was reported that about 20% of the facilities had other reporting channels in addition to DHIS (Ministry of Health Kenya, 2014). Criticism of DHIS data quality can result in program implementers creating other ways of getting their data, hence promoting

parallel reporting. In a study done in Sri Lanka reported that 35% of the respondents indicated that the HIS lacked the reporting timelines (Ranasinghe et al, 2012). However, a study done in Cambodia assessing health facility data quality reported that even though the specific due dates for data reporting were clear, approximately 15% of facilities closed their registers before the due date (WHO, 2012). People responsible for submitting data should understand the reasons why data should be reported on the specific dates and the activities done at each reporting level. If data is collected prior to the cut-off dates, it may lead to under-reporting and also create audit queries during the audits as the standardized cut-off dates are used (Pipino et al, 2002). On the other hand late reporting may result in delays in data processing, analysis and utilization (Kibet et al, 2008).

2.6 PMTCT data quality improvement strategies

Standardization of data collection and reporting tools across all the reporting facilities is fundamental in data management. Studies conducted in South Africa provided evidence that health facilities do not use standardized data collection and reporting tools at all times (Garrib et al, 2008; Mlambo et al, 2014; Mphatswe et al, 2012; Mate et al, 2009). A well-designed PMTCT program should have indicator definitions, policies, and guidelines with clear instructions for successful monitoring and evaluation purpose (Ndabarora et al, 2013; Statistics SA 2009). There are many studies that reported that policies and guidelines for data management were not found (Amoakoh-Coleman et al, 2015; Kibet et al, 2008; Measure Evaluation 2012; Ledikwe et al, 2014).

The availability of dedicated staff to collect and validate health data is obligatory. Various studies reported that poor data quality can be fundamentally resolved by addressing issues around staff shortages (Glèlè Ahanhanzo et al, 2014; Mavimbe et al, 2005; Gimbel et al, 2011). In Malawi it was reported that good quality data was observed where 91% of the facilities had designated people for HMIS activities (Moyo, 2005). Inadequate supportive supervision and monitoring of HMIS activities may lead to lack of data verification at the point of collection

(Kibet et al, 2008).

Capacitating people working with data in collection and reporting through skills development programs is important. Staff skills must be built and maintained through regular formal and informal training (Lippeveld et al, 2000; Margolis et al, 2009). Research findings cited that poor data quality could be linked to lack of knowledge and practice among the health workers characterized by insufficient analysis skills, training and lack of initiative for using information (Nyamtema, 2010).

2.7 Conclusion

Effective monitoring and evaluation of public health care programs rely on complete, accurate, and timely flow of data between the clinics, hospitals, sub-district and district facilities (Gimbel et al, 2011). The district managers responsible for implementing health care services and for allocating the budgets and human resources should, take evidence-based decisions, which are informed by good quality data with confidence. The study aims to describe factors affecting the reporting of DHIS data and to also compare data from source documents with the facility reports, for consistency. Similar studies have been conducted in South Africa (SA), and the results showed that data audits can assist in improving the quality of DHIS data.

CHAPTER THREE: METHODS

3.1 AIM OF STUDY

To describe factors affecting DHIS data reporting and assess the consistency of DHIS data for antenatal services in Vhembe district

3.2 STUDY OBJECTIVES

- To describe factors affecting DHIS data reporting on antenatal services in Vhembe District between 2010 and 2013
- To assess DHIS data consistency for antenatal services by comparing source documents and facility DHIS data, in Vhembe district between 2010 and 2013.

3.3 STUDY DESIGN

This is a descriptive and analytical, quantitative study to describe the factors affecting data reporting and the quality of DHIS data.

3.4 STUDY SITE

The study was carried out in Vhembe district, which has a population of 1 347 235, with a population density of 52.6 persons per km^2 and falls in socio-economic Quintile 2, among the poorer districts (Naomi Massyn, Nazia Peer, Ashnie Padarath, Peter Barron, 2015). There are four sub-districts (Makhado, Musina, Thulamela and Mutale), with 120 primary health care facilities and 8 hospitals in Vhembe. Vhembe District is located in the northern part of Limpopo Province. It borders with Zimbabwe and Botswana in the north-west and Mozambique in the south-east through the Kruger National Park. Vhembe is one of the 11 National Health Insurance (NHI) pilot districts. The NDoH in 2012 reported that HIV prevalence among the ANC clients in this district was at 17.7 % (Department of Health, 2011b).

3.5 STUDY POPULATION AND SAMPLING

The study was conducted at primary healthcare facilities. All four sub-districts were equally represented by the sampled facilities based on the population of ANC clients they register per

month. Health facilities included in the study were selected through systematic random sampling. Facilities were grouped by sub-district, then by number of ANC clients registered in the previous financial year from highest to lowest. A sampling interval of every 8th facility was obtained by dividing the number of facilities (120) on the list by the number of facilities (15) to be sampled. The first facility was chosen using a random number between 1 and 8 and the sub-sequent facilities were obtained by adding the sampling interval to the previous result until 15 facilities were selected.

For the first objective, 15 facility managers from the selected facilities were recruited to participate in the study. To assess the data consistency, data for two indicators (First ANC client tested for HIV and First ANC client tested HIV positive) in February 2010, March 2011, August 2012 and November 2013, was recollected by research assistants from HCT registers and compared with the existing monthly DHIS report. Four different months were purposely selected between 2010 and 2013, from which data for the two PMTCT indicators was collected. The reason for selecting different months from different years was to avoid seasonal patterns in periods like festive seasons and Easter holiday as most people take leave.

3.5.1 INCLUSION CRITERIA

- Facilities provided HIV testing services for first ANC clients between January 2010 and December 2013.
- Facilities used the standard PMTCT and HCT registers developed by the Department of Health during the study period.

3.5.2 EXCLUSION CRITERIA

- Facilities with missing registers and copies of monthly reports for DHIS data between January 2010 and December 2013.

3.6 MEASURING TOOL

A researcher-formulated questionnaire was used as a measuring tool. This questionnaire was formulated after the literature review.

A series of questions which are recommended by WHO for DQA and monitoring and evaluation system assessment were posed to the facility managers with a Yes/No response (Appendix C). Each component and its questions were analyzed individually. The questionnaire sought information on:

- M & E structure, functions, and capabilities
- Indicator definitions and reporting guidelines
- Data collection and reporting forms/tools
- Data management processes
- Links with district reporting system.

To assess the data consistency, data for two indicators (First ANC client tested for HIV and First ANC client tested HIV positive) in four different months was collected from source documents and compared with the figures on the monthly summary report.

3.6.1 VALIDITY OF THE MEASURING TOOL

Validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are (Kimberlin and Winterstein, 2008). In this study, the measuring tool was validated through panel discussion of experts in health information systems and data management field, which was followed by pilot study to pre-test the feasibility of the instrument. Two records collected during pilot study showed a Cronbach's alpha of 0.75, which indicated that questions in the tool asked what they were intended to ask, however two records from two facilities may not provide generalizable results.

3.6.2 RELIABILITY OF THE MEASURING TOOL

Reliability estimates evaluate the stability of measures, internal consistency of measurement instruments, and interrater reliability of instrument scores. Research results are considered reliable if consistent results can be obtained using similar methodology in different circumstances (Kimberlin & Winterstein, 2008).

3.7 DATA COLLECTION

Data on the HIS system was collected using paper-based structured questionnaires with Yes or No options. The questionnaires were administered by a well-trained research assistant. Facility managers were asked to complete the questionnaire with the assistance of the research assistant.

To assess data consistency, HIV testing data for ANC clients was collected by the research assistant with the help of facility staff from the national HCT registers, using a paper-based form. Facility monthly summary reports for the selected periods were accessed to collect information which was compared with the information collected from the source documents.

3.8 PILOT STUDY

A pilot study was conducted in two PHC facilities. Consent was sought from these participants, after explaining what the research was about. The same assistants were used during the pilot study. The aim of the pilot study was to:

- Evaluate the method of data collection
- Identify questions that needed modification or cancellation
- Estimate time needed to complete the questionnaire

The results of the pilot study, which were not used in the final analysis of the research, were as follows: estimated time to complete the questionnaire ranged from 10 to 15 minutes. Collection of data from source documents and monthly summary reports took 30 to 40 minutes. No questions needing modification were identified and no translation difficulties were encountered. The results were also used to train the research assistants.

3.9 DATA MANAGEMENT AND ANALYSIS

Data for consistency and factors affecting DHIS reporting was captured into Excel 2010 from the completed paper questionnaires and the collection tools. This study had two outcome

measures: the Verification Factor (VF), which measures data accuracy (consistency); and expresses the proportion of data reported at the end of the month that can be tracked back to the source documents, and the Quality Score (QS), which indicates the overall quality of the data reporting system. Health information system indicators are assigned "0" for No and "1" for Yes to obtain the QS, which is calculated by dividing the sum of "1" answers by the total number of questions and then multiply it by 100 to convert it into percentage. The study adapted the audit tool recommended by WHO, which has been used successfully in various countries and yielded valid and reliable data. Data was analyzed using STATA version 11 (Stata Corp., College Station, TX, US).

3.10 ETHICAL CONSIDERATIONS

The participants recruited for this study were informed of the nature and methodology of the study. The names of the patients were not recorded in the study and confidentiality was strictly maintained. An introduction letter to the participants from the researcher inviting them to participate and stating the reasons for the research was issued to the proposed participants. Participants were required to give informed consent in writing.

Assurance of confidentiality and anonymity was stated in the information sheet and was maintained throughout the research. The researcher also made these assurances verbally while addressing the participants. The study was given ethics approval by the Human Research Ethics Committee (medical) of the University of the Witwatersrand.

Permission to carry out this study was granted by the Head of Department (HOD) from the Limpopo provincial department of health. Permission was also granted by Vhembe district executive manager. Each facility manager, received copies of all the approvals before the information was collected. The letter from the district executive manager requested facility managers to participate fully and share required registers and reports. The final report with detailed findings on best practices and areas of concerns will be shared with relevant stakeholders for their action.

CHAPTER FOUR: RESULTS

4.1 RESPONSE RATE

The response rate was 100%. Fifteen public health clinics in Vhembe District Municipality were chosen for the study. Facility managers from each facility participated in the study. Data source documents and monthly summary reports for assessment of data consistency were available in all the facilities.

4.2 DHIS DATA CONSISTENCY

The Verification Factor (VF) is a measure of data accuracy (consistency); it expresses the proportion of data reported at the end of the month that can be tracked down to the facility source documents. The VF expresses the accuracy of the reported data as compared to data recounted from the source documents. In this study, the overall VF was 95.9% as indicated in Table 1 below.

Table 1: DHIS data consistency

Data element	Monthly Report	Source Registers	Variance	Verification Factor (%)
Antenatal client HIV 1st test VF	2 622	2 730	108	96.0%
Antenatal client HIV 1st test positive	281	296	15	94.9%
Total	2903	3026	123	95.9%

4.2.1 ANTENATAL CLIENT HIV 1ST TEST VF PER FACILITY

The overall VF for Antenatal client HIV 1st test was 96.0%. Facility VF for ANC client HIV 1st test ranged from 88.4% to 116.0%, as shown in Table 2 below. Facilities that obtained a VF of less than 95% were 6 (40%), between 95% and 105% were 6 (40%) and above 105% were 3 (20%).

Table 2: Antenatal client HIV 1st test VF per facility across all four months

Facility	Monthly Report	Source Registers	Variance	Verification Factor (%)
Facility 1	140	139	-1	100.7
Facility 2	132	123	-9	107.3
Facility 3	203	198	-5	102.5
Facility 4	69	65	-4	106.1
Facility 5	262	279	17	93.9
Facility 6	122	138	16	88.4
Facility 7	313	325	12	96.3
Facility 8	111	123	12	90.2
Facility 9	87	75	-12	116
Facility 10	127	135	8	94.0
Facility 11	508	555	47	91.5
Facility 12	180	185	5	97.3
Facility 13	26	25	-1	104
Facility 14	138	156	18	88.4
Facility 15	204	209	5	97.6
All facilities	**2 622**	**2 730**	**108**	**96.0**

4.2.2 ANTENATAL CLIENT HIV 1ST TEST VF PER MONTH

The Antenatal client HIV 1st test VF from different months used in the study varied from 95.1% in February 2010, 91.1% in March 2011, 98.7% in August 2012 and 99.6% in November 2013 as reflected in Table 3 below.

Table 3: Antenatal client HIV 1st test VF per month

	Antenatal client HIV 1st test		
Period	Source Register	Monthly Report	Verification Factor (%)
February 2010	708	674	95.1
March 2011	709	646	91.1
August 2012	716	707	98.7
November 2013	597	595	99.6
Total	**2730**	**2622**	**96.0**

4.2.3 ANTENATAL CLIENT HIV 1ST TEST POSITIVE VF PER FACILITY

Facility VF for ANC client HIV 1st test positive ranged from 50% to 110.3%. Facilities that obtained a VF of less than 95% were 8 (53.3%), between 95% and 105% were 4 (26.6%) and above 105% were 3 (20.0%). Table 4, provides the detailed analysis per individual facility.

Table 4: Antenatal client HIV 1st test positive VF across all four months

Facilities	Monthly Report	Source Registers	Variance	Verification Factor (%)
Facility 1	11	14	3	78.5
Facility 2	17	19	2	89.4
Facility 3	27	28	1	96.4
Facility 4	6	6	0	100.0
Facility 5	40	40	0	100.0
Facility 6	11	12	1	91.6
Facility 7	63	65	2	96.9
Facility 8	10	11	1	90.9
Facility 9	11	14	3	78.5
Facility 10	14	13	-1	107.6
Facility 11	32	29	-3	110.3
Facility 12	19	19	0	100.0
Facility 13	1	2	1	50.0
Facility 14	6	9	3	66.6
Facility 15	13	15	2	86.6
All facilities	**281**	**296**	**15**	**94.9**

4.2.4 ANTENATAL CLIENT HIV 1ST TEST POSITIVE VF PER MONTH

The Antenatal client HIV 1st test positive VF from different months used in the study varied from 108.9% in February 2010, 95.5% in March 2011, 113.2% in August 2012 and 101.7% in November 2013 as indicated in Table 5 below. This VF was above 100% in all the months except in March 2011 were it was 95.5%.

Table 5: Antenatal client HIV 1st test positive VF per month

Period	Antenatal client HIV 1st test positive		
	Source Register	Monthly Report	Verification Factor (%)
February 2010	89	97	108.9
March 2011	68	65	95.5
August 2012	68	77	113.2
November 2013	56	57	101.7
Total	**281**	**296**	**105.33**

4.3 M&E SYSTEM ASSESSMENT

The total HIS assessment Quality Score (QS) obtained for all fifteen facilities combined was 83.2% as shown in Table 6 below. The QS was based on a series of questions, which were asked of the PHC facility managers. The QS results varied per each component as follows: M & E structure, functions, and capabilities (65.2%), Indicator definitions and reporting guidelines (91.1%), Data collection and reporting tools (93.3%), Data management processes and lastly (83.3%) and Links with district reporting system (84.4%).

Table 6: M&E system assessment quality scores

M&E system components	Score
M & E structure, functions, and capabilities	65.2
Indicator definitions and reporting guidelines	91.1
Data collection and reporting forms/tools	93.3
Data management processes	83.3
Links with district reporting system.	84.4
Total	**83.2**

4.3.1 M&E STRUCTURE, FUNCTIONS AND CAPABILITIES

Seven out of 15 facilities (46.6%) reported that they have a documented organizational chart that clearly identifies positions that have data management responsibilities. Facilities that indicated that all staff positions dedicated to M&E and data management systems are filled were 8 (53.3%). Thirteen of the facilities (86.6%) indicated that they have a designated senior staff member responsible for reviewing the aggregated numbers prior to the submission of reports to the next level. Facilities that reported the existence of a training plan which includes staff involved in data-collection and reporting were 10 (66.6%). Twelve facilities (80.0%) reported that relevant staff has received training on the data management processes and tools. The total quality score obtained for this M&E Structure, Functions and Capabilities was 65.3% as indicated in Table 7 below.

Table 7: M&E Structure, Functions and Capabilities

Variable	Obs	Mean	Std. Dev.	Min	Max
There is a designated senior staff member responsible for reviewing the aggregated numbers prior to the submission/release of reports to the next level	15	0.87	0.35	0	1
All relevant staff have received training on the data management processes and tools	15	0.73	0.46	0	1
There is a training plan which includes staff involved in data-collection and reporting	15	0.67	0.49	0	1
All staff positions dedicated to M&E and data management systems are filled	15	0.53	0.52	0	1
There is a documented organizational structure/chart that clearly identifies positions that have data management responsibilities	15	0.47	0.52	0	1
Sub scale scores	**15**	**0.65**			

4.3.2 INDICATOR DEFINITIONS AND REPORTING GUIDELINES

This component contributed three questions for each facility and the overall quality score obtained was 91.1% as shown in Table 8 below. All 15 facilities indicated that they have indicator definitions. The availability of the District Health Information Management policy and the Standard Operating Procedure (SOP) both scored 13 (86.6%) respectively.

Table 8: Indicator definitions and reporting guidelines

Variable	Obs	Mean	Std. Dev.	Min	Max
The indicator definitions are available	15	1.00	-	1	1
The District Health Information Management policy is available	15	0.87	0.35	0	1
The District Health Information Management policy Standard Operating Procedure(SOP) is available	15	0.87	0.35	0	1
Sub scale scores	**15**	**0.91**			

4.3.3 DATA-COLLECTION AND REPORTING TOOLS

There were five questions under this Health Information System (HIS) component and the overall QS obtained was 93.3%. The results in Table 9 below show that 93.3% of the facilities standard source document and reporting forms which are used for data recording and

reporting. All the facilities indicated that they use those standard tools consistently and the M&E unit provided them with clear instructions on how to complete the data collection and reporting forms/tools. However, only 12 (80.0%) indicated that all source documents and reporting forms relevant for measuring the indicator(s) are available for auditing purposes.

Table 9: Data-collection and reporting tools

Variable	Obs	Mean	Std. Dev.	Min	Max
The M&E unit has identified a standard source document to be used	15	0.93	0.26	0	1
The M&E unit has identified standard reporting forms/tools to be used	15	0.93	0.26	0	1
The standard forms/tools are consistently used	15	1	-	1	1
Clear instructions have been provided by the M&E unit on how to complete the data collection and reporting forms/tools	15	1	-	1	1
All source documents and reporting forms relevant for measuring the indicator(s) are available for auditing purposes	15	0.8	0.41	0	1
Sub scale scores	**15**	**0.93**			

4.3.4 DATA MANAGEMENT PROCESSES

This M & E component constituted six questions and the overall QS was 83.3% as reflected in Table 10 below. Fourteen facilities (93.3%) indicated that M&E unit has clearly documented data aggregation, analysis and/or manipulation steps and data feedback is systematically provided on the quality of reporting (i.e., accuracy, completeness and timeliness). When data discrepancies are discovered in reports, 12 facilities (80%) indicated that it is documented how these inconsistencies should be resolved. Thirteen facilities (86.6%) reported that regular supervisory visits are conducted and that data quality is reviewed during the visits. Eight facilities (53.3%) reported that there is a written procedure to address late and incorrect reports.

Table 10: Data management processes

Variable	Obs	Mean	Std. Dev.	Min	Max
The M&E unit has clearly documented data aggregation, analysis and/or manipulation steps	15	0.93	0.26	0	1
Feedback is systematically provided on the quality of reporting (i.e., accuracy, completeness and timeliness)	15	0.93	0.26	0	1
The recording and reporting system avoids double counting people within and across service delivery points	15	0.93	0.26	0	1
There is a written procedure to address late, incomplete, inaccurate and missing data	15	0.53	0.52	0	1
If data discrepancies are discovered in reports it is documented how these inconsistencies should be resolved.	15	0.80	0.41	0	1
Regular supervisory visits have taken place and that data quality has been reviewed.	15	0.87	0.35	0	1
Sub scale scores	**15**	**0.83**			

4.3.5 LINKS WITH DISTRICT REPORTING SYSTEM

There were three questions asked about this M & E component and the overall QS was 84%. Table 11 shows that fourteen facilities (93.3%) indicated that data is reported through a single channel of the district reporting system. The relevant national tools were reported to be used for data-collection and reporting in 12 of the facilities (80.0%). Another 12 facilities (80.0%) indicated that reporting deadlines are harmonized with the relevant timelines of the National Program (e.g., cut-off dates for monthly reporting).

Table 11: Links with district reporting system

Variable	Obs	Mean	Std. Dev.	Min	Max
The data is reported through a single channel of the district reporting system.	15	0.93	0.25	0	1
The relevant national forms/tools are used for data-collection and reporting.	15	0.80	0.41	0	1
Reporting deadlines are harmonized with the relevant timelines of the National Program (e.g., cut-off dates for monthly reporting).	15	0.80	0.41	0	1
Sub scale scores	**15**	**0.84**			

4. 4 RELIABILITY OF DATA

The overall alpha coefficient for all the items was 0. 71 suggesting that the items have relatively high internal consistency. The results show that the questions in the survey asked what they were intended to ask and provided reliable results and can be used for inferential statistics in the multivariate analysis. However, there were six questions with lower reliability, indicated by asterisks.

Table 12: Reliability of measuring tool results

List of questions	alpha
There is a designated senior staff member responsible for reviewing the aggregated numbers prior to the submission/release of reports to the next level	0.726
All relevant staff have received training on the data management processes and tools	0.704
There is a training plan which includes staff involved in data-collection and reporting	0.728
All staff positions dedicated to M&E and data management systems are filled	*0.691
There is a documented organizational structure/chart that clearly identifies positions that have data management responsibilities	*0.689
The indicator definitions are available	0.723
The District Health Information Management policy is available	0.705
The District Health Information Management policy Standard Operating Procedure(SOP) is available	0.672
The M&E unit has identified a standard source document to be used	* 0.672
The M&E unit has identified standard reporting forms/tools to be used	0.728
The standard forms/tools are consistently used	0.722
Clear instructions have been provided by the M&E unit on how to complete the data collection and reporting forms/tools	* 0.672
All source documents and reporting forms relevant for measuring the indicator(s) are available for auditing purposes	* 0.672
The M&E unit has clearly documented data aggregation, analysis and/or manipulation steps	0.728
Feedback is systematically provided on the quality of reporting (i.e., accuracy, completeness and timeliness)	0.729
The recording and reporting system avoids double counting people within and across service delivery points	*0.686
There is a written procedure to address late, incomplete, inaccurate and missing data	0.722
If data discrepancies are discovered in reports it is documented how these inconsistencies should be resolved.	0.728
Regular supervisory visits have taken place and that data quality has been reviewed.	0.710
Scale reliability coefficient	**0.7177**

CHAPTER FIVE: DISCUSSION

5.1 DHIS DATA CONSISTENCY

The first objective of this study was aimed at estimating the degree of over/under-reporting of HIV data for ANC clients at district level for the selected indicators. The overall Verification Factor (VF) obtained in this study was 95.9% (range: 87.2-110.1), which means that antenatal care clients who received HIV test and those tested positive were undercounted by only 4.1%. When the district summary reports are compiled per individual indicator, figures are added together from individual facilities that are likely to have over or under reported, which may compromise the quality of reported data. Obtaining the VF through averaging the results across the facilities may also conceal the true picture of the actual district data consistency as the VF will depend on the extent of over-reporting against under-reporting. In this study, further analysis on individual facility performance revealed that for the first indicator, Antenatal client HIV 1st test, facilities that obtained a VF below 95% were 6 (40%), and above 105% were 3 (20%), meaning that 9/15 (60%) of the facilities fell out of the acceptable VF range. On the second indicator, which is Antenatal client HIV 1st test positive, facilities that obtained a VF of less than 95% were 8 (53.3%) and above 105% were 3 (20%), resulting in 11/15 (60%) of the facilities falling out of the acceptable VF range. The results suggest that majority of the facilities have under-reported on both indicators, followed by those falling within the norm, while few facilities have over-reported based on Makombe's (2008) range of accuracy of 95% - 105%. This degree of under-reporting shows a slight weakness in the Health Information System (HIS) to accurately report on HIV data for antenatal clients rendered at health facilities, since a VF of 95.9% represents a strong HIS. In a similar study conducted in KwaZulu Natal on six PMTCT data elements, the VF obtained was very low at 12.8% (Mate et al. 2009). This finding suggests that staff at clinics did not validate data enough between the source documents and monthly reports when they were compiling statistics. Inaccurate reporting of HIV data for ANC clients on DHIS can misinform program managers as they make conclusions on program success or failure based on data. It is very important to ensure that errors are avoided when

dealing with HIV data for ANC clients in order to eliminate the transmission of HIV from mother to child in Vhembe District.

5.2 HEALTH INFORMATION SYSTEMS ASSESSMENTS

The VF of 95.9% obtained in this study relies on the performance of the HIS, which was measured though QS (Quality Score). The overall QS obtained from the HIS was 83.2%; which is an indication of a strong health information system. The national assessment of HIS conducted by statistics SA reported the overall QS of 76%, which was lower than our findings (Statistics SA, 2009). Our results indicated that Vhembe District HIS is performing acceptably well to generate HIV data for ANC clients which can be used to track the performance of PMTCT program without doubts. Although the QS obtained was acceptably high, the district did not meet the requirements for a fully functional HIS by close to 20%. The findings revealed both the strong as well as the weak areas of Vhembe District HIS.

Numerous factors such as lack of staff, skills, registers, policies, supervision, feedback, reporting structures, indicator definitions, and standardized data collection tools are widely known to affect the performance of HIS (Garrib et al, 2008). There are studies which recommended simplified data collection tools and procedures, reduced number of data elements and indicators, reduced numbers of registers, allocation of dedicated, trained personnel and other data management resources for a strong HIS (Mate et al, 2009; Mpofu et al, 2014; Mavimbe et al, 2005).

5.2.1 STAFF AVAILABILITY

Availability of skilled data management staff is fundamental for a robust HIS. The results of this study indicated that only 53.3% of the facilities have staff positions dedicated to data management filled, meanwhile 73.3% of them were trained on data collection and reporting tools. There is a devastating shortage of data staff and required data management skills, indicating that there are people who are managing data without being trained. The results further suggest that HIV data for ANC clients which is reported through DHIS in Vhembe

district is generated from HIS operating with high shortage of data staff and the necessary skills. People allocated to perform data management roles are overburdened as they also have other things to do at the clinics, which can compromise the quality of their work as well as the data they report. The gaps identified by the VF and QS results can be associated with this shortage of staff and skills, which need to be addressed immediately. Data management training conducted in KZN improved the accuracy of HIV data for ANC clients from 41 to 65% (Mphatswe *et al.*, 2012). If the district can hire and train more people for data management, the QS and the VF will definitely improve.

5.2.2 SUPERVISION AND FEEDBACK

Supportive supervision coupled with data feedback can improve the quality of HIV data for ANC clients significantly, because when managers conduct support visits, they are likely to identify and correct mistakes on spot. In this study 86.6% of the facilities indicated that managers do assess data quality during supervisory support visits, while 93.3% indicated that feedback was systematically provided on the quality of reporting, which covered timeliness, completeness and accuracy of reported data. The results suggested the possibilities of some supervisors lacking interest on data issues when they visited the facilities. The district M & E unit needs to establish why some supervisors were not checking the registers or reports and intervene accordingly. Without effective supportive supervision which touches data management, facilities will continue reporting incorrect data. Ideally supervisors should utilise HIV data for ANC clients to manage their facilities as part of their routine to track the performance of PMTCT program. It is very important to ensure that data feedback covers good and bad practices, as sometimes managers only provide feedback on bad findings, which can demotivate the staff. An evaluation of the District Health Information System in rural South Africa in 2008 reported that there was no evidence of data feedback either from district office or supervisors to clinic staff, hence the data quality was poor (Garrib et al, 2008).

5.2.3 DATA COLLECTION AND REPORTING TOOLS

The QS indicated that 100% of the facilities have the data element definitions, reporting guidelines and clear instructions for completing data collection tools, although only 80% of the facilities indicated that correct reporting channel and timelines are followed. It means that the district M & E unit has distributed data management tools to the facilities well, which is a good practice, since those tools provide facilities with clear instructions on to manage HIV data for ANC clients. However, there are occasions where facilities fail to submit their reports, mainly due to shortage of transport, stationary and multiple reporting systems. The availability and utilisation of data element definitions and guidelines can minimise errors during data processing. Even though data management is guided by procedures contained in the DHIMS policy and SOP documents, full implementation of the policy is hindered by the shortage of staff, budget, stationary, telephone, fax, photocopy machine and poor communication.

The QS also indicated that 93.3% of the facilities utilize standard documents for data collection and reporting consistently, even though only 80% confirmed that those documents are available for auditing purposes, because sometimes facilities create their own registers or use diaries when their registers are full or missing. A study done in Mozambique (Lungo 2003) reported that 93% of the respondents indicated unavailability of data registers in some months, while another study in Botswana cited that staff at facility level complained that data collection tools keeps on changing, hence some health workers preferred using notebooks as compared to the standard tools (Ledikwe et al, 2014). The 4.1% under-reporting calculated through the VF can be linked to poor utilisation of standard registers; as it is possible that some cases were recorded in other books which cannot be regarded as standard source documents for data collection. Occasionally facilities use diaries and note books while they see clients and later update the registers, which can also lead to under-reporting if the information is not transferred to the standard registers before data collection. The results of this study further suggest that the performance of PMTCT program in Vhembe district is not accurately measured, as there are still gaps with data management processes. Using standardized data collection and reporting tools can improve data completeness as all the facilities reports their

data using similar templates.

5.2.4 LIMITATIONS OF THE STUDY

The study had a few limitations. Since this was a descriptive, analytical and quantitative study, the investigator could not ask the participants for reasons or explanations on good or bad practices. The study was conducted at facility level only, which does not reflect the challenges at sub-district and district levels. Only two indicators were used, which does not reflect the picture of all indicators reported through the DHIS. Utilization of facility managers to complete the HIS assessment checklist may have introduced biases since they are also accountable for poor performance. The small sample size of fifteen facilities may make the overall findings less generalizable to the district at large. Excluding facilities with missing registers/monthly reports on the study introduced a bias as this already indicates a weakness on the health information system. Analysis of VF through averaging of results across the facilities and giving each item equal weight in the health information system assessment QS tool has impacted the study findings negatively.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

The following conclusions were drawn from the findings of this study:

- Data collected and reported in the PHC facilities in Vhembe District was accurate and reliable enough to track process performance or outcomes for PMTCT care with confidence.
- The quality score obtained from Vhembe district health information system was 83.2%, which shows a strong information system.
- The results indicated that data between the facility source documents and the monthly summary reports was 95.9% consistent.
- Data management staff positions are not well reflected on the facility organogram.
- There is a large shortage of data staff in Vhembe district

6.2 RECOMMENDATIONS

It is recommended that:

- The district should prioritise hiring and training of data staff
- Facility managers should validate data between source documents and monthly reports
- Facilities should utilise standardised data management tools at all times
- Strategies such as recognition of good work and positive feedback from management should be implemented to encourage facilities to improve the performance.
- Future studies employing the VF calculations should avoid averaging the results and the QS tool may consider weighting each individual item and avoid averaging the district score.
- Future studies may consider a high sample size to make the results more generalisable to the entire district.
- Other dimensions of data quality such as timeliness, completeness, reliability, integrity may be included in future studies assessing the data quality.

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APPENDIX A PLAGIARISM DECLARATION

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG | FACULTY OF HEALTH SCIENCES

PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

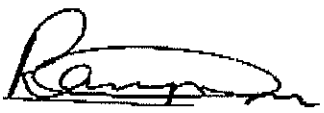
SENATE PLAGIARISM POLICY: APPENDIX A

I Mashudu Issau Rampilo (Student number: **0418424G**) am a student

registered for the degree of **MPH** in the academic year **2016**.

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.

Signature: 

Date: 20 October 2017

APPENDIX B: VERIFICATION OF REPORTED DATA TEMPLATE

District Name: Vhembe	Sub-district Name:		Facility Name:		
Indicator 1	**Data sources**	**Year: 2010 February**	**Year: 2011 March**	**Year: 2012 August**	**Year: 2013 November**
First ANC client tested for HIV	Facility records				
	Facility report				

Indicator 2	**Data sources**	**Year: 2010 February**	**Year: 2011 March**	**Year: 2012 August**	**Year: 2013 November**
First ANC client tested HIV positive	Facility records				
	Facility report				

APPENDIX C: M & E SYSTEM ASSESSMENT TOOL

M &E Systems Assessment		Y/N
I - M&E Structure, Functions and Capabilities		
1	There is a documented organizational structure/chart that clearly identifies positions that have data management responsibilities	
2	All staff positions dedicated to M&E and data management systems are filled	
3	There is a designated senior staff member responsible for reviewing the aggregated numbers prior to the submission/release of reports to the next level	
4	There is a training plan which includes staff involved in data-collection and reporting	
5	All relevant staff have received training on the data management processes and tools	
II- Indicator Definitions and Reporting Guidelines		
6	The indicator definitions are available	
7	The District Health Information Management policy is available	
8	The District Health Information Management policy Standard Operating Procedure(SOP) is available	
III- Data-collection and Reporting Forms / Tools		
9	The M&E unit has identified a standard source document to be used	
10	The M&E unit has identified standard reporting forms/tools to be used	
11	The standard forms/tools are consistently used	
12	Clear instructions have been provided by the M&E unit on how to complete the data collection and reporting forms/tools	
13	All source documents and reporting forms relevant for measuring the indicator(s) are available for auditing purposes	
IV- Data Management Processes		
14	The M&E unit has clearly documented data aggregation, analysis and/or manipulation steps	
15	Feedback is systematically provided on the quality of reporting (i.e., accuracy, completeness and timeliness)	
16	The recording and reporting system avoids double counting people within and across service delivery points	
17	There is a written procedure to address late, incomplete, inaccurate and missing data	
18	If data discrepancies are discovered in reports it is documented how these inconsistencies should be resolved.	
19	Regular supervisory visits have taken place and that data quality has been reviewed.	
V- Links with District Reporting System		
20	The data is reported through a single channel of the district reporting system.	
21	The relevant national forms/tools are used for data-collection and reporting.	
22	Reporting deadlines are harmonized with the relevant timelines of the National Program (e.g., cut-off dates for monthly reporting).	

District Name: Vhembe **Sub-district Name:** **Facility Name:**

This tool was obtained from: http://www.theglobalfund.org/en/me/documents/dataquality/

APPENDIX D: INFORMATION SHEET

I am Mr. Mashudu Rampilo, a second year student doing Masters in Public Health (MPH) at the University of Witwatersrand. I am undertaking a research on the "The consistency of DHIS data for antenatal services and factors affecting DHIS reporting in Vhembe district" and would like to invite you to participate. The study is aimed at determining quality of the data and to understand the factors associated with its reporting. You are invited to participate in this study because you are currently working with the data for DHIS at managerial level. Please note that your participation is voluntary, and you may choose to withdraw from the study at any time. There will be no negative consequences if you choose not to participate. There will be no right or wrong answer.

Purpose of the study:

To determine the level of consistency and indicators affecting the DHIS reporting of ANC clients tested for HIV and those who tested positive in public health facilities in Vhembe District between January 2010 and December 2013. High quality health data is crucial to build strong public health systems, which can address the global challenges, however routinely collected data from public health facilities and submitted to the district offices, is not reliable. Effective monitoring and evaluation of public health care programs rely on complete, accurate, and timely flow of data.

Procedures:

If you agree to participate in this study, we will ask you to complete a checklist about the health information systems. Ticking the checklist should take approximately 20 minutes. Please feel free to stop and ask me questions if anything is unclear. There will be no negative consequences for you if you choose to stop. Your participation is very important to this research, but it is voluntary. The results of the study will have many benefits including evidence based health management and improved health services based on reliable data. All the information will remain confidential and anonymous. If you require further information concerning the study please contact the research supervisor, Professor Ian Couper on 011 717 2602 or the chairperson of the University of Witwatersrand Human Ethics Committee on 011 717 2230.

You consideration to participate in this study is greatly appreciated. If you are happy to take part in the study please read and sign the attached consent form.

Thank you.

APPENDIX E: CONSENT FORM

Consent form for the survey

The aim of the survey has been explained to me, and I understand the objective of this survey.

I have been given the information sheet and any questions I had were answered satisfactorily.

I am willing to participate in this study.

I am over 18 years of age.

I understand that I have the right to withdraw at any point, without any consequences.

I understand that I will not be paid for my participation in the study.

It has been explained to me that my name or position/title will not be used in the survey forms or the final report, and that my identity will be protected.

I understand that there are no risks involved in participating in this study.

Participant

Signed..... Date.....