The Complexities and Possibilities of Health Data Utilization in the West Coast District

Ms. Irma Selina Zimri

Student Number: 9194082

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Supervisor: Dr. James K Njenga

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LIST OF ABBREVIATIONS

AHI -	African Health Initiative
AIDS -	Acquired Immunodeficiency Syndrome
ALOS -	Average Length of Stay
ANC -	Antenatal care
AO -	Administration Officer
APP -	Annual Performance Plan
ART -	Antiretroviral Treatment
BUR -	Bed Utilization rate
CART -	Tracking System for Cath Labs
CBS -	Community Based Services
CDC -	Community Day Centre
CHC -	Community health centre
CLO -	Community Liaison Officer
CMI -	Compliance Monitoring Tool
CPT -	Co-Trimoxazole prevention therapy
CYPR -	Couple Year Protection rate
DHIS -	District Health Information Systems
DHMIS -	District Health Management Information Systems
DHS -	District Health Services
DIKW -	Data Information Knowledge Wisdom
DMC -	District Management Council
DOH -	Department of Health
DQA -	Data Quality Assessment
EC -	Emergency Centre
EDR -	Electronic Drug Resistant
EHR -	Electronic Health Record
EMR -	Electronic Medical Records
ETR-	Electronic TB Register
HAST -	HIV AIDS STI and TB
HBC -	Home Based Care

HCT -	HIV Counselling and Testing
HIM -	Health Information Management
HIS -	Health Information System
HIV-	Human Immunodeficiency Virus
HMIS -	Health Management Information System
HMN -	Health Metrics Network
HPV -	Human Papillovirus
ICT -	Information Communication Technology
ICU -	Information Compliance Unit
IM -	Information Management
IO -	Information Officer
IPT -	INH prevention therapy
ISO -	International Standards Organisation
IT-	Information Technology
JIMI -	Joint Integrated Management of Information
LTFU -	Loss to follow up
M&E -	Monitoring and Evaluation
MCWN -	Mother Child Women and Nutrition
MDR -	Multi-drug Resistant
NDOH -	National Department of Health
NHISSA -	National Health Information Systems Committee of South Africa
NIDS -	National Indicator Dataset
NPO-	Non-Profit Organisation
PDE -	Patient Day Equivalent
PHC-	Primary Health care
PHCIS -	Primary Health Care Information Systems
PIDS -	Provincial Indicator Dataset
PMTCT -	Prevention of Mother to Child Transmission
PRISM -	Performance of Routine Information System Management
PSS -	Paediatric Surge Season
QI -	Quality Improvement

RHIS -	Routine Health Information System
RMR -	Routine Monthly Report
SA -	South Africa
SAO-	Senior Administration Officer
SASQAF -	South African Statistical Quality Assessment Framework
SD-	Sub-district
SDG -	Sustainable Development Goals
SEAD -	Strategic Evaluation, Advisory and Development Consulting
SOP -	Standard Operating Procedure
STATSSA -	Statistics South Africa
SUCCEED -	Stellenbosch University Collaborative Capacity Enhancement through Engagement with Districts
TB-	Tuberculosis
TIER -	Information system used for monitoring patients on ART treatment
TOP -	Termination of Pregnancy
USAID -	United States Agency for International Development
VCT -	Voluntary Counselling and Testing
WBG	World Bank Group
WHO -	World Health Organisation

ABSTRACT

In an ideal public health arena, scientific evidence should be incorporated in the health information practices of making management decisions, developing policies, and implementing programs. However, much effort has been spent in developing health information practices focusing mainly on data collection, data quality and processing, with relatively little development on the utilization side of the information spectrum. Although the South Africa Health National Indicator Dataset of 2013 routinely collects and reports on more than two hundred elements, the degree to which this information is being used is not empirically known. The overall aim of the study was to explore the dynamics of routine primary healthcare information utilization in the West Coast district while identifying specific interventions that could ultimately lead to the improved use of data to better inform decision making. The ultimate goal being to enable managers to better utilize their routine health information for effective decision making.

Using an exploratory qualitative study design, a maximum variation purposeful sampling, 21 in-depth interviews were conducted. Content analysis was done to analyse the data collected, and the researcher developed a thematic framework by identifying all the key concepts and themes. The researcher then interpreted the data to refine concepts and find associations between themes to provide explanations for the findings.

The findings indicate that there is a definite demand for data in the West Coast, not only for management reporting purposes, but also for decision making. All participants indicated that evidence, facts or data is paramount in decision making. Although there is evidence of use of data at all levels, more evidence of use was found at district level compared to sub-district and facility levels. A number of organisational, technical, and behavioural constraints were identified that influence the use of data in the West Coast district. Organisational constraints include lack of dedicated human resources, infrastructural challenges, poor telecommunications in terms of network connectivity, transport inefficiencies, lack of clarity on the role of data in decision making and monitoring and evaluation as well as equipment shortages. In addition to the organisational constraints, the quality of the data in the West Coast district is identified as medium risk by the Information Compliance Unit (ICU) and the respondents expressed mixed perceptions when describing the quality of the data. The technical constraints include the complexity of the reporting tools; the lack of IT support; the lack of or inadequate technical abilities; and the lack of computer literacy and skills in data analysis, interpretation, and use. The behavioural constraints include negative attitudes towards data, although there were some who felt that people’s attitudes were slowly changing for the better.

The respondents described that they use information in their daily lives for planning interventions, monitoring of performance against targets and making decisions about staff needs and allocations, identifying and addressing health needs, as well as improving the quality of the services that they offer.

Consequently, this study recommends measures to address the constraints identified: the allocation of dedicated information staff for data management at all levels; increased use of the technology available for data collection, storage and analysis; improvement in network connectivity, the design and use of more user friendly tools; the provision of improved IT support; the training of staff to improve their technical skills; addressing the transport and equipment inefficiencies identified; clarifying the role of data in decision making and monitoring and evaluation; and that the registers be rationalised to reduce the amount of data elements to be collected. Furthermore, advocating and promoting the use of data at all levels especially at facility level.

Key Words

Data, Information, Health information, Data quality, Data use, Data Utilisation, Health data, Health data utilisation, Data demand.

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Chapter 1 INTRODUCTION

1.1. Topic

In reality, public health decisions are often based around anecdotal evidence, frequently driven by crises or burning issues, chasing targets and even fears from certain vested groups (Brownson et al., 1999). In addition to this, other factors such as power and influence, corruption, political ideology, and arbitrariness can also influence decisions especially in the public domain (MEASURE Evaluation, 2012). Based on this, we find too often that data is under-utilized and even unused, especially in the decision-making processes (Nutley, Gnassou, Traore, Bosso, & Mullen, 2014).

There is therefore a need for a pro-active approach to decision making that incorporates effective use of scientific evidence (Brownson et al., 1999). It is hoped that the greater use of scientific evidence in health will lead to more effective management and ultimately more effective health outcomes.

The District Health Management Information system policy of the National Department of Health (South African Department of Health, 2011), provides a regulatory framework for governing, standardising and coordinating the implementation of a routine health information system which produces comprehensive, good quality, reliable and timeous data that could easily be converted into meaningful information for use in decision making, planning and monitoring in the health sector. This is accomplished using various tools in the collection, processing, analysis and use of data from all service delivery levels within the health system.

The researchers' familiarity with the Department of Health (DOH) at district and sub-district levels, provided valuable insider knowledge on the significant effort in developing information management practices. This entailed having knowledge about the quality of information used to inform management decisions, the rollout of electronic data management systems and the National indicator datasets (NIDS), which is the rationalised standard indicators to be collected routinely, the implementation of DHMIS policy and Standard operating procedures (South Africa National Department of Health, 2012), extra resources in the form of data capturers at facility level, the annual auditing of specific health indicators, training in information systems and data element definitions and as well as information compliance monitoring to ensure that information standards are adhered to.

Although much effort has been expended in developing health information practices mainly focusing on data collection, data quality and processing, there has been relatively little development on the use side of the information spectrum, with district information officers having to do minimal analysis and disseminating this to lower levels in the system (Kelly, 2014). Kelly (2014) also mentions that there has been strong interest on the part of district leadership personnel for gaining capacity for utilising information in programme management and service quality improvement.

In the West Coast thus far, information is used to some degree, but may be limited to creating awareness and understanding priorities within the organization as well as identifying problem areas and thereby informing where health services need to be improved.

1.2. Context

The setting for the study is the West Coast District in the Western Cape Province, one of the rural districts in the Western Cape Province, covers an area of 31 119 km^2 . The District is headed up by the District Director and the district management team. The district is divided into 5 sub-districts (SDs): Bergrivier, Cederberg, Matzikama, Saldanha Bay and Swartland sub-districts. Each of these SDs' management team is headed by a sub-district manager. Within the district there are 41 non-fixed clinics and 27 fixed Primary Health Care (PHC) clinics. The focus of this study is on the 27 fixed PHC clinics that produce PHC information. All these clinics are managed by an operational or a facility manager. Each of these health facilities produce information which is ultimately intended to be used for decision making. The West Coast has a total population of 428 012 for 2014 as per the 2011 census data, with an uninsured population of 258 533 which make 60.4% of the population according to (Western Cape Department of Health, 2014). The significance of the uninsured population is that the majority of these people are dependent on the public health sector. According to the Census 2011, the predominant first language in the West Coast is Afrikaans with 83,67%, while the other two languages namely Xhosa and English are only spoken by 8.58% and 3,98% of the population respectively (Western Cape Department of Health, 2014), while other African languages make up the rest with 3,77%. There is a fairly equal distribution of females and males with each contributing 50.3% and 49.7% respectively to the population size.

1.2.1. Data Flow Procedure

Table 1 describes the flow that was observed in the West Coast District from service point level in the facility, to the sub-district and then onto the district.

Table 1: West Coast District Information Flow Chart

	Action required	**Responsible Person**	**Submission to**	**Frequency and Submission date**
District	Gathering of data, collation, validation, aggregation, reporting	District Information officer/Information Manager	Programme Managers, DD Professional support, Comprehensive Health manager, District manager	Monthly, Quarterly 30th of each month
Sub-district	Gathering of data, collation, capturing validation, aggregation, reporting	Sub-district Information officer/ HAST clerk (only HAST data)	Assistant Manager, HAST coordinators (only HAST data), PHC manager, SD manager	Monthly, Quarterly 15th of each month
Facility	Routine data collation, capturing (on PHCIS at few facilities) validation, aggregation, sign off,	Information clerk/Data clerk/Delegated person	Operational manager	Monthly 7th of each month
Service Point	Routine Data collection, collation, capturing (ART data on TIER.net at fixed facilities), validation, aggregation, sign off,	Individuals at service point	Information clerk/Data clerk/Delegated person	Daily, weekly, monthly 3rd of each month

1.2.2. Data collection tools

There are a number of manual registers that need to be completed on a routine basis at facility level. One of these include the PHC service point registers which is placed at various data collection points in the facility and has different categories of information that needs to be ticked off according to the service provided. This also holds the PHC headcount of the facility. For women we have the cervical cancer register who have been screened for cervical cancer, and the National Mom connect register for all pregnant women. For suspect TB cases we have the TB case identification register, and all the babies who have been exposed to HIV are entered into the PMTCT baby follow up register. When people test for HIV at our facilities we enter them into the HTS register. All children screened at school will be entered into the school health register, and those who require nutritional supplements will be monitored in the Nutrition register. There are also a few registers that the pharmacy staff are required to complete, namely the Pharmaceutical statistical return register, the Tracer medicine register, and the Diflucan registers. The facility complaints and compliments also have to be recorded in the Complaints and compliments register. We also have Community and Home based care workers who provide basic healthcare and screening in the homes of the communities and all these services are recorded in the HBC register. Campaign registers are also commonplace in the facilities which include amongst others, the Diarrhoea campaign, the HPV campaign, the EPI campaign, the Immunization campaign and the Measles campaign.

1.2.3. Information systems

The information systems that are used at facility level include TIER.net and PHCIS. The TIER.net is used for capturing and monitoring the patients that are on antiretroviral treatment and is only implemented at the fixed facilities, and not at the satellites and mobiles. The physical folders of those patients seen at the satellites and mobiles need to be taken to the fixed facility for capturing at a later stage. The PHCIS captures information on patients visiting primary health care facilities and is limited to a few facilities and to only certain modules. The information systems that are used at sub-district level include SINJANI, ETR.net and EDR.net and DHIS. SINJANI is used to capture aggregated primary healthcare information at the end of a period, for example monthly in the case of PHC headcount, child health and immunisation elements, maternal elements, reproductive health elements, etc. while ETR.net captures and monitors patients with confirmed TB, and EDR.net captures and monitors patients with drug resistant TB. DHIS, which is also the official national health information system, is mainly used for capturing campaigns in the Western Cape Province.

1.2.4. Data Quality

The Western Cape Provincial Department of Health has a special unit within Information management called the Information Compliance Unit (ICU) that conducts bi-annual assessments of the health facilities in the Province using a standard pre-audit tool that tests a sample of registers, information management files and data elements against recommended information management standards. The months reviewed were April, July and August 2016. The following nine PHC facilities had assessments done during October and November 2016: Riebeeck West Clinic, Goedverwacht satellite clinic, Piketberg clinic, Porterville clinic, Koringberg satellite clinic, Malmesbury CDC, Moorreesburg clinic, Lambertsbay clinic and Citrusdal clinic. The aim of the assessment was to establish the level of adherence of the facility to IM processes, policies and procedures as well as establish the facility’s general IM compliance status. The areas of assessment included accountability and compliance monitoring, processing (source vs form), data entry (form vs SINJANI), tracking procedures, reconciliation of patient information and quality assurance. related key compliance indicators were marked as either low, medium or high risk.

Table 2: Identified Key Risk Areas

Assessment Area	Key compliance indicators	Risk		
		low	**med**	**high**
Accountability and compliance monitoring	Performance trends and data quality challenges not presented.	☐☐☐	☐☐☐☐☐	☐
	Folder audit team not nominated and appropriately represented	☐☐☐	☐☐☐☐☐	☐
	CMI not completed correctly, filed and stored for audit purposes	☐☐☐☐	☐☐	☐☐☐
Processing (Source vs Form)	Monthly data input forms do not agree with data in the service point registers.		☐☐☐☐☐	☐☐☐☐
Data entry (Form vs Sinjani)	Data captured in Sinjani does not agree with the detail in the monthly data input forms/reports.	☐☐☐☐	☐☐☐☐	☐
Tracking procedures	Patient folder not located.	☐☐☐	☐☐☐☐☐	☐
Reconciliation of patient information	**Validity:** The date of patient visit in the patient folder was inconsistent with the date recorded on the data collection tool (reception register).	☐☐☐	☐☐☐☐☐	☐
	Completeness: The date of patient visits on the data collection tool (reception register) folder was inconsistent with the date recorded in the patient folder.	☐	☐☐☐☐☐☐☐	☐
Quality Assurance	Capturing of compliments and complaints.	☐☐☐☐☐☐	☐☐	☐
	Original compliment / complaint documentation not found.	☐☐☐☐☐☐	☐☐☐	
	Sinjani forms not signed.	☐☐☐☐☐☐☐	☐☐	
Total		**40**	**45**	**14**

The majority of the facilities are in medium-risk (45,45%), while many are in the low-risk category (40,40%), and only 14,14% are in the high-risk areas. Most facilities were struggling with two key compliance indicators: data mismatch between the monthly data input forms and the service point registers, and a failure to correctly complete the compliance monitoring instrument which is filed for auditing. Other areas of identified risk included a) performance trends and data quality challenges that was not being presented, b) and the folder audit team not nominated and appropriately represented, c) data captured in Sinjani did not match with the detail in the monthly data input forms/reports, d) patient folders could not be located, e) validity issues in terms of: the date of patient visit in the patient folder was inconsistent with the date recorded on the data collection tool, f) completeness issues in terms of: the date of patient visit on the data collection tool was inconsistent with the date recorded in the patient folder g) capturing of compliments and complaints were not done.

Table 2 also shows many of the data quality issues occurring at the facilities. This included a) the monthly data input forms did not match the data in the service point registers, b) the patient folders could not be located, c) validity in terms of : the date of patient visit in the patient folder was inconsistent with the date recorded on the data collection tool, d) completeness in terms of : the date of patient visit on the data collection tool was inconsistent with the date recorded in the patient folder and e) the risk that data captured in Sinjani does not match the detail in the monthly data input forms/reports.

1.3. Research Problem

The elements collected according to the National Indicator Datasets of 2013 (See Annexure A) are reported on and closely monitored on a quarterly basis at Provincial level and to a lesser degree at district level. It is not known however, how this data is used in terms of amount, degree and level within the health system.

Valuable data is available that can be used to manage the health services in order to reduce the health burden in the district, but it is doubtful whether it is being used to intervene to improve health outcomes. For example, the West Coast is the district where the highest ischemic heart diseases, lower respiratory infections, colon-rectal cancer and transport mortality rates are recorded in the Western Cape. The Cedarberg sub-district has the highest injury related deaths, whereas Berg River sub-district reports the highest deaths due to communicable diseases (West Coast District Department of Health, 2014).

Despite the availability of data, challenges still exist in ensuring information is effectively used for management decision-making; implementing control measures for performance data reporting at various levels and within the programmes; as well as monitoring the reporting on a monthly basis.

The World Health Organisation (WHO) defines a well-functioning health system as "one that ensures the production, analysis, dissemination and use of reliable and timely information on health determinants, health system performance and health status" (WHO, 2007). In addition, specifications and guidelines provided by National DHMIS policy and relevant Provincial SOP's (South Africa National Department of Health, 2013); (South African Department of Health, 2013a) reinforce the need for data to be converted into meaningful information for decision making and planning. However, there remains little evidence for ensuring that information is effectively used for decision-making purposes, policy formulation and planning by facility managers, programme managers, information managers, sub-district and district managers.

What then are the challenges that exist with regards to data utilization and how can these challenges be addressed to enhance the use and reporting of information for effective decision making**.**

1.4. Purpose of the Study

The purpose of the study is to provide an understanding of the dynamics and use of routine health information by providing evidence of patterns of utilization at various levels in the West Coast. The study came up with recommendations on improvements that could be used to address the identified challenges that included staff issues, the use of technology, technical skills training, the rationalisation of existing tools and elements, and the more optimal use of information at facility level. It is hoped that the outcome of this research will ultimately enable the staff to better utilize their routine health information for effective decision making, thereby overcoming any shortcomings in information use.

The aim of the study was to explore the dynamics of routine primary healthcare information utilization in the West Coast district while identifying specific interventions that could ultimately lead to the improved use of data to better inform decision making.

The following objectives were identified for the study in relation to the West Coast district:

1. To determine the manner in which decisions are made and whether there is a demand for routine primary health data to be utilized;

2. To explore the routine primary health information collection processing procedures;
3. To determine the perceptions of the quality of the routine primary health information;
4. To determine the extent of the availability of routine primary health information;
5. To describe the manner in which routine primary health information is used and the circumstances in which it is used; and
6. To identify strategies for improvement of data quality and use and to make recommendations on how routine primary health information can be used for decision making purposes.

1.5. Structure of the thesis

The thesis starts with the abstract which gives an overview of the study, which is then followed by Chapter one which is a short introduction to the study, where the topic and context is explained including the research problem and purpose. Chapter two provides an extensive literature review which gives an explanation of key data concepts, providing an overview of the international and South African guidelines, health system strengthening, the quality of information, the uses of information and the contextual constraints determining the use of data for decision making in health, and strategies of improving data quality and use. Chapter three elaborates on the research methodology by giving a description of the study design, the study population, the study sample, data collection methods, and data analysis, concepts of trustworthiness and rigor and how it was applied in this study, and the ethical standards adhered to during the study. Analysis of the results is provided in Chapter four with special reference to the objectives of the study. An in depth discussion then follows as the literature is linked to the results of the study. Finally, Chapter five details the conclusions and recommendations are then made to assist the staff in the West Coast to better utilize the data which they collect routinely.

Chapter 2 LITERATURE REVIEW

This literature review is an appraisal of the literature relating to the explanations and debates around concepts of data utilization for decision making in health. These include literature on data concepts, the International and National guidelines governing health data quality and use, the development of information systems in South Africa, identifying influences on how decisions are made, health information in health system strengthening, the quality of the information, the uses of information, and unravelling contextual factors determining the use of information in decision making, and identifying strategies for quality improvement and data use.

2.1. Defining Data Concepts

The three concepts of data, information and knowledge are often regarded as the basic building blocks of the information science field (Zins, 2007). Although the field is constantly changing, Zins (2007) explains that it is crucial to review and redefine these fundamental building blocks regularly. Zins (2007) further noted that although nobody can dispute that these concepts are inter-related, the nature of the relations and their meanings are arguable. Badia (2014) agrees that the concepts are related, but different, and also acknowledged that data, information and knowledge appear to be hierarchical and sequential in nature, with data being the raw material for information and information being the raw material for knowledge. Similarly, Dalrymple (2011) displays the relationship between data, information and knowledge as a pyramid, illustrating the hierarchical nature of the three concepts, with data being at the lowest level and knowledge being on the highest level.

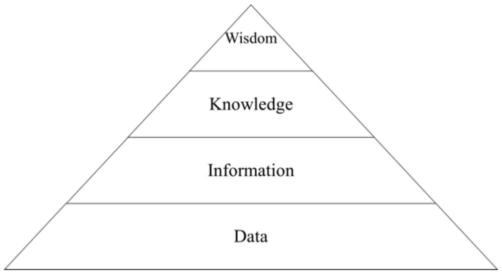


Figure 1: The Knowledge Pyramid (Hey, 2004, p3)

Ackoff (1989) acknowledges this hierarchical relationship, but also incorporates understanding and wisdom on the pyramid. He goes onto define data as symbols that represent properties of objects, events and their environment. In other words, they are products of observation. In this form, Ackoff (1989) argues, data is of no value, until it is processed into a useable form, which is information. Information provide answers to “who”, “what”, “where” and “when”. While knowledge is the application of data and information and providing an answer to the “how” question, while understanding is all about the appreciation of “why” and ultimately wisdom being evaluated understanding. Hey (2004) describes the metaphorical link between the Knowledge pyramid (See Figure 1) and the data, information, knowledge, and wisdom (DIKW) chain (See Figure 2).

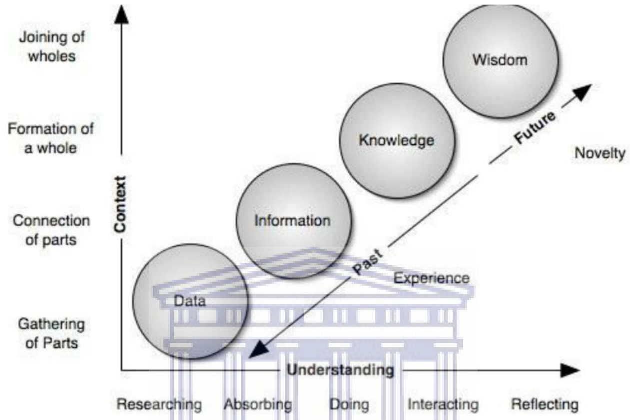


Figure 2: The DIKW Chain (Hey, 2004, p3)

Simply stated data is raw, unprocessed information and information is data with meaning. When we gain information from data, we make sense of the data. Hey (2004) described knowledge as being derived from an “organized body of information” and bringing to mind the appropriate information”. It is clear therefore that the concepts of data, information and knowledge are related, yet they have completely different meanings and they should not be confused with each other.

2.2. International and National guidelines governing health data quality and use

Internationally, there are many guidelines, standards and tools designed to strengthen health systems and more specifically health information systems in countries where the quality of information is poor and the development of health information systems are vital to improve global health (M. A. Chen, 1986) as detailed in Annexure B. The World Health Organization (WHO), Health Metrics Network (HMN), United States Agency for International Development (USAID), MEASURE Evaluation, have all contributed to literature from 2000 until 2015 on guidelines on health data quality.

The Health Metrics Network (HMN) was launched in 2005 to help countries and other partners improve global health by strengthening the systems that generate health-related information for evidence-based decision-making (WHO, 2008). The HMN framework was intended to become the universal standard for data collection, reporting and use of health information in 2008. Figure 3 portrays the HMN framework which outlines the components and standards of a health information system and the principles, processes and tools to strengthen health information systems with the ultimate goal being increasing the availability, accessibility, quality and use of health information vital for decision-making at country and global levels.

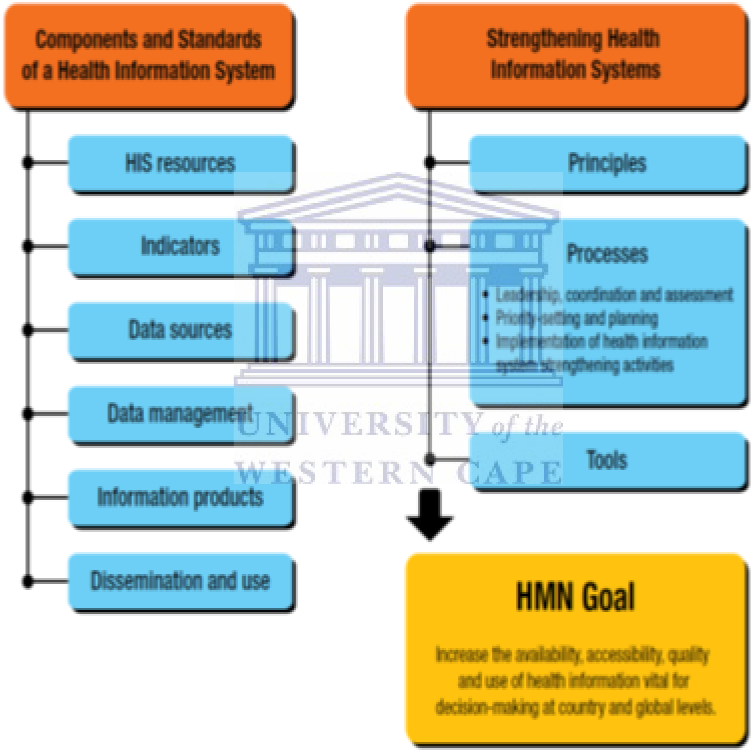


Figure 3: The HMN Framework (WHO, 2008, p4)

Aqil, Lippeveld, & Hozumi (2009) proposed the Performance of Routine Information System Management (PRISM) framework, depicted in Figure 4, which brings a paradigm shift in designing, strengthening and evaluating routine health information systems (RHIS). It goes on to describe organizational, behavioural and technical determinants and processes that influence RHIS performance. The PRISM tools include the RHIS performance diagnostic tool; the RHIS overview tool; the RHIS management assessment tool; and the organizational and behavioural assessment tool.

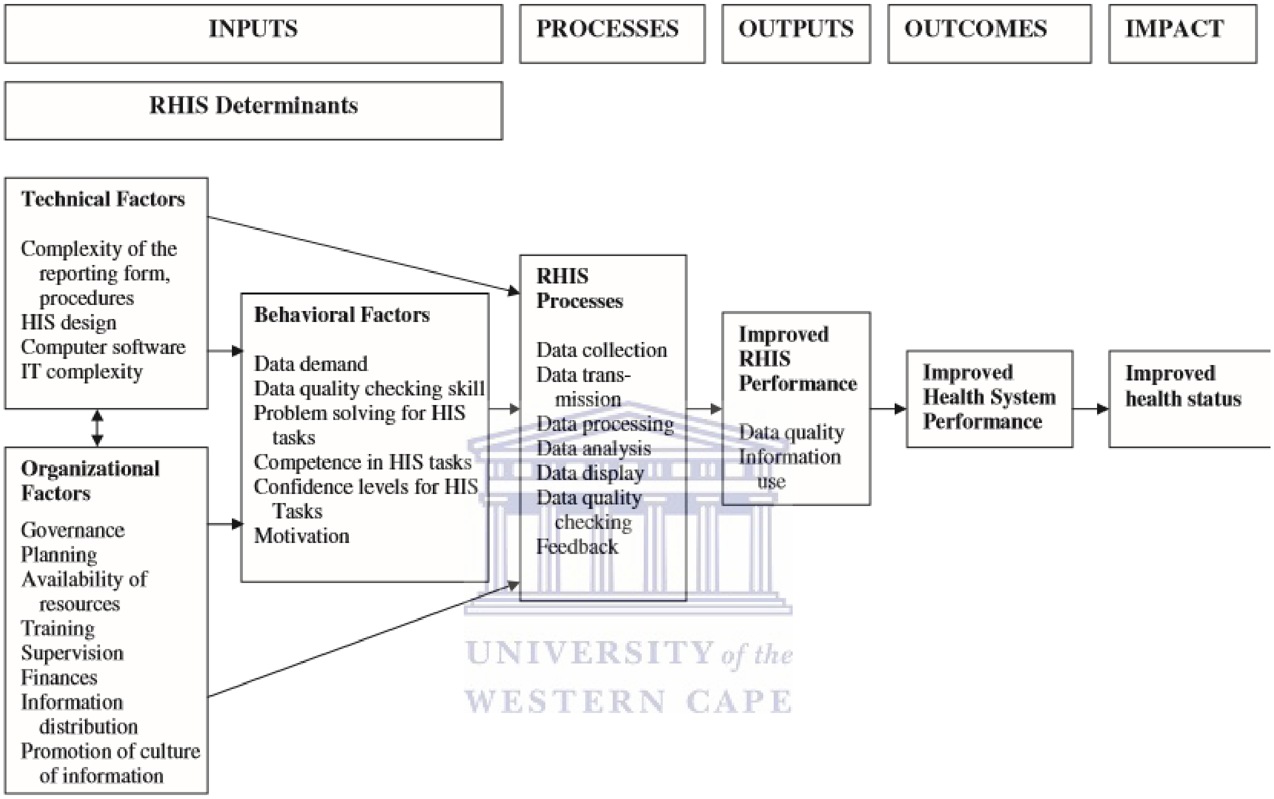


Figure 4: Performance of Routine Information System Management (PRISM) framework with RHIS determinants (Aqil et al., 2009, p220)

Building on work that was done by the Health Metrics Network (HMN) and other international organizations, international agencies (the US Agency for International Development (USAID), the World Bank Group (WBG) and World Health Organization (WHO)) have engaged with partners and country experts to develop a shared approach to measurement and accountability for the post 2015 sustainable development agenda (World Health Organisation, 2015). These agencies have endorsed a Roadmap for Health Measurement and Accountability which was launched at the Summit on the Measurement and Accountability for Results in Health in 2015 which outlines smart investments that countries can adopt to strengthen basic measurement systems and to align partners and donors around common priorities. The roadmap also offers a platform for development partners, technical experts, implementers, civil society organizations, and decision makers to work together for health measurement in the post-2015 era. The goal for 2030 will see countries have the necessary information to measure and achieve health goals set nationally and in the sustainable development goals (SDG's) as shown in Figure 5. An international collaboration called Health Data Collaborative was established to improve measurement and accountability for global public health over the next 15 years. Their goal is to support countries to improve their health information systems (World Health Organisation, 2015).

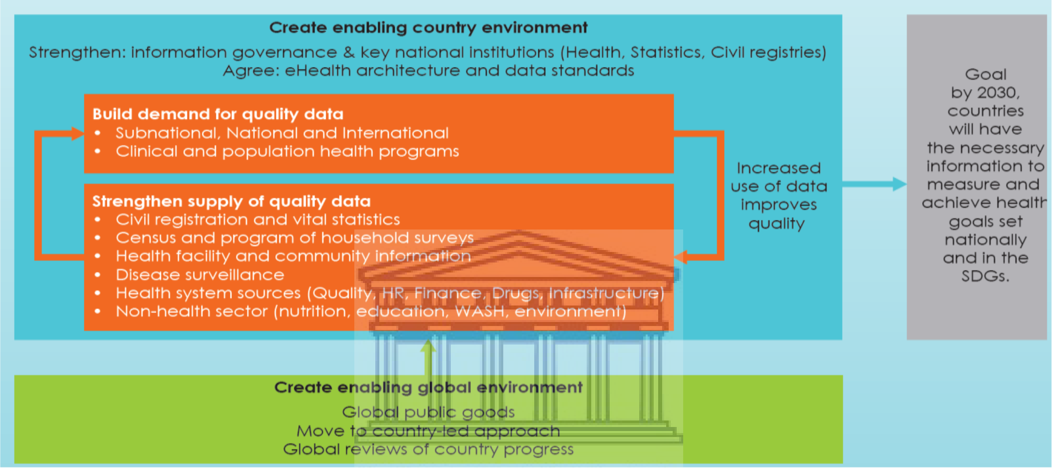


Figure 5: Roadmap to Improved Health Measurement, Reporting and Status (World Health Organization, 2015, p3)

The Health Data Collaborative plans to work closely alongside countries to improve the quality of their health data and to track progress toward the health-related Sustainable Development Goals (SDGs). The aim of the collaborative is that by 2024, 60 low-income and lower-middle income countries, and supporting donors, will be using common investment plans to strengthen health data systems, and that by 2030 countries will transition away from international assistance, with sufficient support for strengthening and sustaining robust health data systems. World Health Organisation (2015) set out developing a one-stop shop for health information system standards that will include: designing measurement and evaluation systems within national health sector plans; recommended indicators, data quality metrics and dashboards for collecting and analyzing data at health facilities and in communities; integrating outbreak surveillance into routine health information systems; harmonised set of survey tools for collecting comprehensive household health data; resource kit to improve birth and death registration; core health workforce metrics; and designing health systems that talks to each other and policies for sharing data.

In South Africa, the District health management information system (DHMIS) policy was developed in 2011, which details what the NDOH expects from users of the DHMIS at all levels of the health system (i.e. at national, provincial, district, sub-district, and health establishments). The benefits of such a policy include harmonization of information across the country, as well as formalisation of the resources required for effective implementation of a well- functioning DHMIS. In addition, Standard Operating Procedures were rolled out at facility in 2012, and at sub-district, district, provincial and national levels in 2014 to guide data management process at each level in the health service (Murphy, Mershon, Struthers, & McIntyre, 2013; South Africa National Department of Health, 2012; South African Department of Health, 2013a, 2013b); (South African Department of Health, 2011). Since then a Standard Operating Procedures for ART Monitoring and Data Management was rolled out in 2012 (National Department of Health, 2012).

2.3. Development of National and Provincial Information systems in South Africa

From the original WHO (1978) International conference on Primary Health care held at Alma Ata, USSR, ministers of health from more than 100 countries, including South Africa subscribed to the goal of "Health for All by the Year 2000" . To achieve this goal, the nations agreed to work towards meeting the people's fundamental needs through a comprehensive and progressive approach to Primary health care (WHO, 1978).

It became the responsibility of government to formulate national policies, strategies and plans of action to launch and sustain primary health care as part of a comprehensive national health system. In South Africa, in Section 74(1) of the National Health Act 61 of 2003, it mandates the National Department of Health with the facilitation and coordination of the establishment, implementation and maintenance of information systems by provincial departments, district health councils, municipalities, and the private health sector at national, provincial and local levels in order to create a comprehensive national health information system. Section 74(2) of the Act stipulates that the Minister may for the purpose of creating, maintaining or adapting databases within the national health system contemplated in subsection (1), prescribe categories or kinds of data for submission and collection and the manner and format in which and by whom the data must be compiled or collated and must be submitted to the national department (South Africa, 2014). The first national minimum data set (NIDS) for PHC was adopted by the National Health Information Systems

Committee of South Africa (NHISSA) in 1999 and rolled out to all public primary level health facilities.

In the Western Cape, the Provincial Indicator Dataset (PIDS) is a revised version of the National minimum dataset customised to the needs of the Province (See Annexure A). The dataset for primary healthcare includes elements for PHC management, child, maternal and women's health, immunization, nutrition, mental, chronic care, oral health, TB control, HIV, drug stock-outs, quality control, ART, TB (ETR), school health, notifiable medical conditions, rehabilitation, mental health, reproductive health and TB and HIV categories.

2.4 Influences in decision making processes

Brownson et al. (1999) contends that there should be a drive towards widespread use of evidence-based strategies to address public health challenges as opposed to policies being frequently developed around anecdotal evidence. He suggested that decision making processes should be a more pro-active approach that incorporated the effective use of scientific evidence and data away from the current practice where decision making is based on short term demands, rather than long term study. Similarly, the Institute of Medicine in Brownson et al. (1999) determined that decisions in public health are often driven by crises, hot issues, and concerns of organized interest groups.

Pappaioanou et al. (2003) highlights the importance of decision making based on evidence, while acknowledging that many public health decisions are made intuitively, or even politically. Nutley (2012) describes data-informed decision making as the proactive and interactive processes that consider data during program monitoring, review, planning, and improvement, advocacy, policy development and review. Mykhalovskiy & Weir (2004) criticized clinical decision making based on individual experience as out of date, and the way forward would be to carefully review and apply the best and most current research literature. Similarly, Randell, Mitchell, Thompson, McCaughan, & Dowding (2009), emphasized the need of clinical guidelines, checklists, needs assessments and decision tools as mechanisms for nurses to use in decision making in primary care.

Dobrow, Goel, & Upshur (2004) stated that greater demand has been placed on decision makers to justify their decisions, because decisions have become subject to greater public scrutiny, with outcomes affecting larger numbers of people, thereby strengthening the requirement for explicit justification. Guerra-Lopez & Blake (2011) agreed that effective leaders must make decisions based on relevant reliable, valid, and complete data as decision making is a process that begins with data collection.

However, sometimes decisions need to be taken without the luxury of sufficient information, especially in cases where life and death decisions need to be taken as in the case of emergencies or the military where traditionally the ability to identify relevant information, and increase the speed of decision making depended on the person in charge (Nicholson, 2005).

2.5. Health information in health system strengthening

The World Health Organization (WHO, 2007) framework for strengthening health information systems identifies 6 building blocks for an effective health system. The building blocks include a health workforce, health services, health financing, governance and leadership, medical products, vaccines and technologies and health information. Figure 6 illustrates the system building blocks leading to improved overall goals and outcomes in the WHO Health System Framework. This emphasizes the importance of health information in strengthening health systems and in the achievement of health outcomes such as improved health, responsiveness, social and financial risk protection and improved efficiency.

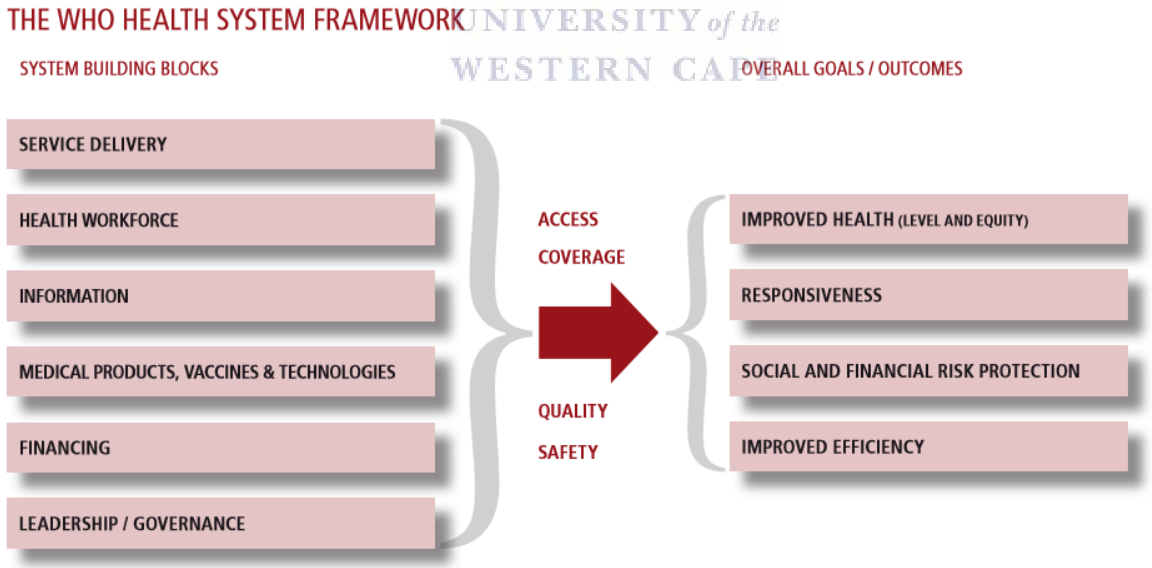


Figure 6: The WHO Health System Strengthening Framework (WHO, 2007, p3)

AbouZahr & Boerma (2005) opine that while each building block of the WHO framework is important to improving health systems and ultimately health outcomes, quality and timely data from health information systems is the foundation of the health system. It also thus informs decision making in each of the other five building blocks of the health system. Health data are, in and of themselves, prerequisites to improving each of the other five building blocks. The WHO (2000) defined overall health system outcomes or goals as: improving health and health equity, in ways that are responsive, financially fair, and make the best, or most efficient, use of available resources, while also identifying intermediate goals: achieving greater access to and coverage for effective health interventions, without compromising efforts to ensure provider quality and safety.

South African Department of Health (2011) in the DHMIS policy of 2011 describes a health information system, as one that integrates data collection, processing, reporting, and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services and a health management information system, as "an information system especially designed to assist in the management and planning of health programmes".

A well-functioning health information system is defined as one that ensures the production, analysis, dissemination and use of reliable and timely health information by decision-makers at different levels of the health system, both on a regular basis and in emergencies. To achieve this, the health information system (HIS) is comprised of six components: health information system resources, indicators, data sources, data management, information products, and dissemination and use as described in (Health Metrics Network, 2006).

2.6. Quality of Information

Strong, Lee, and Wang (1997), Liaw (2012*)* and Zaveri et al. (2012) describe data quality in terms of its "fitness for its intended use in operations, decision making and planning". This definition has also been adopted by Statistics SA (StatsSA) and the National Department of Health (NDOH) as evident in the DHMIS policy (South African Department of Health, 2011). However, when comparing information systems with the real world, data quality is described as how well the information system represents the real world as shown in Figure 7: Schematic framework of Data Quality from (USAID, The Global Fund, & Measure Evaluation, 2008).

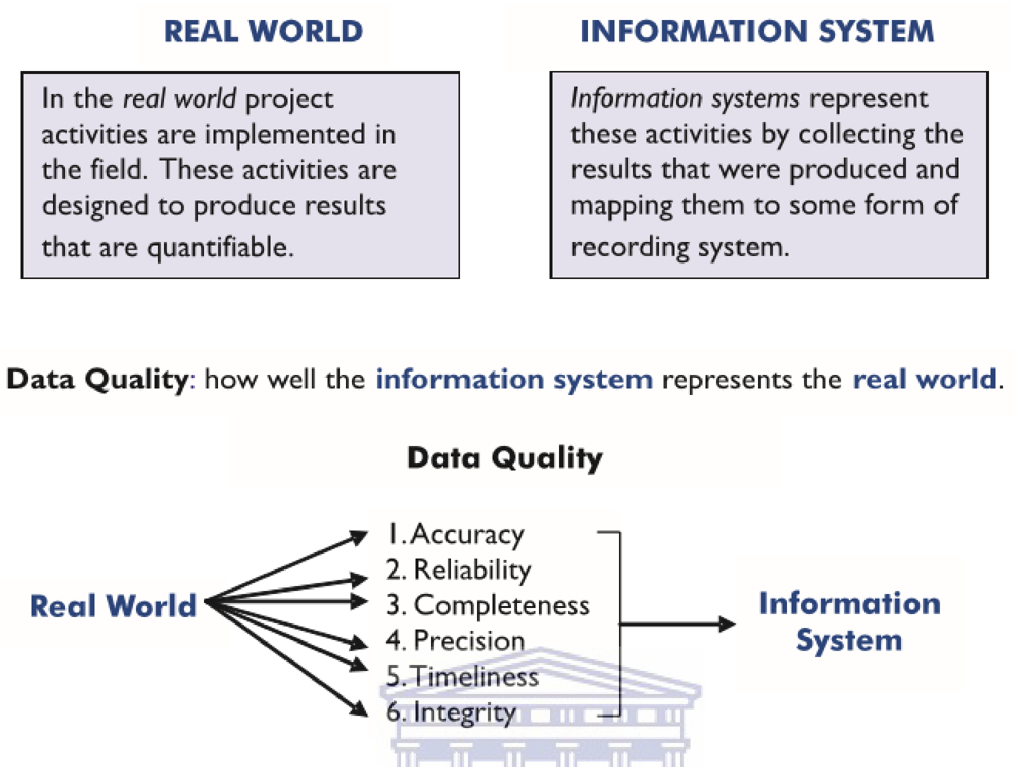


Figure 7: Schematic Framework for Data Quality (USAID et al., 2008, p3)

The dimensions of data quality are varied and very often without consensus on the definitions of the dimensions. Wand and Wang (1996) using Anchoring Data Quality Dimensions in Ontological Foundations Model, identified 26 dimensions of data quality which included accuracy, reliability, timeliness, relevance, completeness, currency, consistency, flexibility, precision, format, interpretability, content, efficiency, importance, sufficiency, usableness, usefulness, clarity, comparability, conciseness, freedom from bias, informativeness, level of detail, quantitativeness, scope, and understandability. The most cited dimensions in the literature were accuracy (25), reliability (22), timeliness (19), relevance (16) and completeness (15) (Wand and Wang, 1996).

Zaveri et al. (2012) classified data quality dimensions into three categories according to the type of information that is used as quality indicator: (1) Content Based - information content itself; (2) Context Based – information about the context in which information was claimed; (3) Rating Based - based on the ratings about the data itself or the information provider. They identify further dimensions and categories to classify the dimensions, namely (1) Contextual (2) Trust (3) Intrinsic, (4) Accessibility (5) Representational and (6) Dataset Dynamicity dimensions.

When Liaw (2012) performed a literature review on data quality, they found that the five most frequently reported dimensions were “accuracy”, “completeness”, “consistency”, “correctness” and “timeliness”. Stausberg, Nasseh, and Nonnemacher (2015) when reviewing literature measuring data quality between 2005 and 2013, they identified 34 different concepts used in the definition of quality indicators (number of articles in parentheses): accessibility (1), accuracy (10), agreement (1), appropriate amount of data (1), availability (1), believability (2), comparability (3), completeness (4), comprehensiveness (21), concordance (3), consistency (5), contextualization (1), correctness (14), currency (6), definition (1), generalizability (1), granularity (1), incompleteness (1), inconsistency (1), incorrectness (1), objectivity (1), plausibility (2), policy relevance (1), precision (1), predictive value (1), prevention of duplicates (2), rate of enrolment (2), relevancy (2), reliability (4), responsiveness of data items (1), spatial stability (1), timeliness (6), usefulness of data items (1), and validity (4). The top three would then be comprehensiveness, correctness, and accuracy. New ideas about indicators of data quality have emerged of late including policy relevance, spatial stability, and usefulness of data items.

In the South African context, the DHMIS policy has adopted the dimensions described by the South African Statistical Quality Assurance Framework with slight modifications. They include relevance, integrity; timeliness, accessibility; reliability; completeness, accuracy, and coherence and comparability (South African Department of Health, 2011).

Health systems thus require quality data from health information systems to plan for and ensure that the workforce is fully funded and equipped with the necessary commodities, infrastructure, resources, and policies to deliver services (Nutley, 2012). For consistent data use to occur, data needs to be of high quality so that data users are confident that the data they are consulting are accurate, complete, and timely. Without quality data, data-informed decision making will not occur and program efficiency and effectiveness will suffer. In addition, when data quality is poor the demand for data drops, thus crippling the cycle of data-informed decision making even further (Braa, Sahay, Heywood, & Sahay, 2012).

Massyn, Peer, Padarath, Barron, and Day (2015) observed that the use of poor quality data can lead to poor decisions because the decisions are based on incorrect information gathered about the situation. Furthermore, if decision-makers become aware of data quality problems, they may lose confidence in the information systems. In recent years, the South African Auditor-General has been auditing non-financial data in South Africa which has intensified scrutiny on the quality of health care data and reports. Some of the causes and sources of poor data quality were identified during the District Health Barometer workshops in South Africa which include:

a) Data collection tools that are poorly designed, out-dated, not user-friendly, too many
b) Multiple data sources for the same element
c) Incomplete data collection tools and standard registers,
d) Lack of understanding of data element definitions,
e) Delay in recording data, or when the data is not recorded at the point of contact with a patient,
f) Calculation errors,
g) Incorrect transcription of values from daily tools to weekly and monthly summaries,
h) Incorrect capturing of data in the DHIS,
i) DHIS data quality assessment functions are not performed,
j) Non-compliance to the District Health Management Information System (DHMIS) Standard Operating Procedures, and the
k) Inadequacies in manual data quality checking should be performed (Massyn et al., 2015).

Mate, Bennett, Mphatswe, Barker, and Rollins (2009) suggests that the area for accurate data transfer at the facility level is during the tallying and collation phases at the primary point of contact between the registers and the routine monthly reports. Nicol (2015) described the quality of the prevention of mother to child transmission (PMTCT) as a major concern in certain South African districts, which he described as 51%. Discrepancies were observed in data quality from the PMCTC register and the RMR indicating better reporting at the district as compared to the facility, implying that the problem was worst at facility level. They also found that factors such as inadequate RHIS resources, (personnel and equipment), insufficient skills to perform RHIS functions, flaws in data collection process, and the wide assortment of data collection tools created opportunities for reporting deficiencies and data compromise. He specifically found that nurses sometimes forgot to record the data, lack of manpower, inadequate RHIS training, incompetencies in recording and validating data, as well as certain structural constraints. Similarly, Christofari in Nicol, Dudley, & Bradshaw (2016) also identifies RHIS staff shortages as a major contributing factor to the lack of data quality and data use. Nicol also suggests further exploration into possible factors which could influence data accuracy and ultimately data use such as data analysis, interpretation and use of data, impact of data quality at point of care, supervision, RHIS processes, training and leadership.

2.7. The Uses of Information

Data use or Information use is defined by Foreit, Moreland, and LaFond (2006) as decision makers' and stakeholders' explicit consideration of information in one or more steps in the process of policymaking, program planning and management, or service provision, even if the final decision or actions are not based on that information. Nutley (2012) describes the use of data as much more than filling in data reporting forms at various levels in the national health information system and the passive dissemination of information reports and information products, but the analysis, synthesis, interpretation and review of data for data–informed decision-making processes, regardless of the source of data.

Data informed decision making then refers to the pro-active and interactive process that consider data during program monitoring, review, planning, improvement, advocacy, policy development and review (Nutley, 2012).

From the literature reviewed data can be used in many ways amongst them: as informal information to inform local decisions (Scott, 2015), for planning purposes, to identify problems in their daily operations, how to improve the information system (Heunis et al., 2011), improving data systems, provision of further training, simplifying data collection methods, for sophisticated electronic data validation systems (Mate et al., 2009) to make comparisons over time, with benchmarks, or with other healthcare providers (Powell, 2003), for effective clinical management and for assessing the extent to which services are meeting the needs and demands of communities, to take decisions regarding the effective functioning of health facilities and of the health system as a whole, for strategic policy-making and resource allocation (AbouZahr & Boerma, 2005), for tracking major changes in health care use (Gething et al., 2007), to improve public health programmes and patient outcomes, and for operational research (Harries, Zachariah, & Maher, 2013), to better understand- and achieve clear statistical evidence (Mandala et al., 2012), for mounting a response to HIV/AIDS epidemic in terms of the magnitude of the disease, and the monitoring of its trends, but also for advocacy, strengthening commitment, mobilizing communities and allocation of resources, and targeting high risk populations (Rehle, Lazzari, Dallabetta, & Asamoah-Odei, 2004), to increase data availability and utilization for research (Fabic, Choi, & Bird, 2012) and to describe the epidemiology or disease burden of a common infectious disease where no formal surveillance systems exist.

Chen, Hailey, Wang and Yu (2014) did a review of data quality assessment methods for public health information systems and found that data-use and data-processes have not been given adequate attention in the literature, although they were equally important factors to the concept of data which determine the quality of data.

Nonetheless, in terms of the contextual factors affecting data use, Pappaioanou et al (2003) also identify the quality of epidemiologic evidence, failure of epidemiologists and other technical advisors to package and present data in an understandable and compelling format, inadequately designed systems, lack of trust in the accuracy of HIS data, resulting in decision makers discounting the information and fear of social or economic consequences. Chaulagai et al (2005) identified additional reasons for inadequate and non-use of information as accountability, resource constraints, lack of effective leadership, lack of holistic vision/approach, punitive environment, lack of management training, skills and personality, incentives and disincentives, inadequate dissemination, organizational and behaviour change strategies, selecting targeted opportunities for strengthening HMIS under favourable conditions for sustainability. Peters, Hibbard, Slovic, and Dieckmann (2007), identified numeracy skills as a prerequisite for people to pay more attention to numbers, comprehend them better, translate them into meaningful information, and ultimately use them in decisions. The PRISM conceptual framework outlined organizational, technical, and behavioural determinants for data use (Chiba, Oguttu, & Nakayama, 2012; Ndabarora, Chipps, & Uys, 2013).

University of Western Cape (2011) training material on the use of Information for managers, adds that information can be used to identify the specific health needs of the community and adequately addressing the need, advising on resource allocation (finances, personnel, equipment, infrastructure), and understanding of priorities within and outside of the organization, improving motivation of staff by highlighting improvements where appropriate, making comparisons with other similar sites and analysing trends, progression and or measurement in terms of targets and benchmarks in health service delivery.

Rehle et al (2004), while looking specifically at surveillance data in HIV, stated that there are many uses for surveillance data, not only in estimating the magnitude of an epidemic, to monitor the trends, and advocate for sufficient resources, but also to strengthen commitment and mobilization of communities in an attempt to create awareness and understanding in what drives the disease.

Pappaioanou et al (2003) suggests that data use for decision making can be improved by 1) strengthening the capacity of decision makers to identify data needs and to interpret and use data for decision making, 2) enhance the capacity of technical advisors to provide valid, essential, timely data to decision makers clearly and effectively and 3) to strengthen health information systems to facilitate the collection, analysis, reporting, presentation, and use at local, district, regional and national levels.

2.8. Contextual factors determining the use of data

Gething et al (2007) describes a lack of capacity, poor data coverage, expense of health information systems as being some of the reasons for the lack of generation of reliable evidence for decision making in Africa.

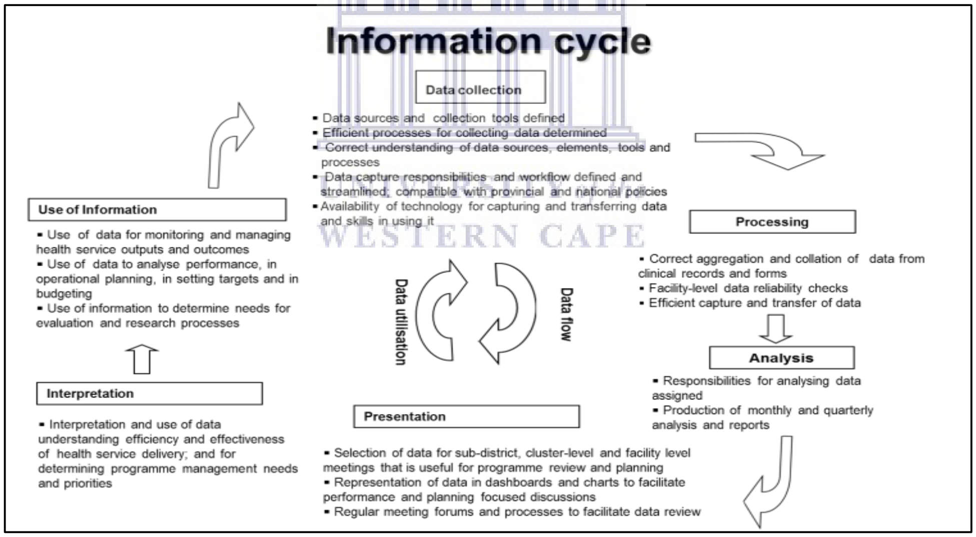


Figure 8: Information Cycle (Kelly, 2014)

The national and provincial government uses the information cycle (See Figure 8) which outlines the steps necessary for information to be used for decision making as data collection, processing, analysis, presentation, and interpretation, with sub activities in each step.

A draft Prism framework was introduced at an international workshop on district HIS in South Africa. RHIS performance was defined as ‘improved data quality and continuous use of information’. It was stated that RHIS performance is affected by three categories of determinants: technical, behavioural and environmental/organizational (Figure 9). Organizational members need motivation, knowledge and skills (behavioural factors) to perform RHIS tasks, and specialized technical know-how/ technology (technical) is required for timely analysis and reporting. This draft Prism framework provided a new direction in analysing RHIS performance; however, further work was needed to delineate the boundaries of the technical, behavioural and organizational determinants, and to specify the relationship among the three categories to measure their relative impact on RHIS performance (Aqil et al., 2009).

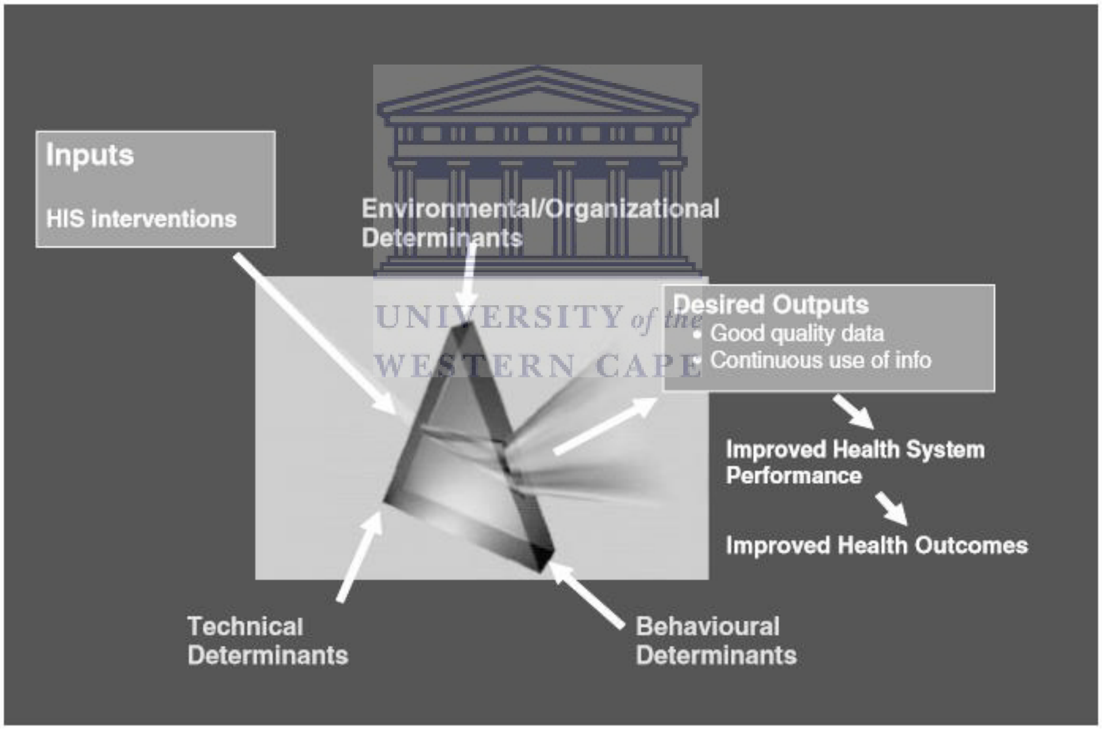


Figure 9: Prism framework (Aqil et al., 2009)

The response was to shift from Prism to the PRISM (Performance of Routine Information Systems Management) framework, focusing on RHIS performance management. A routine health information system is composed of inputs, processes and outputs or performance, which in turn affect health system performance and consequently lead to better health outcomes. A RHIS pays more attention to the internal determinants. Therefore, the environmental/organizational category is renamed as organizational factors, while environmental factors are considered to be constraints under which every RHIS works and has little control over.

They are thus now renamed as organizational, technical, and behavioural domains in the PRISM framework. The organizational determinants relate to infrastructure, poor telecommunications, poor computer infrastructure, low support for data use, data flow inadequacies, critical management functions, governance, planning, training, supervision, quality, finance, and resources. Technical determinants refer to the technical aspects such as technical skills, data analysis or computer literacy, lack of computers, the design of the data system, the definitions of indicators which may not be appropriate for use and the lack of data quality assurance protocols, complexity of reporting forms, computer software and IT complexity. And lastly behavioural determinants refer to the behaviour of individuals who produce and use data. This covers their knowledge, skills, attitudes, values, and motivation of the staff to collect quality data, analyze the data, and use them; as well as the lack of a data culture. The attitude of decision makers will play a big role in determining if data and information are used. If decision makers have no interest in using data, they will make decisions based on other factors (Nutley et al., 2014).

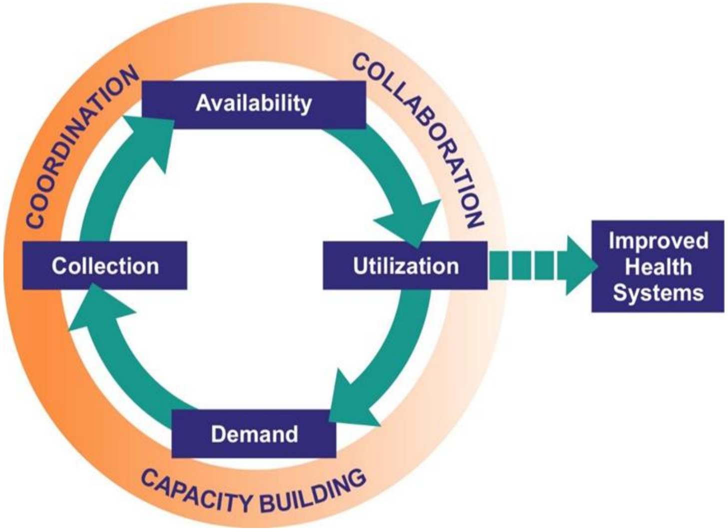


Figure 10: Data Demand and Use Framework (MEASURE Evaluation, 2012)

Figure 10 depicts the MEASURE Evaluation (2012) data demand and use conceptual framework which will be used to describe the utilisation processes as the cycle of data demand, collection, availability, and use inherent to monitoring and evaluation. The all-encompassing principle of the framework is that evidence-based decision making will promote the achievement of improved health outcomes. This approach illustrates the ideal. When there is a demand for data, the necessary resources are invested to collect that data. Once the data are collected, they will be analyzed and synthesized into a format that makes the data available for decision making. The cycle supports the assumption that the more positive experiences a decision maker has in using information to support a decision, the stronger the commitment will be to improving data collection systems and continuing to use the information generated.

A relatively new logic model to strengthen the use of health data in decision making (See Figure 12) was proposed by Nutley (2012) where it describes inputs and activities to strengthen demand for and use of data, giving effect to improved and sustained data demand use, while contributing to WHO's health systems building blocks, and ultimately health outcomes. This links to the conceptual framework as outlined in Nutley et al. (2014).

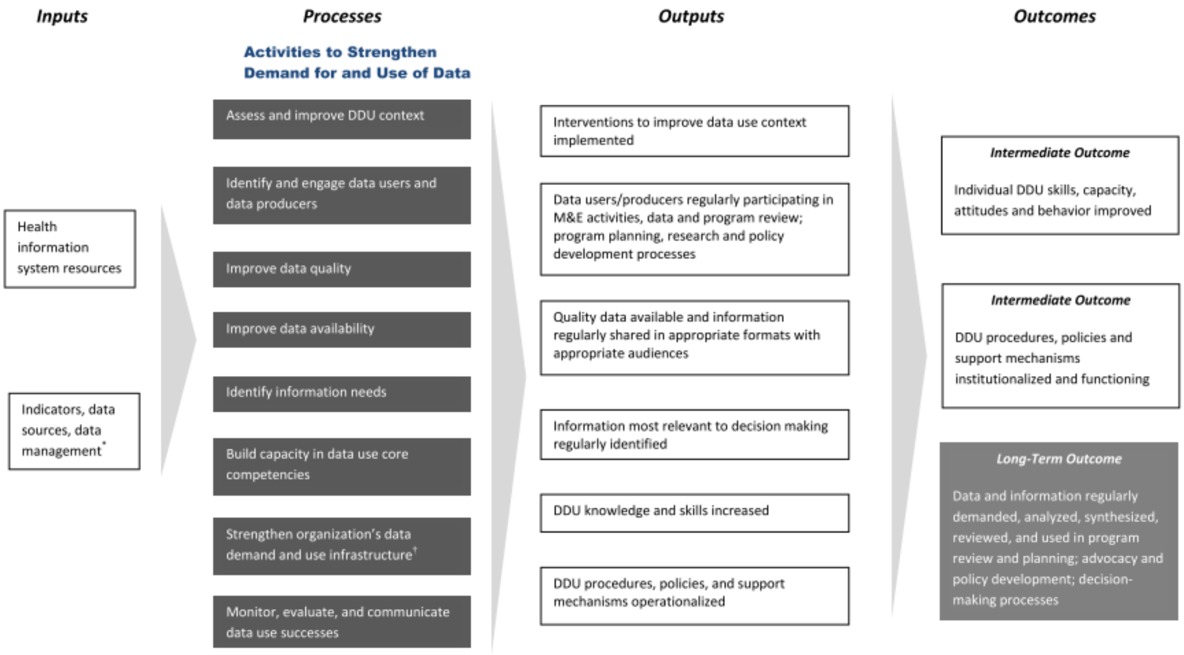


Figure 11: A logic model for strengthening the use of information in decision making (Nutley, 2012)

Barriers to evidence based decision making were also identified. Brownson et al (1999), identified the lack of leadership, lack of a view of the long-term “horizon” for program implementation and evaluation, external pressures driving the process away from an evidence-based decisions, inadequate training in key public health disciplines, lack of time to gather information, analyze data, and review the literature for evidence, lack of comprehensive, up-to-date information on the effectiveness of programmes and policies, lack of data on the effectiveness of certain public health interventions or for special populations.

Pappaioanou et al (2003) identified several barriers to the use of data in decision making by epidemiologists that included the quality of epidemiological data, failure of decision makers to recognize epidemiological questions that are relevant to policy issues, failure of epidemiologists to analyse and frame issues in a policy context for decision makers, failure to package or present data in an understanding and compelling format, hesitancy to interpret and actively participate in the decision making process, poor incentives stemming from lack of decision making authority, failure of HIS to meet the needs of policy makers and program managers in terms of content, format, timeliness, inadequate designed systems, lack of trust in the accuracy of HIS data, fear of social or economic consequences and the type of training received.

Pappaioanou et al (2003) also found that the technical advisors and decision makers needed to possess fundamental understanding and appreciation of how to interpret and use quantitative information (e.g. proportions, rates, ratios). He also emphasized that exposing technical experts to management concepts and principles that required them to work as part of the public health team, were found to be essential to improving the public health interventions. Mentoring and coaching were also needed in helping the participants apply their newly learnt skills and materials to using data for problem solving. Certain socio-political and cultural factors, such as the low demand for contraceptives in certain cultures, the ability of decision makers and technical experts to interact as a mutually beneficial team to enhance greater communication, as well as identifying a strongly motivated senior health official as a champion to drive the decision to use data in decision making were also identified in this article as determinants for data use.

The determinants of data usage have been clearly outlined in general terms and it remains to be seen whether the same is true for the West Coast district. Hence the study to explore the types and ranges of uses of routine health information by determining to what extent this information is being utilized in decision making in the West Coast district, while also exploring the contextual factors that may influence the degree to which information is being utilized.

2.9. Strategies to Improve Data quality and Use

Appendix B outlines the strategies for improvement of data quality and use. Forty nine papers dealt with strategies to improve data quality and use. Twenty articles attributed improvement strategies to technology, such as electronic health records, computerized registries, tracking and reminder systems, integrating electronic data entry, electronic checks, digitization of routine reporting and automated systems. This included Angier et al (2014), Byrd et al (2013), Davidson et al (2003), Evans, Bohensky, Cameron, & McNeil (2011), Goodyear-Smith et al (2008), Hahn, Wanjala, & Marx (2013), Ledikwe et al (2014), Mate et al (2009), Ndabarora et al (2013), Thiru, Hassey, & Sullivan (2003), AbouZahr & Boerma (2005), Gagnon et al (2009), Pappaioanou et al (2003), Myburgh et al (2015), Ajami & Bagheri-Tadi (2013), Berg (2001), Chaulagai et al (2005), Haux (2006), Braa (2009), Krishnan, Nongkynrih, Yadav, Singh, & Gupta (2010). Twenty articles described training, either as staff training, tertiary training programmes, capacity development in terms of numerical, statistical and computer skills, improve the capacity of front-line staff to use data as improvement strategies in data management processes This included Goodyear-Smith et al (2008), Hahn et al (2013), Ledikwe et al (2014), Mate et al (2009), Mphatswe et al (2012), Ndabarora et al (2013), Nicol (2015), AbouZahr & Boerma (2005), Gagnon et al (2009), Nutley & Reynolds (2013), Pappaioanou et al (2003), Braa et al (2012), Arts, Bosman, Jonge, Joore, & Keizer (2003), Mpofu et al (2014), Peersman, Rugg, Erkkola, Kiwango, & Yang (2009), Sherr, Requejo, & Basinga (2013), Chaulagai et al (2005), HMN_WHO (2010), Otwombe, Wanyungu, Nduku, & Taegtmeyer (2007) and Gourlay et al (2015). There were 16 articles assigning data quality audits, ongoing data quality assessments, quality checks, regular reviews as improvement strategies. These included Evans et al (2011), South Africa Every Death Counts Writing Group (2008), Goodyear-Smith et al (2008), Ledikwe et al (2014), Mate et al (2009), Mitsunaga et al (2013), Mphatswe et al (2012), Nicol (2015), Ronveaux et al (2005), Thiru et al (2003), Ward (2004), Murphy, Mershon, Struthers, & McIntyre (2013), Mandala et al (2012), Nutley & Reynolds (2013), Chahed, Bellali, Alaya, Ali, & Mahmoudi (2013) and Chaulagai et al (2005), although South Africa Every Death Counts Writing Group (2008), cautions that audits are powerful, but only if the findings lead to action being taken. Fourthly, 11 articles ascribed standard procedures as improvement strategies, which included standard operating procedures should be developed and implemented, practices should be standardized, standardization of tools and systems, the need to focus on the balance between standardization and local flexibility (localization). These included Evans et al (2011), Goodyear-Smith et al (2008), Ledikwe et al (2014), Murai, Lagrada, Gaite, & Uehara (2011), Ndabarora et al (2013), Nicol (2015), Murphy et al (2013), Jacucci, Shaw, & Braa (2006), Myburgh et al (2015), Braa & Hedberg (2002) and White (2015). Seven articles mentioned data use as a strategy to improve data quality by assessing and improving the data use context and engaging with data users and data producers, prioritizing data usage, implementing data use workshops and improving the capacity of front-line staff to use data. These included Mate et al (2009), Nicol (2015), Nutley & Reynolds (2013), Braa et al (2012), Haux (2006) and HMN_WHO (2010).

Other strategies identified in the articles mentioned below include regular feedback and communication (Mphatswe et al., 2012), (Nicol, 2015), (Chaulagai et al., 2005), (Murphy et al., 2013), support and supervision (Mate et al., 2009), (Mitsunaga et al., 2013), (Mesfin, 2014), (Ajami & Bagheri-Tadi, 2013), (Krishnan et al., 2010), (Otwombe et al., 2007), efficient data collection processes (Martin, 2000), (Murphy et al., 2013), (Pappaioanou et al., 2003), (Mate et al., 2009), (Mphatswe et al., 2012), (Ndabarora et al., 2013), importance of perceiving data as valuable and relevant (Murphy et al., 2013), (Otwombe et al., 2007), clear definitions for elements and indicators (Goodyear-Smith et al., 2008), (Murai et al., 2011), (Arts et al., 2003), (Ahonkhai, Bassett, Ferris, & Freedberg, 2012), responsibilities and accountability for data (Murphy et al., 2013), adequate resource allocation (Nicol, 2015), (Chaulagai et al., 2005), strong leadership (Jacucci et al., 2006), (Haux, 2006), (AbouZahr & Boerma, 2005), (Ndabarora et al., 2013), recruitment of suitably qualified personnel, formulating an appropriate minimum set of indicators (Chaulagai et al., 2005), development of an M&E cadre of personnel (Mpofu et al., 2014), integrated HIM system (Ndabarora et al., 2013), project Management techniques (Ndabarora et al., 2013), fostering an information culture, and involving communities (Braa & Hedberg, 2002), (Chaulagai et al., 2005), (Lippeveld, 2001)

Chapter 3 RESEARCH METHODOLOGY

An exploratory qualitative study design was chosen for this study in the form of an in-depth analysis of the cases. Exploratory research was conducted between August 2016 to February 2017 to gain new insights, discover new ideas, and for increasing knowledge of the experiences of West Coast health care staff in data management processes. While qualitative research provides a richness and depth in order to fully understand the unique experiences of the respondents, it also emphasises the dynamic, holistic and individual aspects of their experience. Through this approach, it was possible for the researcher to deeply engage and interact with the West Coast district staff through in-depth interviews.

This linked well with the study objectives in exploring the health utilization practices and unravelling of contextual factors affecting data utilization. This enabled the researcher to obtain a more dynamic, holistic aspect of the experiences of the participants, by engaging and interacting with the participants and obtaining their perceptions and understanding of the situation.

The target population included Operational managers, Information staff, Programme managers, Sub-district and District managers. In-depth interviews were used to collect the information for the study.

3.1. Study Population

The West Coast district study population included the Operational managers, Information staff, Programme managers, Sub-district and District managers. These are the key people involved in either the production of information, or the use of the information to manage their services, programs, facilities in their regions. They have a vested interest in information to monitor performance of health programmes and service delivery in the health system. They are found at different levels within the district health system, either at facility, sub-district and district levels.

3.1.1. Inclusion Criteria

The participants were included in the study based on the following criteria:

1. They should be permanently employed and either working at or responsible for fixed PHC facilities in the West Coast
2. They should all be able to speak or understand English or Afrikaans as these are the two official languages in the Western Cape and the researcher is fluent in both languages.

3. They should have consented to participate in the study

3.1.2. Exclusion Criteria

The participants were excluded from the study based on the following criteria:

1. Those individuals who did not work at either the District, sub-district offices or fixed PHC facilities in the West Coast district.
2. Those individuals who only speak and understand languages other than Afrikaans and English in the West Coast district
3. Those individuals who have not consented to participate in the study

3.2. Study Sample

Maximum variation purposeful sampling was used to select the participants, who were purposively selected from a wide range of cases. The researcher wanted to understand how a phenomenon is seen and understood among different people, in different settings and at different times. The researcher selects a small number of units or cases that maximize the diversity relevant to the research question. This type of sampling entails purposively selecting a wide range of cases. A total of 17 participants were interviewed. The procedure for selection for the interviews will be 5 facility/operational managers selected from large and smaller facilities in all 5 sub-districts, 5 Programme managers selected from HAST, Child health, Women's Health, Nutrition, PHC programmes, 5 sub-district and district managers selected from all sub-districts and the district office, 5 information officers selected from all sub-districts and 1 information manager selected from the district office. Ultimately the sample consisted of 3 Operational managers, 5 Programme co-ordinators/managers, 4 Sub-district/district managers, 1 Information manager and 4 Information officers, as these were the participants who consented to participate in the study.

The practical procedure for inviting the participants included telephonically or personally making appointments with each of them. The interviews were held at a suitable agreed venue and time to best accommodate the participants. The location needed to be in a quiet area, so as to protect the privacy of the participants. If transport was necessary, the researcher would have provided for this. The researcher would also have arranged for refreshments if necessary, especially if the interviews took longer than the expected 1 and 2 hours.

3.3. Data Collection Methods

In-depth interviews which enabled the researcher to obtain detailed information about the individual participant's thoughts, behaviours and experiences around data utilization and even to address some of the more sensitive topics were used. In-depth interviews are optimal for collecting data on individuals' personal histories, perspectives, and experiences, particularly when delicate topics are being sought.

The questions were adapted from the PRISM Tools namely the Organizational and Behavioural Assessment Tool (Belay, 2013; Hotchkiss, Aqil, Lippeveld, & Mukooyo, 2010; MEASURE Evaluation, 2009); (Measure Evaluation, 2011) the Data demand and use Framework (MEASURE Evaluation, 2012) and the PRISM framework (Aqil et al., 2009), (Hotchkiss et al., 2010), (MEASURE Evaluation, 2009) identifying the Organisational, behavioural and technical constraints. The existing tools were adapted as the PRISM tools were quantitative in design while in-depth responses were required to fully understand the experiences of the respondents. Open ended questions on an interview guide were asked giving participants the opportunity to explain their position, feelings, or experiences more explicitly. Probes with neutral questions, phrases, sounds, and even gestures were used to encourage participants to elaborate on their answers and explain the why's and how's. The lengths of the interviews were guided by the saturation of the subject, while also being mindful of the time constraints of the participants. Most of the interviews ranged from about 1 hour to 2 hours in length. All interviews were tape recorded, and short reflective field notes were also taken as a back-up if recordings fail as well as to note key issues being said, general observations, body language, moods, attitudes, the general environment; and other information of relevance.

3.4. Data Analysis

All field notes were expanded into rich descriptions within 24 hours of the taking of the short notes. The tape recordings were transcribed verbatim. Non-verbal communication (e.g. laughter, sighs) was also transcribed for analysis. The formats of the documents were either text or pdf. The transcriptions were imported into ATLAS.ti where each of the contents of the documents was coded according to key quotations by the participants. A total of 136 codes were identified. The researcher then ran code reports which gave a summary of the quotations in each document related to the identified code. This was then saved as WORD documents and the researcher used sticky notes in order to identify recurrent themes according to the responses from the participants. A thematic framework was then developed by identifying all the key issues, concepts, and themes by which the data can be examined and referenced which are derived from the aims and objectives of the study. The researcher then charted the data by rearranging the data according to the appropriate part of the thematic framework to which they relate. The charts contain the summaries of views and experiences of the participants. The researcher then interpreted the data using the charts to define concepts, and map the range and nature of the concepts, thereby creating and finding associations between themes with a view to providing explanations for the findings.

3.5. Trustworthiness and Rigor

Trustworthiness describes the 4 key concepts as described by Shenton (2004):

- Credibility – seeking to measure or test what is intended to be measured (Shenton, 2004). Review of appropriate preparatory documents and preliminary visits were done to establish a degree of trust. Credibility of the researcher with regards to her background and experience as previously being employed by the DOH as a health professional and also as an information manager, and currently as a sub-partner to advise the DOH on Monitoring and evaluation of the health programmes was established. The researcher did all the interviews herself and checked all the transcribed material for accuracy and peer debriefing and scrutiny with regular interaction with supervisors, colleagues, academics was maintained. The researcher as far as possible elicited honest responses from the participants by ensuring that ethical considerations such as right to refuse, no negative consequences were upheld. Member checking with the expanded notes and the transcribed notes was done to further improve credibility.
- Confirmability – the results reflect that of the participant and not that of the researcher (Shenton, 2004). The researcher has provided evidence of an effective audit trail as well by securely storing all recordings and notes to enable this.
- Dependability – If the work is to be repeated similar results will be obtained (Graneheim & Lundman, 2004). The researcher provided a detailed report to develop a thorough understanding of the design and methods used in the process
- Transferability – How easily the findings of the study can be applied to other studies (Graneheim & Lundman, 2004). An in-depth description of the study context (nature, extent of background, setting, methodology) was documented to assist any future researchers with transferability to other studies.

3.6. Ethical Considerations

Written and informed consent was obtained from the participants for the study. Informed consent is about people's understanding of the purpose, procedures, potential risks, benefits and willingness to participate in the study. The forms were available in English. Written permission was obtained from the Western Cape Department of Health as well as West Coast district management to conduct the study and access the staff in the West Coast. The researcher provided relevant information on the study for clarity of purpose and other general information. The researcher ensured that the participants were informed that they have the right to withdraw from the study at any time without any disadvantage to the participant. The researcher informed the participants that there would be no remuneration for participation in the study. The researcher informed the participants that the results would be published and made public without compromising confidentiality. The researcher did no harm to the participants and group and was prepared to assist the participants if harmed. The researcher guaranteed full confidentiality with interviews.

Chapter 4: RESULTS AND DISCUSSION

Five main themes emerged from the data collected. These themes are decisions and data demand, data collection, data quality, data availability, and data utilization. With regards to decisions and data demand, factors influencing how decisions are made and ways in which to increase the demand for data are discussed. Under data collection there follows a description of the perceptions of the usefulness of the data collection tools, a description of skills and abilities of participants, and strategies to improve data collection procedures. Data quality deals with the perceptions of the participants on the quality of the data and strategies to improve the quality of the data. Additionally, the perceptions of the participants on the attitudes of people towards data management are described as well as providing measures to improve the people's attitudes. In terms of data availability, certain structural constraints were identified which affected the availability of the data and strategies to improve data availability were identified.

4.1 Decisions and Data Demand

The data demand and use framework (Figure 10) as identified by MEASURE Evaluation (2012) outlines the importance of demand for data as a pre-requisite for data utilization. Many factors also influence how decisions are made, and the participants were asked to describe how they perceive how decisions were being taken in the West Coast District.

4.1.1. Data Demand

Data is required for reporting purposes to Provincial and National government. The types of data which is routinely being collected included those that are required by the National and Provincial department of health according to the National Indicator Dataset (NIDS) and Provincial Indicator Dataset (PIDS). In the Provincial Annual Performance Plan under Programme 2: District health services, the information is collected on district management, community health clinics, community health centre, community based services, other community services, HIV and AIDS, nutrition, coroner services, district hospitals, and global fund. For this study, the focus was only on community health clinics, community health centre, HIV and AIDS, nutrition at primary healthcare level. These include data on the following categories under district health services, HIV and AIDS STI and TB (HAST), maternal child women's health and nutrition, and disease prevention and control.

Similarly, to these specific categories of data which needed to be collected, other data such as the district hospital data, quality assurance data, security and safety incidents, care of the carer, community based care, home based care, termination of pregnancies (TOP data), pharmaceutical data, tracer data, diflucan data, oral health data, rehabilitation data, mental health data, home based care data, adverse incident reports and campaigns such as the paediatric surge campaign, immunization campaign, measles campaign as well as special projects data were also mentioned.
In addition to these, other data is also collected specific to the Bergriver and Swartland sub-districts, which included extra immunization and extra chronic disease management data, which is not required by national and provincial for reporting. this data is required by the PHC manager to enable her to make better sense of her data, as these elements were previously collected and she felt that it needed to be continued.

4.1.2 Influences affecting decision making

The respondents described the factors that they felt influenced how decisions were made in the department where they worked.

Decisions based on evidence or facts

All the respondents agreed that evidence or facts or data are used to influence decisions on among others resource allocation, budget allocation, equity, early identification of diseases or illnesses, addressing quality issues, to develop and implement quality improvement plans, making comparisons, motivations for staff, achieving targets and providing feedback at various forums. Respondents affirmed “*Yes, it is all about stats”,* “*Everything is done around stats, it shows if we need personnel, budget constraints, or to maintain equity*” with *a programme coordinator agreeing that “Data is one of the drivers on which decisions are based*”.

Decisions based on target chasing

Despite their affirmation on the role of evidence, most respondents observed that chasing targets influenced decisions with one respondent saying “*Target chasing, it’s the biggest one of all*”. One of the programme co-ordinators quoted:

> *Target chasing, oh we are very target driven and also compliance driven. There’s always something we can say about the West Coast, Yes, we can set the targets and we can try and*

> *achieve it, and as part of our complexities in the West Coast, is it so far apart. Targets, yes, they can be set, I think "target setting, wishful thinking.*

Some were circumspective on chasing targets and cautioned that the drive to achieve targets affects other services that should not be neglected. A manager reported:

> *Target chasing – There's a big issue about target chasing and my opinion is we are a service we should not be driven by targets. What about the one or two people you are short changing because you are chasing targets. We are reaching target, we are not reaching targets." We are looking at service delivery from a different perspective. If you were to compare Saldanha with other sub-districts, there's always that thing, we are not reaching target, but we are a service. We need to do justice with the ones that we reach.*

An information staff member agreed:

> *We are target chasers let there be no two ways about that, but I do think we are not realistic as to how we chase the targets, and yes some areas are neglected to achieve that target, specifically if you have women's season in that quarter, July - September, they will chase reproductive health services and family planning methods which should be done right throughout the year and not specifically during that quarter.*

Decisions based on Policies

All the respondents but one manager agreed with the statement that decisions are based on policies dictated from national, provincial and district levels and that there is no place for taking one's own initiative or input on policy:

> *Look, we are sub-districts, we don't take decisions, decisions come from national, head office, district and only then sub-district. So we receive instructions, Policies – Yes, all decisions are based on policies, protocols and guidelines; everything gets made according to it. There is no place for initiative. We function accordingly. And that is why we seem to have no innovation, because an individual's decision does not matter.*
> *I must admit that policies are the name of the game, so we must adhere to policies.*
> *Policies – 80%, because policies come from Provincial department, and we do not have a say in decisions. We receive it from there and we must implement it.*

Decisions based on considering costs

Costs were considered to be important for decision making by most of the respondents with balancing the costs with the health needs of the people being important:

> *Considering costs – I think it will depend on what the implications will be. Like for instance your need at sub-district level, according to the budget allocated and also where the responsibility of that specific need lies. If it is something that can be addressed in your NPO partners, or funded NPO's and they are being funded for that that can be done. But if it is for instance that is in the overall budget, and under a specific line item, then we need to put*

> *it over to the next financial year. So depending the available budget, if it is in the priority of that need, it will get attention. I mean if it's something critical, we won't say because there's no budget, we won't do it, we will rather look into it and where we can get funding from.*
> *I think they try to balance costs with the health needs of the people.*
> *I think this is now the buzz word, everything has cost implications and you can't just run haywire, but all levels must consider their budget and how they could save on costs, as cost saving is important to the wellbeing of the patient*
> *You cannot cut if you already have nothing*

Decisions based on managerial directives

The majority of the respondents said that managerial directives have an influence on how decisions are made. For the respondents, they felt theirs is more about making operational decisions and consultation within a team instead of merely following managerial directives:

> *Managerial directives – No I think with us it is always a consultative process, we sit together and communicate and discuss it. It is not something that is forced upon us.*
> *Yes, we must implement the instructions, because we do not have a say in it.*
> *Managerial directives - yes even though policy dictates, management also want to be in line with policies*

Decisions based on health needs

Seven of the respondents felt that health needs are taken into consideration when decisions are made by creating linkages between the communities and the PHC platform. Although there are already systems in place to ensure that it is done, strengthening these systems is needed:

> *Yes, very important that we must be in contact with our communities all the time and we must be aware of what is the dynamics in the community. I must say that our managers need to really focus much more on that. They tend to still be a bit more institution focused and not always ofay with the dynamics out there.*
> *One can say that most of the time it can happen at SD level. So there is a linkage between the CBS and the PHC platform. So they meet at SD level at the monthly SD management meeting where all these relevant role-players are a part of. As soon as gaps are identified there, they then communicate and they find ways on which to address it. We also have the CLO community liaison officer, at the district office; she is busy relooking into the MSAT structures.*

Of those with a contrary view, a programme manager admitted that they sometimes at the district office take a blanket approach and not necessarily the needs that come out from the communities and is quoted as saying:

> *I think from the districts perspective, we've got the blanket approach, where we address the global issues for the district, however, we still are able to identify certain hotspots, In the*

> *SD, the PHC managers will also know exactly where their hotspots are, and where they need to focus on.*
> *Dit is maar n general iets – 10% word provinsiaal of nasionaal gedoen, nie op fasiliteits vlak nie, ons moet maar net inval* [English: *That is a general thing, it gets done at provincial or national levels, and not at facility level, we must just do the work]*.

One of the managers said that their health needs are determined by National based on the statistics from the districts.

Another manager mentioned that if a health need is identified at sub-district level, and if it has budgetary implications the decision needs to be taken at district level whether to act upon it or not. Yet another manager mentioned that health needs are discussed, but there is not always the time to do anything about it because of the numbers of patients that they see. There is always a struggle which areas to prioritize, with the few hands that they have. Will they leave the TB room unmanned for the day or sort out the chronic patients for the Doctor, or first see to the babies. But they usually prioritise the sick babies and the frail people.

Decisions based on a sense of knowing

Seven of the respondents agreed with the statement that decisions are made based on a sense of knowing. Although they agreed that the sense of knowing was based on past experiences, the fact that yearly there is an annual influx of seasonal workers who cannot be estimated and then you have to rely on your sense. A manager mentioned that "*Yes, very often decisions are based on sense of knowing, or that you must use your gut, to make decisions, because it's not so easy… This sense of knowing is based on experience*".

The programme co-ordinator agreed that

> *It happens often, because you just want to move this thing to be solved, because of your own past experiences you know that worked and you just continue to do that thing. I will say most of the time they really know what is happening in their sub-districts, and not just that they sense they know.*

However, of those who mentioned that a sense of knowing was not

> *Sense of knowing – I don't think so, our PHC managers are fairly clued up with what happens in their communities* used in making decisions the Comprehensive health manager is quoted as saying*, they know where expansion is, they know where houses are being built, they know, I would say 95% of the time, they know what happens in their SD's.*

and a manager is quoted as saying:

> *It's not really about your sense of knowing but it's about how well you know your area. And I think in my mind it is different. Because I know what is going on in Saldanha and sometimes people might want to dispute it. But then if you take that person by hand to that*

> *same area, then they realize as much as you are sitting here, you know what is happening out there. So I wouldn't really say it's a sense of knowing, it's just about knowing your area and not just relying on an assumption.*

The other manager mentioned that district management is very far from them, and they have no idea what their needs are, because they have never been in their situations, and although they make decisions they have no sense of knowing what is happening at their level.

Decisions based on rumours

Eight of the respondents said that they did not agree that rumours affect how decisions are made. They mentioned that they could not respond to rumours or stories because they were working within boundaries and they do not listen to gossip.

Of those who agreed that rumours and stories could influence how decisions were made included two programme co-ordinators, and one manager. They would not just dismiss the stories as rumours, but would investigate to see whether the story is in fact something to be taken seriously and addressed. One programme co-ordinator mentioned that:

> *We will not just respond, and the PHC managers and nursing managers they need to follow up first. And once when they've gotten their facts, we then respond. So if a community member would come and tell us there are so many TB patients in that area and the people are dying, we will look at the data that we have and also at expansion, we look at where this comes from, because they could be completely misinformed, and if we then go and there is a real problem, we then respond.*

The other programme co-ordinator agreed that

> *It is important to do the analysis to confirm the rumours that is going around, because before the rumour comes the data should already put a spot or like an area of concern. But you do find that you might find with the migration of our people on the farms, that it might be beneficial for us to respond to rumours because of the unknown areas that we do not know of, but there is an analysis that should be done and it will be followed up. And the rumour will just not be denied. So if there is a need for an activity to take place it will happen.*

The manager mentioned that community members are asked to look out for health issues in the community and the Home-based carers will then be sent out to investigate.

Decisions based on corruption

Seven of the respondents answered no to the statement that corruption influences how decisions are made. A manager mentioned that the Department has a values system, of caring, accountability, integrity, and respect. The programme co-ordinator mentioned that they have good relationships with our district health council and good interaction with the municipalities. Another manager mentioned that corruption does not influence how decisions are made, because there is a greater awareness of corruption and everything gets validated.

> *No, I will not say so, because everything gets validated and awareness and training. We have a values system of caring, integrity, accountability and respect.*

Only one information staff member said that there is corruption in terms of people pushing their own agendas.

> *Corruption- yes, it terms of pushing my agenda, yes*

Many acknowledged that they were not aware of any corruption influencing how decisions are made. This included two programme co-ordinator, one information staff member, and one manager. One of the programme co-ordinators mentioned that they try by all means to identify signs of corruption, and she cannot say whether it is happening or not, but they are always on the lookout.

Decisions based on crisis

Six of the respondents responded that decisions are not based on crisis situations. There was a great emphasis on being prepared and proactive and not wait for a crisis to occur. A programme manager mentioned that

> *I don't think it happens that often, I don't think it's to dowse the fires, I think it's because of us having to be pro-active, in the sense that we have identified the crisis, now what is the plan, referring again to the Measles cases, it was reported, we immediately got the teams up and running, contacted the Cape Winelands, because most of it was on their side, but we also had to keep an eye on this side. So it depends on what it is. We don't wait for a crisis, we try and be pro-active.*

Similarly another manager mentioned that

> *No, we learn out of crisis and then we take it forward, but I must say that we are alert of risks, we are talking about risk management on a monthly basis, so we can alert each other of risks and we can come up with preventable measures to address the risk and not wait until crisis and then we run around like mad dogs. Like for instance the 4 identified measles cases, but we already are prepared for it. We don't say its only in Stellenbosch, it won't come to us, we prepared and decided that despite the Human Papillovirus campaign that kicked off now for our little daughters, we are addressing the under 5 years, to be proactive and immunize them again for measles. So we try to be proactive.*

A manager also noted that although they do not respond to crisis mode in their sub-district, they are always on the lookout for crises, and they are already in crisis because of the lack of resources and by cutting costs, and that is the normal in which they have to operate. What somebody else sees as a crisis, for them it is normal.

One of the managers mentioned that in an emergency situation, they all know what to do. She is quoted as saying

> *Crisis – it does not happen very often, as the need arises. It gets discussed at sub-district meetings if there is an outbreak. In an emergency situation, everyone knows what to do, one answers the phone, one hones the ambulance, and one puts up a drip.*

Three information staff, and a manager reported that decisions are made based on crisis situations. The manager mentioned that they are forced to function in crisis mode because of the shortages of staff. She is quoted as saying

> *Crisis – I think we function on crisis mode, we currently don't have a school health PN (Professional nurse), we used to have MMC (Medical male circumcision) PN M, who we don't have anymore, we had an oral hygienist, that we don't have anymore, we had a HAST co-ordinator, who we also don't have anymore, actually our moratorium extends to costs, all our posts that become vacant does not get filled, unless you close a clinic. For example the Assistant manager must also fulfil the functions of a HAST co-ordinator together with the PMTCT co-ordinator. This Sister works with a staff nurse who has been on sick leave for 2 years already. The mobile clinics have had to stand still as we don't have enough staff to deliver the service.*

Decisions based on personal likes

Seven of the respondents agreed that personal likes affected how decisions are made. Some of them felt that personal preferences have a place and is acknowledged, but you still need to adhere to national and provincial departmental expectations. A programme co-ordinator is quoted as saying

> *I think the demand, not in a bad way, but there are expectations from Provincial office, from National office that you have to report on. So I don't think you can really single out something, I think definitely if you are the community health nurse, you will make sure that your stuff works for you, but that person also does not work in isolation, it must be part of the bigger picture. So it's very difficult to say that the one has preference to the other. We try to keep the balance. Because there's such a lot of data/information we need to gather. It's difficult to single out.*

Similarly, another programme co-ordinator is quoted as saying

> *So even though you are passionate about a certain area, we do acknowledge and we will allow it in certain circumstances e.g. If I like HIV programmes, I am not going to let the*

> *programmes suffer because I don't want to be ready. So it will be prioritized based on the need but also looking into the vision and direction of the department in the district and trying to capacitate everybody.*

But the other six respondents felt that they cannot adhere to personal likes as they work within strict parameters and with limited resources. A manager is quoted as saying

> *I don't think in our environments where the budgets are being strictly monitored that you can come up with personal likes to decide this is what we going to do because I do like it*.

Another manager also mentioned that

> *when you have a thin bone there's no room for personal likes, you just make things happen*.

Similarly, another manager also recognises that there are strict parameters in which to work when she is quoted as saying

> *We work strictly according to programme guidelines HIV, TB, child health etc. and everything gets done by exactly the same people at facility level.*

Decisions based on power and influence

Ten of the respondents answered no to the statement of whether power and influence affects how decisions are made in the area where they work. Those who said no spoke about power and influence coming from higher or other parallel levels and not them necessarily using their power to influence others in decision making. A programme co-ordinator mentioned that

> *…that type of pressure is not at our level, the district level. I think that kind of pressure comes from the Premiers office, for instance looking at Saldanha Bay, they are going through this whole development and what industrial development zone. So this is directly coming from the Department of the Premier. So the pressure is being exerted from their side onto us.*

A manager also acknowledges that

> *influence can be exerted upwards to obtain resources because you compete with a lot of other people but if you will be successful it's a different matter. At the moment we in the rural areas, still feel that the Metro with their figures is very powerful, I'm sitting with smaller figures, but I have other contributing factors that make my budget that I need more money, but I think still for me numbers still play a powerful role for resources.*

Another two managers acknowledged that there is no place for power and influence in their sub-districts as they are extremely equity driven and exercise team approach in their respective areas. One manager also emphasises that a distinction should be drawn between power and delegated authority, which has two very separate meanings and delegated authority is what they are using to implement an integrated model. She is quoted as saying

> *There's no power in this sub-district. What we are doing in this sub-district, we are building an integrated model, but its taking long and you know we cannot do it overnight. That forces you to work in a team approach, and in a team approach it is very rare that there will be people who use their power and influence as opposed to authority. As a team you need to have a person who has a delegation for a particular authority, and then people take decisions on authority as opposed to power.*

Three of the respondents said that power and influence affect how decisions are made. This includes a programme co-ordinator and 2 information staff members. The fact that people in more powerful positions have greater influence over those with limited power and the fact that you must still prove yourself to be trusted came up with the programme co-ordinator. She is quoted as saying that

> *Yes, I'm sure; I think most people are moved by people of power or influence. It also depends on what you see as somebody of influence or power, and then the Director will come and say something and it will be looked into, but you have already said the same thing before. I think it is also a matter of proving yourself first, before they can trust you, so sometimes you find that it is an exhausting exercise and you feel a lot of time gets wasted because you know out of experience that implementing something will take you there, but just because it come from you, but if somebody with power will come then it will work. The frustrating part is then we could have been there 3 months ago. So the trust relationship building of powerful people is the issue.*

4.1.3. Ways in which to increase the demand for data

Although it is clear that there is a demand for data, the respondents have identified ways in which to increase the demand for data. These have been grouped into 6 themes namely training and support in the provision of quality data, the utilization of the data, increase in resources, feedback and presentations, and the rationalisation of data.

Training and support in the provision of quality data.

Participants observed that training and support is necessary to increase the demand for data.

> *I would try to make the training interesting. I would ask which patients come here a lot. We would draw that patient's folder, what she was here for. I would make it interesting for the people and they would select the patient that we will base the training on.*
> *…it is also important that the staff be made aware of what is going on in the communities, there will be clinic committees and hospital facility boards, and the DHC, and it's very important that we also sensitize them that this is the data that is available.*
> *They need training on how to use information to make decisions.*

The utilization of data

Some participants observed that that data should be used to create or motivate for posts, increased use at operational level, and to use graphs to inform the public about the performance of the facility. A programme co-ordinator is quoted by saying

> *What I would like to see is Operational managers becoming more involved in their own data. It's not just about capturing and passing it on to the next level. But it is the actual interaction with their own data at a facility level.*

And an information staff member said that the graphs are hanging on the notice boards, but are the patients aware of this and what it means.

The increase in resources

One manager and one information staff member mentioned that an increase in resources such as staff and equipment is needed to increase a demand for data. The manager mentioned that certain categories of staff are performing multiple roles, because of the capacity problems experienced in their sub-district. She is quoted as saying

> *If you have capacity to collect data, in my mind, that would make it clear what you need. But if you are short changed, there will be a gap, and this is what's going on now. In each clinic, I only have 1 administration clerk that also serves as a data capturer.*

Feedback and presentations

Two managers felt that feedback sessions and presentations would increase the demand for data. One manager felt that feedback sessions would benefit them at facility level. The other manager said that the Operational managers use the M&E meeting as a platform to present their data and by doing this they will increase the demand for data at facility level.

Rationalization of data

The programme co-ordinator mentioned that there is a need to rationalize the data elements, the registers and other data collection methods, which has already started. She is quoted by saying

> *Yes, we would still like to see some rationalization and I think those processes have started already. And of course it doesn't happen overnight.*

4.2. Data Collection Procedures

In the West Coast district the data collection procedures follow the Western Cape Provincial Data Flow Policy of 2012, as well as adhering to the National DHMIS Policy of 2012.

4.2.1. Perceptions of the usefulness of data collection tools

The data collection tools have consistently been described as being either user friendly or not user friendly. Majority of the respondents opined that the tools were not user friendly. They described the tools and registers as being too many, being tedious, having too many elements, too many categories, print too small, impractical, not durable, heavy, cumbersome, labour intensive, repetitive, loose papers often get lost, a risk for infection.

One programme co-ordinator said that

> *We don't like it, the registers. First of all- user friendly? – its too many information, too many registers that could be used for 1 patient, we could even be looking at 3 registers per patient, because the kind of service that they require.*

A manager described it as

> *I think its cumbersome, we don't have the capacity to adhere to all those registers and tick sheets, and all these things.*

However, a few who mentioned that the data collection tools were user friendly mentioned specific aspects of the design (e.g. the new design of separating the adult and child JIMI tool, as more user friendly than the combined tool). A programme co-ordinator, who was new in the district and coming from another province, was very impressed with the manner in which the tools are designed, as it makes it effective when doing an audit trail. The managers mentioned that it is very user friendly and they cannot do without it, even the stickers fit and the font is clearly visible.

Limiting factors on the tools identified were lack of dedicated staff especially at the satellites and mobiles that jeopardized the timeous capturing of data, lack of IT support and replacing of old computers, the frequency of changing tools and registers making implementation difficult as existing tools have to be amended/recalled and staff needs to be trained.

4.2.2. Description of skills and abilities

The respondents had to describe their abilities with regard to Microsoft packages WORD, EXCEL, PowerPoint, Outlook, Data Analysis, Data Interpretation, Data use, Indicator and Target setting and M&E abilities. Furthermore, they were required to indicate whether they would require further training in these specific areas.

Many of the respondents had no formal training in the Microsoft packages but had some working experience having been self-taught, while a few of the respondents had some basic training, while only two of the respondents had either advanced training or felt that their abilities were excellent.

Many of the respondents identified a need for training in order to do perform their tasks better. Although only two information staff members expressed the need for further training in WORD and PowerPoint, but the vast majority, which included two managers, four information staff members, and four programme co-ordinators felt that they needed training in EXCEL, which ranged from basic, intermediate to advanced proficiencies.

One information staff member mentioned that

> *I need more training/input in WORD, EXCEL. I need maybe the intermediate to advanced course in EXCEL.*

A programme co-ordinator mentioned that

> *I think I can improve on manipulating pivot tables in Excel - especially the advanced courses where I need more training,*

On data analysis, an information staff member and five managers, had no formal training and either felt they could not analyse the data or were limited in their abilities. They felt they needed further training in the area of analysing data. Another manager, two programme co-ordinators and an information staff member felt that their abilities were good because of either formal training or because of being self-taught.

A manager at the facility level said that

> *We don't do it here, …. does it at the sub-district, but we discuss it every quarter at the M&E, I can't do it myself, but I understand it.*

On data interpretation, two programme co-ordinators, a manager, and an information staff member felt they had a good understanding on how to interpret data either through formal training structures or having being self-taught. Two managers, felt that they did not have a good understanding of interpreting data because they were not comfortable with doing this. However, many of the respondents still felt that they needed more training including a programme co-ordinator, three Information staff members and a manager.

On data use abilities two respondents including a programme coordinator and a manager felt that they had a fair to good understanding of how to use data. Another manager felt that she did not have a good understanding on data use and that she needed training on this. Two information staff members also felt they needed training in this area.

On indicators and target setting, three respondents felt they had a good understanding on indicators and target setting either through formal training or being self-taught. This included the two programme co-ordinators and a manager. However, a few respondents including two managers felt that there understanding on indicators and target setting was limited due to the lack of formal training. They felt they needed more training in this area.

With regards to M&E abilities two programme coordinator felt that they had a good to excellent understanding of M&E due to their formal training, while one manager felt that she did not have a good understanding as she had no formal training. Many of the respondents including the operational manager and four information staff members felt that they needed formal training in this area to perform better in the respective work areas.

4.2.3. Improving data collection processes

However, despite the many challenges, the respondents have come up with some innovative ideas as to how the data collection process can be improved. The overall majority wanted to do away with the paper based manual systems and replace it with automated electronic systems, while a few mentioned more improved data collection processes, more dedicated and adequately trained staff, and more equipment and improved network access.

Automated electronic information systems

Respondents from all categories of staff identified the use of electronic systems to improve the data collection process. They described an integrated information system that interfaces and is interoperable with all the other relevant information systems. In terms of the existing information systems available, the Information officers needed enhancements and upgrades to automatically produce the M&E indicators and graphs. A manager is quoted as saying:

> *Yes I will be happy if we can automate. Data is at the moment getting lost*

and similarly, a programme co-ordinator mentioned that

> *… we should move closer and faster to electronic systems. Then you can optimally use your scarce resources like the CNP, staff nurse, professional nurse, and take those things away from the nurse.*

And one of the Information staff members is quoted as saying

> *I think if the M&E indicators can be on there, it would make it very easy. And if it could give graphs which are easier to make a whole trend for the facility to see, with all the elements of each category. To make the monthly reports which are easier to make. For example, 1 outlier report for the facility, 1 validation report per facility, and not for each category in the dataset per facility.*

Improved data collection processes

Many of the respondents felt that streamlining the data collection processes, rationalizing the tools and registers, and collecting only the most essential information would improve the data collection processes. One of the managers mentioned that,

> *I think we can improve on streamlining of data processes, I think its cumbersome, we don't have the capacity to adhere to all those registers and tick sheets, and all these things. It's really putting the people up to failure, because they are not doing it as good as they can because of our capacity problems.*

A programme co-ordinator wanted to see *"some rationalization and I think those processes have started already. And of course, it doesn't happen overnight."*

An Information staff member said that in his opinion if information is not being used, it should not be collected, because it is time consuming and labour intensive.

Dedicated and adequately trained staff

Some of the respondents that felt that dedicated and adequately trained staff will improve data collection processes. An information staff member mentioned that the provision of dedicated capturing responsibilities of staff at facility (e.g. data clerks) would improve the data collection processes.

> *I would like the facility clerks to capture it all, all of the data. They don't capture on SINJANI yet, they still do paper based. They don't even capture PHCIS, management should enforce the process. They are not enforcing the process.*

The training would specifically revolve around definitions training, and training in the relevant electronic information systems. Another information staff member mentioned that she would *"give* *active training and support them with the physical process of how to get the good quality data"* and that she would *"implant the data definitions in their heads and the validation errors."*

Equipment and improved network access

Two managers felt that computers and improved network connectivity with adequate IT support would improve data collection processes. One is quoted by saying *"Training, computers and network points"* are necessary for data collection improvement to occur.

4.3 Data Quality

The respondents described their perceptions of the quality of the data and how the quality of the data could be improved.

4.3.1. Perceptions of the quality of the data

When asked what the respondent's perceptions were around the quality of the data, some of them responded that the data was of a good quality, while others said it was of a bad quality, and still others felt that it was of a fair quality. There was one respondent that felt she did not know what the quality of the data was.

Categories of data were also identified by the respondents as having data of a better quality or those categories of data which has a poorer quality. They also identified reasons for the better quality as well as identifying the reasons for poor quality data.

Good quality data

Four of the respondents described the data as good quality in their areas. One information staff member is quoted as saying

> *I would say that our data in the sub-district is of a good quality. PHC facilities they are sometimes recording, they are sometimes not reporting, they are sometimes not collating. I wouldn't say they were that good, good quality data, I would say they are just below good quality data.*

Similarly a programme co-ordinator said that the

> *data quality is at about 85-90% quality, and that is because of all the activities happening from facility level to district level. There are still areas needing improvement. The HAST programme and information management have a very good relationship, and when we pick up something we will communicate. We not 100% yet, we know there are still gaps.*

Areas of good quality data included the PMTCT data, which was identified by two managers, and two information staff members because of the number of data elements that needs to be collected. One information staff member is quoted as saying *"The PMTCT baby follow up data – Very few elements and it has very good quality data"* and another Information staff member is quoted by saying

> *PMTCT baby follow up data is better because there's hardly babies, only once in a while we will find a positive baby, and we are doing very well in preventing. There is also a small amount to handle as compared to PHC, ART, and TB. Also because the follow-up of these patients are easy because there's so few patients.*

A few of the respondents also acknowledged that the ART data is of a good quality as well. Their reasons included that it has been decentralised to the facility level where it could be better managed and the manner in which it was rolled out, implemented and maintained. An information staff member said that the *"ART data has been decentralized and every facility is responsible for their own patients,"* and a manager is quoted as saying *"When the HIV programme was implemented it was implemented and there was no compromise on the quality of the data and the data that they wanted."*

One of the programme co-ordinators also mentioned that the ETR and EDR data was of a good quality. She described that the district is so focused on TB as it is a priority area in the district. The EDR data has also recently been decentralized to sub-district level where dedicated data clerks have been assigned to capture the data, as opposed to it being captured at hospitals previously. She is quoted by saying that

> *ETR is of a better quality because that was the thing HAST co-ordinators were focusing on… EDR only used to be available at district level, and we are in a process to decentralize to SD level…In the past we had challenges with recording because of lack of data capturers. Now we have focal persons to do the capturing at SD level, this has improved quite a lot.*

One of the information staff members mentioned that PHC data is of a better quality as *"PHC is of a better quality"* because there are controls in place to govern when and how data updates are made, which is important for auditing purposes.

Other reasons for describing the quality of data as good included there is lots of cross checking that gets done and the Information compliance unit assess and monitors the quality of the data on a regular basis.

Poor quality data

Four respondents described the data in their area as being of a poor quality. One manager is quoted by saying

> *The quality is not good, because of the staff shortages and the fact that the work is so labor intensive.*

An information staff member mentioned that the quality is a challenge, because of the staff turnover rate, and the resultant training which is required. The specific areas where the quality of the data is poor has been listed as Community based services, HAST data (specifically TB, ART, HCT, Male condoms), RMR data (Headcount). The reasons for the CBS data being of a poor quality is that the elements are new and the processes have not been standardized. A programme co-ordinator said that

> *I'm very worried about CBS at this stage, because it's new and our trainers are going through new training, so we have to wait and see what comes out and we will take it as it comes our way. But I think on the whole there are still a lot of discrepancies…*

An information staff member described the HAST data as

> *With regards to ART, the reports are not the same when you draw it at different times of the month. It changes all the time, because of processes that they do such as cleaning of the data, and this doesn't always get filtered up to the district level at different times of the month due to late capturing and lack of timeliness of data for reporting that compromises the quality. This is the same for ETR, where, it does not end off, or cut off at a specific time.*

A manager mentioned that the HCT data is of a poor quality as the service is run by NGO's and there are challenges with performance of the staff. A programme co-ordinator mentioned that the recording of the male condoms on the bin cards proved challenging during audits. And an information staff member recognized that the PHC headcount was problematic when having to be reconciled with registers and data input forms.

Other reasons for the poor quality included

1. Staff capacity and persons performing multiple roles (Data clerk and Reception clerk, Operational manager and Facility manager, Information officer for both Hospitals and PHC data) as described by two managers, and three information staff members. One information staff member is quoted as saying,

> *There is just so much going on for that one person to do. The data clerk and the reception clerk are the same person. 80 % of the clerks do not collect data, the CNP's collect the data, and each nurse collects their own data, they would put it on a service point and there is no time for quality checks.*

And one manager mentioned that there are enormous staff shortages at many of the clinics having only one clerk, and not a data capturer, that must do everything from folders to switch board and everything else. Also the other information staff member mentioned that,

> *We have one information officer per sub-district, who monitors hospitals and sub-district data. One person monitoring both.*

2. Too busy or forget to tick the services or leave the ticking for later as described by a manager and an information staff member. The manager said that

> *Maybe you don't mark it off, you forget, or you are too busy, or you tell yourself you will do it later. The people sometimes keep the folders to mark it off later.*

1. Too many tally sheets and registers as described by a manager
2. The lack of an efficient folder flow process as described by a manager
3. Labor intensive validation practices as described by a manager
4. The implementation of the Integrated model where the clinicians are expected to do "everything" as described by a manager
5. The lack of definitions for all elements, especially the HAST data elements as described by an information staff member.

Fair quality data

Four respondents described the data in their area as fair quality. A manager said that

> *The capacity that we have in comparison with other districts, we are doing fairly well. There are gaps and we do know of it. There are some areas that do not do well. But …. does focus on them. I think we fair quite well, despite the capacity problems.*

An information staff member said that

> *The data quality can definitely improve. In two of the sub-districts we are scoring 70% and 80% in Bergrivier and Swartland in the audits. In Saldanha we have had an improvement to 70%. In Matzikama and Cederberg we need to look at the quality.*

Only a programme co-ordinator said that she didn't know what the quality of the data is like as she only sees it once it has been cleaned by information management already.

4.3.2 Improving the Quality of the Data

The respondents identified areas in which to improve the quality of the data. These included the use of technology, addressing the staff challenges, taking ownership of your data, adopting an outcome based approach, training, providing feedback sessions, the provision of incentives and rewards.

The use of technology

Five of the respondents felt that the use of technology would improve the quality of the data. One of the managers felt that better quality would result if an electronic RMR would be implemented. An information staff member is quoted as saying that

> *I think if they should have a booking system at the facilities, and if they would only work according to the booking system they would be able to manage their time better. That would free up some time for everyone to take time to ensure good quality data*

and another information staff member is quoted as saying *"accept the technology that we have and make it work for you, because that is what we have at the moment."*

The other manager explained that she would like to see an information system with built in error checking and compulsory fields that do not allow you to continue unless you have completed a section. Similarly, she also felt that improving the manner in which systems are introduced will improve the quality of the data. For her the TIER system was rolled out beautifully, with all people working in the area understanding the processes but with other systems e.g. PHCIS the implementation was problematic.

Addressing the staff challenges

A few of the respondents felt that addressing the staff challenges would improve the quality of the data. A programme co-ordinator is quoted as saying "*In the past we had challenges with recording because of a lack of data capturers. Now we have focal persons to do the capturing at SD level, this has improved the quality quite a lot."*

A manager mentioned that due to the lack of staff at facility level to validate data, the quality issues then need to be addressed at sub-district level. She is quoted as saying *"If we can start to address the capacity issues, this will help."*

Taking ownership of your data

Two of the respondents felt that taking ownership of the data at facility level would improve the quality of the data. A programme co-ordinator mentioned that the data should be well maintained and they would need to take ownership of their data. An information staff member is quoted as saying

> *Data quality also needs to take into account ownership, who takes that ownership. Ownership is supposed to be at facility level. So when they do have access and monitor their data at facility level, the quality will improve. At facility it is important to check on data quality before it goes to the next level.*

Adopting an outcome based approach

A programme co-ordinator and an information staff member felt that allowing the staff to see the outcomes in the work they are doing in an outcomes-based approach would improve the quality of the data. The programme co-ordinator is quoted as saying

> *There should be an understanding of why they are working and I would like to be able to tell that NPO "when the facility saw 200 TB patients for that month, and they put 15 new people on treatment, I would want that NPO to know that those referrals that they made, that you picked up 8 of them are on treatment. This is adding value for me.*

The information staff member is quoted as saying

> *If we had DHIS, instead of SINJANI, that gives you your outcomes immediately, that will help, as we are now only getting our outcomes a year later from DHIS reports. SINJANI doesn't give you the nice outcomes that DHIS gives. This makes it so difficult.*

Training

One information staff member mentioned that training the staff in the areas that they are lacking would improve the quality of the data. He realized that he himself needs more training in ETR to impact the quality of the ETR data.

Providing feedback sessions

One information staff member mentioned that feedback is important to improve the quality of the data. She is quoted as saying "*show them what they currently have and what they should have, looking at targets, how data is applied, such as in some facilities.*"

The provision of incentives and rewards

One information manager also recognized that the provision of rewards and incentives for good quality data would improve the quality of the data. She is quoted as saying that

> *Facilities have also been rewarded, not in monetary terms but rewarded for achieving good quality data e.g. a SD received water towers at all facilities, another one received a building for rehabilitation services.*

4.3.3. Attitudes towards data

The perceptions of the respondents on people's attitudes towards data ranged from people having negative attitudes, people's attitudes are changing towards more positive, or that it depends from person to person. Also, they had to give suggestions on how they could influence the negative attitudes for the better.

Negative attitudes towards data

The vast majority felt that people have negative attitudes towards data, and that was evident from most categories of respondents. The respondents felt that peoples attitude to data was that *"they have to do it", they "hate" it, "they don't understand the importance of data", "they don't like it", "they have no interest in data", "the staff is too busy", that data management is "too much work", the "patients are their first priority", it's one of those things that are "last on the list", "it's a burden", "they do not value the data", "they are not impressed", "it is boring",* and *"it's difficult to implement".*

Attitudes are changing to more positive

Two of the respondents mentioned that people's attitudes are changing for the better, although they admit that previously it was bad. One information staff member is quoted as saying

> *People's attitudes have improved. Previously people did not want to have anything to do with data. It has improved. They appreciate when they can go on the training, they appreciate the value of data, they check for errors*

Attitudes differ from person to person

Two managers felt that people's attitudes differ from person to person. One was quoted by saying

> *I think it differs from person to person. But I think we are progressing in understanding and sensitivity of the importance of data collection. There is still room for improvement and there are some who don't bother with data, but no-one complain if you come to give the outcome of the data. Then they are pleased to see that they are doing well, we are moving in leaps in this regard.*

The other manager also mentioned that it depends on who the person is, if it is the nurses, they would prioritize their patients and if they have time they would see to the data issues.

4.3.4. Improving people's attitudes

All of the respondents felt that that they could help to influence people's attitudes in the areas where they work. Many felt that management had a huge role to play, while some felt that feedback would improve people's attitudes, that training and support would make a difference that using the data to link it to necessary resources and that data management should be made more user-friendly.

Management to play a huge role

Many respondents felt that management intervention was necessary to improve people's attitudes. The information staff members felt that management should stress the importance of data and that all relevant staff should have some aspect of information management be written into their job descriptions. One of the managers wanted management to create a positive working environment with sufficient staff to do the work that is required. A programme co-ordinator is quoted by saying

> *You know last year we started a process with …, where we identified 12 of our operational managers and they went on this management development programme, and I can guarantee you that 2/12 is not doing well. I think it's about attitude, maybe. The rest I can tell you, there is a marked difference since they are back from that course. And we still advocating for that course … and we have highly recommended the programme*

A manager identifies the importance of providing incentives to motivate people. She is quoted as saying

> *We have an award evening, on an annual basis, they call it a "Carin Day", and I decided to reward based on the priority indicators…I usually give 2- 3hours off from work and everyone from the cleaner to the manager can take 2-3 hours off... last year in April we had and also will be having this year, an award giving function where we issue appreciation certificates and give them a cup of tea and a cupcake.*

The provision of feedback

Many of the respondents also felt that the provision of feedback in the form of displaying data on notice boards, constant communication with staff on the importance of data, inspiring the staff, as well as listening to what the people have to say and hearing their concerns and suggestions, would improve the people's attitudes towards data and change their mind sets. A manager is quoted as saying

> *We also have 4 notice boards and 1 is allocated to M&E. They must put their own clinic achievements and draw the attention of the community around them.*

A programme co-ordinator said that they should

> *Also have people input to come up with suggestions*

Training and support

Some of the respondents felt that training sessions, workshops and constant support would contribute to improving people's attitudes towards the data. A programme co-ordinator and the managers agreed that training the data clerks in programme information is crucial in improving attitudes towards data management. The programme manager is quoted as saying

> *What we also did last year with all the data capturers, we put them through a very basic course of programme stuff e.g. the basic clinical stuff around TB, why is it important to capture signs and symptoms, linking it to the screening part. So we linked whatever they needed to collect to what is in the clinical programme. So it will not just be a number, but that number must make sense to them as well.*

Using the data to link it to necessary resources

A few of the respondents felt that using the data and linking it to resources would assist in influencing people's attitudes for the better. A manager felt that the data should be used to motivate for the creation of posts.

Data management should be made more user-friendly

One of the Information staff members mentioned that she felt that people's attitudes could be influenced for the better by implementing an electronic information system (PHCIS) and ensuring that the tools are made to be more user friendly for the people to use. She is quoted as saying

> *Make sure that they know the importance of their work. Make tools user-friendly, implement PHCIS, where they can scan and get rid of paper based. Give trainings and provide support.*

4.4. Data Availability

The respondents identified certain structural constraints which affected the availability of the data as well as to identify how the data availability can be improved.

4.4.1. Structural Constraints to the availability of data

The respondents identified four areas that affect the availability of data when needed. This included structural constraints such as staff capacity and responsibilities, transport issues, the lack of efficient technology and equipment shortages.

Staff constraints

Many of the respondents from all categories felt that staff capacity was a major factor affecting the availability of data. The vast majority mentioned that there are definitely staff challenges, especially with regards to information staff including data/information clerks at facilities to senior administration officers at sub-district level. One of the managers is quoted as saying

> *Staffing – we have a big capacity problem in the district*

An information staff member said that

> *The staff is non-existent. We have one IO per SD for PHC and Hospitals. We don't have IM data clerks, IM clerks, just a few at District office.*

Another manager even described the staffing challenges as a *"crisis situation"*.

There was however another manager who said that they did not have any staffing problems at the moment.

The roles and responsibilities of the staff also seemed to be a factor affecting the availability of the data. Many of the respondents felt that the staff often had to perform multiple tasks, due to staff shortages in the district. One of the managers mentioned that

> *We only have 1 AO to oversee the PHC and the hospitals. It's too big because of the distances. So the monitoring and collation and validity is lacking because of supervision that is not there. It makes it difficult for … and the SAO in this office because of the cadre of staff that is lacking in the sub-district. Because there's no SAO, we must do it. There's only 1 AO per sub-district. This is the leader of the pack. So its … and the SAO and AO's here. So they are very much out there to assist and out of the office here, instead of doing some analysis work here, they are out there to monitor. That is not their job at all.*

An information staff member also mentioned that there is only 1 admin officer at sub-district level to cover both the hospital data as well as the sub-district PHC data. She is quoted as saying "*IM staff get tangled up with IT issues, technical issues, and especially with QI data where we are responsible for monitoring the data also."*

And another manager also mentioned that the data clerk at her facility also had to manage the data at five satellite clinics and a mobile clinic. She is quoted as saying

> *She does all the information management on a daily basis here at our facility. Here by us, we also have 5 satellite clinics and a mobile clinic, and the person manages their data also. It's a very huge workload, but she copes and her work is always on time and of a good quality.*

However, an information staff member and a programme co-ordinator felt that staff actually know what their roles and responsibilities are. The information staff member is quoted as saying *"IM know what we should do"* and the programme co-ordinator said that people are now clearer with regards to HAST data roles and responsibilities.

Transport constraints

Many of the respondents identified transport as a structural constraint in the availability of the data. Poor roads, roadworks and long distance to travel were cited as problematic in certain areas especially in Matzikama and Cederberg sub-districts. A programme co-ordinator is quoted by saying

> *You know if this is your staff, then this is all you have, nobody calculates the distances that staff need to travel, just say you need to work for at least 7 hours for the day, but you take 2 hours of the day you are actually travelling to get to where you need to render the service. We've got 26 satellites, and those satellites need a service, and they are depleting your fixed facilities.*

A manager also mentioned that in Matzikama sub-district the driver collecting and delivering samples to and from the laboratory is also used to transport the data forms between facilities and the sub-district office.

The need for more cars was also raised as the existing cars are not always available when needed because it gets issued by the hospitals. Another manager is quoted as saying "*We are in need of more cars especially in Matzikama, and with new people coming on board."* The information staff members mentioned that driver's licences are sometimes a problem, especially with the interns that are appointed as they do not always have driver's licences and they are also not allowed to drive the government cars as they are not permanent employees.

Technology constraints

Many of the respondents from all the categories identified technology issues as affecting the availability of data. The area of greatest concern was with the limited network connectivity, especially in far rural and at the satellites. A manager is quoted as saying "*Connectivity – we struggled a lot and remember our satellite clinics don't have, that's why we struggle.'*

Also, computer hardware, software and computer theft also contributes to the technological constraints affecting the data availability as was identified by another manager, a programme co-ordinators and two information staff members.

IT support was also identified as a technological constraint as identified by one of the managers, and two programme co-ordinators. The time taken to respond to the call logged has been identified as unacceptable. The manager is quoted as saying

> *They do come out but its sometimes cumbersome, they take some time to get here. Each call must be logged separately, so if I have a problem, and when they come to me, …also has a problem, they will not see to her problem at the same time, she must log her call. This is how they work.*

Equipment and Stationery constraints

A few of the respondents identified the lack of equipment or broken equipment as structural constraints to the availability of data. Copiers, fax machines, printers, scanners were amongst those equipment constraints. This is especially evident at the satellites and mobiles.

With regard to stationery shortages, only one respondent, the Information manager said that it could be a problem, only because of supply chain issues. She is quoted as saying

> *Stationery – problems with supply chain management and ordering is sometimes a problem.*

4.4.2. Improve the availability of data

All of the respondents gave some suggestions on how data could be made more available when it is needed. This included:

1. Increasing the staff numbers. A manager mentioned that "*the satellites and mobiles need clerks, …we cannot expect the CNP's to draw data and to do the data".*

2. Management to intervene in providing support and staff to relieve when there is someone on leave. An information staff member said that *"the operational manager must take part in assisting with the tallies when someone is on leave or make sure there is a relief person*".
3. Improved network connectivity. A manager mentioned that *"network connectivity*" can also help.
4. The provision of a standard operating procedure and the effective use of the request for data template. A manager mentioned that "*there is no standard operating procedure for this*".
5. Provision of necessary equipment. A programme co-ordinator mentioned that *"computers need to be procured."*
6. Do away with nurses doing the work of a data clerk. A programme co-ordinator mentioned that Nurses are not information management, *"Nurses are nurses. Give the responsibility of data collation to the people that is responsible for that. Nurses are responsible for nursing."*
7. Moving HAST information into Information management. A manager mentioned that *"All these data sources are not always available because its been done from health programmes HAST, but they are in a process to move that info data to provincial info management."*
8. The provision of a general job description for clerks. A manager mentioned that "A JD is one"
9. Provision of improved transport. A manager mentioned that *"Transport, this can be improved."*
10. Improve the timeliness of the data. A programme co-ordinator said that *"I think when the data has been completed on time, it will impact the availability."*
11. The provision of an integrated approach to upskill all staff on information management. An information staff member mentioned that "*We need more staff, we have a limited number of staff, we should look at an integrated approach. We can upskill the HAST admin personnel and we should change the mind-set of the data clerk. Wherever you have persons responsible we need to emphasise the importance of the data. All personnel involved in data and this should also include CBS clerks (the admin support)"*
12. Having a "No compromise attitude" as mentioned by a manager.
13. Changing mind-sets by emphasizing the importance of data. An information staff member said that *"Unless management drives the process of changing mind-sets, and tell them the importance of all the processes, we will stay where we are forever and forever"*

4.5. Data Utilization

All of the respondents were given an opportunity to describe their roles in information management at their respective areas of work. They were also asked to give examples of data utilization in their daily operations, and to describe how data can be used at various levels in the organization ranging from facility, sub-district and district levels. Some of the respondents also suggested ways in which to improve the use of data.

4.5.1. Description of roles in information management

The West Coast district health department have positions that serve different roles at different levels in information management, these include the managers at facility level, the programme co-ordinators at sub-district and district level, and the managers at sub-district and district levels and how they described their roles in information management**.**

The managers at facility level reported in the study are interpreting the data, comparing the data between quarters and years, presenting the data to the staff on a monthly basis as well as providing feedback on the facilities performance to the staff after the M&E meeting which happens quarterly.

The programme coordinators roles, in addition to what was reported by the managers at facility level, are checking on the timeliness and accuracy of the data, following up with the relevant facilities, evaluating programme performance, identifying areas of concern in the performance, identifying areas of need (e.g. training needs), providing feedback to the facilities and monthly reviewing and sign off of the data.

The managers at sub-district and district levels described their roles as one of making sure that there is a constant supply of the necessary tools and registers, that they have input into new tools and new elements, ensuring that the staff receive the necessary training with regard to data management, manage the logistics for the roll out of new services, reviewing and validating the facility data, sign off the data together with the compliance monitoring tool and the facility folder audits, the analysis of the performance data in terms of trends, follow up with the facilities if there is poor performance, discuss the data at various forums such as quarterly M&E meetings and sub-district management meetings, assist the facilities and programmes in implementing improvement plans, prepare presentations and reports for the district M&E meetings. At a district level, to ensure that the data that is reported is a true reflection of what is happening in the field through auditing of folders at the facilities, analysing and interpreting the data to make sense of it, identifying whether there are challenges or needs in specific areas, giving direction on data use, supporting and guiding in activities, communicating results of the data to various stakeholders, and she also acts as an advocate for data in the district. Also, at this level, management take on a more strategic role information management that involve ensuring that data that is reported is very close to the true reflection of what is happening on the ground; monitoring and evaluating the use of data for effective decision making and timely medical interventions and outcomes against targets; and streamlining and improving processes by comparing outcomes by linking various sources of data (e.g. the PHCIS and the manual system, the appointment system and the waiting times of patients). Also ensuring the availability of technical and human capacity.

4.5.2. Examples of data use in their areas of work

A manager at facility level mentioned that when she returns form the quarterly M&E meetings, she discusses the data with the facility staff and if they are doing badly in an area, they make remedial plans to improvement. Another manager also mentioned that she uses data every morning to discuss with the staff the number of patients and the number of staff on duty and how they will manage their patients for the day. It also informs them on staff allocation, leave planning, when they can have meetings e.g. when the facility is not that busy. Yet another manager uses the data to compare it with the targets that she receives and to motivate the staff to do better. Another manager uses data regularly to work out targets, and on a weekly basis they discuss the data and do their planning around that. If they are falling behind, they will push the numbers for the following week.

A programme co-ordinator at sub-district used their data recently to identify training needs in the programme. One of the other programme co-ordinators at the sub-district level uses data to identify whether there is a specific need (in this case low TB smear conversion rate) at a facility and to target and intervene at that facility. She is quoted as saying "*I think I'm always acting on information for instance if the smear conversion is constantly low, then I must target that clinic more often, to try to assist.*" Another programme coordinator uses data to make graphs for her facilities to show how bad the smear conversion rate is and to help them to make improvements. A programme co-ordinator at sub-district level said she uses data on a continual basis to evaluate programme performance. While another coordinator used data for the antenatal initiation rate at hospitals and the recording of this at the facilities. She found a gap, in terms of no referral system, and she could intervene by putting in place an improved patient flow strategy to improve the antenatal initiation rate from patients coming from the hospitals to the PHC facility.

One of the managers at sub-district level used her data to identify needs within the community and informs the relevant people for example the community based caregivers to assist and support. Another manager at sub-district level use data for planning and she also teaches the staff to use the data to motivate. She is quoted as saying

> *Last Friday, we had our Operational Planning meeting, and they received data to do the planning. So everything I do, I teach them to look at their data and to motivate.*

Another manager at sub-district level used her data to motivate for staff, equipment, budget, infrastructure and also to provide feedback to her facilities.

A manager at the district level uses a recent example of using termination of pregnancies data and is quoted as saying

> *When I sit with the programme managers on a monthly basis, then I say to them, so you're telling me there are 50 TOP's this month in Swartland, but what is it telling you about the TOP's, does it take you back to teenage pregnancies they want to get rid of, or how does it link to CYPR, should we have done 100 instead of 50, is it about accessibility, so I ask the question, so what if we did 50 TOP's, what does that 50 tell you. We have gotten used to that question "SO WHAT?", Was there sepsis with these 50 TOP's, who came back for DMC's after that, So what is the quality tag that you put to that 50. Instead of just seeing the number, are you able to tell me that 50 that was done and was it done according to the policy. Did we have all the drugs to do the 50, did some of them go home, so tell me more.*

Another manager at the district level uses data to

> *compile reports, for preparing data for politicians, or a meeting or for district visits from top management, for our own internal planning, to monitor our own progress in terms of programmes.*

While another manager at the district office uses data for speeches in the community and has used data recently to decide whether a complaint from a nursing sister at one of the facilities was valid. She explained that

> *When I was visiting Wupperthal 2 weeks ago, the Sr there complained that she must do everything and I came back and asked my assistant director to give me the last 3 years headcount and also the chronic diseases, an analysis of what it is all about at the clinic, to see if her compliant is valid and reasonable or because sometimes people feel that they are overwhelmed but if you have a look into the figures that is not the case that they feel it is.*

At district level, another manager recently used the data to make a booklet of the districts profile on what was relevant for the district to bring to the attention of senior managers who visit the district in terms of 15/16 and 16/17 data staffing numbers, and other relevant information e.g. we looked at CYPR at Cederberg SD, PSS, because we wanted to link the Khayelitsha and Clanwilliam and how that links to the admissions at hospitals, severe acute malnutrition and so on.

4.5.3. Description of how data can be used at various levels

The respondents came up with ways in which to use data at facility, sub-district and district level.
The respondents mentioned that data can be used at facility level to render better services, to motivate for staff, equipment, improve services such as TB screening, for surveillance for outbreaks of disease, to plan their daily services taking into consideration patient numbers and staff availability, identifying areas of greatest need and moving staff around in the facility to accommodate this, monitor waiting times, plan outreaches, identify the burden of disease locally, capacitate staff, to discuss the data, to improve on performance against targets and to put remedial plans in place for under-performance.
They felt that at sub-district level data could be used to look across the facilities, to identify where the greatest need is and to intervene at these facilities in terms of efficient use of budget and human resources allocation. One information staff member is quoted as saying

> *If … would ask them why they spend so much on vaccines for example, they can explain why, because we see so many patients per day. To offer explanations on how money was spent, for staffing, equipment, for planning ahead, by looking at previous experiences*

The quality of the data can also be monitored at this level when looking across and comparing the facilities. Planning is another use of data at this level. One of the prgramme co-ordinators said the data at the sub-district level could be used as a platform to escalate issues that need urgent attention to higher levels.
There were also a few that mentioned that data at district level could be used for the more strategic decisions such as budget, human resources, equipment, infrastructure allocation, motivation for staff, to identify where the biggest burden is when comparing sub-districts and facilities and allocating resources accordingly. A manager facility level said that the district is in a position to identify outbreaks, plan interventions, provide the staff, resources and all to control the outbreaks. A few also metioned that feedback to the lower levels are also important at this level to keep staff motivated.

4.5.4. Suggestions on how to improve the use of data

The respondents made suggestions on how to improve the use of data. A programme co-ordinator suggested that at facility level the operational managers should be engaging their data more regularly. She is quoted as saying

> *What I would like to see is operational managers becoming more involved in their own data. Its not just about capturing and passing it on to the next level. But it is the actual interaction with their own data at a facility level. I would like to see much more engagement at that specific level.*

Also she mentioned that the data should be linked to each person in the facility. She is also quoted as saying

> *Because even if it is the clerks at reception, who draws the folders, has no clue about the pink or the white or whatever, that person must be able to see that if I have drawn 1000 folders for chronic what is there on that notice board that makes sense to me. At their level, WOW!! This is my contribution to what we have achieved or not achieved.*

Another programme co-ordinator mentioned that intersectoral collaboration is important in using data, the health department is not able to solve all the problems. One of the managers mentioned that the headcount should not be the only data which is used to allocate the staff, but other data such as workload, finance, staffing numbers, and performance sould also be considered. Another programme co-ordinator also mentioned that the data should be linked to the resources and the staff should be made aware of it.

Chapter 5 CONCLUSION AND RECOMMENDATIONS

This study sought to explore the dynamics of routine primary healthcare information utilization in the West Coast district while identifying specific interventions that could ultimately lead to the improved use of data to better inform decision making. The ultimate goal being to enable managers to better utilize their routine health information for effective decision making. Each section is discussed in line with the objectives of the study and is also linked to the relevant literature which either substantiates the finding or is in opposition to the findings. The limitations of the study are also outlined in this chapter.

5.1. Objective 1: To determine the manner in which decisions are made and whether there is a demand for routine primary health data to be utilized in the West Coast district

It is clear from the findings that there is a demand for data in the West Coast. This demand is manifested by the fact that not only are they collecting the data which is required by Provincial and National Departments of Health, including information on community health clinics, community health centre, HIV and AIDS, Nutrition at Primary Healthcare level, extra data is also collected. This is especially evident in the Bergriver and Swartland sub-districts which included extra immunization and extra chronic disease management data, which is not required by National and Provincial Departments for reporting. This data is required by the manager to enable her to make better sense of her data, as these elements were previously collected and she felt that it needed to be continued. This is in line with the Logic model for strengthening the use of health data in decision making (See Figure 11) that emphasises there needs to be a demand for data in order for it to be used (Nutley & Reynolds, 2013).

With regard to how decisions are made, all the participants mentioned that evidence facts or data is paramount in decision making in the West Coast. Target chasing and policies were the second and third highest factors influencing how decisions are made. Managerial directives were identified as the fourth highest factor on which decisions are made. Considering costs was next, followed by health needs, a sense of knowing, and personal likes. Most of the participants felt that decisions were very unlikely to be taken arbitrarily, based on power and influence, by responding to rumours, corruption, and crisis. This is in contrast to what Nutley et al (2014) found when it was mentioned that too often data is under-used and even unused, especially in the decision making processes and that managers rely on their "sense of knowing" or "expert opinions" when it comes to what the health needs and priorities in the populations that they serve are (Nutley et al., 2014). As well as being in contrast to what is described by Brownson et al (1999) when he states that decisions are often based on short term demands, rather than long term study, while policies are frequently developed around anecdotal evidence and that decisions in public health are often driven by crises, hot issues, and concerns of organized interest groups.

Although there is a demand for data in the West Coast and most of the decisions are based on evidence facts or data, the respondents have also suggested ways in which to increase the demand for data. These included providing training and support, increasing the utilization of the data, increasing the existing resources, the provision of feedback and presentations, and the rationalization of data. And some of these are in line with strategies that have been identified in the above mentioned conceptual framework to improve the demand for data as (1) assessing and improving the data use context; (2) engaging data users and data producers; (3) improving data quality; (4) improving data availability; (5) identifying information needs; (6) building capacity in data use core competencies; (7) strengthening the organization's data demand and use infrastructure; and (8) monitoring, evaluating, and communicating results of data use interventions (Nutley & Reynolds, 2013).

5.2. Objective 2: To explore the routine primary health information collection processing procedures in the West Coast district

The data flow process is outlined in the Introduction Section 1.2.1 and it follows the National and Provincial Data flow policies. The vast majority of the respondents mentioned that the tools were not user friendly. They described the tools and registers as being too many, being tedious, having too many elements, too many categories, print too small, impractical, not durable, heavy, cumbersome, labour intensive, repetitive, loose papers often got lost and a risk for infection. Other limiting factors were also identified which gave rise to the challenges experienced in data collection, which included the lack of dedicated staff especially at the satellites and mobiles as data is not being captured timeously or gets lost between facilities, lack of IT support and upgrading and replacing of old computers, the fact that new tools and registers are rolled out throughout the year and implementation is then difficult as existing tools have to be amended/recalled and staff needs to be trained. These challenges with regard to the design of data collection tools are vastly quoted in the literature as being constraints to data use (Nicol, 2015), (Byrd et al., 2013), (Davidson et al., 2003), (Mate et al., 2009), (Mphatswe et al., 2012), (Murai et al., 2011), and (Martin, 2000).

To optimize data collection, it is essential that the staff have the technical skills and abilities to do their work (Goodyear-Smith et al., 2008), (Hahn et al., 2013), (Ledikwe et al., 2014), (Mate et al., 2009), (Mphatswe et al., 2012), (Ndabarora et al., 2013), (Nicol, 2015), (AbouZahr & Boerma, 2005), (Gagnon et al., 2009), (Nutley & Reynolds, 2013), (Pappaioanou et al., 2003), (Braa et al., 2012), (Arts et al., 2003), (Mpofu et al., 2014), (Peersman et al., 2009), (Chaulagai et al., 2005), (HMN_WHO, 2010), (Otwombe et al., 2007) and (Gourlay et al., 2015). Many of the respondents had no formal training in the Microsoft packages, data analysis, data interpretation, data use, indicators and target setting, and monitoring and evaluation, although many of them had gained experience in these areas, and many were self-taught. Many of the respondents felt the need for formal training in these areas so that they could use their valuable time more effectively and perform better in their respective work areas. The vast majority expressed a need for training in EXCEL which ranged from basics to advanced levels.

From the technical skills test which tested the abilities of the Information staff in analysing data, their interpretation skills, and possible uses of the data it was found that the Information staff, especially the Information officers had poor to limited abilities. For basic calculations in data analysis such as percentages and mean percentages, four of the five respondents were able to correctly do the calculations. Only two of the information staff was able to develop a bar graph from information related to the question on percentage. Only two of the respondents could interpret the findings of the graphs adequately. Only one respondent, the Information manager, was able to provide possible uses for the data at facility, sub-district, district and community levels.

However, despite the many challenges, the respondents identified some areas to improve the data collection processes. The overall majority wanted to do away with the paper based manual systems and replace it with automated electronic systems, while a few mentioned more improved data collection procedures, more dedicated and adequately trained staff, and more equipment and improved network access.

5.3. Objective 3: To determine the perceptions of the quality of the routine primary health information of the West Coast district

The quality of the data is often mistrusted and this influences the utilization practices by some managers. The ICU assessment revealed that the majority of the facilities assessed fell in the area of medium risk at 45,45%. The key compliant indicators where most of the facilities were struggling with included that the monthly data input forms do not agree with data in the service point registers. Other areas included performance trends and data quality challenges not presented and folder audit teams not nominated and appropriately represented, data captured in Sinjani does not agree with the detail in the monthly data input forms/reports, patient folders could not be located, validity and completeness could not be established.

Similarly with determining the perceptions of the respondents with regard to the quality of the data, they expressed mixed feelings, with almost equal amounts describing the data as good, poor and fair. Although they were somewhat divided in their expressions, they could come up with some strategies to improve the quality of the data which included the use of technology, addressing the staff challenges, taking ownership of the data, adopting an outcome based approach, training, providing feedback sessions, and the provision of incentives and rewards. This is important towards improving the quality of the data as health systems require quality data from health information systems to plan for and ensure that the workforce is fully funded and equipped with the necessary commodities, infrastructure, resources, and policies to deliver services. For consistent data use to occur, data needs to be of high quality so that data users are confident that the data they are consulting are accurate, complete, and timely. Without quality data, data-informed decision making will not occur and program efficiency and effectiveness will suffer (Mavimbe, Braa, & Bjune, 2005).

Furthermore, people’s attitudes towards data can also influence whether data is utilized. The vast majority felt that people have negative attitudes towards data, although some felt that people’s attitudes are slowly changing for the better and that all people could not be lumped together as it depends on person to person. This then provides a danger that those decision makers with the negative attitudes will not be using the data, as the attitudes as described by Nutley et al (2014) of decision makers will play a big role in determining if data and information are used. If decision makers have no interest in using data, they will make decisions based on other factors.

All of the respondents felt that that they could help to influence people’s attitudes in the areas where they work. Many felt that management had a huge role to play, while some felt that feedback would improve people’s attitudes, that training and support would make a difference that using the data to link it to necessary resources and that data management should be made more user-friendly.

5.4. Objective 4: To determine the extent of the availability of routine primary health information in the West Coast district

Structural constraints have been known to affect the availability of data. Certain structural constraints were identified by the respondents and this included staff capacity and responsibilities, transport issues, the lack of efficient technology and equipment shortages. The respondents also came up with some suggestions as to how data could be made more available when it is needed. Many of these were in line with many of the strategies identified in the literature to improve data quality and use. This included increasing the staff numbers (WHO-HMN, 2009), management to intervene in providing support and staff to relieve when there is someone on leave (Ledikwe et al., 2014), (Mate et al., 2009), (Mitsunaga et al., 2013), (Ndabarora et al., 2013), (Murphy et al., 2013), (Pappaioanou et al., 2003) and (Berg, 2001), improved network connectivity, the provision of a standard operating procedure and the effective use of the request for data template (Nicol, 2015), provision of necessary equipment (WHO-HMN, 2009), do away with nurses doing the work of a data clerk (WHO-HMN, 2009), moving HAST information into Information management, the provision of a general job description for clerks and give it different weighting according to the core responsibilities (Chaulagai et al., 2005), the provision of improved transport, improve the timeliness of the data, the provision of an integrated approach to upskill all staff on information management, having a "No compromise attitude" and changing mind-sets by emphasizing the importance of data.

5.5. Objective 5: To describe the manner in which routine primary health information is used and the circumstances in which it is used in the West Coast district

It is said that everybody has a role to play in data management and that data is everybody's business. The respondents were given an opportunity to describe their roles in information management at their respective areas of work. All of them were in one way or another involved either operationally, tactically or strategically in information management. The roles stretched from data collection, data analysis, data processing, data interpretation, data reporting and data use in varying degrees. They were also given the opportunity to give examples of how they use data in their respective work places. The utilization of data included for motivation for more staff, identifying needs, compile remedial plans, addressing the needs, analysis in terms of graphs, managing the patient load and linking it with available staff numbers at facility level, improve the quality of the services offered, compilation of reports, inform communities about service performance, target chasing, identifying busy times to inform and manage leave and when to have meetings, and to validate complaints of overwork by staff. This was especially true for the sub-district and district levels, but the use of information was slightly less evident at the facility level, where the Operational managers struggled a bit to use information at facility level, because of time constraints and heavy workloads. The use of data is very important in identifying strategies to improve data utilization (Nicol, 2015), (Jacucci et al., 2006), (Murphy et al., 2013), (Nutley & Reynolds, 2013) and (Braa et al., 2012).

There were those at the various levels who came up with some ideas on how to use data at facility, sub-district and district level. At facility level this included to render better services, to motivate for staff, equipment, improve services such as TB screening, for surveillance for outbreaks of disease, to plan their daily services taking into consideration patient numbers and staff availability, identifying areas of greatest need and moving staff around in the facility to accommodate this, monitor waiting times, plan outreaches, identify the burden of disease locally, capacitate staff, to discuss the data, to improve on performance against targets and to put remedial plans in place for under-performance.

At sub-district level the respondents said that data could be used to look across the facilities, to identify where the greatest need is and to intervene at these facilities in terms of efficient use of budget and human resources allocation. The quality of the data can also be monitored at this level when looking across and comparing the facilities. Planning is another use of data at this level. Data could also be used as a platform to escalate issues that need urgent attention to higher levels.

They mentioned that at district level data could be used for the more strategic decisions such as budget, human resources, equipment, infrastructure allocation, motivation for staff, to identify where the biggest burden is when comparing sub-districts and facilities and allocating resources accordingly, to identify outbreaks, plan interventions, provide the staff, resources and all to control the outbreaks. Feedback to the lower levels is also important at this level to keep staff motivated.

Suggestions on how to improve the use of data came from some of the respondents. They suggested that at facility level the Operational managers should be engaging their data more regularly (Nicol, 2015), that the data should be linked to each person working with data in the facility (Murphy et al., 2013), that inter-sectoral collaboration is important in using data as health is not able to solve all the problems, that headcount should not be the only data which is used to allocate the staff, but other data such as workload, finance, staffing numbers, and performance should also be considered.

5.6. Objective 6: To identify strategies for improvement of data quality and use and to make recommendations on how routine primary health information can be used for decision making purposes.

Many strategies for data quality and use have been suggested and are relevant for the South African setting. The findings show that staff capacity and the fact that one staff member performs multiple functions is the major problem in the West Coast district presently. According to (WHO-HMN, 2009), health information staff should be accountable for data collection, reporting and analysis at peripheral levels, and that, too often, such tasks are given to overburdened care providers who see this as an unwelcome additional task that detracts from their primary role. Deploying health information officers within large facilities and districts (as well as at higher levels of health-care systems) results in significant improvements in the quality of data reported and in the understanding of its importance by health-care workers. Similarly according to (Mpofu et al., 2014), recommends that a dedicated M&E cadre should be available at the district level to positively contribute to improving data quality, management, and data use.

Not only should the staff capacity issues be addressed, but also the existing information staff needs to develop improved technical skills, when it comes to Microsoft office software packages especially EXCEL, data analysis, interpretation, indicator and target setting, data use, monitoring and evaluation to enable them to perform their functions optimally and is in line with multiple authors (Goodyear-Smith et al., 2008), (Hahn et al., 2013), (Ledikwe et al., 2014), (Mate et al., 2009), (Mphatswe et al., 2012), (Ndabarora et al., 2013), (Nicol, 2015), (AbouZahr & Boerma, 2005), (Gagnon et al., 2009), (Nutley & Reynolds, 2013), (Pappaioanou et al., 2003), (Braa et al., 2012), (Arts et al., 2003), (Mpofu et al., 2014), (Peersman et al., 2009), (Chaulagai et al., 2005), (WHO-HMN, 2009), (Otwombe et al., 2007) and (Gourlay et al., 2015) who advocate for an appropriately technically skilled staff to perform data management which will ultimately lead to improved data quality and use.

The need for an effective use of technology in the form of electronic information systems, improved network connectivity, and the integration of information systems is paramount in the West Coast. This is in agreement with literature in identifying improvement strategies in automated electronic technology, such as the implementation of electronic health records, computerized registries, tracking and reminder systems, integrating electronic data entry, electronic checks, digitization of routine reporting and automated systems (Angier et al., 2014), (Byrd et al., 2013), (Davidson et al., 2003), (Evans et al., 2011), (Goodyear-Smith et al., 2008), (Hahn et al., 2013), (Ledikwe et al., 2014), (Mate et al., 2009), (Ndabarora et al., 2013), (Thiru et al., 2003), (AbouZahr & Boerma, 2005), (Gagnon et al., 2009), (Pappaioanou et al., 2003), (Myburgh et al., 2015), (Ajami & Bagheri-Tadi, 2013), (Berg, 2001), (Chaulagai et al., 2005), (Haux, 2006), (Braa, 2009) and (Krishnan et al., 2010).

Assigning data quality audits, ongoing data quality assessments, quality checks, regular reviews as improvement strategies are also suggested interventions (Evans et al., 2011), (Goodyear-Smith et al., 2008), (Ledikwe et al., 2014), (Mate et al., 2009), (Mitsunaga et al., 2013), (Mphatswe et al., 2012), (Nicol, 2015), (Ronveaux et al., 2005), (Thiru et al., 2003), (Ward, 2004), (Murphy et al., 2013), (South Africa Every Death Counts Writing Group, 2008), (Mandala et al., 2012), (Nutley & Reynolds, 2013), (Chahed et al., 2013) and (Chaulagai et al., 2005), although South Africa Every Death Counts Writing Group (2008) cautions that audits are powerful, but only if the findings lead to action being taken.

Standardised procedures have also been suggested as improvement strategies, which included standard operating procedures should be developed and implemented, practices should be standardized, standardization of tools and systems, the need to focus on the balance between standardization and local flexibility (Evans et al., 2011), (Goodyear-Smith et al., 2008), (Ledikwe et al., 2014), (Murai et al., 2011), (Ndabarora et al., 2013), (Nicol, 2015), (Murphy et al., 2013), (Jacucci et al., 2006), (Myburgh et al., 2015), (Braa & Hedberg, 2002) and (White, 2015).

Data use as a strategy has also been suggested to improve data quality by assessing and improving the data use context and engaging with data users and data producers, prioritizing data usage, implementing data use workshops and improving the capacity of front-line staff to use data (Mate et al., 2009), (Nicol, 2015), (Nutley & Reynolds, 2013), (Braa et al., 2012), (Haux, 2006) and (WHO-HMN, 2009).

Other strategies as identified in the literature to improve data use were discussed in Section 2.9:

a) Regular feedback and communication - (Mphatswe et al., 2012), (Nicol, 2015), (Chaulagai et al., 2005), (Murphy et al., 2013),
b) Support and supervision - (Mate et al., 2009), (Mitsunaga et al., 2013), (Mesfin, 2014), (Ajami & Bagheri-Tadi, 2013), (Krishnan et al., 2010), (Otwombe et al., 2007),

c) Efficient data collection processes - (Martin, 2000), (Murphy et al., 2013), (Pappaioanou et al., 2003), (Mate et al., 2009), (Mphatswe et al., 2012), (Ndabarora et al., 2013),
d) Importance of perceiving data as valuable and relevant - (Murphy et al., 2013), (Otwombe et al., 2007)
e) Clear definitions for elements and indicators -(Goodyear-Smith et al., 2008), (Murai et al., 2011), (Arts et al., 2003), (Ahonkhai et al., 2012)
f) Responsibilities and Accountability for data - (Murphy et al., 2013)
g) Adequate resource allocation -(Nicol, 2015), (Chaulagai et al., 2005)
h) Strong leadership - (Jacucci et al., 2006), (Haux, 2006), (AbouZahr & Boerma, 2005), (Ndabarora et al., 2013)
i) Recruitment of suitably qualified personnel - (Chaulagai et al., 2005), (Nicol, 2015),
j) Formulating an appropriate minimum set of indicators - (Chaulagai et al., 2005)
k) Development of an M&E cadre of personnel - (Mpofu et al., 2014),
l) Integrated HIM system - (Ndabarora et al., 2013)
m) Project Management techniques -(Ndabarora et al., 2013)
n) Fostering an information culture - (Ndabarora et al., 2013), (Nicol, 2015)
o) Streamlining reporting - (Braa, 2009), (HMN_WHO, 2010)
p) Involving communities - (Braa & Hedberg, 2002), (Chaulagai et al., 2005), (Lippeveld, 2001)

Based on the findings of the study and other relevant literature, the following recommendations have been suggested on how routine primary health information can be more optimally used for decision making purposes.

Firstly, there should be more advocacy for optimal use of information at facility level in terms of more regular feedback, supervision and support from sub-district and district levels.

Secondly, for effective data use, staff shortages should be addressed especially where staff are performing multiple tasks e.g. data clerks (as reception and data clerks at clinics, satellites and mobiles) and information officers (at hospitals and PHC facilities and as IT support). It would be ideal if there was a data clerk at each clinic, satellite clinic and if possible at mobile clinics as well. The sub-district information officer should be at a level of senior administration officer to oversee both the data at PHC facilities and hospitals, because of the vast load which is required of both these designations. The hospitals should have an information officer which is allocated for information management. A permanent IT technician should be based at the sub-district offices as the support from Provincial office is inefficient.

Thirdly, existing information management staff needs to develop improved technical skills, when it comes to Microsoft office software packages especially EXCEL, data analysis, interpretation, indicator and target setting, data use, monitoring and evaluation to enable them to perform their functions optimally.

Fourthly, effective use of technology in the form of electronic information systems, improved network connectivity, integration of information systems be managed appropriately and implemented as soon as possible. In addition, rationalising and redesigning the registers to include user-friendly tools and data elements should be implemented as an improvement strategy.

5.7. Limitations of the study

One limitation of the study was in the sample, which was intended to cover all the sub-districts in the West Coast district, but the researcher was only given permission by the Western Cape Government to conduct the research in four of the five sub-districts. Although this did not affect the results, it would have been ideal to include all the sub-districts in the study.

Despite the strengths of qualitative interviews, they also have weaknesses in this case being prone to bias. Since the researcher was a major part of a research instrument, she was likely to incorporate personal opinions and perceptions into the study, especially around her perceptions of lack of data use in the district. Participants may also anticipate the researchers' expectations and respond accordingly. The probing which was used was very likely to focus the attention of the respondent on the issue of interest.

While the validity of the PRISM tool has been widely used, the researcher felt that the instrument needed to be adapted in order to gather the experiences of the respondents to a greater degree. The appropriateness of the adapted tool may be another limitation to the study as it has never been tested other than being used for this study.

6. BIBLIOGRAPHY

AbouZahr, C., & Boerma, T. (2005). Health information systems: the foundations of public health. *Bull World Health Organ*, *83*(8), 578–583. https://doi.org/S0042-96862005000800010 [pii]\r/S0042-96862005000800010 [doi]

Ackoff, R. L. (1989). From data to wisdom. *Journal Of Applied Systems Analysis*, *16*(1), 3–9. Retrieved from http://www.citeulike.org/user/uvriss/article/11105744

Ahonkhai, A. A., Bassett, I. V, Ferris, T. G., & Freedberg, K. A. (2012). Improving HIV outcomes in resource-limited countries: the importance of quality indicators. *BMC Health Services Research*, *12*(January 2014), 427. https://doi.org/427\r10.1186/1472-6963-12-427

Ajami, S., & Bagheri-Tadi, T. (2013). Barriers for adopting electronic health records (EHRs) by physicians. *Acta Informatica Medica*, *21*(2), 129–134. https://doi.org/10.5455/aim.2013.21.129-134

Angier, H., Gold, R., Gallia, C., Casciato, A., Tillotson, C. J., Marino, M., … DeVoe, J. E. (2014). Variation in outcomes of quality measurement by data source. *Pediatrics*, *133*(6), e1676-82. https://doi.org/10.1542/peds.2013-4277

Aqil, A., Lippeveld, T., & Hozumi, D. (2009). PRISM framework: A paradigm shift for designing, strengthening and evaluating routine health information systems. *Health Policy and Planning*, *24*(3), 217–228. https://doi.org/10.1093/heapol/czp010

Arts, D. G. T., Bosman, R. J., Jonge, E. De, Joore, J. C. A., & Keizer, N. F. De. (2003). Training in data definitions improves quality of intensive care data. *Critical Care*, *7*(2), 179–185. https://doi.org/10.1186/cc1886

Badia, A. (2014). Data, Information, Knowledge: an information science analysis. *Journal of the Association for Information Science and Technology*, *65*(6), 1279–1287. https://doi.org/10.1002/asi.23043

Belay, H. (2013). PRISM Tools Application.

Berg, M. (2001). Implementing information systems in health care organizations: myths and challenges. *International Journal Medical Informatic*, *64*, 143–156. https://doi.org/10.1016/S1386-5056(01)00200-3

Braa, J. (2009). Health Information Systems in Developing Countries. *Vital Wave Consulting*, (May), 69.

Braa, J., & Hedberg, C. (2002). The Struggle for District-Based Health Information Systems in South Africa. *The Information Society: An International Journal*, *18*(2), 113–127. https://doi.org/10.1080/01972240290075048

Braa, J., Sahay, S., Heywood, A., & Sahay, S. (2012). Improving quality and use of data through data-use workshops: Zanzibar, United Republic of Tanzania. *Bulletin of the World Health Organization*, *90*(5), 379–84. https://doi.org/10.2471/BLT.11.099580

Brownson, R. C., Gurney, J. G., & Land, G. H. (1999). Evidence-based decision making in public health. *Journal of Public Health Management and Practice : JPHMP*, *5*(5), 86–97. https://doi.org/10.1097/00124784-199909000-00012

Byrd, J. B., Vigen, R., Plomondon, M. E., Rumsfeld, J. S., Box, T. L., Fihn, S. D., & Maddox, T. M. (2013). Data quality of an electronic health record tool to support VA cardiac catheterization laboratory quality improvement: The VA Clinical Assessment, Reporting, and Tracking System for Cath Labs (CART) program. *American Heart Journal*, *165*(3), 434–440. https://doi.org/10.1016/j.ahj.2012.12.009

Chahed, M. K., Bellali, H., Alaya, N. Ben, Ali, M., & Mahmoudi, B. (2013). Auditing the quality of immunization data in Tunisia. *Asian Pacific Journal of Tropical Disease*, *3*(1), 65–70. https://doi.org/10.1016/S2222-1808(13)60014-6

Chaulagai, C. N., Moyo, C. M., Koot, J., Moyo, H. B. M., Sambakunsi, T. C., Khunga, F. M., & Naphini, P. D. (2005). Design and implementation of a health management information system in Malawi: Issues, innovations and results. *Health Policy and Planning*, *20*(6), 375–384. https://doi.org/10.1093/heapol/czi044

Chen, H., Hailey, D., Wang, N., & Yu, P. (2014). A review of data quality assessment methods for public health information systems. *International Journal of Environmental Research and Public Health*, *11*(5), 5170–5207. https://doi.org/10.3390/ijerph110505170

Chen, M. A. (1986). A Quiet Revolution.

Chiba, Y., Oguttu, M. A., & Nakayama, T. (2012). Quantitative and qualitative verification of data quality in the childbirth registers of two rural district hospitals in Western Kenya. *Midwifery*, *28*(3), 329–339. https://doi.org/10.1016/j.midw.2011.05.005

Dalrymple, P. W. (2011). Data, information, knowledge: The emerging field of health informatics. *Bulletin of the American Society for Information Science and Technology*, *37*(5), 41–44.

Davidson, A. J., Melinkovich, P., Beatty, B. L., Chandramouli, V., Hambidge, S. J., Phibbs, S. L., … Steiner, J. F. (2003). Immunization registry accuracy:

Improvement with progressive clinical application. *American Journal of Preventive Medicine*, *24*(3), 276–280. https://doi.org/10.1016/S0749-3797(02)00638-4

Dobrow, M. J., Goel, V., & Upshur, R. E. G. (2004). Evidence-based health policy: Context and utilisation. *Social Science and Medicine*, *58*(1), 207–217. https://doi.org/10.1016/S0277-9536(03)00166-7

Evans, S. M., Bohensky, M., Cameron, P. A., & McNeil, J. (2011). A survey of Australian clinical registries: Can quality of care be measured? *Internal Medicine Journal*, *41*(1 A), 42–48. https://doi.org/10.1111/j.1445-5994.2009.02068.x

Fabic, M. S., Choi, Y., & Bird, S. (2012). A systematic review of Demographic and Health Surveys: data availability and utilization for research. *Bulletin of the World Health Organization*, *90*(8), 604–612. https://doi.org/10.2471/BLT.11.095513

Foreit, K., Moreland, S., & LaFond, a. (2006). Data Demand and Information Use in the Health Sector Conceptual Framework, 1–19. Retrieved from http://www.cpc.unc.edu/measure/publications/ms-06-16a

Gagnon, M.-P., Legare, F., Labrecque, M., Fremont, P., Pluye, P., Gagnon, J., …

Gravel, K. (2009). Interventions for promoting information and communication technologies adoption in healthcare professionals. *The Cochrane Database of Systematic Reviews*, (1), CD006093. https://doi.org/10.1002/14651858.CD006093.pub2

Gething, P. W., Noor, A. M., Goodman, C. A., Gikandi, P. W., Hay, S. I., Sharif, S. K., … Snow, R. W. (2007). Information for decision making from imperfect national data: tracking major changes in health care use in Kenya using geostatistics. *BMC Medicine*, *5*(1), 37. https://doi.org/10.1186/1741-7015-5-37

Goodyear-Smith, F., Grant, C., York, D., Kenealy, T., Copp, J., Petousis-Harris, H., … Kerse, N. (2008). Determining immunisation coverage rates in primary health care practices: A simple goal but a complex task. *International Journal of Medical Informatics*, *77*(7), 477–485. https://doi.org/10.1016/j.ijmedinf.2007.08.008

Gourlay, A., Wringe, A., Todd, J., Michael, D., Reniers, G., Urassa, M., … Zaba, B. (2015). Challenges with routine data sources for PMTCT programme monitoring in East Africa: Insights from Tanzania. *Global Health Action*, *8*, 1–5. https://doi.org/10.3402/gha.v8.29987

Graneheim, U. H., & Lundman, B. (2004). Qualitative content analysis in nursing research: Concepts, procedures and measures to achieve trustworthiness. *Nurse*

Education Today, *24*(2), 105–112. https://doi.org/10.1016/j.nedt.2003.10.001

Guerra-Lopez, I., & Blake, A. M. (2011). Leadership decision making and the use of data. *Performance Improvement Quarterly*, *24*(2), 89–104. https://doi.org/10.1002/piq

Hahn, D., Wanjala, P., & Marx, M. (2013). Where is information quality lost at clinical level. *Global Health Action*, *6*(1), 1–11. https://doi.org/10.3402/gha.v6i0.21424

Harries, A. D., Zachariah, R., & Maher, D. (2013). The power of data: using routinely collected data to improve public health programmes and patient outcomes in low- and middle-income countries. *Tropical Medicine & International Health*, *18*(9), 1154–1156. https://doi.org/10.1111/tmi.12159

Haux, R. (2006). Health information systems - Past, present, future. *International Journal of Medical Informatics*, *75*(3–4 SPEC. ISS.), 268–281. https://doi.org/10.1016/j.ijmedinf.2005.08.002

Health Metrics Network. (2006). *Strengthening country healh information systems: assessmnet and monitoring tool*. Health Metrics Network, World Health Organization. Retrieved from http://www.hrhresourcecenter.org/node/747

Heunis, C., Wouters, E., Kigozi, G., Engelbrecht, M., Tsibolane, Y., van der Merwe, S., & Motlhanke, S. (2011). Accuracy of Tuberculosis Routine Data and Nurses' Views of the TB-HIV Information System in the Free State, South Africa. *Journal of the Association of Nurses in AIDS Care*, *22*(1), 67–73. https://doi.org/10.1016/j.jana.2010.06.003

Hey, J. (2004). The data, information, knowledge, wisdom chain: the metaphorical link. Intergovernmental Oceanographic Commission. *2004*, (December), 18. Retrieved from http://www.dataschemata.com/uploads/7/4/8/7/7487334/dikwchain.pdf

HMN_WHO. (2010). Assessment of the Health Management Information Systems in Select Areas of Aceh Province. *Rehabilitation*.

Hotchkiss, D. R., Aqil, A., Lippeveld, T., & Mukooyo, E. (2010). Evaluation of the Performance of Routine Information System Management (PRISM) framework: evidence from Uganda. *BMC Health Services Research*, *10*(1), 188. https://doi.org/10.1186/1472-6963-10-188

Jacucci, E., Shaw, V., & Braa, J. (2006). Standardization of Health Information Systems in South Africa : The Challenge of Local Sustainability. *Information Technology for Development*, *12*(3), 225–239. https://doi.org/10.1002/itdj.20044

Kelly, K. (2014). *Mod 1- Introduction to data utilisation DHS*.

Krishnan, A., Nongkynrih, B., Yadav, K., Singh, S., & Gupta, V. (2010). Evaluation of computerized health management information system for primary health care in rural India. *BMC Health Services Research*, *10*(1), 310. https://doi.org/10.1186/1472-6963-10-310

Ledikwe, J. H., Grignon, J., Lebelonyane, R., Ludick, S., Matshediso, E., Sento, B. W., … Semo, B. (2014). Improving the quality of health information: a qualitative assessment of data management and reporting systems in Botswana. *Health Research Policy and Systems*, *12*(1), 7. https://doi.org/10.1186/1478-4505-12-7

Liaw, S. T. (2012). Towards an ontology for data quality in integrated chronic disease management : A realist review of the literature. *International Journal of Medical Informatics*, *82*(1), 10–24. https://doi.org/10.1016/j.ijmedinf.2012.10.001

Lippeveld, T. (2001). Routine Health Information Systems: The Glue of a Unified Health System. *Presentation at the Potomac Workshop*.

Mandala, J., Moyo, T., Torpey, K., Weaver, M., Suzuki, C., Dirks, R. G., & Hayashi, C. (2012). Use of Service Data to Inform Pediatric HIV-free Survival Following Prevention of Mother-to-Child Transmission Programs in Rural Malawi. *BMC*

Public Health, *12*(1), 405. https://doi.org/10.1186/1471-2458-12-405

Martin, L. A. (2000). Effective data collection. *Total Quality Management*, *11*(3), 341–345. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/0954412006856

Massyn, N., Peer, N., Padarath, A., Barron, P., & Day, C. (2015). *District Health Barometer 2014/15*. (N. Massyn, N. Peer, A. Padarath, P. Barron, & C. Day, Eds.). Durban.

Mate, K. S., Bennett, B., Mphatswe, W., Barker, P., & Rollins, N. (2009). Challenges for routine health system data management in a large public programme to prevent mother-to-child HIV transmission in South Africa. *PLoS ONE*, *4*(5), 1–7. https://doi.org/10.1371/journal.pone.0005483

Mavimbe, J. C., Braa, J., & Bjune, G. (2005). Assessing immunization data quality from routine reports in Mozambique. *BMC Public Health*, *5*(1), 108. https://doi.org/10.1186/1471-2458-5-108

Measure Evaluation. (2011). Tools for Data Demand and Use in the Health Sector - Performance of Routine Information Systems Management (PRISM) Tools, 1–39.

MEASURE Evaluation. (2009). PRISM : Performance of Routine Information

System Management. *PRism*, (March).

MEASURE Evaluation. (2012). Data Demand and Use : An Introduction to Concepts and Tools, *54*(March).

Mesfin, G. (2014). Data quality and information use : A systematic review to improve evidence ,Ethiopia. *International Journal of Intelligent Information Systems*, *3*(6), 69–75. https://doi.org/10.11648/j.ijiis.20140306.13

Mitsunaga, T., Hedt-Gauthier, B., Ngizwenayo, E., Farmer, D. B., Karamaga, A., Drobac, P., … Mugeni, C. (2013). Utilizing community health worker data for program management and evaluation: systems for data quality assessments and baseline results from Rwanda. *Social Science & Medicine (1982)*, *85*, 87–92. https://doi.org/10.1016/j.socscimed.2013.02.033

Mphatswe, W., Mate, K., Bennett, B., Ngidi, H., Reddy, J., Barker, P., & Rollins, N. (2012). Improving public health information: a data quality intervention in KwaZulu-Natal, South Africa. *Bulletin of the World Health Organization*, *90*(3), 176–182. https://doi.org/10.2471/BLT.11.092759

Mpofu, M., Semo, B., Grignon, J., Lebelonyane, R., Ludick, S., Matshediso, E., … Ledikwe, J. H. (2014). Strengthening monitoring and evaluation (M & E) and building sustainable health information systems in resource limited countries :

lessons learned from an M & E task-shifting initiative in Botswana. *Mpofu et Al. BMC Public Health 2014*, *14:1032*, 1–8. https://doi.org/10.1186/1471-2458-14-1032

Murai, S., Lagrada, L. P., Gaite, J. T., & Uehara, N. (2011). Systemic factors of errors in the case identification process of the national routine health information system: a case study of Modified Field Health Services Information System in the Philippines. *BMC Health Services Research*, *11*(1), 271. https://doi.org/10.1186/1472-6963-11-271

Murphy, J., Mershon, C.-H., Struthers, H., & McIntyre, J. (2013). `Feedback: Where data finally get thrilling' - tools for facility managers to use data for improved health outcomes in the prevention of mother-to-child transmission of HIV and antiretroviral therapy. *Southern African Journal of Hiv Medicine*, *14*(3), 131–134. https://doi.org/10.7196/SAJHIVMED.883

Myburgh, H., Murphy, J. P., Van Huyssteen, M., Foster, N., Grobbelaar, C. J., Struthers, H. E., … Peters, R. P. H. (2015). Implementation of an electronic monitoring and evaluation system for the antiretroviral treatment programme in the Cape Winelands District, South Africa: A qualitative evaluation. *PLoS ONE*, *10*(5), 1–22. https://doi.org/10.1371/journal.pone.0127223

Mykhalovskiy, E., & Weir, L. (2004). The problem of evidence-based medicine:

Directions for social science. *Social Science and Medicine*, *59*(5), 1059–1069. https://doi.org/10.1016/j.socscimed.2003.12.002

National Department of Health. (2012). *Standard Operating Procedures for ART Monitoring and Data Management*. Pretoria.

Ndabarora, E., Chipps, J., & Uys, L. (2013). Systematic review of health data quality management and best practices at community and district levels in LMIC. *Information Development*, *30*(August 2016), 266666913477430. https://doi.org/doi: 10.1177/0266666913477430

Nicholson, M. D. J. (2005). *" Seeing the Other Side of the Hill ":*

Nicol, E., Dudley, L., & Bradshaw, D. (2016). Assessing the quality of routine data for the prevention of mother-to-child transmission of HIV: An analytical observational study in two health districts with high HIV prevalence in South Africa. *International Journal of Medical Informatics*, *95*, 60–70. https://doi.org/10.1016/j.ijmedinf.2016.09.006

Nicol, E. F. (2015). *Evaluating the Process and Output indicators for Maternal , Newborn and Child survival in South Africa : A comparative study of PMTCT information systems in KwaZulu-Natal and the Western Cape*. Stellenbosch University.

Nutley, T. (2012). *Improving data use in decision making:an intervention to strengthen health systems*. Retrieved from https://www.measureevaluation.org/resources/publications/sr-12-73/folder_contents

Nutley, T., Gnassou, L., Traore, M., Bosso, A. E., & Mullen, S. (2014). Moving data off the shelf and into action: an intervention to improve data-informed decision making in Cote d'Ivoire. *Global Health Action*, *7*(1), 1–10. https://doi.org/doi/full/10.3402/gha.v7.25035

Nutley, T., & Reynolds, H. W. (2013). Improving the use of health data for health system strengthening. *Global Health Action*, *6*, 1–10. https://doi.org/http://dx.doi.org/10.3402/gha.v6i0.20001

Otwombe, K. N., Wanyungu, J., Nduku, K., & Taegtmeyer, M. (2007). Improving national dat collection systems from voluntary counselling and testing centres in Kenya. *Bulletin of the World Health Organisation*, *85*(4), 315–318. https://doi.org/10.2471/BLT.06.033712

Pappaioanou, M., Malison, M., Wilkins, K., Otto, B., Goodman, R. A., Churchill, R. E., … Thacker, S. B. (2003). Strengthening capacity in developing countries for evidence-based public health:: The data for decision-making project. *Social Science and Medicine*, *57*(10), 1925–1937. https://doi.org/10.1016/S0277-

9536(03)00058-3

Peersman, G., Rugg, D., Erkkola, T., Kiwango, E., & Yang, J. (2009). Are the investments in national HIV monitoring and evaluation systems paying off? *Journal of Acquired Immune Deficiency Syndromes (1999)*, *52 Suppl 2*, S87–S96. https://doi.org/10.1097/QAI.0b013e3181baede7

Peters, E., Hibbard, J., Slovic, P., & Dieckmann, N. (2007). Numeracy skill and the communication, comprehension, and use of risk-benefit information. *Health Affairs*, *26*(3), 741–748. https://doi.org/10.1377/hlthaff.26.3.741

Powell, A. (2003). Using routine comparative data to assess the quality of health care: understanding and avoiding common pitfalls. *Quality and Safety in Health Care*, *12*(2), 122–128. https://doi.org/10.1136/qhc.12.2.122

Randell, R., Mitchell, N., Thompson, C., McCaughan, D., & Dowding, D. (2009). Supporting nurse decision making in primary care: exploring use of and attitude to decision tools. *Health Informatics Journal*, *15*(1), 5–16. https://doi.org/10.1177/1460458208099864

Rehle, T., Lazzari, S., Dallabetta, G., & Asamoah-Odei, E. (2004). Second generation HIV surveillance: better data for decision- making. *Bulletin of the World Health Organisation*, *82*(2), 121–127. Retrieved from http://www.who.int/bulletin/volumes/82/2/en/121.pdf

Ronveaux, O., Rickert, D., Hadler, S., Groom, H., Lloyd, J., Bchir, A., & Birmingham, M. (2005). The immunization data quality audit: Verifying the quality and consistency of immunization monitoring systems. *Bulletin of the World Health Organization*, *83*(7), 503–510. https://doi.org/S0042-96862005000700010 [pii]

Scott, V. E. (2015). A health system perspective on factors influencing the use of health information for decision-making in a district health system, (November), 1–492.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, *22*(2), 63–75. https://doi.org/10.3233/EFI-2004-22201

Sherr, K., Requejo, J. H., & Basinga, P. (2013). Implementation research to catalyze advances in health systems strengthening in sub-Saharan Africa: the African Health Initiative. *BioMed Central Health Services Research*, *13*(Suppl 2), S1. https://doi.org/10.1186/1472-6963-13-S2-S1

South Africa. National Health Act 61 of 2003, Pub. L. No. Act 61 of 2003, 2008 1 (2014). South Africa: Government Gazette 26595. Retrieved from http://www.chr.up.ac.za/undp/domestic/docs/legislation_55.pdf

South Africa Every Death Counts Writing Group. (2008). Every death counts : use of mortality audit data for decision making to save the lives of mothers , babies , and children in South Africa Mortality audit for mothers , babies , and children, *371*(1).

South Africa National Department of Health. (2012). Facility Level (DHMIS) SOP, (November).

South Africa National Department of Health. (2013). Information System (DHMIS) Standard Operating Procedures : National Level, (December).

South African Department of Health. (2011). District Health Management Information System (DHMIS) Policy. *Department of Health, Republic of South Africa*, 1–38. Retrieved from http://www.doh.gov.za/docs/policy/2012/dhmis.pdf

South African Department of Health. (2013a). Information System (DHMIS) Standard Operating Procedures : Provincial Level, (December).

South African Department of Health. (2013b). Information System (DHMIS) Standard Operating Procedures : Sub-District Level, (December).

Stausberg, J., Nasseh, D., & Nonnemacher, M. (2015). Measuring Data Quality: A

Review of the Literature between 2005 and 2013. *Studies in Health Technology and Informatics*, *210*, 712–716. https://doi.org/10.3233/978-1-61499-512-8-712

Strong, D. M., Lee, Y. W., & Wang, R. Y. (1997). Data quality in context. *COMMUNICATIONS OF THE ACM*, *40*(5), 103–110. Retrieved from http://web.mit.edu/tdqm/www/winter/StrongLeeWangCACMMay97.pdf

Thiru, K., Hassey, A., & Sullivan, F. (2003). Systematic review of scope and quality of electronic patient record data in primary care. *BMJ (Clinical Research Ed.)*, *326*(7398), 1070. https://doi.org/10.1136/bmj.326.7398.1070

University of Western Cape. (2011). *Overview Routine HIS Notes*.

USAID, The Global Fund, & Measure Evaluation. (2008). Data quality audit tool, (September), 106. Retrieved from http://www.cpc.unc.edu/measure/publications/ms-08-29

Wand, Y., & Wang, R. Y. (1996). Data quality dimensions in ontological foundations. *COMMUNICATIONS OF THE ACM*, *39*(11), 86–95. Retrieved from http://web.mit.edu/tdqm/www/papers/94/94-03.html

Ward, N. S. (2004). The accuracy of clinical information systems. *Journal of Critical Care*, *19*(4), 221–225. https://doi.org/10.1016/j.jcrc.2004.09.005

West Coast District Department of Health. (2014). *West Coast District Profile*.

Facilities. Malmesbury.

Western Cape Department of Health. (2014). Circular H28-2014 - population.pdf. Cape Town.

White, C. (2015). *ART M & E Facility Assessments Report*.

WHO. (1978). *Alma - Ata 1978 Primary Health Care*. Retrieved from https://www.unicef.org/about/history/files/Alma_Ata_conference_1978_report.pdf

WHO. (2000). *The world health report 2000: health systems: improving performance*. *World Health* (Vol. 78). https://doi.org/10.1146/annurev.ecolsys.35.021103.105711

WHO. (2007). *Everybody's business: strengthening health Systems to improve health outcomes: WHO's framework for action*. Geneva: WHO Library Cataloguing-in-Publication Data : Everybody. Retrieved from http://apps.who.int/iris/bitstream/10665/43918/1/9789241596077_eng.pdf

WHO-HMN. (2009). Guidance for the Health Information Systems (HIS) Strategic Planning Process. *Design*, (March), 144. Retrieved from http://www.who.int/entity/healthmetrics/tools/HISStrategicPlanningProcessGuidance_2009_March_3.pdf?ua=1

WHO (World Health Organization). (2008). *Framework and Standards for Country Health Information Systems* (Vol. 2nd Ed). https://doi.org/10.4018/978-1-60566-988-5

World Health Organisation. (2015). The Roadmap for Health Measurement and Accountability, (June), 25. Retrieved from http://www.who.int/hrh/documents/roadmap4health-measurement_accountability.pdf?ua=1

Zaveri, A., Rula, A., Maurino, A., Pietrobon, R., Lehmann, J., & Auer, S. (2012). Quality Assessment Methodologies for Linked Open Data: A Systematic Literature Review and Conceptual Framework. *Semantic Web – Interoperability, Usability, Applicability*, *1*, 33. https://doi.org/10.3233/SW-150175

Zins, C. (2007). Conceptual approaches for defining data, information and knowledge. *Journal of the Association for Information Science and Technology*, *58*(4), 479–493. https://doi.org/10.1002/asi.20508

ANNEXURE A: NATIONAL AND PROVINCIAL INDICATOR DATASET

Element name

A. **Headcount PHC/Management**

1. PHC headcount under 5 years
2. PHC headcount 5 years and older
3. PHC case seen by Professional Nurse

4. PHC case seen by Doctor
5. PHC professional nurse clinical work days
6. PHC doctor clinical work days
7. PHC supervisor visit (fixed clinic/CHC/CDC)

B. **Child Health**

8. Child under 5 severe acute malnutrition new
9. Child under 5 diarrhoea with dehydration new
10. Child under 5 diarrhoea without dehydration (P)
11. Child under 5 pneumonia new
12. Child 12-59 months dewormed

C. **Maternal & Women's health**

13. Antenatal 1st visit before 20 weeks
14. Antenatal 1st visit 20 weeks or later
15. Antenatal client HIV 1st test
16. Antenatal client HIV 1st test positive
17. HIV positive women aged 15 – 24 years (P)
18. Antenatal client HIV re-tested at 32 weeks or later
19. Antenatal client HIV re-test positive at 32 weeks or later
20. Antenatal client CD4 1st test
21. Antenatal client eligible ART
22. Antenatal client initiated on ART
23. Antenatal client on ART at delivery
24. Antenatal client who delivered having received adequate PMTCT therapy (P)
25. Live birth to HIV positive woman
26. Infant given Nevirapine within 72 hours after birth
27. Infant initiated on CPT under 2 months
28. Infant PCR test under 2 months
29. Infant PCR test positive under 2 months
30. Mother postnatal visit within 6 days after delivery
31. Oral pill cycle
32. Medroxyprogesterone injection

33. Norethisterone enanthate injection
34. IUCD inserted
35. Health facilities with contraceptive service (P)
36. Cervical smear in woman 30 years and older screened for cervical cancer
37. Adequate cervical (Pap) smears (P)

D. **Immunization**

38. BCG dose under 1 year
39. OPV 1st dose
40. DTaP-IPV/Hib (Pentaxim) 1st dose
41. DTaP-IPV/Hib (Pentaxim) 3rd dose
42. HepB 3rd dose under 1 year
43. RV 2nd dose
44. PCV 3rd dose
45. Measles 1st dose under 1 year
46. Immunised fully under 1 year – new
47. Measles 2nd dose
48. DTaP-IPV/Hib (DTaP-IPV/Hib) 4th dose
49. Td at 6 years

E. **Nutrition**

50. Child under 2 between -2 SD and -3 SD new
51. Child under 5 underweight for age (P)
52. Vitamin A 12–59 months
53. Child under 5 on food supplementation new
54. Infant exclusively breastfed at HepB 3

F. **Mental Health**

55. Mental health patient 18 years and older
56. Mental health patient under 18 years

G. **Chronic Care**

57. Diabetes patient 18 years and older new
58. Diabetes patient under 18 years new
59. Hypertension patient treatment new

60. Wheelchair applications

61. Wheelchair issued – new

H. <u>Oral Health</u>

62. Dental headcount

63. Tooth extractions

64. Tooth restorations

65. Tooth eruption 1st or 2nd molars (child)

66. Tooth fissure sealant 1st or 2nd permanent molar (child)

I. <u>TB Control</u>

67. TB AFB sputum sample sent

68. TB AFB sputum result received within 48 hours

69. TB suspect sputum sent for 5 years and above

70. TB suspect case total

71. TB suspect tested positive

72. TB suspect initiated on treatment

73. TB asymptomatic contact under 5 years

74. TB contact under 5 years initiated on IPT

J. <u>HIV</u>

75. Female condoms distributed

76. HIV positive client eligible for IPT

77. HIV positive client initiated on IPT

78. HIV test client 15-49 years

79. HIV positive clients (P)

80. Male condoms distributed

81. STI treated - new episode

82. Male urethritis syndrome treated – new episode (P)

83. HIV/TB co-infected patient – total

84. HIV/TB co-infected patient initiated on ART

85. HIV/TB co-infected patient initiated on CPT

86. CD4 tests done (P)

87. Sexual assault cases new

88. Sexual assault prophylaxis new

89. Sexual assault - completed PEP (P)

90. Sexual assault female under 13 years – new (P)

91. Sexual assault female 13 years and older – new (P)

92. Sexual assault male under 13 years – new (P)

93. Sexual assault male 13 years and older – new (P)

94. Sexual assault cases that sero converted (P)

95. Public Health facilities offering PEP for sexual assault cases (P)

96. Sexual assault case new offered comfort kits (P)

K. **Drug Stock outs**

97. Any tracer item drug stock-out

L. **Quality Control**

98. Complaint received

99. Complaint resolved

100. Complaint resolved within 25 working days

101. Planned mortality and morbidity reviews multiplied by number of disciplines within the facility

102. Mortality and morbidity review conducted

103. Hospital patient satisfaction: Number of questionnaires with 1 or 2 recorded for with pleased with treatment (P)

104. Hospitals conducting a patient satisfaction survey at least once per year (P)

105. Waiting time in hospital (P)

106. Health facilities compliant with physical safety and security standards (P)

107. Health facilities meeting minimum cleanliness standard (P)

M. ART

108. Health facilities with ART services (P)

109. Adult started on ART during this month - naïve

110. Adult remaining on ART at end of the month - total

111. Child under 15 years started on ART during this month - naïve

112. Child under 15 years remaining on ART at end of the month - total

113. Total clients started on ART during this month - naïve
114. Total clients remaining on ART at end of the month
115. Adult naïve started ART (TOT)
116. Adult naïve male started ART
117. Adult naïve female started ART
118. Adult screened for TB at start of ART
119. Adult on TB treatment at start of ART
120. Adult on INH prevention therapy (IPT) at start of ART
121. Adult on Co-trimoxazole prevention therapy (CPT) at start of ART
122. Adult female pregnant at start of ART
123. Adult CD4 below 100 cls/µl at start of ART
124. Adult CD4 100 to 199 cls/µl at start of ART
125. Adult CD4 200 to 350 cls/µl at start of ART
126. Adult CD4 done at start of ART
127. Adult ART experienced started
128. Adult ART on first-line regimen (FLR)
129. Adult ART on second-line regimen (SLR)
130. Adult ART stopped (STO)
131. Adult ART died (RIP)
132. Adult ART lost to follow up (LTF)
133. Adult ART transferred out (TFO)
134. Adult ART transferred in (TFI)
135. Adult viral load done (VLD)
136. Adult viral load under 400 cps/mL (VLS)
137. ART child 1-<5 years starting ART treatment
138. ART child 5-<15 years starting ART treatment
139. Child under 1 year started ART
140. Child under 15 years not on TB treatment screened for TB at start of ART
141. Child under 15 years on INH prevention therapy (IPT) at start of ART
142. Child under 15 years on Co-trimoxazole prevention therapy (CPT) at start of ART
143. Child under 15 years on TB treatment at start of ART

144. Child under 15 years CD4 done at start of ART

145. Child under 15 years CD4 TLC below 15pc or 100 cls/µl at start of ART

146. Child under 15 years CD4 TLC 15-19pc or 100-199 cls/µl at start of ART

147. Child under 15 years CD4 TLC 20-25pc or 200-350 cls/µl at start of ART

148. Child under 15 years on second-line regimen (SLR)

149. Child ART on first-line regimen (FLR)

150. Child under 15 years viral load done (VLD)

151. Child under 15 years viral load under 400 copies/mL (VLS)

N. <u>TB (ETR)</u>

152. TB (new pulmonary) client initiated on treatment

153. TB (new pulmonary) patient cured

154. TB (new pulmonary) treatment defaulter

155. TB patient new cured and completed treatment

156. TB patient death during treatment

157. TB MDR confirmed new patient

158. TB MDR confirmed patient initiated on treatment

159. TB MDR patient successfully treated

160. TB MDR patient death during treatment

161. TB XDR confirmed new patient

162. TB XDR confirmed patient initiated on treatment

163. TB XDR patient death during treatment

164. TB XDR patient successfully treated

165. TB patients tested for HIV (P)

166. TB patient HIV positive

167. TB/HIV co-infected patients registered

168. TB/HIV co-infected patient on ART at completion of TB treatment

169. TB smear positive re-treatment - cured (P)

170. TB smear positive re-treatment – failed (P)

171. TB new smear positive cases that converted at two months (P)

172. TB primary in children 0 to 7 years of age (P)

O. **<u>Headcount Inpatients</u>**

173. Inpatient beds – total
174. Day patients - total
175. Inpatient days - total
176. Inpatient death - total
177. Inpatient discharge - total
178. Inpatient transfer out - total

P. Child Health

179. Inpatient death under 1 year
180. Inpatient discharge under 1 year
181. Inpatient transfer out under 1 year
182. Inpatient death under 5 years
183. Inpatient discharge under 5 years
184. Inpatient transfer out under 5 years
185. Child under 5 diarrhoea admitted
186. Child under 5 diarrhoea death
187. Child under 5 pneumonia admitted
188. Child under 5 pneumonia new
189. Child under 5 severe acute malnutrition admitted
190. Child under 5 severe acute malnutrition death

Q. Maternal & Women's health

191. Live birth in facility
192. Still birth in facility
193. Born alive before arrival at facility / BBA
194. Low birth weight (under 2500g)
195. Inpatient death - early neonatal
196. Inpatient death - late neonatal
197. Delivery in facility total
198. Normal delivery in facility (P)
199. Delivery by caesarean section
200. Delivery in facility to woman under 18 years
201. Unbooked delivery in facility (P)

202. Maternal death in facility

203. Sterilisation – male

204. Sterilisation – female

205. Termination of pregnancy performed

206. Medical termination of pregnancies (P)

207. Surgical termination of pregnancies (P)

208. Teenage pregnancies (P)

R. HIV

209. Medical male circumcision performed

210. Medical Male Circumcision sites (P)

S. **Headcount Outpatients**

211. OPD new patient not referred

212. OPD new patient referred

213. OPD follow-up patient

214. Emergency headcount

T. **Eye Care**

215. Cataract surgery

U. Mental Health

216. Mental health admission under 18

217. Mental health admission 18 and older

218. Mental health admission involuntary

219. Psychiatric re-admissions (within 90 days) (P)

V. Management Financial

220. Expenditure total

W. Theatre (P)

221. Operating lists started on time

222. Operating theatre cancellations

223. Compliance with WHO checklist

224. Simple theatre procedures

225. Complex theatre procedures

226. Operations under 30 minutes

227. Operations of 30 to 60 minutes

228. Operations over 60 minutes

X. <u>School health Services</u>

229. School Quintile classification

230. School Grade All - learners total

231. School Grade 1 - learners total

232. School Grade 4 - learners total

233. School Grade 8 - learners total

234. School Grade 10 - learners total

235. School learners screened - total

236. School Grade 1 - learners screened

237. School Grade 4 - learners screened

238. School Grade 8 - learners screened

239. School Grade 10 - learners screened

240. School Grade Other - learners screened

241. School learner underweight

242. School learner overweight

243. School learner referred for Oral Health

244. School learner referred for Eye Care

245. School learner referred for Hearing problems

246. School learner referred for Speech problems

247. School learner referred for Suspected TB

248. School learner immunised

249. Td dose at 6 years

250. Td dose at 12 years

251. School learner dewormed

252. Grade 1 learners with dental problems (P)

253. Grade 1 learners with minor ailments (P)

254. Grade 8 learners with minor ailments (P)

255. Grade 10 learners with minor ailments (P)

Y. <u>Notifiable Medical Conditions</u>

256. Malaria deaths

257. Cholera deaths

ANNEXURE B: International and National Guidelines, Policies and Standards for Data quality and use

Author	Year	Title	Content
AHIMA	2011	A new view of HIM: Introducing the core model	Developed a new view of Health Information Management (HIM)—one that addressed changing practice roles, settings, and functions emerging from increased automation, changing regulations, and dissemination of data.
USAID	2007	Data quality Assurance Tool for programme level indicators	Defines data quality and dimensions of data quality, reporting of results, double counting, comparison of results over reporting periods,
Anwer Aqil, Theo Lippeveld and Dairiku Hozumi*	2009	PRISM framework: a paradigm shift for designing, strengthening and evaluating routine health information system	The PRISM framework offers a paradigm shift by putting emphasis on RHIS performance and incorporating the organizational, technical and behavioural determinants of performance. By describing causal pathways of these determinants, the PRISM framework encourages and guides the development of interventions for strengthening or reforming RHIS and it conceptualizes and proposes a methodology for measuring the impact of RHIS on health system performance. The PRISM framework proposes a new agenda for building and sustaining information systems, for the promotion of an information culture, and for encouraging accountability in health systems.
WHO	2008	Assessing the National Health Information System An Assessment Tool Version 4.00	The Health Metrics Network (HMN) was launched in 2005 to help countries and other partners improve global health by strengthening the systems that generate health-related information for evidence-based decision-making. HMN is the first global health

			partnership that focuses on two core requirements of health system strengthening in low and low-middle income countries. First, the need to enhance entire health information and statistical systems, rather than focus only upon specific diseases. Second, to concentrate efforts on strengthening country leadership for health information production and use.
Hiwot Belay, Theo Lippeveld	2013	Inventory of PRISM Framework and Tools: Application of PRISM Tools and Interventions for Strengthening Routine Health Information System Performance	This paper describes the conceptual framework on the determinants of RHIS performances and effectiveness of strategies to improve the system. The examples addressed in this paper highlight the RHIS permanence in various countries at different administrative levels, efforts made to address identified gaps, and some observed progresses. Preliminary findings of PRISM assessments after intervention show encouraging results. Also, at the global level, MEASURE Evaluation is working on guidelines for RHIS data management standards
MEASURE Evaluation	2006	Data Demand and Information Use in the Health Sector: Conceptual Framework	This publication provides a framework for improving the use of information to guide policymaking, program design, management, and service provision in the health sector in developing countries.
WHO	2004	Developing Health Management Information Systems: A Practical Guide for Developing Countries	This Manual is designed to be a quick-and-easy, user-friendly reference for the development of health management information systems (HMIS), with the focus on applications. It serves as a primer on HMIS development and provides a general overview of the basic principles, as well as the fundamental steps and issues involved in the different activities to be undertaken. The information is presented in a

			concise, direct-to-the point, easy-reading, and outline format. It aims simply to provide the basic elements on HMIS development for people who do not have the time or the need to read deeply on the subject.
Health Metrics Network	2006	Strengthening Country Health Information Systems: Assessment and Monitoring Tool v1.96	Tool to assess resources, indicators, data sources, data management, information products, dissemination and use and how to interpret the results.
Health Metrics Network	2012	Framework and Standards for Country Health Information Systems 2nd edition	Framework and Standards for Country Health Information Systems (the “HMN Framework”) will be the universally accepted standard for guiding the collection, reporting and use of health information by all developing countries and global agencies.
MEASURE Evaluation	2009	PRISM: Performance of Routine Information System Management. PRISM Tools for Assessing, Monitoring, and Evaluating RHIS Performance	PRISM tools v3.0 used for assessing data quality and use of information at facility and district level, information systems mapping tool, Facility /Office checklist, Management assessment tool, Organisational and Behavioural Assessment tool
Measurement and Accountability for Results in Health	2015	The roadmap for health measurement and accountability	The Roadmap articulates a shared strategic approach to support effective measurement and accountability systems for a country’s health programs. The Roadmap outlines smart investments that countries can adopt to strengthen basic measurement systems and to align partners and donors around common priorities. It offers a platform for development partners, technical experts, implementers, civil society organizations, and decision makers to work together for health measurement in the post-2015 era.

MEASURE Evaluation	2011	Tools for Data Demand and Use in the Health Sector. Performance of Routine Information Systems Management (PRISM) Tools	PRISM Tools provided a structured way for the ministry to assess the quality of data and use of information in its routine health information system. The findings were revealing. Data errors were very high, due in part to overly complex data collection forms, inaccurate transfer of data from patient records, and calculation errors. The PRISM assessment led to the design of easy-to-use forms, a refresher training course in data collection and processing for health workers, and a series of meetings and publications to share performance results and successes.
Arthur Heywood, Jon Rohde		The Equity Project: Using Information for Action – A manual for health workers at facility level	This manual, based on years of training programs, seminars, and workshops, was developed to record the many different elements of a smoothly working information system for health services in South Africa. While aiming to present and communicate this information in an attractive and clear fashion, the authors, distilled its contents from the experiences of and discussions held throughout the country with health workers, information officers, and managers.
NDOH	2016	Adherence Guidelines for HIV, TB and NCD	Aim of the guidelines is to work towards the achievement of SA’s 2030 National Development Plan.
Braa and Hedberg	2002	Developing District-based Health Care Information Systems: The South African Experience	Development of DHIS in South Africa
Health Metrics Network		Components of a strong Health Information System: A guide to the HMN Framework	This leaflet briefly explains six key components that help countries develop their own health information systems (HIS) in a way that empowers all those who contribute to and

			benefit from health information i.e. HIS resources, Indicators, Data sources, Data management, Information products, Dissemination and use.
WHO	2004	Developing HMIS: A practical guide for developing countries	This Manual is designed to be a quick-and-easy, user-friendly reference for the development of health management information systems (HMIS), with the focus on applications. It serves as a primer on HMIS development and provides a general overview of the basic principles, as well as the fundamental steps and issues involved in the different activities to be undertaken. The information is presented in a concise, direct-to-the point, easy-reading, and outline format. It aims simply to provide the basic elements on HMIS development.
Vital Wave Construction	2009	Health Information systems in developing countries	This document considers several aspects of health information systems for developing countries. It looks at the threats to health and the challenges facing health care systems in the developing world. It surveys the landscape of efforts to specify and create successful HIS at the national level. Then it examines three case studies in depth and finally reviews the important challenges and opportunities associated with creating an effective HIS.
Health Metrics Network	2009	Guidance for the Health Information Systems (HIS) Strategic Planning Process: Steps, Tools and Templates for HIS systems design and Strategic Planning	Provides all the necessary practical steps, tools and templates for HIS Systems Design and Strategic Planning for strengthening their national health information systems

HMN	2007	Assessment Tool for Country Health Information systems v4.00	The actual excel version of the tool to assess country HIS. Allows the entry of data and provides the results of the assessment.
HMN	2008	Framework and Standards for Country Health Information Systems 2nd Edition	It is intended that by 2011, this Framework and Standards for Country Health Information Systems (the "HMN Framework") will be the universally accepted standard for guiding the collection, reporting and use of health information by all developing countries and global agencies. This will only be achieved by fostering agreement on the goals and coordinated investments now needed by country health information systems.
NDOH	2011	DHMIS Policy	The policy presents in detail what the NDOH expects from users of the DHMIS at all levels of the health system, i.e., national, provincial, district, sub-district, and health establishments. The benefits of such a policy include harmonisation of information across the country, as well as formalisation of the resources required for effective implementation of a well-functioning DHMIS.
NDOH	2012	DHMIS SOP Facility Level	These SOP's provide standardized procedures to: • provide health information coordination and leadership • select and review indicators in routine health information systems • ensure effective data/information management • manage data analysis and information products • enhance data dissemination and use
NDOH	2014	DHMIS SOP Sub-district Level	
NDOH	2014	DHMIS SOP District Level	
NDOH	2014	DHMIS SOP Provincial Level	
NDOH	2014	DHMIS SOP National Level	
NDOH	2003	National Health Act	To provide a framework for a structured uniform health system within the SA, taking into account the obligations imposed by the Constitution and other laws on the national, provincial and local

			governments with regard to health services; and to provide for matters connected therewith.
WHO	2007	Everybody's Business: Strengthening Health systems to improve health outcomes	This Framework for Action addresses the urgent need to improve the performance of health systems. It is issued at the midpoint in the countdown to 2015, the year given so much significance and promise by the Millennium Declaration and its Goals. On present trends, the health-related Goals are the least likely to be met, despite the availability of powerful drugs, vaccines and other tools to support their attainment.
NDOH	2012	Standards Operating Procedures for ART Monitoring and Data Management	To provide standardised procedures for collecting and managing accurate and complete routine ART data from the facility generation of the data through the flow of the data to the sub-district, district, provincial and the national levels whilst enhancing the use of and reporting of information. These standard operating procedures (SOPs) are applicable to all public health service points providing ART throughout the country, including correctional facilities and hospitals.
NDOH	2014	National TB Management Guidelines 2014	These guidelines are meant to provide guidance to professional health care workers on the management of people with Tuberculosis as well as those co-infected with HIV. The main changes in these guidelines include; • Targeted screening intervention to increase detection • The use of Xpert MTB RIF in diagnosing pulmonary and extra pulmonary TB • The revised definitions and treatment regimen for retreatment patients • Management of adverse

			drug events • ART initiation and follow up of patients on both ART and TB medicines
Elsevier Publishers	2007	Making sense of data and information	Becoming a critical thinker, finding and showing the message in numbers, using computer tools, and analytical statistics
Lippeveld T, Sauerborn R, Bodart C.	2000	Design and implementation of health information systems	A collection of health information system concepts, experiences and examples in developing national health information systems.
MEASURE Evaluation	2006	Data Demand and Information Use in the Health Sector Conceptual Framework	The PRISM analytical framework of health information system performance identifies three main determinants of the use of health information: the technical aspects of data processes and tools, the behaviour of individuals who produce and/or use data, and the system/organizational context that supports data collection, availability and use
David R Hotchkiss, Anwer Aqil, Theo Lippeveld and Edward Mukooyo	2010	Evaluation of the Performance of Routine Information System Management (PRISM) framework: evidence from Uganda	The study results provide some empirical support for the reliability and validity of the PRISM instruments and the validity of the PRISM conceptual framework, suggesting that the PRISM approach can be effectively used by RHIS policy makers and practitioners to assess the RHIS and evaluate RHIS strengthening interventions.
Health Information System Knowledge Hub, Institute for Health Metrics and Evaluation	2009	Improving the quality and use of health information systems: essential strategic issues	This paper sets out some of the critical issues that countries and donors should consider when investing in the development of health information systems. These range from incentives and practices to improve the quality and, especially, the use of health information by those in policy who have the greatest need for reliable, timely and relevant health information for planning, to strategies to create a culture of information demand and use.

Health Metrics Network	2011	Country Health Information systems: A review of the current situation and trends	Country Health Information Systems provides an overview of the status of health information systems (HIS) in low- and middle-income countries. It uses various components of the Health Metrics Network/WHO HIS framework to describe the general status of HIS, data sources, monitoring of the health system as well as disease-specific practices. The review shows that while there has been progress in several HIS areas there are also major persistent gaps. In particular, the imbalance between increasing demands for reporting against specific indicators and the actual efforts to strengthen country health information systems and their core data sources, remains a major challenge in many countries. The findings underscore recommendations made by the heads of eight global health agencies (the H8) and the Global Health Information Forum (GHIF) in 2010: Countries must urgently develop comprehensive health information systems supported by a sound policy, legal and institutional environment.
WHO	2000	The World Health Report 2000: Health Systems: Improving Performance	In this report, pertinent health systems questions are answered such as why do health systems matter? how well do health systems perform?, are health services well-chosen or well organised?, what resources are needed?, who pays for health systems?, how the public interest in protected?,

ANNEXURE C: The strategies for improvement of data quality and use

Author	Year	Title	Content
Lana A. Martin	2000	Effective data collection	Emphasises the importance of effective data collection methods as a strategy to improve the quality of the data
Heather Angier, Rachel Gold, Charles Gallia, et al	2014	Variation in Outcomes of Quality Measurement by Data Source	Adding Electronic health records data to administrative claims may yield more complete measurement
James Brian Byrd, Rebecca Vigen, Mary E. Plomondon, et al	2013	Data quality of an electronic health record tool to support VA cardiac catheterization laboratory quality improvement: The VA Clinical Assessment, Reporting, and Tracking System for Cath Labs (CART) program	Electronic Health Records have been identified as a key tool for quality improvement, but EHR needs to be of sufficient quality to support QI efforts
Arthur J. Davidson, Paul Melinkovich, Brenda L. Beatty, et al	2003	Immunization Registry Accuracy Improvement with Progressive Clinical Application	Computerised registries, Tracking and reminder systems, integrating electronic data entry by clinicians instead of paper-based charting. Generating patient and provider reminder/recall efforts, Changing information flow, Immunisation as one staff members responsibility, Collaboration efforts across all health care sectors
S. M. Evans, M. Bohensky, P. A. Cameron	2009	A survey of Australian clinical registries: can quality of care be measured?	Central repository should be established, Operating standards should be developed, Funding model needs to be developed to include data quality checks and investment in technology, A coordinated approach to ensure appropriate coverage of registries

and J. McNeil			
Felicity Goodyear-Smith, Cameron Grant, Deon York,	2008	Determining immunisation coverage rates in primary health care practices: A simple goal but a complex task	To improve recording of immunisation coverage we recommend a standard early age of registration and enrolment; standard definitions of the denominator and of immunisation delay; greater uniformity of PMS; improved staff training; intrinsic data quality checks; integration of PMS with changes in the immunisation schedule; incentives and interval electronic checks to improve data quality
Daniel Hahn, Pepela Wanjala and Michael Marx	2013	Where is information quality lost at clinical level? A mixed-method study on information systems and data quality in three urban Kenyan ANC clinics.	To improve the effectiveness and capabilities of these HIS systems, combined measures are needed which include technical and organizational aspects (e.g. regular feedback to health workers) and individual skills and motivation.
Jenny H Ledikwe, Jessica Grignon, Refeletswe Lebelonyane, et al	2014	Improving the quality of health information: a qualitative assessment of data management and reporting systems in Botswana	Addressing fundamental M&E system issues, further standardization of M&E practices, and increasing health services management responsiveness to time-sensitive information are critical to sustain progress related to health service delivery in Botswana. In addition to high-resource initiatives, such as investments in electronic medical record systems and tertiary training programs, there are a variety of low-resource initiatives, such as regular data quality checks, that can strengthen national health information systems. Applying best practices that are effective within one health program to data management and reporting systems of other programs is a practical approach for strengthening health informatics and improving data quality.

Kedar S. Mate, Brandon Bennett, Wendy Mphatswe et al	2009	Challenges for Routine Health System Data Management in a Large Public Programme to Prevent Mother-to-Child HIV Transmission in South Africa	Improving data systems, further training, simplified data collection methods, use of sophisticated electronic data validation systems, data needs to be perceived by front line staff as valuable and used as such, and clinic staff need to be supported and supervised in data management tasks
Tisha Mitsunaga, Bethany Hedt-Gauthier, Elias Ngizwenayo et al	2013	Utilizing community health worker data for program management and evaluation: Systems for data quality assessments and baseline results from Rwanda	Ongoing data quality assessments integrated into routine activities, Strengthening the routine supervision visits, Improvements in completeness and consistency of data
W Mphatswe, KS Mate, B Bennett, et al	2012	Improving public health information: a data quality intervention in KwaZulu-Natal, South Africa	Data improvement intervention involved training on data collection and feedback for health information personnel and programme managers, monthly data reviews and data audits
Shinsuke Murai, Leizel P. Lagrada, Julita T. Gaite, et al	2011	Systemic factors of errors in the case identification process of the national routine health information system: A case study of Modified Field Health	The present study described three characteristics of definitions of indicators in the case identification step of RHIS such as those that are (1) unsupported by the current conditions in the health system, i.e., (a) data are required from a facility that cannot directly generate the data and, (b) definitions of indicators are not consistent with its corresponding program; (2) incomplete or ambiguous, which allow several interpretations; and (3) complete yet easily

		Services Information System in the Philippines	misunderstood by health workers. These characteristics highlight the existence of upstream systemic factors that can induce health workers to commit errors.
Eleazar Ndabarora, Jennifer A Chipps and Leana Uys	2013	Systematic review of health data quality management and best practices at community and district levels in LMIC	For diseases such as HIV/AIDS paper based records are not adequate and should be replaced by efficient EMR's, The use of technology could improve the quality and use of data which could lead to better outcomes. To improve utilization of health information, strong leadership, project management techniques, establishing standards and training their staff is essential for implementation success and more work needs to be done to overcome the barriers to implementation such as technical infrastructure and care providers' computer illiteracy. Key strategies to improve the implementation and utilization of health information systems include the development of integrated health information systems, reengineering of work flow and medical records, management commitment to create an information culture and training of data collectors and users as well as the development of EMRS with open standards and sharable components using open source software.
Edward Nicol	2015	Evaluating the Process and Output indicators for Maternal, Newborn and Child survival in South Africa: A comparative study of PMTCT information systems in KwaZulu-Natal and the Western Cape.	Recommendations include – 1. Efforts to improve RHIS performance, in terms of data quality and information use, 2. Facility and programme managers should be trained and encouraged to use information, 3. A culture of information use should be encouraged 4. A feedback mechanism should be done, 5. Institutional capacity to recruit qualified personnel with basic knowledge of the data collection processes. 6. Efforts are needed to strengthen and improve the country's education system in terms of limited numeracy skills, in both basic education, and training of health professions. Numeracy training should be

			made mandatory for all nursing degrees. Skills in basic arithmetic should be considered a prerequisite for all prospective nursing, and health information students. Basic numeracy skills should be considered a compulsory requirement when recruiting health information personnel. 7. Implement and monitor standards for HIS staffing and IT equipment outlined in the DHMIS policy guidelines and standard operating procedures. 8. Resource allocation should be based on informed decisions, so that adequate resources are channelled to where they are most needed.
O. Ronveaux, D. Rickert, S. Hadler, H. Groom, J. Lloyd, A. Bchir, & M. Birmingham	2005	The immunization data quality audit: verifying the quality and consistency of immunization monitoring systems	The DQA is an innovative tool that provides a way to independently assess the quality of immunization monitoring systems at all levels of a health service and serves as a point of entry to make improvements. It provides a useful example for other global health initiatives.
Federal Ministry for Economic Cooperation and Development	2014	A Quiet revolution: Strengthening the Routine Health Information system in Bangladesh	The results show digitisation of routine reporting has dramatically reduced administrative burdens and more time for patients, a national electronic data repository signalled the end of information silos, the use of individual health records improves patient care, better quality and more comprehensive routine information is now available from the public sector, and improved capacity at Bangladesh's Ministry of Health and Family Welfare and growing international contributions in eHealth.
Krish Thiru, Alan Hassey, Frank Sullivan	2003	Primary Care: Systematic review of scope and quality of electronic patient record data in primary care	The appraisal of data quality has favoured the selection of practices that embrace technology.

Nicholas S. Ward	2004	The Accuracy of Clinical Information Systems	Automated systems are clearly superior to human entered data in terms of completeness and legibility but the correctness of entered data remains unclear.
Carla AbouZahr & Ties Boerma	2005	Health information systems: the foundations of public health	Money is necessary but not sufficient, capacity development in terms of numerical & statistical skills to generate and analyse data, responsibility at ministry of health, responsibilities, Increasing emphasis on results-based management and performance-based funding is focusing minds on the need for sound data generated through reliable and transparent systems.
J Murphy, C H Mershon, H Struthers, J McIntyre,	2013	'Feedback: Where data finally get thrilling' – tools for facility managers to use data for improved health outcomes in the prevention of mother-to-child transmission of HIV and antiretroviral therapy	Better communication about data within facilities, Accountability for the data is the responsibility of everyone i.e. data collectors, to district managers to policy makers. Accountability includes knowing the data elements, what the data reveal about health service delivery and outcomes, and how to accurately and efficiently use data to improve the health system. Standardisation of tools and systems according to the DHMIS would facilitate correct and timely completion of collection tools, assist users in becoming familiar and comfortable with the data tools, and make it easier for users and collectors to identify issues and errors. Data must also be prioritised within the system to highlight its worth as a valuable tool to improve health service delivery.
Debbie Bradshaw, Mickey Chopra, Kate Kerber et al	2008	Every death counts: use of mortality audit data for decision making to save the lives of mothers, babies, and children in South Africa	Audit is powerful, but only if the data lead to action.

Marie-Pierre Gagnon, France Légaré, Michel Labrecque et al	2009	Interventions for promoting information and communication technologies adoption in healthcare professionals	The evidence shows that group training, or one-on-one training sessions, or providing training materials, may improve the use of ICTs (electronic medical records, medical journals and databases on the internet, videoconferencing for doctor appointments, or systems on the internet to give feedback) to improve the healthcare given.
Justin Mandala, Tiwonge Moyo, Kwasi Torpey, et al	2012	Use of service data to inform paediatric HIV-free survival following prevention of mother-to-child transmission programs in rural Malawi	The authors recommend that 1) mothers' addresses are routinely collected to enable follow-up, 2) testing of HIV-exposed infants are done at specific ages (e.g. six weeks, six months, 12 months, 18 months), 3) clinical data are systematically recorded during home visits (duration and type of mother's ARV regimen and age of HIV testing of children), 4) quality control of data being collected is ensured, and 5) a strategy to drastically reduce LTFU among HIV-positive pregnant mothers is implemented.
Tara Nutley and Heide W. Reynolds	2013	Improving the use of health data for health system strengthening	Assess and improve the data use context, Engage data users and data producers, Improve data quality, Improve data availability, Identify information needs, Build capacity in data use core competencies, Strengthen organisation data demand and use infrastructure, Monitor, evaluate and communicate results of data use interventions.
Marguerite Pappaioanoua, Michael Malison, Karen Wilkins, et al	2003	Strengthening capacity in developing countries for evidence-based public health: the data for decision-making project	The CDC funded a Data for Decision Making project to a) strengthen the capacity of decision makers to identify data needs for solving problems and to interpret and use data appropriately for public health decisions; (b) enhance the capacity of technical advisors to provide valid, essential, and timely data to decision makers clearly and effectively; and (c) strengthen health information systems (HISs) to facilitate the collection, analysis, reporting,

			presentation, and use of data at local, district, regional, and national levels. Assessments were conducted to identify important health problems, problem-driven implementation plans with data-based solutions as objectives were developed, interdisciplinary, in-service training programs for mid-level policy makers, program managers, and technical advisors in applied epidemiology, management and leadership, communications, economic evaluation, and HISs were designed and implemented, national staff were trained in the refinement of HISs to improve access to essential data from multiple sources, and the effectiveness of the strategy was evaluated.
Hiwot Belay Theo Lippeveld	2013	Inventory of PRISM Framework and Tools: Application of PRISM Tools and Interventions for Strengthening Routine Health Information System Performance	This paper describes the conceptual framework on the determinants of RHIS performances and effectiveness of strategies to improve the system. The examples addressed in this paper highlight the RHIS permanence in various countries at different administrative levels, efforts made to address identified gaps, and some observed progresses. Preliminary findings of PRISM assessments after intervention show encouraging results.
Jørn Braa, Arthur Heywood & Sundeep Sahay	2012	Improving quality and use of data through data-use workshops: Zanzibar, United Republic of Tanzania	Data-use workshops with active engagement of data users themselves can improve health information systems overall and enhance staff capacity for information use, presentation and analysis for decision-making.
Mohamed Kouni Chahed, Hedia Bellali,	2013	Auditing the quality of immunization data in Tunisia	Data quality audits provide an effective tool for self-assessment implementation and developing a critical analysis of the quality of the routine immunisation data at all levels of the service.

Nissaf Ben Alaya, et al			
Daniëlle GT Arts, Rob J Bosman, Evert de Jonge, et al	2003	Training in data definitions improves quality of intensive care data	Training in data definitions and data extraction guidelines is an effective way to improve quality of intensive care scoring data.
Edoardo Jacucci, Vincent Shaw, Jørn Braa	2006	Standardization of Health Information Systems in South Africa: The Challenge of Local Sustainability	A successful change process is documented, wherein the organization, through innovative management and leadership, actively and successfully appropriated the national standard. The case study is used to highlight three main messages, namely, that standards should be able to be locally appropriated, that the creation of networks helps to support the local adaptation of standards, and that the layering of information systems is important to encourage the use of information and helps to improve data quality.
Mulamuli Mpofu, Bazghina-werq Semo, Jessica Grignon, et al	2014	Strengthening monitoring and evaluation (M&E) and building sustainable health information systems in resource limited countries: lessons learned from an M&E task-shifting initiative in Botswana	The development of a dedicated M&E cadre at the district level contributed positively to health information systems in Botswana by helping build M&E capacity and improving data quality, management, and data use. This assessment has shown that such cadres can be developed sustainably if the initiative is country-led, focusing on recruitment and capacity-development of local counterparts, with a clear government retention plan.
Wilbroad Mutale, Namwinga Chintu, Cheryl	2013	Improving health information systems for decision making across five sub-Saharan African	Design differences described across the PHIT Partnerships reflect the different theories of change for each project, particularly with regards to what information is needed, who will use the information to

Amoroso et al		countries: Implementation strategies from the African Health Initiative	affect change, and how this change is expected to manifest.
Hanlie Myburgh, Joshua P. Murphy, Mea van Huyssteen et al,	2015	Implementation of an Electronic Monitoring and Evaluation System for the Antiretroviral Treatment Programme in the Cape Winelands District, South Africa: A Qualitative Evaluation	This article engages with theory on implementation to identify and contextualise enabling and constraining factors for implementation of the electronic register, to describe experiences and use of the register, and to make recommendations for implementation in similar settings where standardisation of ART monitoring and evaluation has not been achieved.
Greet Peersman, Deborah Rugg, Taavi Erkkola,	2009	Are the Investments in National HIV Monitoring and Evaluation Systems Paying Off?	If M&E is to fulfil its role in helping achieve an M&E system strengthening over the next 5 years should focus on: 1. Prioritizing data use; 2. Addressing important data gaps; 3. Fully drawing on available donor funding for M&E and increasing the share of domestic funding sources over time; and, 4. Implementing a systematic evidence-based approach to human capacity-building at all levels.
Kenneth Sherr, Jennifer Harris Requejo, Paulin Basinga	2013	Implementation research to catalyze advances in health systems strengthening in sub-Saharan Africa: the African Health Initiative	The African Health Initiative (AHI) was launched to catalyze significant advances in strengthening health systems by supporting Population Health and Implementation Training (PHIT) Partnerships in five diverse sub-Saharan African contexts. Each Partnership is implementing and evaluating an innovative project designed to address key health systems constraints and improve service delivery and health outcomes. The PHIT Data collaborative formed from all key partners involved in AHI was established

			to stimulate cross-site research, timely dissemination of findings, and use of results for programming purposes, as well as policy and strategy formulation.
Sima Ajami, Tayyebe Bagheri-Tadi	2013	Barriers for Adopting Electronic Health Records (EHRs) by Physicians	EHR's are useful to create legible and organised recordings and to access clinical information about patients, but may healthcare providers are slow to adopt the EHR's. The article shows that electronic health record use requires the presence of certain user and system attributes, support from others, and numerous organizational and environment facilitators.
Marc Berg	2001	Implementing information systems in health care organizations: myths and challenges	This paper discusses three myths that often hamper implementation of Patient Care Information system Processes i.e. 1) the implementation of a PCIS is a process of mutual transformation and PCIS implementations can be intended strategically to help transform the organization. 2) A top down framework for the implementation is crucial to turn user-input into a coherent steering force, creating a solid basis for organizational transformation. 3) The management of IS implementation processes is a careful balancing act between initiating organizational change, and drawing upon IS as a change agent, without attempting to pre-specify and control this process.
Jørn Braa & Calle Hedberg	2002	The Struggle for District-Based Health Information Systems in South Africa	They focus on the need to balance standardization and local flexibility (localization); development of a modular hierarchy of global and local datasets and the possible relevance of the results of the research in other countries.
Chet N Chaulagai, Christon M Moyo, Jaap Koot, et al	2005	Design and implementation of a health management information system in Malawi: issues,	A minimum set of indicators was identified and a strategy was formulated for establishing a system in the country. All health and support personnel were trained, employing a training of trainers cascade approach. Information management and use was

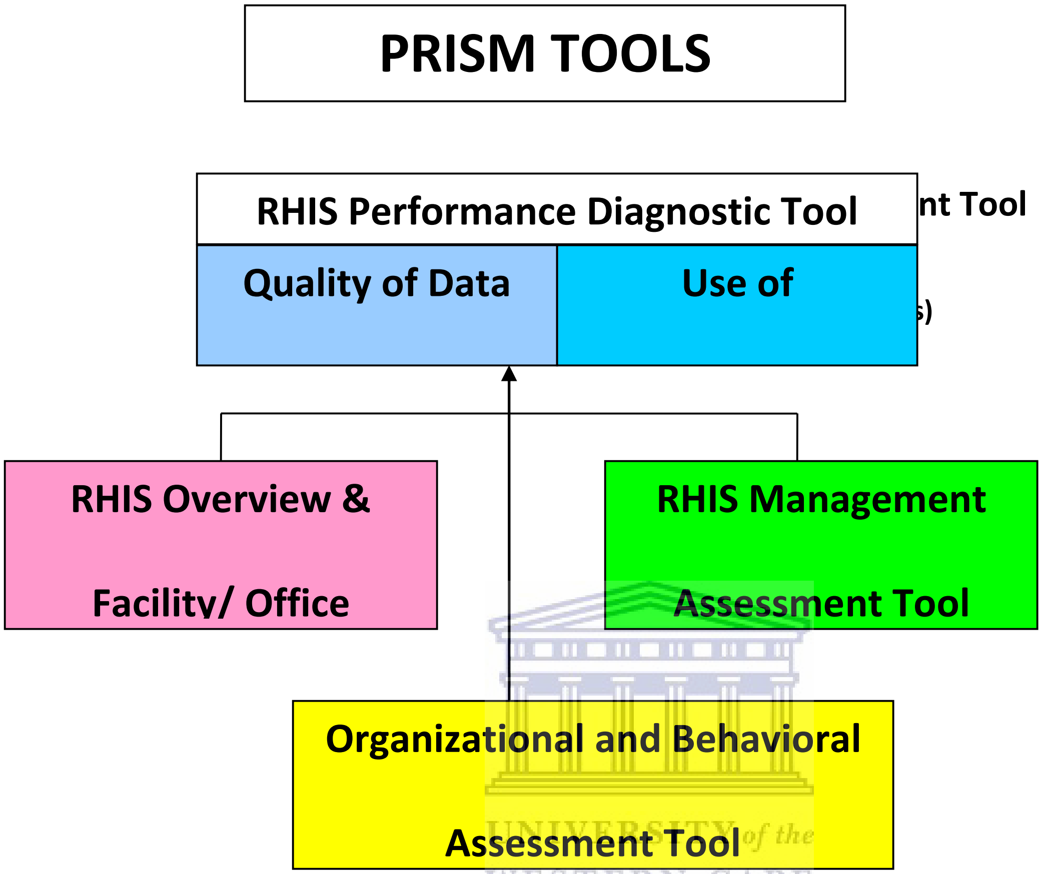
		innovations and results	incorporated into the pre-service training curriculum and the job description of all health workers and support personnel. Quarterly feedback, supportive supervision visits and annual reviews were institutionalized. Civil society organizations were involved in monitoring coverage of health services at local levels. A mid-term review of the achievements of the health information system judged it to be one of the best in Africa.
Reinhold Haux	2006	Health information systems — past, present, future	Development for HIS were considered as important by (1) the shift from paper-based to computer-based processing and storage, (2) the shift from institution-centred departmental and, later, hospital information systems towards regional and global HIS; (3) the inclusion of patients and health consumers as HIS users, besides health care professionals and administrators; (4) the use of HIS data not only for patient care and administrative purposes, but also for health care planning as well as clinical and epidemiological research; (5) the shift from focusing mainly on technical HIS problems to those of change management as well as of strategic information management; (6) the shift from mainly alpha-numeric data in HIS to images and now also to data on the molecular level; (7) the steady increase of new technologies to be included, now starting to include ubiquitous computing environments and sensor-based technologies for health monitoring.
Vital Wave Construction	2009	Health Information systems in developing countries	1. Enhance HIS success rates by supporting initiatives that have high-level sponsorship and occur in the context of wider health-system reform, 2. Support in setting clear priorities for reform, 3. Define HIS needs and goals, 4. Streamline data collection, 5. Develop HIS to support user decision-making, 6. Plan for

			project operations and maintenance at project outset, 7. Invest in adapted technology, 8. Develop commercial markets, 9. Increase project accountability by changing the structure of provider contracts, 10. Invest in increasing the attractiveness of the HIS technology and services market.
Anand Krishnan, Baridalyne Nongkynrih, Kapil Yadav et al	2010	Evaluation of computerized health management information system for primary health care in rural India	More than 95% of data was found to be accurate using computerised HMIS. Health workers acknowledge the usefulness of HMIS in service delivery, data storage, generation of work plans and reports. For program managers, it provides a better tool for monitoring and supervision and data management.
HMN	2010	Assessment of the Health Management Information Systems in Select Areas of Aceh Province	Recommendations include- Budget for future hardware needs, Look for “low hanging fruit” (improving patient and info flow, stop double entry of data, ensure adequate hardware to support new processes, streamline reporting), 4. Improve the capacity of front-line staff to use data
Theo Lippeveld		Routine Health Information Systems: The Glue of a Unified Health System	Experiences have shown that decentralization of information management toward the district level is an effective strategy to improve the use of routine information. A second strategy is to carefully manage the routine health information system restructuring process. The authors propose involving communities directly in health services planning and information system management. Examples include reporting births and deaths; notification of cases of infectious diseases and outbreaks; identification of high-risk children, pregnant women, and families; coverage and defaulters of critical services; coverage of households with safe water supply and sanitation; and monitoring air, water, land, and noise pollution.
Kennedy N Otwombe,	2007	Improving national data collection	Periodical field visits by the national officials to offer on-the-job training about data management to data

John Wanyungu, Kilonzo Nduku et al		systems from voluntary counselling and testing centres in Kenya	collectors and to address data quality issues can dramatically improve the quality and completeness of VCT reports. The perceived relevance of the data and the data collection process to those working at the sites is the critical factor for data quality and timeliness of reporting.
Aima A Ahonkhai, Ingrid V Bassett, Timothy G Ferris et al	2012	Improving HIV outcomes in resource-limited countries: the importance of quality indicators	An evidence-based set of program-level quality indicators is critical for the improvement of HIV care in resource-limited settings.
Gebrekidan Mesfin, Hajira Mohamed, Habtamu Tesfaye, et al		Data quality and Information use: A Systematic review to Improve evidence, Ethiopia	To improve the data management processes, The authors recommends instigating: • A favourable administrative and legal environment that ensures or reinforces mandatory routine reporting; • Sound data archiving; • The designation of institutional responsibilities for the approval of national data collection instruments and methods; • Infrastructure support to enhance the efficiency and quality of reporting as well as building capacities of health information experts. • Adopting procedures to address late, incomplete or inaccurate reports received from sub-reporting levels and corrections to earlier discrepancies in reports through regular integrated supportive supervision. This study recommends that follow-up assessments on data management and reporting systems should be integrated into the routine supervision systems as a means identifying and monitoring necessary improvements.
Annabelle Gourlay, Alison	2015	Challenges with routine data sources for PMTCT programme	Strengthening the indexing and recording of routine PMTCT data will necessitate investments in health systems such as staffing, training, and health infrastructure. We must ensure that data monitoring

Wringe, Jim Todd, et al		monitoring in East Africa: insights from Tanzania	systems keep pace with rapidly evolving guidelines and advances in PMTCT service delivery.
Clinton Health Access Initiative	2015	ART M&E Facility Assessment Report	Recommendations for improving are clearly outlined and often refer to the adherence to ART M&E SOP of 2012

ANNEXURE D: PRISM tools – Organizational and Behavioral Assessment Tool



DD1. Title of the person filling the questionnaire (circle answer)

(Make these categories appropriate to the host country)

1. Provincial DG
2. Provincial HMIS focal person
3. District HO
4. District HMIS focal person
5. Facility in charge
6. Other facility staff (specify) --------------------

DD2. Age of the person ----------------------

DD3. Sex 1. Male 2.Female

DD4. Education

1. 10 years   2. Intermediate (11-12)   3. Bachelor (13-14)   4. Master

5. Professional diploma/degree (specify)-----------

6. Other (specify) --------------------------------------.

DD5.   Years of employment   -----------------------

DD6. Did you receive any training in HMIS related activities in last six months?   0. No   1.Yes

We would like to know your opinion about how strongly you agree with certain activities carried out by ________________. There are no right or wrong answers, but only expression of your opinion on a scale. The scale is about assessing the intensity of your belief and ranges from strongly disagree (1) to strongly agree (7). You have to determine first whether you agree or disagree with the statement. Second decide about the intensity of agreement or disagreement. If you disagree with statement then use left side of the scale and determine how much disagreement that is – strongly disagree (1), somewhat disagree (2) or disagree (3) and circle the appropriate answer. If you are not sure of the intensity of belief or think that you neither disagree nor agree then circle 4. If you agree with the statement, then use right side of the scale and determine how much agreement that is – agree (5), somewhat agree (6) or strongly agree (7) and circle the appropriate answer. Please note that you might agree or disagree with all the statements and similarly you might not have the same intensity of agreement or disagreement and thus variations are expected in expressing your agreement or disagreement. We encourage you to express those variations in your beliefs.

This information will remain confidential and would not be shared with anyone, except presented as an aggregated data report. Please be frank and choose your answer honestly.

Strongly disagree	**disagree**	**Somewhat Disagree**	**Neither disagree nor agree**	**Somewhat Agree**	**agree**	**Strongly agree**
1	**2**	**3**	**4**	**5**	**6**	**7**

To what extent, do you agree with the following on a scale of 1-7?

In health department, decisions are based on

Strongly disagree	Somewhat disagree	disagree	Neither disagree nor	Agree	Somewhat agree	Strongly agree

D1. Personal liking	1	2	3	4	5	6	7
D2. Superiors’ directives	1	2	3	4	5	6	7
D3. Evidence/facts	1	2	3	4	5	6	7
D4. Political interference	1	2	3	4	5	6	7
D5. Comparing data with strategic health objectives	1	2	3	4	5	6	7
D6. Health needs	1	2	3	4	5	6	7
D7. Considering costs	1	2	3	4	5	6	7

Strongly disagree	Somewhat disagree	disagree	Neither disagree nor	Agree	Somewhat agree	Strongly agree

In health department, superiors

S1. Seek feedback from concerned persons	1	2	3	4	5	6	7
S2. Emphasize data quality in monthly reports	1	2	3	4	5	6	7
S3. Discuss conflicts openly to resolve them	1	2	3	4	5	6	7

S4. Seek feedback from

concerned community 1 2 3 4 5 6 7

S5. Use HMIS data for

setting targets and monitoring 1 2 3 4 5 6 7

S6. Check data quality at the facility and

higher level regularly 1 2 3 4 5 6 7

S7. Provide regular feedback to their staff through

regular report based on evidence 1 2 3 4 5 6 7

S8. Report on data accuracy regularly1 2 3 4 5 6 7

In health department, staff

P1. Are punctual 1 2 3 4 5 6 7

P2. Document their activities

and keep records 1 2 3 4 5 6 7

P3. Feel committed in improving

health status of the target population 1 2 3 4 5 6 7

P4. Set appropriate and doable

target of their performance 1 2 3 4 5 6 7

P5. Feel guilty for not accomplishing

the set target/performance	1	2	3	4	5	6	7
P6. Are rewarded for good work	1	2	3	4	5	6	7

In health department, staff	Strongly disagree	Somewhat disagree	disagree	Neither disagree nor	Agree	Somewhat agree	Strongly agree
P7. Use HMIS data for day to day management of the facility and district	1	2	3	4	5	6	7
P8. Display data for monitoring their set target	1	2	3	4	5	6	7
P9. Can gather data to find the root cause(s) of the problem	1	2	3	4	5	6	7
P10. Can develop appropriate criteria for selecting interventions for a given problem	1	2	3	4	5	6	7
P11. Can develop appropriate outcomes for a particular intervention	1	2	3	4	5	6	7
P12. Can evaluate whether the targets or outcomes have been achieved	1	2	3	4	5	6	7

P13. Are empowered to

make decisions	1	2	3	4	5	6	7
P14. Able to say no to superiors and colleagues for demands/decisions not supported by evidence	1	2	3	4	5	6	7
P15. Are made accountable for poor performance	1	2	3	4	5	6	7
P16. Use HMIS data for community education and mobilization	1	2	3	4	5	6	7
P17. Admit mistakes for taking corrective actions	1	2	3	4	5	6	7

Personal

BC1. Collecting information which is not used for decision making discourages me	1	2	3	4	5	6	7
BC2. Collecting information makes me feel bored	1	2	3	4	5	6	7

Strongly disagree	Somewhat disagree	disagree	Neither disagree nor	Agree	Somewhat agree	Strongly agree

BC3. Collecting information is

meaningful for me	1	2	3	4	5	6	7
BC4. Collecting information gives me the feeling that data is needed for monitoring facility performance	1	2	3	4	5	6	7
BC5. Collecting information give me the Feeling that it is forced on me	1	2	3	4	5	6	7
BC6. Collecting information is appreciated by Co-workers and superiors	1	2	3	4	5	6	7

U1.Describe at least three reasons for collecting data on monthly basis on the followings:

U1A. Diseases

1.

2.

3.

U1B. Immunization

1.

2.

3.

U1C. Why is population data of the target area needed?

1.

2.

3.

U2. Describe at least three ways of checking data quality.

1.

2.

3.

Dr. Akram, EDO Health, read a recent district report which showed that the data quality was 40% and felt very disturbed by it. “I need to take actions”, he said aloud. He paced back and forth thinking about his next steps to improve data quality. After some time, he calmed down and wrote his action plan. Please describe how Dr. Akram defined the problem and what major activities Dr. Akram must have included in his action plan for improving data quality…

PSa. Definition of the problem

PSb. Major activities

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

SELF-EFFICACY

This part of the questionnaire is about your perceived confidence in performing tasks related to health information systems. High Confidence indicates that person could perform the task, while low confidence means room for improvement or training. We are interested in knowing how confident you feel in performing HMIS-related tasks. Please be frank and rate your confidence honestly.

Please rate your confidence in percentages that you can accomplish the HMIS activities.

Rate your confidence for each situation with a percentage from the following scale

0 10 20 30 40 50 60 70 80 90 100

SE1. I can check data accuracy 0 10 20 30 40 50 60 70 80 90 100

SE2. I can calculate percentages/rates correctly 0 10 20 30 40 50 60 70 80 90 100

SE3. I can plot data by months or years 0 10 20 30 40 50 60 70 80 90 100

SE4. I can compute trend from bar charts 0 10 20 30 40 50 60 70 80 90 100

SE5. I can ex plain findings & their implications0 10 20 30 40 50 60 70 80 90 100

SE6. I can use data for identifying gaps

and setting targets 0 10 20 30 40 50 60 70 80 90 100

SE7. I can use data for making various types of

decisions and providing feedback 0 10 20 30 40 50 60 70 80 90 100

We would like you to solve these problems about calculating percentages, rates and plotting and interpreting information.

C1. The estimated number of pregnant mothers is 340. Antenatal clinics have registered 170 pregnant mothers. Calculate the percentage of pregnant mothers in the district attending antenatal clinics.

C2.The full immunization coverage for 12-23 month-old children were found 60%, 50%, 30%, 40%, 40% for years 1997, 1998, 1999, 2000 and 2001 respectively.

C2a. Develop a bar chart for coverage percentages by years

C2b. Explain the findings of bar chart

C2c. Did you find a trend in the data? If yes or no, explain reason for your answer

2d. Provide at least one use of above chart findings at:

UD1. Facility level

UD2. District level

UD3. Policy Level

UD4. Community level

C3. A survey in a district found 500 children under five years old that were malnourished. The total population of children less than five years old was 5000. What is the malnutrition rate?

C4. If the malnutrition rate in children less than 2 years old was 20% and the number of total children less than 2 years old was 10,000, then calculate number of children who are malnourished.

ANNEXURE E: LETTER OF PERMISSION

56 Park Avenue

Westridge

Mitchell's Plain

7798

Dear Sir/Madam

This letter serves to request permission to conduct my research study in the West Coast district in the Western Cape Department of Health.

I am currently registered with my International Master's Degree in Health Information Management with universities in SA, Kenya and Germany.

My topic is around health data utilization in the West Coast. The reason why I chose this topic was for it to be relevant for my work with SEAD as an M&E advisor, as well as my own perceptions that there might exist a need in this area as I was involved in the sub-district M&E preparations and processes in the district with the Information management staff. The study will involve 21 interviews and 3 focus with facility managers, sub-district managers, information officers, programme managers and the district manager respectively. Questions relating to data demand, data processes, data management and data use will be addressed, as well as identifying factors that affect data and information usage.

All information collected will be completely confidential and the participants will be able to withdraw from the study at any time.

I am also attaching all the necessary documents for your perusal in order to make an informed decision. Please do not hesitate to contact me for any clarification issues. My contact numbers are (021) 371 5847 or 060 707 3640.

Hoping to receive a favorable response.

Yours sincerely

………………………………………………………………………………………………………

………

Irma Zimri

ANNEXURE F:

UNIVERSITY *of the* WESTERN CAPE

Department of Economic and Management Services

INFORMATION SHEET FOR PARTICIPANTS IN RESEARCH INTERVIEW

Dear participant

Irma Zimri – Degree Master of Commerce: Information Management

The title of my thesis is:

The complexities and possibilities of health data utilization in the West Coast district

Please take time to read through this information sheet carefully in order for you to be knowledgeable on what is required of you as a research participant in this study.

As a participant who gave consent for your participation in this study, you will be required to attend an interview session where you will be given the opportunity to express your knowledge, perceptions and opinions on data utilization in the West Coast district. The interview will take about 1 hour to complete. There are no right or wrong answers, but only expressions of your opinion.

This will provide a greater understanding of the dynamics and use of timeously available and seemingly relevant and useful routine health information by providing evidence of patterns of utilization of information at various levels in the West Coast. You will be required to respond to questions relating to:

1. Decision making and data demand in the West Coast district
2. Data collection processes in the West Coast district
3. The quality of the data in the West Coast district
4. The availability of data in the West Coast district
5. Data utilization practices in the West Coast

If warranted and relevant, the findings will be used to propose recommendations in adapting existing strategies or developing new strategies in which to better make use of information to enhance decision making. The ultimate goal being to improve health outcomes by enabling the staff to better utilize their routine health information for effective decision making, and thereby overcoming any shortcomings in information use.

Your participation in this study is voluntary and no remuneration will be provided in return for your contribution. You remain free not to participate and have the right to withdraw from the study at any time without the need to provide any reason for such withdrawal. All information will be treated as confidential. The results will be published in professional journals and will be included in a thesis, without disclosing the identity of the participant. The researcher will ensure your anonymity throughout the research process.

We appreciate your assistance and co-operation in participating in the interview session.

If you have any questions concerning this research, feel free to contact me or my supervisor:

Irma Zimri	Cell phone: 060 707 3640	(advocc@gmail.com)
Dr James Njenga	Cell phone: 072 037 3284	(jkariuki@uwc.ac.za)

I hereby consent voluntarily to participate in this study. I have been given a copy of this form.

____________________________ ____________________________

Name of participant **Date**

Email:______________________________________

Thank you for participation in my study.

ANNEXURE G:

UNIVERSITY *of the* WESTERN CAPE

Department of Economic and Management Services

Letter of Consent

CONSENT FORM FOR INTERVIEW PARTICIPANTS

I, ………………………………………………………………., have had the opportunity to ask questions related to this study and obtained satisfactory answers to my questions.

I have also received any additional information that I may have requested about this research.

I agree to participate in this research.

I understand that my participation in this study is voluntary and that no remuneration will be provided in return for my contribution. I am free not to participate and have the right to withdraw from the study at any time without the need to provide any reason for such withdrawal.

I am aware that the interview might result in research which may be published, but that my identity will never be revealed. It is my understanding that the researcher will ensure my anonymity throughout the research process.

I retain the right of refusal to answer any question which I do not feel comfortable or able to respond to.

Date:…………………………………………………..…………………………………...…………………………

Participant Name:………………………………………………………………………………………………

Participant

Signature:……………………………..………………………………………………………

Interviewer

name:…………………………….…..IrmaZimri…..………………………………………

Interviewer Signature:

……………………………………………………………………………………

If you have any questions concerning this research, feel free to contact me: Irma Zimri, Cell phone: 060 707 3640 or my Supervisor Dr James Njenga, Cell phone: 072 037 3284

ANNEXURE H:

UNIVERSITY *of the* WESTERN CAPE

Department of Economic and Management Services

INTERVIEW SCHEDULE

MCOMM (INFORMATION SYSTEMS)

UNIVERSITY OF WESTERN CAPE

This interview is a part of the research being conducted on the complexities and possibilities of health information utilization in the West Coast district to provide a greater understanding of the dynamics and use of timeously available and seemingly relevant and useful routine health information by providing evidence of patterns of utilization of information at various levels in the West Coast.

If warranted and relevant, the findings will be used to propose recommendations in adapting existing strategies or developing new strategies in which to better make use of information to enhance decision making. The ultimate goal being to improve health outcomes by enabling the staff to better utilize their routine health information for effective decision making, and thereby overcoming any shortcomings in information use.

We would like to know your knowledge, perceptions and opinions about certain activities carried out by the department of health in the West Coast district. There are no right or wrong answers, but only expressions of your opinion.

Your name is not required. This information will remain confidential and would not be shared with anyone, except presented as an aggregated data report.

The interview will take about 1 - 2 hours to complete.

We appreciate your assistance and co-operation in completing this study.

Thank you.

1. Decisions and Data Demand

DD 1	Discuss the types of data which is routinely being collected? Is there any data which is prioritized or more in demand? Have you ever had a special request to collect data? For what purpose was this data needed? Who are the people who would normally request data from you? Name the job categories.	
DD 2	In your opinion, what else might influence decisions that are made in your organization? Policies, Managerial directives, Evidence/facts -Using data, Health needs, Considering costs, Crises, Sense of "knowing", Personal likes, corruption, Power and influence, Arbitrariness, Target chasing, Anecdotes (stories/rumors).	
DD 3 - IO	In the health department in the West Coast where you work, do you have many requests for information from your superiors or other interested persons? Is there a demand for data? Prompts - Request information on a regular basis in order to make decisions, seek feedback on information submitted from higher levels, perform data quality checks before sending the information to the next level, use HMIS data for setting targets and monitoring, seldom use information, provide monthly feedback to their staff through reports based on evidence, reviews and signs off the data on a monthly basis, report on data accuracy on a monthly basis, take action on poor performing areas based on the reports.	
DD 4 – FM	In the health department in the West Coast where you work, do you make many requests for information from your information department? Prompts - Request	

, SM , PM ,D M	information on a regular basis in order to make decisions, seek feedback on information submitted from higher levels, perform data quality checks before sending the information to the next level, use HMIS data for setting targets and monitoring, seldom use information, provide monthly feedback to their staff through reports based on evidence, reviews and signs off the data on a monthly basis, report on data accuracy on a monthly basis, take action on poor performing areas based on the reports.	
DD 5	In your opinion, how could you ensure that there is a demand for data in your sub-district? How could you influence how decisions are made using data?	

2. **Data collection and processing**

DC1	Discuss data collection processes in the department where you work? Prompts – paper registers, information systems in use,– are they efficient, data sources clearly defined? Is there any data that you currently collect, but not reporting on? What is this data? Why do you collect it? How can the data collection processes be improved?	
DC2	Discuss the tools that you are currently using to collect data? Design of the data collection tools - font, size, user friendly, headings, page size? How can the tools be improved?	
DC3	Do you have standard definitions for all of the elements that data is being collected for? Which ones do not have standard definitions? Do you fully understand all the data elements? Which ones do you not fully understand?	

DC4	Can you describe the data capturing responsibilities in the sub-district or facility where you work? How does data get aggregated and collated?	
DC5 - IO	Discuss the information systems are in use in the sub-district or facility? Which ones are you very comfortable with? Which ones do you feel you still need more training in? Do these information systems provide you with indicators in terms of your district priorities? How can the information systems be improved?	
DC6 - IO	Discuss your abilities with regards to the following areas? Word, PowerPoint Excel 1 (basic concepts), Excel 2 (formula and functions), Excel 3 (manipulating data), Outlook, Data analysis, Data interpretation, Indicator and Target setting, Statistical concepts, Data use, Monitoring and Evaluation. Do you feel the abilities you have is enough for you to do your job? Where would you need more training?	
DC7 – FM, SM, PM, DM	Discuss your abilities with regards to the following areas? Word, PowerPoint Excel 1 (basic concepts), Excel 2 (formula and functions), Excel 3 (manipulating data), Outlook, Data analysis, Data interpretation, Indicator and Target setting, Statistical concepts, Data use, Monitoring and Evaluation. Do you feel the abilities you have is enough for you to do your job? In which areas will you need more training?	

3. Data quality

DQ1	How would you describe the quality of the data in your sub-district or facility? Prompts – discuss the findings of	

	the latest ICU assessment done in your facilities? Ask to see report? How could it be improved?	
DQ2	In your opinion, which data is of a better quality? Name the categories – PHC, ART, HCT, ETR, PMTCT Baby, PMTCT follow up, Why do you think so? Prompts – Nobody reported to the data collectors that there were errors in the data, Data collectors are not adequately trained to collect data accurately, Errors occur when adding up the data, Data are grouped incorrectly, There are missing data forms, Error checks are inadequate, Data does not get signed off at every level, no clear definitions, definitions not clearly understood, not user friendly tools,	
DQ3	In your opinion, what do you think people's attitudes are towards producing quality data? Prompts - Data collectors do not appreciate the value of the data, Nobody checks for errors (whose job is it anyway?), Error checks are not perceived as being important, Checking for errors is time consuming, Checking for errors is perceived as being a boring task, Error checking requires you to be nit-picking and meticulous (perfectionist), People detect errors, but do not ask data collectors to correct them, as they do not like to tell others that they are wrong and/or get into arguments with data collectors, Checking for errors suggests that you distrust staff, Information is seldom used, therefore people don't see the need to check it (or collect it)	
DQ4	In your opinion, how could you influence the attitudes of people regarding data production, quality, and information usage?	

4. Data availability

DA1	Describe the data flow process from facility to district level. Include timelines, responsible persons, data sign off, and accuracy checks. Is there an SOP for data flow? Are you compliant with the timelines? Show me the records?	
DA2 - IO	Do you regularly provide data for facility managers, programme managers etc.? Is there an SOP around data availability? What is the time period that you have to provide the data? Are you happy with this time period? In your opinion, what would be the appropriate time in which to provide routine data? What format do you give it to them? Do they understand the format you sent it to them?	
DA3 – FM, SM, PM, DM	Do you regularly receive data from the information department? Is there an SOP around data availability? What is the time period that you receive the data? Are you happy with this time period? In your opinion, what would be the appropriate time in which to be provided with routine data? What format do you receive it in? Do you understand the format that you receive it in? Could you suggest in what format you would want to receive it?	
DA4	Do you know of any structural constraints that can affect the availability of the data? Prompts - poor roads, network connectivity for internet, intranet, email access, lack of working space, lack of equipment – telephone, fax line, computer, printer, data collection forms, registers, lack of stationery – calculator, pens, rulers, long distances to travel, too few staff, availability of cars, lack of drivers licenses, unclear roles and responsibilities with regard to information management	
DA5	In your opinion, what can be done to improve the availability of the data? What can you do, what structures must be in place?	

5. Data utilization

DU1 -IO	Describe your role with regards to analyzing the information? Production of monthly reports? Quality reporting? Quarterly reports? What format is used? Is it generated electronically or manually? What do you do with these reports?	
DU2-FM, SM, PM, DM	Describe your role in information? Quality checks review and sign off? Do you receive reports on the performance of the facility/sub district/programme according to specific indicators on a monthly basis? What do you do with these reports? Do you discuss this information at management meetings? Are graphs of at least 2 months back data displayed in your facility/sub district office/district office?	
DU3	Discuss your role in presentation of this data/information? What platforms, what format is used (PowerPoint, excel dashboards, written reports, charts, graphs, indicators/elements, performance monitoring against targets) what audience, what is it you actually do (just operate the computer to scroll up and down or actual participation in the discussion)	
DU4	Discuss your role in interpretation of the data? Are you able to interpret graphs and charts? Do you understand efficiency and effectiveness, do you understand trends, and benchmarking, statistical concepts, mean, percentages, coverage?	

DU5 -IO	Discuss your role in producing programme-specific e.g. Child health and HAST data. Do you know what your district priority indicators are? What are they? Mention 5 priorities. Do you feel that programme data is not your responsibility? Who responsibility is it? Do you have a good understanding of programme data as it relates to Child health, Women's Health, DHS, Hospitals, HAST, Disease control, Nutrition, Mental health, Dental health, Rehabilitation? Do you think you would need more knowledge on any of the programmes mentioned above in order to understand and produce better programme data?	
DU6 -IO	What would you like the people you provide the information to, to do with the information? What do you expect them to do with this data?	
DU7– FM.SM.PM.DM	How do you use the information you receive? Can you give a recent example of how information was used?	
DU7	Can you suggest ways in which information can be used at facility level?	
DU8	Can you suggest ways in which information can be used at sub-district level?	
DU9	Can you suggest ways in which information can be used at district level?	

6. Demographical information

Name of District: Name of Sub-district:

Name of Assessor:

Date of Assessment:

Designation of person being interviewed:

Facility manager Information officer Sub-district manager Programme
Manager Information manager District manager