

# **A Case Study of the Health Information System in Gaborone**

*Information Flow and Managers' Information Use*

**Ragnhild Flingtorp**



**Supervisor: Professor Grete S. Botten**  
**Co-supervisor: Research Fellow Johan I. Sæbø**

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*If physiology literally means 'the logic of life', and pathology is the  
'logic of disease', then health informatics is the logic of health care  
(Source: Coiera 2003:xxi)*

## Abstract

**Background:** Developing countries experiences an increasing burden of disease as well as challenges financial and human resources. Good information about the current situation of the health situation is important in planning, monitoring, evaluation, resource allocation, and need assessments. A well functioning health information system for gathering, processing, analysing and using health information will facilitate this.

**Objectives:** Three main areas have been examined in this thesis on health information flow and information use in Gaborone, Botswana; an analysis of the simplicity, user-friendliness, overlap, relevance, completeness and effectiveness of data collection tools used in the Gaborone district, what this information is used for and how managers use it. The last objective has been to identify improvement possibilities the information flow between health facilities in Gaborone district and the selected health programmes (Mental Health, Prevention of Mother To Child Transmission, Mother and Child Health, and Expanded Programme on Immunization).

**Methodology:** Through a case study of HIS in the capital area, Gaborone, focusing on selected health programmes data was collected over a 12 weeks period. 10 observations, in a total of eight facilities and administrations, in Gaborone health district were performed. The study resulted in seven semi-structured interviews of managers in the national, district and facility levels of Botswana. Monthly reports from the PMTCT, Mental Health, EPI, MCH health programmes were collected from the facilities under observation.

**Results:** The study revealed a diverse and fragmented information flow, differing from programme to programme. Two coexisting HIS was identified, one formal and informal system. The SOURCE-analysis mainly revealed a problem of overlapping data collection tools. The form of the EPI programme is the only one amongst the assessed programmes that satisfy all the SOURCE criterions. The study revealed data quality discrepancies, in terms of incorrectness, incompleteness, inconsistencies and un-timeliness of delivering reports. Un-timeliness is one of the major constraints of the HIS according to the informants. An equal pattern of information use was seen among all the interviewed managers. Facility and district level seems to have a lower degree of information use than the national level.

**Conclusion:** The challenges of overlap, data quality, informal information channels and coordination were perceived to be interconnected and they all contributed to managers' non-access to and use of information. It is argued that the HIS of Gaborone is unsuccessful.

**Key words:** Health information system, Botswana, Gaborone, SOURCE-assessment, data collection tools, microsystem, coordination, information circle, information flow, information use.

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## Preface

This thesis is written as a partial fulfilment of the Master of Philosophy in Health Economics, Policy and Management at the University of Oslo, Norway. The degree is multidisciplinary and seeks to combine economic, political and organizational analysis, health care policy evaluation and health care management in an international perspective. Many of these elements are covered by this thesis, and do hereby live up to the goals of the Master's degree programme. I was introduced to health information system research in April 2007, when I attended a two week course in Health Information Systems (HIS), a master course provided in collaboration between Centre for International Community Health and Department of Informatics, University of Oslo. The course made me aware of health managers need for correct, consistent, complete and timely data. My curiosity towards HIS ultimately led me to collaborate with Research fellow Johan I. Sæbø, at the Department of Informatics, who through the global infrastructure research programme, HISP, had established contacts with the government, NGOs and research institutions in Botswana. During the 1<sup>st</sup> half of 2008, 12 weeks of field work were spent in Gaborone, Botswana, culminating in this case study of the health information system in Gaborone focusing on information flow and managers' information use.

The main challenge during this study has been to gain access to the field. The first application to the Health Research Unit (HRU), the research ethics board in the Ministry of Health in Botswana was sent mid December 2007. When the application was not approved by the end of February my supervisors advised me to travel anyway. First obstacle was however removed few days after arrival Gaborone, when I gained approval from HRU. No information was however, given to me that I also had to get written approvals from the management of each department I wanted to visit. The last approval came April 24<sup>th</sup>. This delayed my work and demolished my intentions of conducting a multi-case study between two different health districts, Gaborone and Kgatleng. The reason is that I found two full weeks to perform the necessary personal recruitment of health facilities and continue my study at the national level in Gaborone would have been too comprehensive to do a proper study. During my study I revealed a necessity to visit Lobaste Mental Hospital in the South-East district. A visit to Lobaste Mental Hospital was not covered by my approval from the HRU, hence a new

application was sent. This was however denied grounded on my inadequate ability to convince the HRU of the necessity to include Lobase Mental Hospital in the study.

This project differs from other master theses accomplished at the international master's programme of the Department of Health Management and Health Economics in several ways. First, few students collect their own data; and second, no students has ever travelled abroad to perform a study. The majority of the graduated students have in addition focused on quantitative research, while this study is purely qualitative. I knew that conducting field work in a foreign country would require more effort than a "regular" master thesis. Still the process resulted in even more work than expected, especially concerning the amount of paper work required to gain access to the field. To conduct research in a country not of one's own origin can be cumbersome. It does also affect the writing process. Since the targeted reader, the examiner, probably has limited pre-knowledge of Botswana in general and the health system of Botswana in particular I have found it necessary to elaborate the topics in this paper. Hence, the choice of study site, methodology and a complex topic in itself all contributes to the fact that the length of this thesis exceeds the guidelines set by the Department. The final product has however been approved by my main supervisor in collaboration with the administration of the Department. The thesis is aimed at readers with a basic understanding of medical terminology, epidemiology, management and research competence.

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## List of abbreviations

<b>ARV</b>	Antiretroviral drugs
<b>BEANISH</b>	Building Europe Africa collaborative Network for applying IST in Health care Sector
<b>DHIS</b>	District Health Information System software
<b>DHT</b>	District Health Team
<b>DPT</b>	Diphtheria, Pertussis, Tetanus vaccine
<b>EPI</b>	Extended Programme on Immunization
<b>GDP</b>	Gross Domestic Product
<b>HIS</b>	Health Information System
<b>HISP</b>	Health Information System Programme
<b>HRU</b>	Health Research Unit
<b>HSU</b>	Health Statistics Unit
<b>MCH</b>	Mother and Child Health
<b>M&amp;E</b>	Monitoring & Evaluation
<b>M&amp;E Officer</b>	Monitoring & Evaluation Officer
<b>MoH</b>	Ministry of Health
<b>PMTCT</b>	Prevention of Mother To Child Transmission
<b>Record book</b>	Patients' individual book of record
<b>Register book</b>	Book of aggregated statistics
<b>SOURCE</b>	Simplicity, Overlap, User-friendliness, Relevance, Completeness, and Effectiveness
<b>STI</b>	Sexual Transmittable Infections
<b>TBC</b>	Tuberculosis
<b>TT</b>	Tetanus Toxoid vaccine
<b>WHO</b>	World Health Organization



*Picture 1: A health clinic in Gaborone*



*Picture 2: Outside a health facility in Gaborone*

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# 1. Introduction

## 1.1 Motivation and approach

Improvement in health is recognized as a central factor for development in poor countries. Management is essential to facilitate improvements. To make management possible managers need good information about the current situation of the health of the population. Acquiring good information, a well functioning health information system (HIS) for gathering, processing, analysing and using health information is necessary (World Health Organization 2007). Botswana, being the country hardest hit by the HIV/AIDS scourge in the world, is in a particular need for good management of their resources to be able to deal with both the HIV/AIDS patients and other emerging diseases. The core ideas of this thesis are that:

*“Information can be a valuable driver of change. It shines a light on any society. It can foster awareness and understanding of social injustices, and it can provide evidence for people both within and outside government to argue for, to decide on, and to implement successful reforms. Information is the lifeblood of transparent, informed and open societies - fundamental aspects of democratic and well-managed states” (Africa Commission 2004:1).*

This project was initiated in the wake of the Building Europe Africa collaborative Network for applying IST in Health care Sector (BEANISH) pilot project in Botswana. BEANISH is a research and development programme on HIS appreciating the need to include information technologies as a basis for health information activities in public health care. The programme is based on work by the Health Information System Programme (HISP), a global research network consisting of researchers from Norway, South Africa, Mozambique and India, to mention a few (BEANISH Project 2008). In HIS research there is a strong tradition of action research approaches. Previous research on HIS has focused on specific technical devices and software. I have chosen a different path, choosing more “traditional” research methodologies in my study. I am focusing on a case study based on observations, interviews and document reviews enabling analysis of the data collection tools, what health information is used for, how it is used and finally try to find solutions to any identified challenges. Health information use is a relatively uncovered topic globally. Yet, researchers have acknowledged it as a focus area of more research (BEANISH conference in Gaborone 12. – 13. March 2008).

Researchers (Sæbø 2007) have identified several global challenges within the HIS of Botswana. The system is complex and fragmented which may result in coordination challenges. There are

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also indications of poor data quality, duplication of work among health workers, and low accessibility of information. This makes the HIS in Botswana a good example to study. To create a picture of the HIS I have chosen one health district in Botswana – Gaborone – as a research setting. The thesis focuses on information flow between different institutions in Gaborone health district, and information use among managers. To study how managers use information will provide a better understanding of the processes and will be a contributing factor to develop better HIS in Botswana in the future. Four health programmes with different significance were chosen to illustrate the challenges and opportunities; Mental Health, Prevention of Mother To Child Transmission (PMTCT), Mother and Child Health (MCH), and Expanded Programme on Immunization (EPI).

To look further into these questions I have collected information about Botswana before departure (chapter 2). Second, I have studied the literature (chapter 3) in order to formulate specific research objectives and hypotheses (chapter 4). Based on this methodology was chosen (chapter 5) which gave me empirical data on how the HIS in Botswana works in practice (chapter 6). Finally, I have discussed my findings in relation to the theoretical frame and other studies (chapter 7). Concluding remarks are provided in the last chapter.

### **1.1.1 Basic concepts**

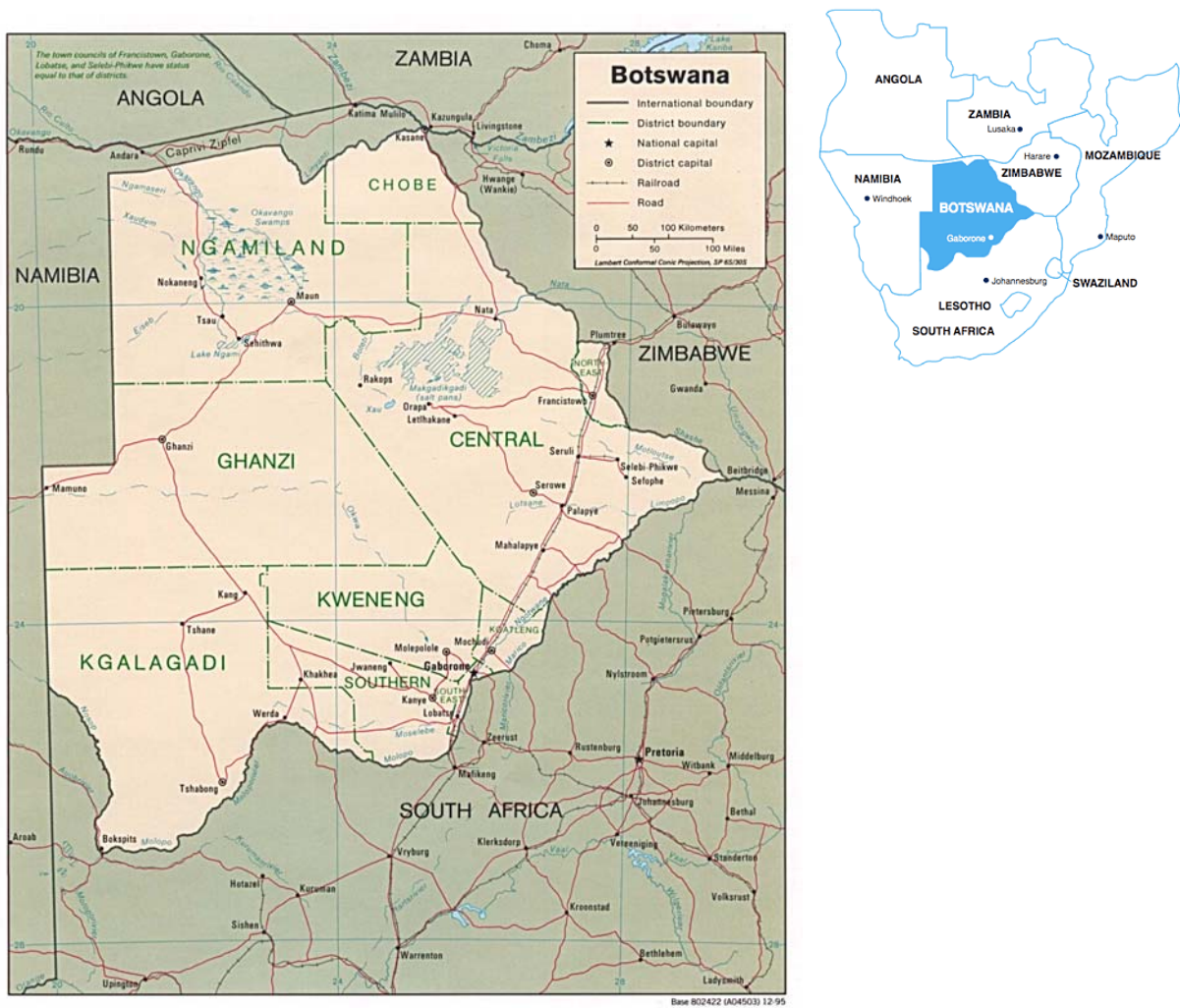
In this thesis the terms ‘data’ and ‘information’ refer to any kind of qualitative and quantitative data. “Data consists of evidence of observations or measurements about the world [...], [k]nowledge defines the [causal] relationship between data[, while] information is obtained by the application of knowledge to data” (Coiera 2003:13). Data that are analysed and interpreted are what is called information.

Health Information Systems (HIS) is a broad term, with several understandings. In this thesis it is understood as a media for gathering health data, as well as all possible means of storing, processing, aggregating and presenting health information; those who generate the data; those who use the information; and those who maintain the data and the means by which it is captured, stored, processed, aggregated and presented. Hence a HIS is both a technical, social and organizational matter. The processes of collection, aggregation, processing and analyzing health data is a part of a HIS. Using the data collected to perform action is an essential end product of the activities performed in the HIS.

## 2. Background

### 2.1 Botswana

Botswana is a landlocked country in southern Africa that borders on South Africa, Zimbabwe, Zambia and Namibia. The topography is flat and semi-arid, the winters are warm and the summers are hot. Botswana was a former British protectorate, known as Bechuanaland, and gained its independence in 1966 (CIA 2008b).



(ReliefWeb 2008)

Figure 2.1: Map of Botswana

The country is a parliamentary republic that during its' history has been, and still is, politically stable. It is 600.370 km<sup>2</sup> large, which is comparable in size with France. The Kalahari Desert constitutes the majority of the country. Hence its about 1.8 million inhabitants have scattered settlements all over the country. About 80 % of the population belongs to the Tswana tribe, 11



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% to the Kalanga, 3 % Basarwa, 7 % constitute other tribes like the San and the Caucasian. Over 70 % of the inhabitants are regarded as Christians. The official languages are English and Setswana (CIA 2008b).

Botswana is categorized as a middle-income country and got one of the fastest growing economies in the world, with diamonds, cattle, and tourism as the major sources of revenue. In 2006 the Gross Domestic Product (GDP) per capita was \$14,300 (2007 estimate) (CIA 2008a). In comparison South Africa had a GDP per capita of \$9,700, Russia, \$14,800, and Norway, as the 6<sup>th</sup> highest ranked in the world, \$53,000 (CIA 2008a). Still, 1/3 of Botswana live below the poverty line. Botswana received \$70.89 million in economic aid in 2005 (CIA 2008b). The inflation is however increasing with an inflation rate of 11 %, in April 2008, an increase of 2.6 % since the new-year. This is also affecting the everyday-man's economic situation due to increasing food and oil prices.

## 2.2 The Health System in Botswana

Botswana is divided into 9 districts, which is further divided into 24 health districts. In this thesis the term district refers to a health district. The country has 3 national referral hospitals, 14 district hospitals, and 17 primary hospitals. In addition clinics, health posts and mobile stops make up the health facility infrastructure (Ministry of Health 2007). The health care sector is divided into three levels; local (primary hospitals, clinics, health posts and mobile stops), district (district hospitals) and national (national referral hospitals) level. The health system is based on primary health care principles, where access to health care is a primary goal for the government. 84% of the population lives within the targeted 5 km radius to the nearest health facility, and 95% lives within a radius of 8 km (Majelantle 2007).

The Ministry of Health (MoH) is responsible for policy making, and are in charge of the primary, district and referral hospitals, while the Ministry of Local Government is responsible for policy implementation and administration of local authorities and members of staff in the clinics, health posts, and mobile stops (Molutsi 1996). In 2006 7.2 % of the GDP were allocated to health, less than 6 % of the resources came from external financial sources (World Health Organization 2008b). The financial responsibility is centralized to the national level of

government (Molutsi 1996). User fees are low, with a cost of 5 Pula (= 0.8 US\$<sup>1</sup>) per consultation for citizens of Botswana. Most treatments are free of charge for the users, amongst these are HIV/AIDS treatment, antenatal and child welfare care.

### *Gaborone*

Gaborone health district is situated in the south-east part of the country, towards the border of South-Africa and constitutes the capital city. The estimated population for 2008 was about 208.000 inhabitants (CIA 2008b). Table 2.1 provides an overview over the structure of the district's health facilities.

	National Referral Hospital	General Hospital (private)	Primary Hospital	Clinics w/ beds	Clinics no beds	Health Posts w/ nurse	Health Post no nurse	Mobile Stops	Total
<b>Gaborone</b>	1	1	0	3	21	0	0	0	<b>26</b>

(Source: Ministry of Health 2007:v)

*Table 2.1: Overview of the health facility structure in Gaborone*

In 2004 there were 2 doctors and 26.5 nurses and midwives per 10.000 Batswana nationally, making human resources a huge challenge for the health sector. Even in contrast with counties naturally being compared to Botswana this is low. Gaborone district however has got 31 doctors and 390 nurses/midwives in total (Health Statistics Unit 2004; World Health Organization 2006b). Hosting the largest national referral hospital and being a capital city, the district both attracts more qualified personnel than what is common in rural areas.

## 2.3 Mortality and burden of disease in Botswana and Gabarone

A global picture of the mortality and burden of disease in Botswana, in comparison with other countries, is presented in table 2.2. Due to the HIV/AIDS situation in the country, Botswana has a life expectancy of only 40 years. In 2003 the prevalence rate among 15-49 year olds was 37.3 %, leaving Botswana as the worst affected country by HIV/AIDS in the world. 85% of HIV patients recommended to receive antiretroviral (ARV) treatment receives it, something that is exemplary in Southern Africa. Mothers receiving antenatal coverage and births attended by skilled personnel are the highest in the region. Despite this, maternal mortality is 100 deaths per 100.000 live births. The infant mortality rate and the neonatal mortality rate is respectively 75

<sup>1</sup> Exchange rate June 1 2008

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and 40 deaths per 1000 live births respectively – among the highest rates in Southern Africa. In 2004 the under-5 mortality rate was 116 per 1000 live births (World Health Organization 2006b). The main killers were HIV/AIDS and neonatal causes (World Health Organization 2008a). Below, four chosen public health issues, reflecting the health programmes selected as cases, and their corresponding structure of services are presented in some details.

### **2.3.1 HIV among pregnant women**

About 50 % of pregnant Batswana women tested in 2005 were found to be HIV positive, varying with age group and place of residence. (UNAIDS & World Health Organization 2008). To prevent the transmission of HIV from the parents to the unborn baby is identified as a primary goal of the governments (Ministry of Health 2006). The PMTCT programme is highly influenced by the primary health care ideology in Botswana (UNAIDS & World Health Organization 2008). In Gaborone each clinic has employed a PMTCT lay-counsellor responsible for VCT, formula feeding delivery and general counselling of patients. By 2009 the government expect the percentage of HIV positive mothers receiving prophylaxis for the PMTCT purposes to be 100 %, while only 10 % of infants born to infected mothers should be positive at 18 months of age (National AIDS Co-ordinating Agency 2003). HIV/AIDS is recognized as a national challenge, affecting all sides of the society. A separate coordinating agency, National AIDS Co-ordinating Agency (NACA), is therefore established and functions as the main provider of policy and planning related to HIV/AIDS. Other departments and divisions in several governmental agencies are involved in HIV/AIDS work, among them are the PMTCT unit in the Department of AIDS Prevention and Care in the MoH.

Country	Life expectancy at birth (years)		Infant mortality rate (per 1000 live births)	Neonatal mortality rate (per 1000 live births)	Maternal mortality ratio (per 100.000 live births)	HIV prevalence among adults (15-49) (Both sexes %)	Antenatal care coverage (Both sexes %)		Births attended by skilled health personnel (%)	Antiretroviral therapy coverage (%) (2005)	Physician density (per 1000)	Nurse/ Midwife density (per 1000)
	♀	♂	Both sexes	Both sexes			≥ 1 visit	≥ 4 visits				
<b>Botswana</b>	40	40	75	40	100	37,3	99	97	94	85	0,02	2,65
<b>Namibia</b>	52	55	42	25	300	5,4	85	69	76	71	0,06	3,06
<b>Norway</b>	77	82	3	3	10	0,1	...	...	...	>75	0,89	16,22
<b>South Africa</b>	47	49	54	21	230	21,5	89	72	84	21	0,13	4,08
<b>Zambia</b>	40	40	104	40	750	16,5	94	71	43	26	0,04	2,01

(Source: World Health Organization 2006b)

Table 2.2: Mortality, morbidity and administrative health care data from Botswana, Namibia, Norway, South Africa, Zambia and Zimbabwe.

### **2.3.2 Mental Health**

The most common mental conditions are schizophrenia, depressive episodes, and mental disorders related to alcohol abuse (Health Statistics Unit 2003). The Mental Health programme in Botswana's is based in Lobatse Mental Hospital in the town of Lobatse, in the southern part of the country. Gaborone has one Mental Health out-patient clinic, located at the national referral hospital. In addition, the general clinics receive, refer and follow up psychiatric patients. The national Mental Health programme is situated in the Public Health department of MoH.

### **2.3.3 Preventable communicable diseases**

Different countries have different guidelines for which vaccines to include in their EPI programme. In Botswana tuberculosis (TBC), hepatitis B, measles, diphtheria, pertussis, tetanus (DPT) and polio are identified as diseases children (and mothers) should be vaccinated against. In addition vitamin A is given as supplementation to babies (Expanded Programme on Immunization 2007). Communicable diseases still are a public health concern in Botswana, and people die of both TBC and measles. Immunization is free of charge. Vaccinations are performed at general clinics as a part of the antenatal and well-baby care services as well as at delivery clinics. The Expanded Programme of Immunization (EPI) unit in the Ministry of Health is responsible for prevention of communicable diseases in Botswana.

### **2.3.4 Mother and child health**

Mother and Child Health (MCH) cover health care services for pregnant women, deliveries, and services for infants under 1 year old. This includes provision of contraceptives, antenatal, postnatal and neonatal care, in addition to well-baby care services with growth monitoring. The main reason of neonatal deaths in Botswana in 2004 was infants between 28 and 37 weeks of gestation the health personnel were not able to save. Other reasons are caesarean section affected complications and newborns affected by mothers hypertension. HIV, puerperal sepsis, and respiratory conditions being the main causes of maternal deaths (Health Statistics Unit 2004). All district facilities provide antenatal and well-baby care services. There are four delivery clinics in Gaborone, in addition to the national referral hospital. At the

national level the Sexual and Reproductive Health Unit in the Public Health department, MoH is responsible for mother and child health issues.



*Picture 3: A Mother and Child health examination room*

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## 3. Theoretical framework

### 3.1 Microsystems

In health care we talk about the cardiovascular system, systems of best treatment guidelines. Earlier in this thesis both the HIS and the health care structure in Botswana were described as systems. The concept of “systems” is an abstraction helping us to compartmentalize a part of the world to make it more logical (Coiera 2003). A “system is defined as a collection of interdependent elements that interact to achieve a common purpose” (Nolan 1998:294), for example an organized process or a connected set of actions (AbouZahr & Boerma 2005). It may be argued that an organization may be a system in itself as well as handle a chain of interdependent actions, as a system within the larger organization (Nolan 1998). Such systems are defined by Nelson et al. (2002) as clinical microsystems:

*A clinical microsystem is a **small group** of people who work together on a regular basis to provide care to discrete **subpopulations of patients**. It has clinical and business **aims**, linked **processes**, and a shared **information** environment, and it produces performance **outcomes**. Microsystems evolve over time and are often **embedded** in larger organizations. They are **complex adaptive systems**, and as such they must do the primary work associated with core aims, meet the needs of internal staff, and maintain themselves over time as clinical units (Nelson et al. 2002:474).*

The health system as a whole is constituted of a network of microsystems that collaborate to various degrees to reduce the burden of disease in the population. Nelson et al. (2002:474) assume that (1) structure of the health system (the macrosystem) are made of smaller systems; (2) these smaller microsystems produce quality, safety, and cost outcomes at the front line of care; and (3) the outcomes of the macrosystems cannot be better than the microsystems of which it is composed.

Despite the large number of people involved in providing health data, the generation of reports and use of the information are performed by a limited number of people. Data are collected routinely and are linked to specific patient groups. The goal of HIS is to provide information and ease decision-makings. The processes in the HIS are sequentially linked by data collection, processing, analysis, presentation, interpretation, and eventually information use. The outcomes produced are information that can be used to improve health services in various degrees. Several researchers have identified HIS as complex adaptive systems (Sæbø 2007; Thorseng 2008). HIS are hereby identified as microsystems.

### *Integration of information*

Microsystems vary in their ability to integrate information as a daily routine, as well as how technology is used in the facilitating of information integration (Mohr & Batalden 2002). Globally there is an increasing awareness that computerization is the most cost-effective way to achieve high quality information (Herbst 1999). Implementing IT solutions for data collection saves time, limits the number of errors, and increases the timeliness and reliability of the data. A threat that needs to be taken into account before starting computerization is that managers may become passive consumers of information (Chaulagai 2005). It does not matter how fancy the available devices are, and all processing and analyzing of information is done automatically if the managers in the end of the chain still do not actively use the data in the final decisions they make. To succeed, the members of the microsystem have to “trust, collaborat[e], [be willing] to help each other, appreciat[e] complementary roles, respect and recogni[ze] that all contribute individually to a shared purpose” (Barach & Johnson 2006:i11). To set a good example at the top of the chain of management, at the national level and in higher managerial positions, will give an effect in the rest of the organization. By emphasizing higher level of management’s use of information one legitimizes their request for data from the health workers and mid-level management (Cibulskis & Hiawalyer 2002). An indicator of a successful integration is information available at the right time to perform the work (Mohr & Batalden 2002).

### *Measurement*

A microsystem should collect data to measure processes in and outcomes of its own work on a regular basis. The actions the microsystem take should be based on the data they collect, and feedback should be given to data providers. (Mohr & Batalden 2002). A success criterion for microsystems is that data give a true picture of the processes and outcomes in the system. The main assumptions when developing data collection tools is that they are useful to improve programme management and accountability. Simple data sheets, clear objectives, user involvement, dissemination, and standard event definitions are the corner stones of a successful HIS (Tshimanga 1997). Appropriateness of data collection tools is difficult to achieve. Several studies in developing countries have revealed tools difficult to grasp and use, overlapping data elements, irrelevant to information users, and ineffective for decision-making (Heywood & Rohde 2001). Poor national coordination and donor funded projects with different donors who require different information, are likely reasons of duplication of data collection tends to be an obstacle in the HIS (AbouZahr & Boerma 2005;Evans &



Stansfield 2003). Evans and Stansfield (Evans & Stansfield 2003) describe some arising challenges:

*“Countries and donors invest heavily in attempts to measure effects and deficiencies of their particular health systems, but unfortunately many of these measurements are made in such a way that their benefit is negligible. Duplication [of data elements]abounds when health information systems are developed for each special health programme; inefficiency and opportunity costs rise when the same person has to fill in the forms for all programmes separately. Information collected has an unfortunate tendency to go up but never come down; or the data are simply never used” (Evans & Stansfield 2003:856) .*

Hence, overlapping data elements is unnecessary, time consuming and expensive, because it requires extra resources in form of time for data recording, compiling and processing. In most cases no measurement strategies has been developed for data collection (Murray 2007).

### ***Supportiveness of the larger system***

The larger organization, which the microsystem is a part of, may either be supportive or toxic to the performance of the microsystem (Mohr & Batalden 2002).

*“The way in which an organization is designed also has considerable importance for the nature and content of the information system needed by the organization. Since an organization design specifies who has power to make which decisions, it also indicates which positions need what types of information and at what times. Organization design also has implications for how performance will be evaluated and rewarded. Finally, the knowledge gathered from performance indicators will be fed back to subsequently influence the organization’s mission” (Shortell & Kaluzny 2006)*

### ***Constancy of purpose***

Visions, missions and aims should be visible and integrated part of the daily work of the microsystem (Mohr & Batalden 2002). The purpose of an information system is to ease the effort of managers by simplifying the decision-making process and manage a set of activities. In complex situations the information system facilitates reduction of the complexity of the situation, and to decrease the probability of making errors (Coiera 2003).

### ***Connection to the community***

Mohr and Batalden (Mohr & Batalden 2002) look at the microsystem and the surrounding community as mutually dependent upon another and shared resources. HIS researchers have until now not exploited the larger society in the effort of encouraging better HIS performance. One exception is an action research project in Uganda. Here, data was disseminated to the community as a summary in the local newspaper. This resulted in a public demand of explanations of poor health service performances, forcing managers answer to the community. With information, the community demanded better planning and decision-

making. Facility committees and other more regular forums are other ways of including the community members in decision making (RHINO 2003).

### *Investment in improvement*

Factors of achievement of microsystems are that investments in development are set as a priority. The necessary time, money and trained personnel should be available and working towards improvement at all times (Mohr & Batalden 2002).

### *Alignment of role and training*

The employees in the microsystem are expected to work at the upper limit of their educational background. Increased training in data handling and the importance of information at facility level may improve how the health workers perceive the licensure of the duty. In this way the system may become a promoter for good quality data to be used in decision making processes (Mohr & Batalden 2002).

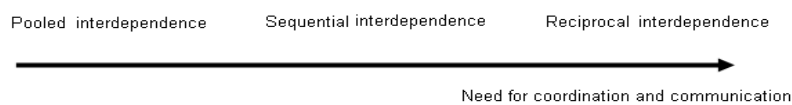
Microsystems focus on the performance of local staff members and the relationship between small groups of the larger organization (Mohr & Batalden 2002). In improvement work microsystems' complex nature must be considered carefully. As complex adaptive systems even small changes in the system can result in large effects (Shortell & Kaluzny 2006).

## 3.2 Coordination

The need for coordination arises from interdependencies among people and units in an organization or among organizations working towards a common goal. Interdependence is defined as “the condition of mutual dependence between or among organizational units (including entire organizations) that exists whenever work activities are interconnected in some manner – physically or intellectually” (Shortell & Kaluzny 2006:534). Thompson (Thompson 1967) describes three degrees of interdependencies. The following definitions are based on Shortell and Kaluzny's (2006:239-240) analysis of his work:

1. *“Pooled interdependence occurs when individuals and units in an organization are related but do not bear a close connection. They simply contribute separately in some way to the larger whole.*
2. *Sequential interdependence occurs when individuals and units bear a close, but sequential, connection. [...] what is done [...] are done in a sequential manner.*
3. *Reciprocal interdependence occurs when individuals and units bear a close relationship, and the interdependence goes in both directions”.*

Coordination is a managerial action that tries to create a relationship between different units in a system and enable them to work towards the same goal (Mintzberg 1979). The degree of interdependency determines the necessity for coordination. The closer the relationship between the members, the more coordination is needed, figure 3.1. The larger the size and the more unpredictable the tasks of an organization are, the more feedback the members will need to achieve the preset organizational goals and the more coordination from the management is required (Shortell & Kaluzny 2006).



*(Based on Thompson 1967)*

*Figure 3.1: Interdependence and the need for coordination*

Efficient coordination may facilitate good quality and system performance (Charns & Smith Tewksbury 1993). In contrast, inefficient coordination may lead to fragmentation, isolation and development of vertical structures in the system (Shortell & Kaluzny 2006).

### *Coordinating mechanisms*

Mintzberg (1979:3-6) has developed five coordination mechanisms. All may occur in the same organization:

- 1. " Mutual adjustment achieves the coordination of work by the simple process of informal communication*
- 2. Direct supervision achieves coordination by having one individual take responsibility for the work of others*
- 3. Work processes are standardized when the contents of the work are specified, or programmed*
- 4. Outputs are standardized when the results of the work [...] are specified*
- 5. Skills (and knowledge) are standardized when the kind of training required to perform the work is specified"*

How a system or organization is organized is also a coordination mechanism. There are several ways to design the way in which building blocks of the organization – authority, responsibility, information, punishment and rewards – are arranged to ensure efficiency (Shortell & Kaluzny 2006). In table 3.1 two diverse perspectives are presented.

<b>Divisional design</b>	<b>Matrix design</b>
<u>Characteristics:</u> Units created according to specialities or product-lines Decentralization of decision-making to the lowest level where key expertise is available Individual divisions have considerable autonomy Each division has its own internal management	<u>Characteristics:</u> Dualized authority system Vertical and lateral communication and authority channels Usually there are functional and product-line managers, both reporting to a common superior <u>and</u> exercising authority over workers
<u>Suitable for:</u> Large organizations Continuous changing environment Organizations with semiautonomous units	<u>Suitable for:</u> Highly technological areas that focus on innovation Allow members of the organization to contribute with their special expertise
<u>Benefits:</u> Enable the specialized units to handle relevant elements of the environment directly	<u>Benefits:</u> Enables programme managers to interact directly with the environment Facilitates coordination of organizational units
<u>Difficulties:</u> In times of resource constraints, greater sharing of resources are required, and more efficient horizontal integrating mechanisms are needed	<u>Difficulties:</u> Individual workers may find having two bosses to be untenable since it creates conflicting expectations and ambiguity Requires large amount of coordination Expensive

(Source: Scott 2003:243-244; Shortell & Kaluzny 2006:328-333)

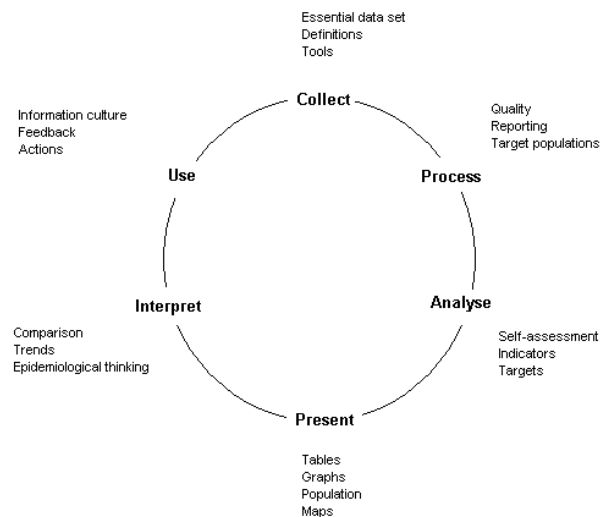
*Table 3.1: Divisional and Matrix Design*

The design of an organization has implications for the development of information flows. Hierarchical design, as divisional design, got several advantages e.g. distinction of power. It does foster centralized communication (Scott 2003) that are better suited to perform rapid decisions, and are highly sustainable once developed (Vroom, in Scott 2003). The matrix design cultivates informal communication. Informal information flow is more efficient if the tasks of the organization are of more creative character. In more formalized settings it may hinder efficient communication because of the large amount of information channels and participants involved. Conversely, hierarchies may undermine social structures of the organization, and reduces incentives for the members to find solutions without involvement of a superior (Scott 2003).

### 3.3 The Information Circle

The main purpose of keeping records of information is to ensure proper treatment of the individual patient's health problem. As early as in 1662, John Graunt, the father of biostatistics, identified the usefulness of systematically recorded data as a public good and an enabler for better population health. In modern time, the World Health Organization (WHO) has acknowledged that information is an important contributor in decision-making. They are now requesting better information systems "to detect, assess and respond to public health events" (World Health Organization 2007 : 7).

The processes ongoing in a HIS are presented in the Information Circle, figure 3.2. To use the gathered data, the data has to be collected, processed, analysed and interpreted and put into the context of the health system and delivery of health services (Heywood & Rohde 2001).



(Source: Heywood & Rohde 2001:21)

Figure 3.2: The information circle

Data processing is the process of compiling data from different sources and assessing the data quality. Quality is a vague term, that is hard to define, yet, several have tried. In health informatics, data of good quality is recognized as data that are:

- *“Available on time and at all levels*
- *Correct, complete and consistent*
- *Reliable and accurate enough to support decisions*
- *Represent all recorders of similar data*
- *Comparable i.e. using the same definitions of data items”*

(Heywood & Rohde 2001:42).

Data sources, statistical techniques and estimation methods should be scrutinized carefully to ensure that biases do not affect decision-making. Correct calculations are essential for reliability of the information. The statistics must cover all records of similar data, and all cases should be reported. In addition, the same definitions of data items must be used in all records. A broad definition of a disease opens up for misinterpretations since health workers have to interpret the patient’s condition to fit it to the disease groups on the tally sheets. Old data is not useful and may be potentially dangerous, since the precondition for the decisions made might have changed (Heywood & Rohde 2001). In Kenya, Otvombe et al. (2007) discovered that data originating from rural facilities were less timely than more centrally

located sites. Plausible representativeness adjustments are however possible if 60 % of the reports are available (Hill 2007).

The value of information depends on temporal, spatial, ecological factors. This indicates that information has only value for decision-makers according to a certain time, at a certain location, and gives new knowledge of certain things in the catchments area of the decision-maker (Seppänen 2007). Decisions based on poor data consistently results in resources being poorly exploited. Often the 'cost' of poor information cannot be known at the time of decisions being made, but is only visible retrospectively when the damage has been done (Africa Commission 2004).

Only after analysis can data from different facilities or districts be meaningfully compared (Heywood & Rohde 2001). Visualization of information is an efficient form of creating a picture of the reality. To achieve this, graphs, tables and charts are good tools (Heywood & Rohde 2001). Interpretation is the action of combining routine information, other sources and "common sense". Comparison to other districts or facilities and ability to identify development over time are essential elements in identifying the organization's progress towards goals and mission. It also reveals how well one is performing compared to earlier stages and other stakeholders. Finally, it helps in identifying the epidemiological challenges one is facing at the moment and possible solutions to these.

## *Use of health information*

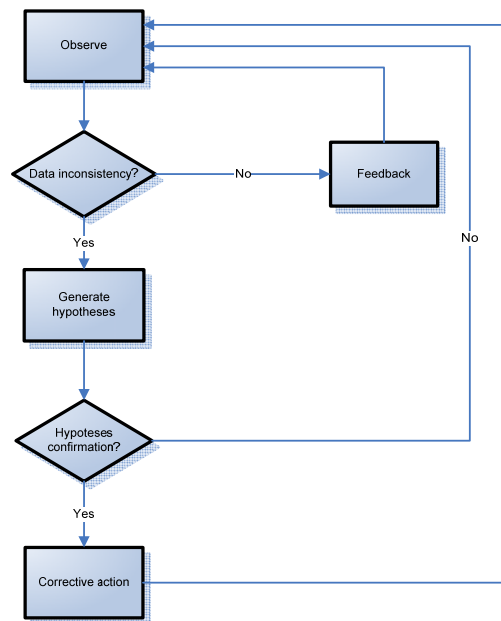
The final outcome of the information circle is the use of the information. To plan for the real challenges in the health care sector, managers need data that represents a true picture of the reality (Heywood & Rohde 2001). The World Health Organization (2003:7) recognize managers need good quality data for:

- *“determining the continuing and future care of a patient at all levels of health care;*
- *medico-legal purposes for the patient, the doctor and the health care service;*
- *maintaining accurate and reliable information about diseases treated and surgical*
- *procedures performed in a hospital and within a community, as well as immunization and screening programmes, including the number and type of participants;*
- *clinical and health service research and outcomes of health care intervention, if required;*
- *accurate, reliable and complete statistical information about the uses of health care services within a community;*
- *teaching health care professionals; and*
- *working out staffing requirements and planning health care services”.*

The following is an example of how good data helped improve child mortality in Tanzania:

*“In the Morogoro District of Tanzania the Ministry of Health operates a sentinel surveillance system to monitor key demographic indicators such as mortality and morbidity. These data were used to set priorities and allocate health care resources. Following the evidence presented in the data, health expenditure for the district was increased by \$0.86 per head and better targeted at the key diseases. As a consequence child mortality dropped by 43% since 1997-8. According to the District Medical Officer: “Now we can prioritise comfortably because we have concrete, reliable information from the public at large”(Africa Commission 2004:5).*

An important aspect of the human behaviour is the ability to relate to information. Members of health care organizations, for instance managers, make decisions about how to seek and how to use information based on a desire to make right decisions and improve services (Feldman & March 1981). A way of doing this is identified as the Cycle of Information Use (figure 3.2), where a manager first observes a report, identify inconsistencies, and if any - give feedback to data providers. Following generation of hypothesis that may explain the inconsistencies, and, if hypothesis are confirmed, actions to improve the performance (Pauley 1982).



(Source: Pauley 1982:125)

*Figure 3.3: The Cycle of Information Use*

The organization may foster or discourage a good information culture. A good information culture is characterized by information that is being used on a regular basis; graphs and tables are displayed for staff and the public; information should be disseminated to the information providers, the public, and decision-makers in other related segments of the health sector and society.

*“An information culture is achieved when everyone asks for hard data and clear indicators to plan, take action, or propose new activities, and when data speaks loudest for all decisions” (Heywood & Rohde 2001:96).*

To secure the sustainability of the health information system creating a culture that supports information use in decision making processes is as important as technical devices (Chaulagai 2005). Pauley et al.’s (1982) experienced that arranging regular interaction of representatives from each organizational level increased the knowledge, interest and potential information use at all levels.

Experiences from developing countries show that significant progress has been made in using health information for monitoring and evaluation (M&E) purposes the last few years. The challenge of using data in other areas does however persist (Otwombe 2007).

In addition to culture, feedback is seen as an indicator of information use (figure 3.2).

Feedback is understood as the procedure by the data users to inform the data collectors of decisions made and actions taken based on the data collected. It could appear as verbal reports to meetings, supervision of facility actions, summary reports to annual reports on a specific



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topic. The feedback may be presented as tables of monthly data, short programme reports, graphs, or quarterly or annually reports (Heywood & Rohde 2001). Feedback is however more than just distribution of raw data. Feedback is identified as an area where potential improvement would be beneficial for lower level of responsibility related to both M&E, planning and decision-making activities. Mohr (2002) state feedback of information to data providers as a key aspect in a thriving system.

### **3.3.2 Strategies for increasing information use**

The normative decision theoretic perspective assumes that only relevant information will be gathered and analyzed, and when information is available and of good quality it will be used (Mutemwa 2006). Evidence exists however that managers gather good information but “leave it in the drawer” (Feldman & March 1981; Health Metrics Network 2007).

To facilitate increased information use among managers several strategies has been suggested. Essential data sets enable the manager to gain an overview of the available information. By limiting the number of data elements collected evidence shows that the data quality is likely to increase. This will again enhance managers’ trust in it, and facilitate information use. To increase how data providers value information, feedback, including comparative feedback with neighbouring facilities, is essential. In this way data providers will feel their data collection contribute to improvements and change benefiting both themselves and patients and create an ownership to the data. Developing skills in analyzing, interpreting, and decision-making promote data use. To include information tasks in job description could be useful. At district level one designated person or team should be responsible for information. In addition, information (including raw data), should be made available to all potential information users (RHINO 2003). Factors contributing to sustainable production and use of good-quality data are technical factors (e.g. data-collection sheets, processes), IT devices, data analysis, environmental, organizational, and behavioural factors (Health Metrics Network 2007).

## 4. Aim and research objectives

In the short term, the purpose of this project has been to gather systematic information on how public health data in Gaborone health district, Botswana, are collected, and to analyze the collection sheets (see appendix 5) for the chosen health programmes. To further, explore where collected data are sent, which of the collected data are used by managers and how they use it, has been another aim. In the long run, the aim is to provide recommendations on ways of improving the HIS to facilities, the government, donors and other concerned organizations. Hopefully reaching out to stakeholders in Botswana too, and providing some keys to solve some of the identified challenges.

The main research objective of this master thesis has been to explore the data collection process and the use of information among managers, as well as to identify challenges in the information flow between the facilities and the information generating institutions.

According to the literature, my hypothesis is that health data in Gaborone is of poor data quality, managers have low access to data, managers use information to a low degree, and there is a lack of coordination between the local, district and national health care level. I presuppose that poor coordination mechanisms affect managers' use of health information. Further I hypothesize that health programmes targeting the same population collects many of the same data elements. Hence, I expect to find overlapping data elements in the tally sheets of PMTCT, MCH, and EPI health programmes, all targeting children. I also expect to find HIS that function better in health programmes high on the political and international agenda than on the lower level. Hence, I hypothesize that PMTCT and MCH will have better HIS than the Mental Health programme.

The specific objectives of my study are therefore to:

- analyze the simplicity and usability, degree of overlap, relevance, completeness and effectiveness of monthly data collection sheets from the PMTCT, Mental Health, MCH, and EPI health programmes used in health facilities in Gaborone district
- investigate what the selected monthly data are used for and explore how managers in the selected health programmes use health information

- discuss possible ways to improve the information flow between health facilities, Gaborone district and the selected health programmes.

To identify any common challenges in data collection between chosen programmes has been a goal in the development and accomplishment of the study.

## 5. Methodology

### 5.1 Research approach

There are different ways of classifying a research project. The most common are the differentiation between quantitative and qualitative research. The selection of research approach depends on the purpose of the research. This study does not aim at quantitative analyses using statistics to identify significant differences among facilities; the intention has been to present ways to deal with various information tasks. The focus is information flow and information use, which are both highly related to social settings. Health information systems are deeply embedded in the social context it is a part of (Braa & Hedberg 2002). To choose a qualitative approach, a case study, seemed appropriate in accordance with the purpose of this study. A case study is understood as a method of investigating theoretical concepts of health information and health management within a real-life context. Choosing a case study is based on the desire to study a complex social phenomenon (Yin 2003) in a scientific intersection of social science, informatics and medicine. Multiple factors will influence how managers use information. Hence the phenomenon is not clearly linked to its context. The study hereby fulfils Yin's (2003) definition of a case study.

“[T]he ultimate goal [...] [of a HIS] is to produce relevant information that health system stakeholders can use for making transparent and evidence-based decisions for health system interventions” (Health Metrics Network 2007 : 13) based on good-quality data. Assessment of HIS performance should therefore be based on both quality of data produced and “on evidence of the continued use of data to improve health system performance, to respond to emergent threats, and to improve health” (Health Metrics Network 2007 : 14). This thesis is based on an analysis of data collection sheets, information flow and use of information among managers. Data collection has taken place in facilities in one single district and for selected programmes (see chapter 5.2). Studying one case has enabled a thorough understanding of the phenomenon under study and provides a detailed description of the units under analysis. Case studies can be said to provide “a” truth, rather than “the” truth (Walsham 1993). This report can therefore be said to provide one perspective of the truth in the period I spent in Gaborone, based on my interpretation of what I saw and experienced.

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## 5.2 Choice of study site and health programmes

### Study site

The Gaborone district was selected as a study site partly based on quota sampling criteria and partly based on convenience sampling. Quota sampling is selection of study sites based on specific, pre-decided characteristics (Chambliss & Schutt 2006). Here, the district's participation in the BEANISH project was decisive. In Botswana four districts, Gaborone, South-East, Kgatleng and Okavango, was enrolled in the BEANISH pilot project in 2005. The aim of the project was to implement the free, open-source district health information system (DHIS), and improve the HIS (BEANISH Project 2008). The DHIS software functions as a data collection tool, a database which enables data processing, analysis and generation of reports which easily may be electronically transferred from one computer to another. Among the four districts Gaborone was chosen due to convenience because of the time frame and human and economical resources available for the project.

Originally this study aimed at a comparison between Gaborone and the semi-rural district of Kgatleng. Due to a delay of permission to do research in Kgatleng, Gaborone was the only district finally included.

### Health programmes

The chosen programmes are examples of areas that have different significance on the political agenda, both in Botswana and internationally. PMTCT was chosen due to the level of resources invested on that programme by the Botswana government and its reputation of good HIS performance. Mental Health was chosen as psychiatry often lacks resource investment in the health care sector internationally. The Millennium Development Goals identify MCH as a targeted area of focus towards 2015. EPI was chosen due to Botswana's good achievements in vaccination coverage

## 5.3 Entry to the field

Proceedings to enter the field were started immediately after methodological considerations were accepted by the Department of Health Management and Health Economics, University of Oslo (researcher's host institute). Several correspondences between the Health Research Unit (HRU) in the Ministry of Health in Botswana and the researcher with requests of

clarifications and improving the research proposal were performed. The researcher arrived in Botswana on March 4 2008. Permission to enter the field from the Health Research Unit was given one week after her arrival. After which new applications of conducting the research was sent to the various departments in the Ministry of Health enrolled in the study as well as the District Health Teams (DHT) of Gaborone and the ethical board of Princess Marina Hospital. It took time to figure out the bureaucratic system; in addition, unreliable postal services affected the flow of the recruitment process. Permission was however, granted from the DHT in Gaborone early in the process, giving the researcher the possibility to start collecting data. Later permission from the Ministry of Health was given. The last research permit was received on April 24<sup>th</sup>. The letters of approval from the various study sites is attached (appendix 1).

After permissions to perform the study on the selected study sites was granted, personal recruitment of both facilities and interview objects were performed. A letter of information together with the letters of approval from the HRU and the DHT were hand-delivered to the person in charge of the facility and to the manager identified as interview object. An example of these letters can be found in appendix 3.

## 5.4 Data collection strategies

This case study includes three sets of data, observation, interviews and review of data collection tools. The purpose of this multi-data collection approach has been that one method will complete the other methods and thereby limit possible methodological weaknesses. In addition, the three different methods expand the scope of the project and work as an enabler to see the HIS in a wider perspective.

### **Observations at the sites**

The purpose was to investigate the data collecting methods at the facility level such as data sheets, computers, and measurement routines of items such as weight, blood screenings and blood pressure. In addition, sources of data used in the compilation, tally sheets, patient records, working conditions, presence of duplication of work, methods of transferring collected data (hand-delivery, mail or internet), and presence of data storage facilities, written guidelines, and access to information compiled in the light of own collected data were the

main targets under observation. The aim was to get first hand knowledge of the procedures in the HIS and obtain insight in the information flow. During the observations comments from the health workers contributed to my understanding of the data collection and available facilities. Their comments were written down and constitute a part of the data material. About half a working day was spent at each of the observation sites, except for the DHT office where the researcher spent one day in total.

## **Interviews**

Semi-structured interviews of national health programme managers and district health managers were chosen in order to gain knowledge of the managers' function, to describe practises, their use of information, and to identify challenges and possible causes within HIS. An interview guide is developed, and is enclosed in appendix 2. This guide was not followed thoroughly, something that enabled the researcher to follow up on different issues appearing important during the interviews. All the interviews took place in the office of the informants.

## **Review of data collection sheets**

Simultaneously with triggering demand for data, and escalating understanding of the value of and capacity to make use of information, it is essential also to strengthen the capacity of health information systems to produce the required data of good quality (Africa Commission 2004). The data collection tools were gathered to obtain knowledge of available data sources. The core idea behind this is that weakly designed data collection forms may affect the collection of data, resulting in poor quality data (World Health Organization 2003). The ultimate result of poor data quality is that the use of information will be inadequate. Blank data sheets used by the facilities related to the PMTCT, Mental Health, MCH, and EPI health programmes (see appendix 5) that is in use by the sampled health facilities were collected. The forms were collected at the sampled clinics, the DHT, and found in national guidelines. In cases where there were a lack of forms or there were a danger that the record book would be destroyed if a single piece of paper were ripped out, the collection of a physical form was substituted with pictures.

## 5.5 Sampling methods

### **For observations**

Based on purposive sampling (Chambliss & Schutt 2006), only public facilities and administrations in Gaborone district involved in PMTCT, Mental Health, MCH, and EPI activities are included. Health personnel handling data sheets and/or reports to higher levels of responsibility constitute the population observed. The observation sites have been chosen based on random sampling, stratified to type of facility. One national referral hospital, two clinics with beds and five clinics without beds were drawn from a population of one national referral hospital, four clinics with beds and 19 clinics without beds (appendix 4 discuss the real number of facilities). Three hospital wards were chosen according to the purpose to illuminate the programmes in focus.

### **For interviews**

The interview objects in the Gaborone district and working in the selected national health programmes were chosen based on their attachment to the chosen programme, willingness to participate, type of responsibility, and available recourses. This does also correspond to Chambliss and Schutt's (2006) purposive sampling. Respondents were also asked to identify others in the population that may provide useful information to the researcher, so-called snowball sampling (Chambliss & Schutt 2006).

### **For data collection sheets**

The data collection sheets have been selected based on the purpose of the sheet. Only forms used in the selected programmes, by the selected health workers in the selected facilities were collected. In cases where there were different versions of the data collection sheet in use, all were collected.



## 5.6 Sample size

The final sample size was not determined previous to the study, observation continued until the routines felt well covered. Thus the final sample size depended upon when the saturation point (the point where new respondents have little new information to add) were felt achieved (Chambliss & Schutt 2006). In the preparations to the study I estimated that 10 health facilities and 10 interviews in Gaborone would be a sufficient sample size.

### **For observations**

Out of 11 identified observation sites, 10 observations were performed in a total of eight facilities and administrations, since one clinic did no longer exist. Only staff members working within the selected programmes, handling data and information, and willing to participate were included. Three of the observation sites were wards at the hospital, one of which was an in-patient ward, while the other two were out-patient wards. The district administration centre was identified as the main handler of the data collection sheets. The remaining eight sites were health clinics. The saturation point felt achieved after 6-7 observations, the study did however continue to capture all relevant issues and to cover the specialist health care. The observation sites consists of two hospital outpatient wards, one hospital ward, two general clinics with maternity units, four general health clinics, and one special health clinic.

English is the working language in the health care sector, and is among other areas used in patients' records and reports. During the consultations the health worker and patient usually communicate in Setswana. The health workers were therefore asked to translate the main content of the conversations between the consultations.

### **For interviews**

The study resulted in seven interviews, lasting for about an hour each. In one interview all members of the staff involved in information handling showed up, leaving me with a total number of 10 informants in this group. Table 5.1 provides an outline of the informants.

Interview number	Position	Location of interview	Duration of interview
1	National programme coordinator	Coordinator's office, Ministry of Health	1 hr 4 min
2	National programme coordinator	Coordinator's office, Ministry of Health	1 hr 10 min
3	M&E Specialist	M&E Specialist's office, Ministry of Health	44 min
4	National programme coordinator	Coordinator's office, Ministry of Health	43 min
4	Regional Coordinator	Coordinator's office, Ministry of Health	43 min
4	Data clerk	Coordinator's office, Ministry of Health	43 min
4	Nutritionist	Coordinator's office, Ministry of Health	43 min
5	National programme coordinator	Coordinator's office, Ministry of Health	1 hr 4 min
6	District coordinator	District coordinator's office	1 hr 45 min
7	Matron	Matron's office, facility	42 min

*Table 5.1: Outline of interview informants enrolled in the study*

Due to problems of anonymity it was not possible to provide the reader with more extensive details of the informants. Some of the targeted informants were not available due to issues out of the researchers control such as study leave and field trips and did therefore not respond to enquiries.

### **For data collection sheets**

Four PMTCT reports, two Mental Health report, one EPI reports, and three MCH reports were identified and collected. In addition several locally developed record books were identified for each programme.

## 5.7 Ethical considerations

The study has been ethically reviewed and approved from relevant authorities in Botswana, see appendix 1. Supervisors reviewed and approved the research protocol.

### **Informed consent**

According to the Declaration of Helsinki (World Medical Association 1975) participation in all research should be voluntary, informed consent should be obtained and the researcher should assure all participants in the study's right to anonymity.

A letter of information was hand-delivered to all participants in the study, see appendix 3.

They were also orally explained that participation in the study was voluntary, their right to refuse tape recording and their right to withdraw from the study at any given time.

Participants were asked to give an informed consent before the observation or interviews. Due to practical reasons the facilities' management were asked to sign the form of consent on behalf of the staff members.

As the health personnel were the main target under the observation, consent was not obtained from patients. However I instructed the health worker to let me know if the patient felt uncomfortable having me around during the consultations. Most patients did not mind or started the consultation without asking about my presence. Only two patients asked me to leave as they were going through private examinations.

### **Confidentiality**

The respondents' right to anonymity has been a main aim during this project. All observations and interview material used in reports have been stripped of data that may identify the respondent. Only the researcher has had access to unanonymized materials. All data collected have been protected during the study. All recorded tapes will be destroyed after dissemination of this paper. Transcribed, anonymized material will be destroyed after five years and in the meantime be protected.

## 5.8 Data analysis

During the observations notes were taken of the physical environment and during unstructured conversations with the health workers. All interviews were taped and transcribed immediately after the interview took place. This resulted in 96 pages of written materials. Both the notes from the observations and the transcripts from the interview has been read and reread several times during the data analysis. The data analysis started already during the fieldwork, as is the case for many qualitative research studies. In the more systematic analysis process, the software HyperRESEARCH™, a qualitative analysis tool, was used in the categorization of the transcribed interviews. The software was also used as a helping tool during analysis of the observation notes. In the analysis of the interviews, categories and dimensions were developed based on the objectives for the interview guide and according to existing literature. These steps of analysis are mainly based on Kvale's (1997) methods of analysis and correspond to his categorization of meaning.

An analysis of the tools was performed with the purpose of assessing the appropriateness of the data collection tools. Identification of how the forms support or undermine information use has been essential. To achieve this, a framework developed by Heywood and Rohde (2001), the SOURCE-framework, has been used. This framework is a set of criteria used to assess data collection tools, like tally sheets, register forms and registers. SOURCE stands for **S**implicity, **O**verlap, **U**ser-friendliness, **R**elevance, **C**ompleteness, and **E**ffectiveness. A simple and user-friendly data collection tool means that it is clear and easy to understand. The user of the tool should be able to understand the indicators without using any amount of energy trying to understand it. Overlap between tools should not exist, since this will create duplication of work. To fill out the same number in several forms will create frustration among the health workers, is not cost effective and a threat to data quality (Heywood & Rohde 2001). If two indicators are almost identical misunderstandings may occur and influence the quality of the data collected. Data elements supporting measuring incidence/prevalence, coverage/quality, expenditure, or input/process/output/outcomes are considered relevant. If the data is not useful for local, managerial or research purposes it should not be collected. To be complete no useless or missing data elements should appear on the form. The data collected should support effective decision-making for public health,

management, supervision, support and/or monitoring and evaluation; otherwise the data should not be collected. Table 5.2 summarize the principles of analysis of the data collection tools:

<b>Simplicity</b>	<b>Overlap</b>	<b>Relevance</b>	<b>Completeness</b>	<b>Effectiveness</b>
Simple forms:  - User-friendly - Clear layout - Easy to understand	No duplicate elements  - What - When	Useful for assessing:  - Incidence/Prevalence - Coverage/Quality - Expenditure - Input/Process/ Output/Outcome	Forms include:  - Priority actions - No useless data - All data required	Useful in decision-making:  - Public health - Management - Supervision/Support - Monitoring/Evaluation

(Heywood & Rohde 2001)

*Table 5.2: The SOURCE-criteria for analysing data collection tools*

The data collection tools were analyzed according to the tools of the specific health programmes. An outline of the analysis is presented in table 5.3. Comprehensive assessment has not been possible due to the scope of this study. A summary of this work is provided in chapter 6.2. Details are provided in the appendix.

	<b>Simplicity and usability</b>	<b>Overlap</b>	<b>Relevance</b>	<b>Completeness</b>	<i>Effectiveness</i>
<b>Mental Health</b>					
<b>MCH</b>					
<b>PMTCT</b>					
<b>EPI</b>					

*Table 5.3: Overview of the Data collection tools matrices used in data analysis.*

An evaluation of these methods as applied in Botswana is provided in the discussion chapter (chapter 7).

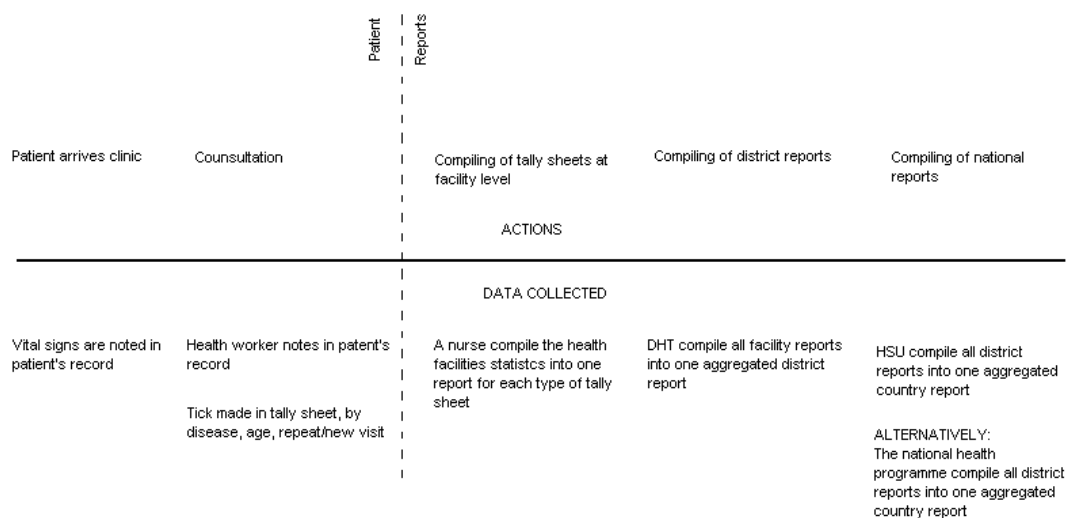


## 6. Results

### 6.1 The Health Information System in Botswana

#### *At the facility level*

When a patient is coming for consultation vital signs are registered by a health worker in the patient's record before the consultation is performed, either by a nurse or a doctor. During the consultation the health worker takes notes in the record book like test results, symptoms, diagnosis and treatment. The patient is responsible for his own record book. After the consultation a tick is made in a register book, tally sheet, which is in place in every consultation room. The tick will indicate the patient's age, gender, and diagnosis and whether this patient has been to the clinic for the same condition before (repeat) or if it is a new case (new). For an example see picture 4.



*Figure 6.1: Timeline of actions in the data collection process from the facility to the national level*

A case is here defined as a diagnosis, and not a patient since one patient may have several diagnoses, and the health worker is required to make one tick for each. In one month several sheets in one book are usually filled out. At the end of each month a nurse, appointed on a

rotational basis, is given the responsibility to compile the record books into one report. This is done manually. These reports are then hand-delivered to the Community Health Nurse's office at the DHT by the driver of the facility. This indicates that each facility may drive to the DHT several times a month, to deliver all reports. This is usually not seen as a problem, since there are other businesses to be performed at the DHT office as well.

### ***District level***

At the DHT the reports are registered in a locally developed book to trace which facilities deliver which reports. The facilities' reports are compiled into one common report for the whole district. This is the Monitoring & Evaluation officer's (M&E officer) main responsibility, even though other officers at the office participate fulfilling the task. All monthly reports are compiled manually, except for the EPI report which is entered electronically into the DHIS. The compiled reports are sent by car to the respective departments in the Ministry of Health, through a named officer. The driver brings a book where the receiver has to sign that the report is received, to avoid disputes with the ministry. Of the programmes under investigation, MCH and EPI follow this procedure, while Mental Health and PMTCT follow other pathways of information flow.

The PMTCT programme has a district coordinator who is given the responsibility of collecting the monthly reports. At a monthly advisory meeting with the PMTCT coordinator, the lay counsellors bring their monthly reports. The reports are then compiled into one common paper report for the whole district and sent to the MoH by car.

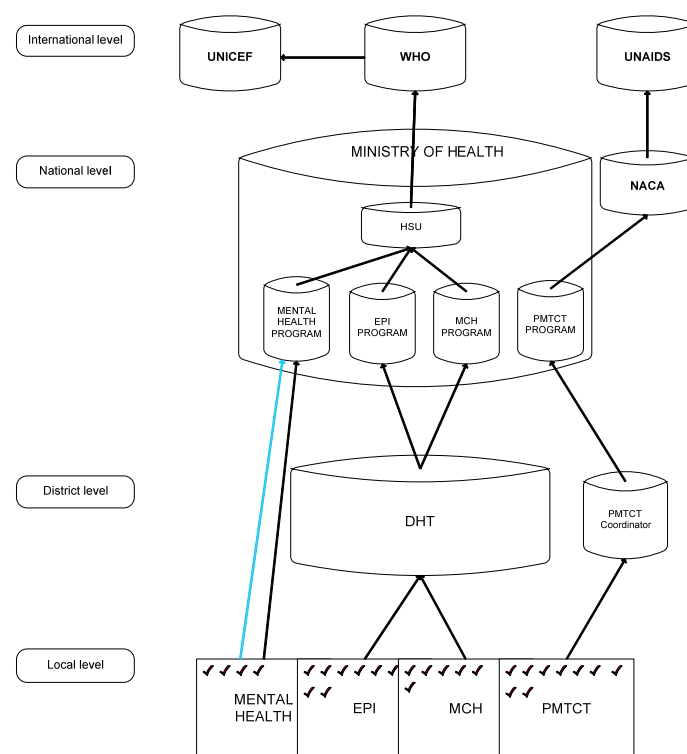
### ***National level***

From the Mental Health facilities the monthly reports are hand-delivered directly to the national programme coordinator. The official Mental Health reports are then stored in the office until most reports are received, next, the programme coordinator hand-delivers them to a contact person in the Health Statistics Unit (HSU). The HSU are a seconded unit of the Central Statistics Office of Botswana, physically located in the Ministry of Health. The HSU compiles the district reports into a common report for the whole country. In addition the facilities are requested to deliver report to the national Mental Health programme management. These reports are stored until there is time to enter and compile the reports into a computer.

When the reports are received at the respective national programme management, data clerks enter the statistics into various software programmes. Based on these statistics the different



programmes disseminate national reports to other national agencies, e.g. the National AIDS Co-ordination Agency and international organizations, like WHO. Figure 6.2 summarizes the information flow from the facilities, through the DHT and MoH to international agencies. The local level is illustrated by the sources of data – the patient record and tally sheets – for each programme. An arrow points out movements of data between the levels. The Mental Health programme has two arrows going from the local level to the national level representing two streams of data, one to the HSU and one to the programme management. In addition, there is a certain degree of feedback on the statistics given from higher to lower levels of responsibility. This is not shown in the figure in order to not make it appear too complex.



*Figure 6.2: Information flow from the local level, to the district, national and international level of responsibility for the chosen health programmes*

Table 6.1 provides an overview of the information flow from the districts to the national level for the various programmes in MoH as presented at the period of data collection. It shows whether the reports are delivered directly to the health programme (directly) or via HSU (centrally), how the reports are delivered, to whom the national level disseminates and how DHTs are given feedback on their reports.

<i>Health Programme</i>	<i>Delivery</i>	<i>Delivery mode</i>	<i>Dissemination</i>	<i>Feedback to DHT</i>
<b>Mental Health</b>	Directly, Centrally	Post, Car	HSU, WHO	Not last year
<b>MCH</b>	Directly, Centrally	Post, Car, Fax	HSU, Director	Annual report, biannual meetings
<b>PMTCT</b>	Directly	Fax, E-mail	NACA	Biannual meetings
<b>EPI</b>	Directly	Fax, Car	Director, WHO	Biannual meetings

*Table 6.1: Delivery of data collection tools from districts to MoH.*

## 6.2 Description of data collection tools in terms of simplicity, useability, overlap, relevance, completeness and effectiveness

Based on the SOURCE-criteria data collection tools from the four health programmes has been classified according to simplicity/usability, overlap, relevance, completeness and effectiveness. In addition, the World Health Organization (WHO) guidelines on essential data set and international classification of diseases have been used. A comprehensive SOURCE-assessment has not been possible due to the scope of this study. Due to length limitations only a summary of the findings from the analysis is provided here. A detailed analysis is found in the appendix. Table 6.2 summarizes the forms in use, and the routines of handling each form. A full collection of the data collection tools under investigation is provided in appendix 5.

Data collection form	Code	Report compiler	Delivery deadline	Report recipient	Record
<b>MENTAL HEALTH PROGRAMME</b>					
Mental Disorder Out-Patient Register	MH1053/Rev2003 (Official form)	Facility	One week after end of reporting month	HSU via Mental Health national programme manager	Out-patient consultation for mental disorders
Out-patients & In-patients monthly return form for Mental Health	(Unofficial form)	Facility	One week after end of reporting month	Mental Health national programme manager	Out- and in-patient by diagnosis group, referrals, follow ups, staff, drugs, mortality
<b>MOTHER AND CHILD HEALTH PROGRAMME</b>					
Mother Child Health/Family planning (MCH/FP) Tally Sheet	MH1046/Rev2003	Facility/District	Monthly	MCH national programme management and HSU	Out-patient consultation for MCH and FP services
Midnight Census Register	MH001/Rev2003	Facility	5 <sup>th</sup> day of the month	HSU	Admissions, discharges, transferrals, deaths, deliveries
Maternal and Perinatal Monitoring Tool, Summary Monthly Report	MH3123	Facility/District	7 <sup>th</sup> day of the month	MCH national programme management	Deliveries, mode of delivery, complication, congenital abnormalities, deaths
<b>PMTCT HEALTH PROGRAMME</b>					
Facility Monthly Report from MCH Units	—	Facility/District	5 <sup>th</sup> day of the month	PMTCT national programme management	Antenatal, child welfare, post-natal, partner testing, HIV test results, stock management
Facility Monthly Report from Maternity Units	—	Facility/District	5 <sup>th</sup> day of the month	PMTCT national programme management	Deliveries, HIV test results, treatment, breastfeeding practices, stock management
Report form for babies on formula feeding	—	Facility/District	5 <sup>th</sup> day of the month	PMTCT national programme management	Babies 1 and 3 month, graduated, drop-ins, tins dispensed, current number of tins
<b>EPI HEALTH PROGRAMME</b>					
Immunisation Tally Sheet and Vaccine Stock Control	MH1036/Rev'94	Facility Compiled into DHIS at district level	2 <sup>nd</sup> day of the month	EPI/IMCI national programme management and HSU	Vaccinations by type, stock management, drop-out rates, coverage rates

*Table 6.2: Overview of gathered data collection forms from the Mental Health, mother and child health, PMTCT and EPI health programmes.*

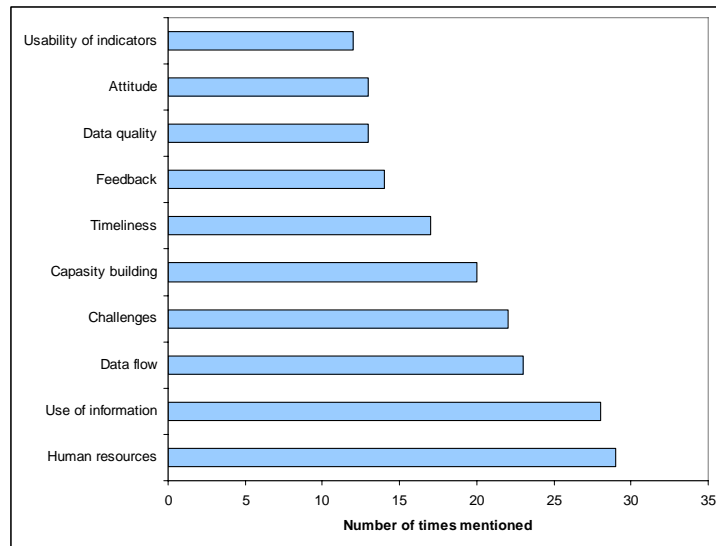
Here, table 6.3 summarize the main findings. The green cells indicate that the forms that satisfy the SOURCE-requirements, the red that the forms do not live up to the standards. Most forms are simple and user-friendly and provide relevant information for managers. There are however several forms collecting the same information. All forms of the MCH overlap to various extents, while the forms of the Mental Health and PMTCT programme overlaps to a less degree. Only two forms are considered to capture all relevant data elements recommended by WHO. The Mental Health forms are relevant, but neither complete nor particularly effective for decision making. The unofficial tool is very complex. The form of the EPI programme is the only one satisfying all the SOURCE-criterions.

	Simple and user-friendly	Overlap	Relevance	Completeness	Effectiveness
<b>Mental Health</b>					
MH1053	Yes	Yes	Moderately	No	No
Unofficial tool	No	Moderately	Yes	No	No
<b>MCH</b>					
MH001	Moderately	Yes	Yes	Moderately	Yes
MH1046	No	Yes	Yes	Moderately	Yes
MH3123	Yes	Yes	Yes	Moderately	Moderately
<b>PMTCT</b>					
Facility monthly report from MCH units	Moderately	Yes	Yes	Yes	Moderately
Facility monthly report from maternity units	Moderately	Yes	Yes	Moderately	Moderately
Formula feeding report	Yes	Yes	Moderately	Moderately	Moderately
<b>EPI</b>					
EPI tally sheet	Yes	No	Yes	Yes	Yes

*Table 6.3: Summary of the data collection tools from the chosen health programmes described by the SOURCE-criterions.*

## 6.3 Results from interviews and observations

The process of analyzing the interviews resulted in development of a total of 69 categories (procedure in chapter 5.7). In figure 6.3 a frequency distribution of the 10 most often mentioned categories is provided.



*Figure 6.3: Frequency distribution of categories mentioned in interviews.*

The categories were grouped into 10 dimensions; data quality, data collection tools, information flow, data processing, data analysis, information use, informal HIS, resources, challenges, and suggested solutions to challenges. Table 6.4 presents which categories that constitute the various dimensions. These ten dimensions create the basis for this chapter. Data collection tools and information flow are covered in chapter 6.1 and in the SOURCE-analysis, appendix 6. Below, the most central categories will be point out related to their dimension.

<b>Data collection tools</b>	<b>Information flow</b>	<b>Data processing</b>	<b>Data quality</b>	<b>Data analysis</b>
Accessibility of data collection tools Target indicators Tools in use Unnecessary data collection Usability of variables	Information flow Delivery mode Dissemination	Computerized HIS Data aggregation DHIS Manual HIS Miscoding Software in use	Completeness Confirmation of data Consistency Correctness Data quality Denominator problem Good quality recording Follow up Lack of reliable data Old data Reliability Representativeness Timeliness Underreporting Use old forms	Data analysis Show insight in statistical skills
<b>Use of health information</b>	<b>Resources</b>	<b>Informal HIS</b>	<b>Challenges</b>	<b>Suggested solutions to challenges</b>
Action taken based on information Demand for information Depending on other department's data Impact of actions taken based on information use Lack of data use Lack of data use at lower level Need of data Other departments depending on data Use of information Use of other department's information Feedback Lack of feedback Information culture	Human resources Lack of resources Need for capacity building Training	Establishment of informal HIS Informal HIS	Challenges Disclaimer of liability Financing Lack of awareness Lack of communication Lack of coordination Lack of integrated software programmes Lack of local decision-making power Lack of management Logistical challenges Ownership of data Sustainability	Efforts to improve challenges M-and-E officers Opportunity for better performance Requests computerization Strengths Suggestions to improve challenges

*Table 6.4: Dimensions developed by analysis of the interviews and categorization of these*

### 6.3.1 Data processing

Up to the national level all HIS of the programmes are manual. At the national level the programmes have various forms of databases. Mental Health, MCH and PMTCT are all using Excel, while EPI is using EPI-Info. Two of the programme managers express their desire to change their software system in the near future. MCH are hoping for external financing of SPSS, while PMTCT are waiting for an Access based system. Managers of both the MCH and PMTCT have heard about DHIS. PMTCT has chosen an Access based system founded on the idea that their system will be able to communicate with DHIS, and that it will eliminate some of the problems they experience with Excel.

At district level the PMTCT health worker acknowledge the importance of validating the data quality of the facility reports. She would manually go through each report and check the consistency of the numbers, e.g. Women HIV tested would correspond to women tested HIV-positive + women tested HIV-negative + HIV test results pending.

#### *Data quality*

##### **Correctness**

In one interview a manager explains health personnel usually report correctly in their own notes at the facilities. On the other hand, at several occasions observations show crosses made in the wrong diagnosis or age box in a tally sheet. In one case a nurse looking for a patient in the registry book without finding the name, the nurse still gives her treatment. The result is one case missing in the monthly report. Observations show that compiling the monthly reports are substance of counting errors and miscalculations.

Monthly reports consist of a three sheeted carbon paper, one remains at the DHT, one goes to the HSU and one goes to the health programme. When compiling discrepancies often arise due to mistyping at the different levels of the HIS:

*“[A]t the end whatever we [health programme] are producing might not be similar to what they [HSU] are producing” (Interview 3:62-63).*

Just like many other poor countries, Botswana struggles with uncertain population figures. This affects the ability to project the size of the population. Hence, estimates of needed health care become difficult and the results are uncertain. The EPI programme learned this the hard way. Foreign statisticians had in the 1990s made a population projection that Central Medical

Stores were using in their need assessment and provision of vaccines. In 2005 some of the districts reacted to their immunization coverage rates were above 100%, even though they had identified pockets in the society not bringing the children for vaccination, see figure 6.4. It took two years of discussion before the projection model was corrected.

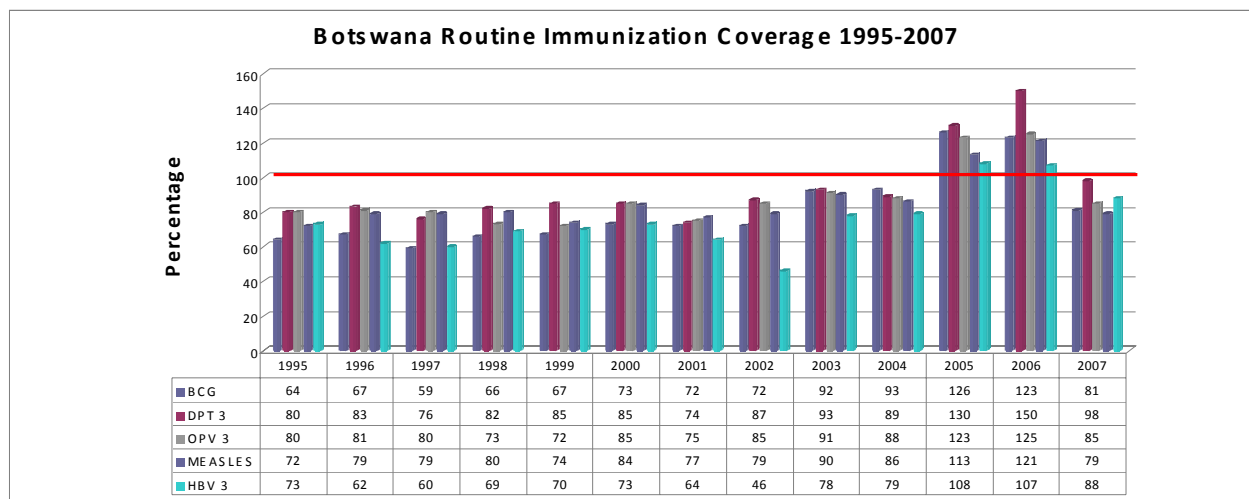


Figure 6.4: Vaccination coverage rate trends from 1996 to 2007 in Botswana.

## Completeness

Documents available at the DHT, at the time of the observation, show that 50 % of the facilities did not deliver all required reports in March and April 2008. One of the tally sheets, MH1046 (appendix 5), requires that the health worker make both a tick in an aggregated box and in a specific disease box. At one clinic investigation reveal an inconsistency between the aggregated number and the specific number. In a similar constructed tally sheet (MH1048) the number of new attendances were observed to be 274 in total; while 290 ticks are made in the disease specific box. The aggregated number of repeat attendances are 212; while 190 are recorded in specified field (Observations:167-171). It has been difficult to find documentation for the total number of attendances of all the involved clinics in the study period. At clinic 1 the total number of attendances in March vary with over 500 cases, looking at two different record books (Observation:657-661). One reason might be that one of the record books contains more indicators. More over, non-citizens and patients from other catchments areas are not tallied, making it difficult identify of the true number of patients attending a clinic. The data collected is only from public facilities. This means that both private and traditional services are excluded from the statistics. The interviewed managers perceive the underreporting to be quite large. In addition, the national coordinators do assert that some



districts and facilities continuously do not report - often the same ones. The national referral hospital, Princes Marina Hospital in Gaborone does for instance not report maternal deaths. With a total delivery of 4600 in 2007, it makes a significant loss to the statistics.

The impression from most of the nurses is that the reporting is not always complete. Their explanations spans from time constraints to doctors not seeing the necessity for documentation. One of the doctors confirms that “it is easy to forget to tick someone when you see 40-50 patients a day” (Observation:115-118). Observation of the same doctor supports the statement, a two hour observation resulted in four lacking cases. A health worker working six hours a day, five days a week, 48 weeks a year will thereby loose more than 2.500 cases a year if this number is representative.

## Consistency

Only one programme, Mental Health, is using international recognized disease codes. The other programmes use broader definitions of diseases. A data clerk is satisfied with the data quality, but sees that health personnel from time to time misunderstand the indicators:

*“The quality [of the data] is very, very high. It is only there and there because of some other factors that we have reached like misunderstanding of the indicators, as we keep on developing them, but some people [nurses and doctors] might fail to understand it” (Interview 5:188-191).*

The Statistical Yearbook 2003 refers to both old and new data collection tools. Interviews showed that facilities got both new and old forms in daily use. Examination of the reports at DHT showed that one clinic had delivered both the new and the old form of maternal and perinatal monitoring tool (MH3123) in April. One programme manager commented on her experience with the existence of both new and old forms:

*“If they [HSU personnel] look [at the old form], then ‘Aaah, this is not what I want’. [...] They put it aside, and in that particular minute you have lost data” (Interview 4:308-313).*

At facility level several registry books are developed locally. These do not necessarily correspond to the tally sheets. The reason may be other data needs locally or that the local registry books were developed before revision of the tally sheets. This may be challenging by the time of report compiling and threatens the consistency of data.

## Timeliness

Table 6.5 gives an overview of MoH's monthly report deadlines. The clinics do not have separate guidelines regarding delivery of reports.

Monthly report	Deadline
EPI report	2nd day of the month
Daily temperature chart for EPI vaccines report	5th day of the month
PMTCT report	5th day of the month
ARV report	Monthly

*Table 6.5: Some selected deadlines for delivery of monthly reports from the District Health Team in Gaborone to the Ministry of Health in Botswana*

Among all clinics in Gaborone none delivered all their reports in either March or April 2008. In total 8 clinics did not report anything to the DHT in April, amongst these is the referral hospital. Among the sampled clinics, one did deliver two of the required reports to the DHT before the deadline to the MoH. Only one clinic reported stock of formula feeding and the MCH Units form, this clinic was not among the sampled ones. All sampled clinic delivered the EPI form. This form was the most frequently delivered among clinics in total, 19 out of 23 clinics. It is however striking that only four of the six sampled clinics delivered the daily temperature form for vaccines. Clinic 8 and 10 delivered most reports in April, both with 8 out of 15 reports, which is also best among all clinics in Gaborone. As for the PMTCT forms only 2 out of 24 was lacking the day after the deadline. One of the PMTCT counsellors had forgotten it; the other did not attend to the meeting. At the time of data collection the Mental Health reports from Gaborone had not reached the MoH. The results of the MCH programme is mixed, two out of three clinics delivered the Midnight Census, while only one clinic delivered the Maternal/perinatal monitoring tool. The DHT's record books did not contain any information about the MCH/FP tally sheet. These numbers are the total number of reports delivered in April, regardless of the DHT's deadline.

Officers at the district level claim they use to call the facilities asking for reports that have not been delivered. During the observation study one of the matrons said during the morning report that the clinic had got feedback over the phone from the DHT saying they do not report timely, the reports on diarrhoea and communicable diseases were lacking. She responded in front of all staff members: "but we have a clinic to run". At one facility compiling the required reports may take a nurse more than four days. To compile the largest report in use in

Gaborone, MH1048, took one nurse six efficient hours, while the EPI report took about 20 minutes.

Data not reaching the MoH at the deadline is seen as a huge constraint among all the programme managers. One manager expresses it this way:

*“Ooooh, tell me about it.. Time – it’s a problem. We have to sit on the phone, call this district, call, sometimes following people even in their bedrooms, and say ‘please!’ Mhm. ‘Send that report first thing tomorrow morning, please’, yeah that’s how we survive. It’s very tedious. Very, very strenuous on the data office, ooh! It is very strenuous” (Interview 1:288-291).*

The majority of the reports from the districts are said to be received on time. One of the national programme staff members had estimated the response rate of the monthly reports:

*Interviewer: “Do you have any idea of the proportion of this problem [of timeliness]? How many reports are not delivered?” Respondent: “Well about 20 or so”.  
Interviewer: “20?” Respondent: “20 % or so. I mean, the response rate would be about 80 [%] or so” (Interview 3:123-129).*

Data arriving late to the decision makers do tamper on the ability to make decisions at the right time. In a disease outbreak that may have large implications, one manager describes:

*“Sometimes I think, last year [2007], I don’t know whether it was October, when we didn’t have, was it measles [vaccination coverage rate] totally? Eeeh, before you could see that report you’d not know the situation, you know. By the time we realized that, AH, measles is so low – what is happening? You know. It was like three weeks after the report was compiled, so when you push people to ‘Say, please order those immunizations quickly’ Three weeks afterwards, they are going to take another three weeks if not more to get a special order” (Interview 1:322-328).*

Despite this, a delay of up to three months is seen as acceptable among most managers. Tedious efforts to obtain the reports also have effects on both the staff members and efficiency of the organization:

*“[...] of course it also hits very hard on my staff. Because when you sitting there in the data office trying to get all these reports you get frustrated and burned out at the end of the day. At the end of the day you get burned out, mhm. It’s not a good experience at all. Mhm, you talk too much on the phone, calling this district, calling. And it’s not cost effective” (Interview 1: 332-336).*

### 6.3.2 Use of health information

Table 6.6 provides an overview of areas where the programme managers use health information. The table is organized hierarchically based on the number of interviews where the area of use was mentioned.

What information is used for	Number of interviews
Monitoring and evaluation	7
Planning	4
Stock management	3
Financing	2
Work force management	2
Quality improvements	2
Needs assessment	1
Resource allocation	1
Trend analysis	1
General management	1

*Table 6.6: Overview of what information is used for among the interviewed managers in Botswana.*

The analysis revealed a pattern of information use (see figure 3.3), reflected in all programmes. This example from MCH is an illustration of this:

*“[...] during the – I think it was 2006 – in Ngamiland, it was clear that they had lot of eclampsias and they had about five maternal deaths that were related to eclampsia. That was quite a big number for a small facility like that, ee<sup>2</sup>. So we followed it up with them, and we conducted some updates and looked at how they managed, how, most of those cases were managed to really find out if there was some problems that needed to be addressed, ee. You find in a case like that our workshop will be [...] really get to addressing towards the problems on the, on the ground – what are their problems, do they have problems with transport or what, or the knowledge of the community members – do they know that that’s a high risk that needs to move to the health facility or what, ee. So it [data] becomes quite critical” (Interview 2:138-146).*

This example shows that the manager first **observe** reports high maternal deaths related to eclampsias. This is data interpreted and put into context with goals and compare performance with facilities of similar size. Follow ups are conducted to find out if there is a real problem

<sup>2</sup> “Ee” is the Setswana word for “yes”.

(data quality evaluation). Then **hypothesis are created** (at the workshop), before any **correcting strategies** are created.

A manager in Mental Health explains how data are used in her unit. Monitor the burden of disease through prevalence data and assessment the need for health care are seen as important tasks for the management:

*“It [data] tells you how many people maybe with a chronic disorder that you have in a particular district, and it tells you how many young people are, all of a sudden, coming up with a drink and drug problem that must be attended to then and there. Then it also shows you, you know, which areas have a problem of people committing suicides and other things, then you plan according to that” (Interview 4:188-192).*

The managers confirm that information is used in assessing the impact of the programmes. Below is one example where keeping track of the provision of HIV transmission prophylactic drugs are used in an evaluation process:

*“Yes, by evaluating the programme, how good the programme is doing. For example, if we do the programme uptake – then we can say – well at least we have moved from so many women taking prophylaxis and treatment in 2003, or a certain percentage to a certain percentage in 2007. Then it means the percentage of women who are put on prophylaxis or treatment is increasing or is not. So even the impact of the programme, when it comes to the percentage of babies that are being saved through the programme – so that is how we evaluate our programme” (Interview 5:166-172).*

The interviews however show that lack of data use in decision-making processes is inadequate in other areas. A national programme coordinator raises attention to a lack of information use in planning of new facilities:

*“[A]s the coordinators we have got this opportunity of going around and looking at the facilities, you’d find that a facility is struggling, the structure, the numbers of deliveries, the number of patients they see, but they are congested. Then you go to another facility that is so beautiful, you know, statistics – nothing. So you wonder, why was that structure put there in the first place, did people really look at the number of people that come there, or? You know, a beautiful structure becomes a white elephant, ee. When on the other side people will be sweating and suffering. And you wonder, why, why, how, I wish people up there can start realizing that we need to use data. There is a lot of uneven distribution of the resources around here, because we are not using data properly” (Interview 2:505-513).*

A manager’s ability to identify areas of information use does not necessarily reflect the true level of use. One manager that identify several areas of use in planning, M&E and financing, later in the interview explains that there are no other employees working in this particular programme. In addition, s(he) is also running another programme. Being overworked, months

of gathered data from the facilities are not being entered into the local software. Data piles up, creates stress, data are getting old, and are not being used.

At district and facility level the gathered data are often sent to higher levels of responsibility without being actively used in local planning and decision-makings. During the observations a nurse explains that STI-contacts in this month should correspond with the sum of PID, vaginal discharge syndrome and urethral discharge syndrome next month. Follow up slips are usually delivered to patients with a sexual transmittable infection (STI). Last month her clinic ran out of contact slips, and follow ups were therefore hindered (Observation 274-284). One of the national level managers confirms lower level's lack of use of information:

*“They are always excited to [...] waiting for these reports so they can, because with them now they can not actually argue with you and say ‘No, your figures are not corresponding with ours’ (laughter). Agreed the expectation is that they should be having their numbers and say ‘Mma [name], no, no, no, no, that’s doesn’t represent us’ But they are not in that position” (Interview 2:286-290).*

There are some exceptions. One of the clinics under observation commented on the April report that:

*“The number of S.T.Is had increased especially method of discharge, vaginal discharge & more emphasis should be on S.T.Is education to reduce the spread of infection. Patients should be encourage on safer-sex. (use of condom) and return-[unreadable] in the clinic” (Observation:552-555)*

## Information culture

One of the main challenges the programme managers are facing is the attitude of health workers towards other health workers. This seems to exist at all levels of the health care sector. During observation on delivery of monthly reports, one deliverer brought only a photocopy of the original, three-paged carbon paper. The clinic had no originals left. The receiving officer asks the deliverer to return to fill out a new form with all three pages or find a photocopy store. After minutes of argument and asking permission to make copies at the office's copy machine, (s)he got a new, blank report from the officer. (S)he then filled the form out again. The process of filling out the new report takes about 20 minutes. In the meantime the driver waits impatiently.

Even though the programmes claim to be writing reports and disseminate them, data is generally unavailable for the public. Libraries do not have statistics, and governmental institutions are reluctant to provide statistics to people from outside. Hospitals, the HSU and

health programmes all perceive themselves to be owners of the data they handle. One of the managers illustrates:

*“People don’t feel they have any obligations to be giving you data. ‘It’s mine, I keep it even if I am not using it’” (Interview 4:481-482).*

## Feedback

Feedback in form of meetings, visits to districts and facilities with the purpose of supervision and annual reports is identified from MoH to facilities and the district. One respondent explains one way of how MoH gives the districts feedback:

*“In fact we have biannual managers meetings, which the whole ministry participates in. It is a one week meeting. So what happens, different programmes go to present at that meeting to district managers. So what we do, we’ll print for every district. Then we will give them feedback on how the country is doing, and how then on how individual districts are doing” (Interview 5:102-105).*

One of the managers does however question the effect these meetings have on their ability to give the DHTs feedback on their performance (Interview 3:261-262). Districts which are identified by the programmes not reaching the targeted level of statistics, e.g. vaccination coverage rates, are visited for follow ups. This is seen as a way to give the districts feedback on their statistics. Feedback from the DHT to facilities in form of supervision visits to facilities occurs. The general impressions from the facilities are that feedback on other issues than un-timeliness is limited.

### 6.3.3 Resources

The most frequently mentioned category during the interviews is human resources. All programme managers see the lack of human resources as a large constraint to the data collection, data processing and information use. Human resources vary substantially from programme to programme.

Whether it is a lack of human resources or managerial capacities that is the districts’ main constraints is a subject of discussion. It seems however that it might be a combination of both:

*“Well, it’s, it’s, it’s surprising that there are some districts that will continuously [...] will have the same problem regardless of changing management. But other districts keep on changing depending on who is there, ee. Sometimes I think there isn’t enough hand-over when others leave and others take over and now you realize that some of the reports are not coming as they used to be” (Interview 2:68-72).*

Observations reveals a difference in the use of information at national level compared to the district and local level in Gaborone. Employees in national health programmes have the same impression:

*Respondent 1: “One of the challenges will also be, here and there we have discrepancies in the data from certain districts – like when he [the data clerk] is entering, he is like: ‘this number is not suppose to exceed that number’. You see? Those discrepancies, some people just compile and not use it themselves. [...] But some people will just compile and send for the sake of reporting, not necessarily using the data themselves in order to understand it and to use it for their own planning [...] and decision-making. [...]”. Respondent 2: “It is because of inadequate knowledge in M&E” (Interview 5:246-256).*

The programme managers’ experience of training the community health personnel to improve the information process (see figure 3.2) is diverse. One claims it helps preventing the same mistakes happening twice, another sees no effects.

Technical resources are scarce. Only one clinic and two of the hospital wards had access to computer. Both of them, the DHT and MoH have got access to internet. Due to a broken fax machine one of the programmes experiences that the reports do not reach them. At the district level, transportation was at times inadequate and restricted deliveries of the reports to the DHT.

A constraint that seems to be repeated is the physical availability of the forms. After a cost sharing reform the departments in MoH are supposed to pay government printers for their forms. This sometimes this restructuring imply that new forms are not delivered when the forms run out, something that requires the facility to photocopy new ones to be able to deliver any reports. Copy machines are not available in the facilities, something that results in pressure on the health workers to use their own time and money to photocopy the forms. One manager explains:

*“You know like, they (the nurses) have to use their money from their own pocket so that they can make some photocopies and then at the end, I mean, if you don’t have money, then, why bother? Why bother make copies for something that is for public consumption? So at the end of the day some would go an extra mile to make copies, some won’t. But at the end the data will not be here” (Interview 3:74-78).*

#### **6.3.4 Informal HIS**

The latest statistics from HSU, produced in 2007, uses data from 2003. Currently they are working on the 2004 report. Two of the programmes clearly states that the time-lag affects their planning and decision-making capacity. In addition, data elements important to the



programmes, like adolescent sexual and reproductive and administrative variables, not being collected by the HSU has contributed to the development of local forms. One manager explains:

*“So, we realized that, when we started, we thought health statistics [HSU] can be of assistance to us, but they said no, their statistics – they are always lagging behind. And then we took that opportunity, ‘OK, fine. Then with us we would need to have a form, an official form, that is send straight to us’, ee. So, that is what is happening. And then we, we time and again compare the number with the Central Statistics [HSU], but you will find they, at this stage, they are not very helpful because right now we can only compare 2005. We[...]and it is not helping us. For them – they are interested in numbers only. But for us, we are interested in looking at the service, improving what is done to reduce the morbidities and the mortalities, ee” (Interview 2:366-374).*

These developments may be characterized as a development of an informal HIS, but to use informal health information has its limitations:

*“Because the ones you are collecting every month for our use [local data], you cannot publish it, you cannot even quote it in a report. You can only quote statistics which has been verified by the statistics unit, but you can use it for your own planning purposes in the office” (Interview 4:28-31).*

The compiling of the informal reports takes time, and with low numbers of data clerks, they pile up, not being entered into a computer and subsequently not being used. Even for the more resourceful programmes a one to two years time-lag of creating a report is seen.

### 6.3.5 Challenges

On top of the already mentioned challenges programme managers see several constraints on the HIS of today. One of the most frequent is related to lack of coordination and information between different levels of the HIS:

*”[...] probably this is an administrative issue, you know, we have Ministry of Local Government; they run the clinics and health posts. Ministry of Health they run hospitals. Public Health is responsible for Public Health issues, whether you are at the Ministry of Local Government or Health, Public Health Department, right. But all these hospitals they are under Clinical Department, Clinical Service Department, NOT Public Health [superior to the majority of the selected programmes], you see. [...] At the end of the day, who are Public Health? Now my boss is Clinical Services, you know. So we have to go to Clinical Services and beg them – (Soft, begging voice) ‘Oh Sir, Oh Madam, can you please tell your (Pause) to submit the data’, see what I mean?” (Interview 3:289-295, 301-301).*

This fragmented structure and distribution of responsibility results in different concerns. The most recurrent apprehension is that data does not reach the programmes. Logistical issues, whether there is a fax machine that is not working, unreliable transport or postal services are other challenges. Some of the programmes have found solutions to this:

*“[T]hey [the facilities] know that if they drop it [the report] here, in my office, it will definitely reach there [to HSU], compared to dropping it at the Registry. ‘Cause at the Registry sometimes it gets lost and many other things, so we have an arrangement that they can always drop it here, and I’ll take it upstairs [to HSU]” (Interview 4:278-281).*

Lack of integrated software systems has caused facilities with available computers to adapt their own software. This influences integration of information. One manager portrays the situation:

*“It’s like, they [software systems] are not connected, their [the facilities] system is not linking to them [HSU], and you wonder how then, if we [Botswana] create those systems in the hospitals and you don’t link them to health statistics – I am not even talking about us here [health programme] – health statistics – that is supposed to be the main consumer [of data]. If we [health programme] are not linked to them [HSU], then what are we really doing, ee. So these are the, the.. I wish they could really try to link all these so that we can have information all over” (Interview 2:479-484).*

### **6.3.6 Managers’ suggested solutions to the challenges**

One of the solutions to the identified challenges seen by the respondents is to move from manual HIS, to a computerized HIS, starting at facility level. One doctor was even willing to use his own computer for data collection and processing to get rid of the manual system. The comprehensive computer illiteracy, non-electrified districts and the scaling of internet connection to rural areas are conversely seen as restraints nationally. Locally, security issues may refuse investments in computers. One of the hospital wards had experienced that their computer had been stolen, since it is located in a desolated area.

Two out of three programmes that do not have a programme coordinator at the district level requested one:

*“PMTCT their figures they are always having them on the tips of their fingers. So that is what we would need. And, and sometimes you know one thing that would also smoothen our information of data is when, when maybe there is a coordinator there who looks at a programme as big as EPI, ‘cause EPI is a big programme. You don’t just look at the immunization, the vaccines and the what. You also have to look at their management, the equipment, all those things. If at the district level we could get just a coordinator who looks JUST at EPI/IMCI not dilating to TB to here to general out-patient to what-what-what, a-ah, there is too much, you see PMTCT is doing excellently because they’ve got a coordinator” (Interview 1:485-493).*

One of the managers wants the staff of HSU to be seconded to each programme to improve the data quality:

*“So if they are seconded here, they will be able to know what is c-section, what is ANC, what is Family Planning, what is this. This is how we are supposed to report and record. But being there [at HSU], they just see data” (Interview 3:287-289).*

With the purpose of improve the logistical challenges one suggests:

*“Where possible, divisions or departments should have their own fax machines, you know, their own postal address, so that the data that is been sent doesn’t get easily lost, you know” (Interview 3:342-344)*

Another manager identifies follow ups of the health workers as a solution:

*“There needs to be better follow up of facilities, and DHT’s. Somebody just needs to go around and carry this book or carry some other things and show them “Guys, look at how you are performing. We need to do better than that”” (Interview 4:524-526).*

The BEANISH project introduced the concept of one M&E officer in each district. This is perceived as strength:

*Respondent 2: “Yeah, I would say that like the recent introduction of this M&E officers maybe they can become on hand and improve the situation. Because it is like they are like in the same..” Respondent 1: “setting”. Respondent 2: “Yeah, in the same setting”. Respondent 1: “If the M&E people for the ARV programme – if the programmes were integrated at district level so that the same M&E person can take care of even the PMTCT programme. Then he or she may be able to work together with the focal persons so that maybe they are away on leave or on other duties then the M&E officer can take over to compile the reports. That is our main hope” (Interview 5:212-220).*

The manager of the programme also pictures scaling of more than one M&E officer to oversee related programmes. The scaling of M&E specialists in the Ministry of Health, to help in for example revising indicators and data collection tools, is also seen as a possible gain to the programme.

## **7. Discussion**

### **7.1 Summary of the findings**

The findings show that the information flow is diverse and fragmented, differing from programme to programme. There are two coexisting HIS, identified as one formal and one informal system. The formal system consisting of official reports delivered to the HSU. The informal system is created by locally developed reports delivered elsewhere than to HSU. The SOURCE-analysis mainly revealed a problem of overlapping data collection tools. The form of the EPI programme is the only one amongst the assessed programmes that satisfy all the SOURCE-criteria. The findings are not unified concerning the simplicity and user-friendliness, relevance, completeness and effectiveness of the collected forms. The study revealed data quality discrepancies, in terms of incorrectness, incompleteness, inconsistencies and un-timeliness of delivering reports. Un-timeliness is one of the major constraints of the HIS according to the informants. An equal pattern of information use was seen among all the interviewed managers. Facility and district level seems to have a lower degree of information use than the national level. The findings are however not distinct. Human and technical resources vary from programme to programme and facility to facility.

### **7.2 Discussion of the methodology**

#### **7.2.1 Validity and reliability**

Validity is defined as the ability to investigate what it is intended (Johannessen, Kristoffersen, & Tufte 2007). Participants were asked to describe own actions and intentions. This might be a threat to the study's validity since people tend to present themselves in a better light when asked about their own performance (Chambliss & Schutt 2006). This may imply that some managers may claim to use more or different information than they actually do. The interviews were conducted with this in mind, and control questions were asked. Data collection continued until the saturation point felt achieved. The use of several data collection methods contribute to assure the validity of the results. To tape record and transcribe the interviews also gives surety to the validity.

Reliability means that the results should stay consistent over time, and if they change it is due to a real change in the phenomenon under study (Chambliss & Schutt 2006). For others to duplicate this study, as for most qualitative studies will be difficult. The data analysis represents the researcher's interpretation of text and the context and is influenced by personal theoretical perspectives. Readers with other perspectives are likely to find other contexts of meaning in the same material. Based on a hermeneutic and post-modern scientific philosophy the analysis in this paper must still be accepted as one representation of the reality (Kvale 1997). Duplication of this study, as for most qualitative studies, will be difficult. The respondents provided to a large extent consistent answers. Hence, reliability is considered achieved.

Generalizability refers to the ability to draw conclusions that hold true for a whole population of information creators and users (Chambliss & Schutt 2006). Generalizability might be difficult to achieve. The primary reasons is that Gaborone health district is not representative for the whole of Botswana. The district has more health personnel, technical resources and better infrastructure than elsewhere in Botswana. Still, Gaborone district is seen as a critical case – if the HIS does not work well here it might not be expected to work well in areas with fewer resources (Flyvbjerg 2006). The sample size is limited, but could not easily be expanded due to the limited time frame. In the initial study proposal Kgatleng health district was included. Due to delays of getting a research permit from both MoH and the district, Kgatleng was excluded (see preface). This does probably limit the generalizability further. The chosen programmes are different in case of responsibility and access to resources, and should create a picture close to the reality. The interviewed managers confirmed that several of the findings from Gaborone seem to apply for numerous health districts. The findings may therefore be representative for other districts in Botswana, and even Botswana as a whole. The main purpose of science is to gain knowledge. If formal generalizability is not possible, the study still has value since it has accumulated knowledge of the HIS in Gaborone (Flyvbjerg 2006).

The data analysis represents the researcher's interpretation of text and the context and is influenced by personal theoretical perspectives. Readers with other perspectives are likely to find other contexts of meaning in the same material. Based on a hermeneutic and post-modern scientific philosophy the analysis in this paper can still be one representation of the reality (Kvale 1997).

## 7.2.2 Language problems

English is the working language in Botswana, and all written material is kept in English. Hence, all conducted interviews and other communication with health workers were performed in English. Consultations of patients however took place in Setswana. The health personnel were asked to translate the conversation with their patients during and in between the consultations. As the targeted persons for observation were the health worker, and most of their actions could be observed without understanding Setswana, language problems were not a constraint. To use the persons under observation as translators of their own conversations is not an ideal situation. They might become more aware of their own actions and behave differently than they normally do. It is possible that my presence could have contributed to behaviour not current in the daily routines. Several health workers did for instance speak English to each other while I was nearby, but changed to Setswana when they thought I was not within hearing distance.

## 7.2.3 Possible biases

The interview objects were not randomly chosen, something which might have lead to selection bias (Peat et al. 2002). Selection of the health district under study might also result in selection bias. At the beginning of the BEANISH project software and hardware installation were performed in the four pilot districts, amongst them, Gaborone, and key users were trained in M&E and DHIS. Health workers and managers of Gaborone might therefore have other characteristics than in districts not involved in the BEANISH project. Open observation of health workers' compilation of data sheets may bias their behaviour. There is a chance that interview objects answer what they expect is the correct answer. The interviews were based on open, concrete questions (Peat 2002). There is a risk that I have notice only what interests me and thereby missed important information. My cultural background may also have led to ignoring important factors. I was highly aware of this challenge and did my best to diminish them (Peat 2002).

The interviews were performed in the respondents' office. This created from time to time disturbances like phone calls or visits from other members of staff. No interviews were however delayed for this reason and the atmosphere was generally good and comfortable for both the informant and the investigator. The process of transcribing the tape records eliminated some of these disturbances (Kvale 1997).

## 7.3 Discussion of the results

*To analyze the simplicity and usability, degree of overlap, relevance, completeness and effectiveness of monthly data collection sheets* Heywood and Rohde's (Heywood & Rohde 2001) work on assessment of data collection tools are used. With the purpose of *investigating what the selected monthly data are used for and explore how managers in Gaborone district and in the selected health programmes use health information* previous studies of similar topics have been applied. The analysis has discovered several issues in the HIS of Gaborone that correspond to the characteristics of a microsystem. This framework has in addition contributed to identify *ways to improve the information flow between health facilities in Gaborone district and the selected health programmes*.

### 7.3.1 The data collection tools

Overlapping data elements are a challenge in many poor countries (Heywood & Rohde 2001). This is also identified as the main constraints with the data collection tools in Botswana. The only exception is the EPI programme. The overlap exists mainly due to development of additional, informal forms. Low accessibility of data from the HSU is seen as the possible explanation of this development. The managers identified a trade-off between liberating local health workers from extra work and the need for information. Too much workload on the single health worker affects the time available for the individual patient. On the other side, if information is not collected the basis for decision-making improving the health situation and the health services becomes a risk. Access to necessary information in time for decision-making is perceived as most important.

HIS in poor income countries are to a large extent influenced by external donors of programmes and international policy developers (Boerma & Stansfield 2007). The recent years' focus on how efficient financial aids are being used has resulted in increased demand for documentation from poor countries. In the receiving countries, some side effects have been a development of similar reports, overlapping data elements and duplication of work across programmes. International policy developers appeal for equal data from all countries. National registers of e.g. birth weight, maternal complications, vaccination coverage or psychiatric disorders are non-existent in many rich countries. Poor countries may feel obligated to provide data to secure next years finances. Rich countries, on the other hand, are not tied up by this pressure, and are thereby free to collect the information they utilize

themselves. The rationale behind poor countries spending lots of resources on something rich countries find unnecessary is highly questionable.

### **7.3.2 Use of the health information**

An equal pattern of information use was seen among all the interviewed managers – observing data contradicting preset goals, generating hypothesis and response by corrective actions. The pattern corresponds to Pauley et al.'s (1982) circle of information use. Higher levels seem however able to utilize information more than the lower levels. The findings are however not distinct. Examples are a clinic in Gaborone that does relate their data to possible interventions to reduce sexual transmittable infections. Contradictory, did a national planning process not take data into account before building a new facility.

The main area of information use is monitoring and evaluation of the programmes. Other areas, like planning and resource allocation seem to get less attention. This corresponds to what Otwombe (2007) identified in Kenya. The focus on the Millennium Development Goals has been an important contributor to the attention on monitoring and evaluation internationally the past few years (Boerma & Stansfield 2007). The focus has led to improvement in producing data of better quality. Still, other areas of use are requested by researchers, for instance Boerma and Stansfield (2007).

The creation of comprehensive informal data collection tools is an indication of managers finding data necessary and useful. One of the programmes with a comprehensive informal tool does however, leave the unprocessed data “in the drawer”; contradicting the normative perspective on information use (Feldman & March 1981; Mutemwa 2006). This particular programme has only one appointed officer. Hence, the manager has limited time to process the data. Information use is thus not solely dependent upon availability of information. Here both human resources and time are influential factors.

The un-timeliness in the deliveries of reports is seen as a major constraint for information use in Gaborone. This study did not reveal any structural differences in the timeliness of the reporting between facilities as Otwombe (2007) did in Kenya. The un-timeliness is generally perceived to be connected to logistical obstacles and the capacity of the local management. The un-timeliness is seen as an indication of poor information culture and low demand of



information by the top management. Pauley et al.'s (1982) found that regular meetings and exchange of information created a supporting environment for information use. In Gaborone, the PMTCT programme's use of monthly meetings for report deliveries has made the information flow transparent. In this way they succeed in creating information demand and ownership. Still, not all the facilities in Gaborone attend the meeting. One of the involved clinics had not heard about it.

### **7.3.3 Information flow in a microsystem perspective**

Several microsystems were identified during the data analysis; single facilities, DHT, national programme units in MoH, as well as the four different health programmes horizontally structured from the national to the facility level. The main microsystem under investigation is a system overreaching all the other microsystems, the health information system.

Poor data quality, e.g. mistyping or -calculation, the existence of both new and old forms and use of different definitions of data elements all jeopardize the use of information. In relation to timeliness of the reports from the district of Gaborone at the time of data collection, only EPI and PMTCT reports may be said to satisfy the 60 %-norm of timeliness (Hill 2007). Currently available, validated data from HSU are four years old. Data this old are not useful in the decision-making processes as managers are not informed early enough to make proper assessments (Heywood & Rohde 2001). The case of immunization coverage rates exceeding 100 %, figure 6.4, indicates that the capacity to react upon poor data quality is low even in national level management. Thus, the data quality represents a threat to the efficiency of decisions made.

The HIS of Gaborone are highly fragmented, including many stakeholders. The flow of information is diverse across the programmes, with various ways of report deliveries. The number of computers available and the software used in data processing and analysis differ from programme to programme. Several managers identified the need for computers at district and facility level. They also request other data analysis software, like Access and SPSS. Integration of software systems across level and facilities are recognized as important by the informants. This is in accordance with the goals of the BEANISH project (2008), as computerization is recognized as a tool for improving data quality (Herbst 1999). The DHIS

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software is developed with the intention of revealing such inconsistencies. Chaulagai (2005) and his co-authors emphasize the necessity to build capacity among information users in addition to building out technology to ensure good data quality and information use. Computerization of all districts in Botswana was in progress during the data collection period. According to informal sources all districts now got access to computers with DHIS software installed.

In relation to microsystem terminology, the fundamental elements of the HIS are the three levels of care; facility, district and national level. Between the different levels sequential interdependence are identified in the sense that data collection at facility level is necessary for data processing and eventually information use. One level is dependent upon the other to do their part of the job. The proximity between the different levels of responsibility regarding data collection and information use is partly indistinguishable. To determine a reciprocal relationship the interdependence should be going in both directions. As the results show, the degree of feedback to the districts and facilities are close to non-existent. It is however seen as necessary and useful among both data providers and information users. Hence, one may argue that the interdependence between the different levels of care is also of a reciprocal character. A high degree of coordination is thereby necessary according to Thompson (1967).

Analysis of the results revealed one “formal” and one “informal” health information system. This corresponds to what Sæbø et al. (2007) observed in Botswana. The formal system is identified by the official reports, and the delivery of the reports to the formal unit of statistics, HSU. The main coordinating mechanism associated with the formal system is direct supervision (Mintzberg 1979), as the HSU is the national coordinating agency of health statistics in Botswana, having the main responsibility for provision of data. The informal information channels are recognized by health programmes’ development of local reports delivered elsewhere than to HSU. The informal system is related to Mintzberg’s (1979) mutual adjustment due to the informal character of the information flow. The use of informal reports has developed in a large scale in the MCH and Mental Health programme. In a managerial perspective, an informal HIS is not necessarily evil in itself. Coiera (2003:110) argues that informal information systems are useful when “data are of temporary value, of interest to very few people, are complex or the content is not predictable in advance. When tasks are infrequent, it is more cost-effective to use an informal solution”. In general it is necessary to have access to routine data over a longer period of time to compare the

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population's state of health across time and space. Health information has a great interest in several groups of the society, from policy makers, managers, and the general public. The HIS is also in general complex (Sæbø 2007; Thorseng 2008). The usefulness of an informal information system is hereby seen as limited in the case of the HIS in Botswana. Why then has the informal system aroused?

The formal system is organized according to a divisional system design, as hierarchy of information handling units, with a unit of specialists in statistics as the coordinator of the HIS. Public health decisions are in contrast made in the single programmes. The informal system corresponds to a form of matrix system designed with a dualized authority system, as both HSU and the single programme management are giving instructions to the districts. The information channels correspond to this duality, where both the HSU and programme manager receives reports from the districts. As the HSU do not provide the needed information on time, the informal system design has developed in order to remove problems associated with divisional designs (Scott 2003). This has happened despite Vroom's (in Scott 2003) perception of hierarchical systems as better suitable for decision-making in cases of rapid decision-making. To access information programme managers have to communicate directly with the districts and facilities themselves. When a formal system fails, someone has to make sure the job gets done and that the population gets the services they are entitled to at the right time. The purpose of the informal system is perceived to correct the faults in the formal system. Still, it is striking that accessibility of data is low – mainly due to the untimely deliveries of reports. In some programmes the use of information is also low, despite access to data. Hence, the problems in Botswana seem deeper embedded than the failures identified above.

In the wake of the BEANISH project there are efforts proceeding to improve the HIS in Botswana. The improvements are slowly operationalized and little work seems to have been going on to prepare the single programme for the planned changes. For instance all the programme managers had different perspective on how to improve their HIS. Furthermore, only one employer had heard about the BEANISH or DHIS. Even though improvement has been a set target area by the top management (BEANISH Project 2008; Government of Botswana 2004), little results are seen further down the organization. If no plans are done in order to secure involvement of programme managers, ownership of the improvements to come might be at risk (Pauley 1982).

The M&E officer has a key role to play when it comes to achieving good information to the management at the right time for decision to be made. The general impression is that more capacity has to be built to maximize the potential benefit of the information available at district and facility levels. National managers highly request a focal person at district level, such as the PMTCT district coordinator in Gaborone. The M&E officers function as a district HIS coordinator today.

The resources of the community are not exploited to its fullest. For the public to get access to health statistics is difficult. The major libraries, websites, or direct contact with relevant institutions do not provide the latest health statistics. When available, only brackets of the information are presented. In Uganda the inclusion of the community publishing routine health information in the newspapers facilitated information use and a means towards improving the public health situation (RHINO 2003).

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## 8. Conclusion

Three main objectives have been examined in this thesis: (1) *a SOURCE-analysis of the data collection sheets used in the Gaborone district*, (2) *what this information is used for and how managers use it*, and (3) *ways to improve the information flow between health facilities in Gaborone district and the selected health programmes*.

The capacity to integrate information in decision making processes differed among the programmes. The SOURCE-analysis revealed that the majority of the data collection tools were simple, user-friendly and provided relevant data for managers. Both the MCH and Mental Health programme had developed substantial informal forms. An expected overlap between similar health programmes was identified. Also within the health programmes there were overlaps. This was true except for the EPI tool. In addition informal channels and poor coordination in information flow were observed.

The challenges of overlap, informal information channels and coordination were perceived to be interconnected and they all contributed to managers' non-access to and use of information. Since HSU was not able to provide information in time for decision-making, hence managers had to start collecting data single-handedly, despite the extra work it implied for the health personnel. This expansion of the HIS created a vicious circle where the system got more fragmented, and more coordination was needed. Data quality, especially the lack of timeliness, also affected the managers' access to information. The un-timeliness of report deliveries were attributed to low capacity in the local management, logistical obstructions and poor information culture. Both the data providers and data users saw the degree of feedback as unsatisfactory. The non-accessibility of data may be attributed to the poor information culture. Deficient coordination of the HIS at the national level has also been revealed. This was partly due to delay of data from the HSU and lack of fluent exchange of data between the programmes. The findings do not clearly identify how much the managers used the information, and to support the hypothesis that managers' use information to a low degree has therefore not been possible PMTCT had founded a culture of information that was functioning well in Gaborone. On the other end the Mental Health programme had far too little resources to process and utilizes data on a regular basis. It is however difficult to

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establish a causal relationship between resources and HIS performance based on these findings.

To summarize the study in a microsystem perspective, managers did not have the right information available at the right time. Even after development of informal systems the accessibility of data was limited in the single programme. This is a sign that the challenges identified in Gaborone were more extensive than first anticipated. Feedback was not optimal, and it is doubtful what role information played in decision-making. The interdependency between the different levels of care and the information channels were diverse and fragmented. The aims of the HIS were blurred. The connection to the community was low. Hence, it is argued that the microsystem, HIS of Gaborone, has fallen short. Improvements of the HIS were however identified as a priority area at the top of the organization, and training and resources were available to improve staff members' skills in data collection, processing, and analysis.

## 8.1 Possible improvements of the HIS

When changing microsystems, one must keep in mind their complex nature and ability to change themselves. The challenges described have ended up in the following recommendations for improvements:

1. Development of any new data collection tools should have an end-user focus. All data elements must however be well funded in a managerial or public health perspective. The simplicity of the tools must be maintained due to both users and compilers.
2. Gaborone would benefit from computerization as this is perceived to increase data quality. Software systems have many features that would be beneficial to improve correctness, consistency and completeness. In cases where computers are not available, manual control of the reports by competent personnel should be encouraged.
3. As HIS are social systems, establishing a good information culture is as important as technical solutions. Regular meetings as in the PMTCT programme could improve the timeliness. Enabling facilities to set own priorities, communicate their expectations, participate in decision-making and evaluation processes should be enforced. It might be prudent to professionalize the use of information in one area, e.g. monitoring and

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evaluation, at the current stage. As managers' capacity of using information increases, other areas of use can be introduced.

4. Better coordination of the national HIS is needed and such coordination is best managed and financed by one unit being responsible for the information process. Creating an ownership of information from the top management downwards may generate more efficient dissemination.
5. The need for capacity building in medical terminology and public health issues among the HSU staff should be considered. Getting one focal person for each major health topic might be one idea. Staff members may visit the different programmes as auditors.
6. To set a fixed deadline for data delivery will ease data providers' work, limit logistical challenges and contribute to increased timeliness. To improve timeliness development of a data tracking system could reveal logistical and human obstructions in the report deliveries.
7. The M&E officer's skills in data processing and analysis should actively be transferred to members of the DHT and matrons all over Gaborone. Cooperation between the M&E officers and the MoH should be established.
8. Trying to improve the whole HIS is a difficult task. To choose one or two health programmes to start with could be advantageous. Among the assessed programmes, PMTCT or EPI could function well as pilots due to their successfulness and the available resources.

### *Final reflections and further research*

Understanding the collection process and how data are used should be useful in further development of the health information system in Gaborone and the selected programmes. If the information generated here is used it could provide health personnel with a better tool of documentation, ease the data collection process and hence their daily work. Generalization to other areas of Botswana might be possible since the tools under study are used nationally. The national managers' impression is also that equal challenges are identified all over the country. Several of the challenges identified, e.g. un-timeliness and fragmentation are seen globally.

Thus, the findings may be useful in developing and improving health information systems in other countries as well.

It would be both interesting and necessary to gain more knowledge of the Health Statistics Unit perspective on the issues raised in this thesis. To investigate coordination challenges in other districts of Botswana would be relevant for future improvement work of the national HIS. A topic that would be interesting to pursue further in Botswana is the use a data warehouse for integration of information, especially related to availability issues. The BEANISH project has lounded improvement work in Botswana. Further research could also be done on how to make improvements in the HIS sustainable. This study has mainly focused on technical barriers to efficient information use. In the future organizational psychological studies focusing on information seeking behaviour would be an appropriate field of study.



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## Appendix 1: Research permits

Telephone: (267) 3632000  
FAX (267) 353100  
TELEGRAMS: RABONGAKA  
TELEX: 2818 CARE BD



MINISTRY OF HEALTH  
PRIVATE BAG 0038  
GABORONE

REPUBLIC OF BOTSWANA

---

REFERENCE No: PPME-13/18/1 PS Vol III (35) 13 August 2008

Ranghild Flingtorp  
Gamle Bygdevei 174  
1284 Oslo, Norway

Dear Ms Flingtorp

**Permit : PUBLIC HEALTH INFORMATION USE BY MANAGERS IN BOTSWANA. A CASE OF GABORONE DISTRICT FOCUSING ON PMTCT, MENTAL HEALTH, MCH AND EPI HEALTH PROGRAMMES**

Your application for a research permit for the above stated research protocol refers. We note that you have satisfactorily revised the protocol as per our suggestions.

**Permission is therefore granted to conduct the above mentioned study.** This approval is valid for a period of 1 year effective August 13, 2008.

This permit does not however give you authority to collect data from facilities without prior approval from the management. Consent from the identified individuals should be obtained at all times.

The research should be conducted as outlined in the approved proposal. Any changes to the approved proposal will need to be resubmitted to the Health Research and Development Division in the Ministry of Health for consideration and approval.

Furthermore, you are requested to submit at least one hardcopy and an electronic copy of the report to the Health Research, Ministry of Health within 3 months of completion of the study.

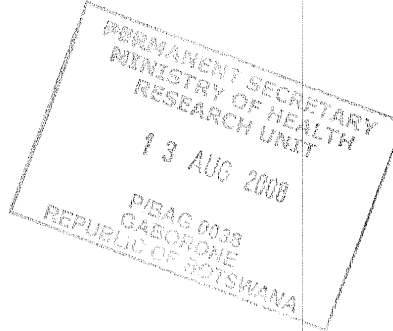
Approval is for academic fulfilment only. Copies should also be sent to all other relevant authorities.

Yours sincerely



P. Khulumani

**For/Permanent Secretary**







**GABORONE CITY COUNCIL**

All correspondence should be addressed to the

**TOWN CLERK**  
Private Bag 0089  
Telephones: 3657400  
Tel. Add.: 'CIVIC'  
GABORONE  
BOTSWANA  
Fax: 3900141

**Reference:** GCC / H / 8

**Date:** 13<sup>th</sup> March 2008

**To:** Ragnhild Flingsorp  
c/o International Office  
P/Bag 0022,  
University of Botswana  
Gaborone

Tel: 74635682

**Re: REQUEST FOR PARTICIPATION IN RESEARCH.**

Reference is made to your letter dated 13<sup>th</sup> March 2008 requesting for permission to conduct a study in Gaborone City Council Health Facilities on "Use of Public Health Information by Health Managers in Botswana".

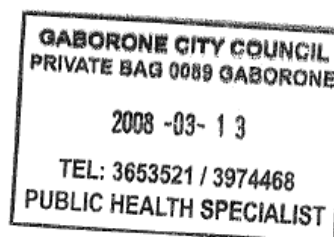
In view of the approval letter authorizing the study by Health Research Unit, Ministry of Health, and considering the interest of your research as outlined in the Study Proposal, Gaborone City Council is hereby granting you permission to recruit study participants in Health Facilities and among Health Managers in the City.

Matrons, Nurses-in-charge of the Clinics and other Health Managers are hereby informed and requested to allow access and give you all the necessary support and cooperation as needed.

Nevertheless, you will still need have the informed consent of each respondent to participate in the study.

Thank you.

.....  
Dr P. N. Mihigo, MD, MPH  
Chief Medical Officer  
For Town Clerk.



TELEPHONE: 3170585  
FAX: 3902092  
TELEGRAMS: RABONGAKA  
TELEX: 2818 CARE BD  
REFERENCE:



DEPARTMENT OF PUBLIC HEALTH  
PRIVATE BAG 00269  
GABORONE

REPUBLIC OF BOTSWANA

DPH 13/18 I (6)

2<sup>nd</sup> April 2008

Ragnhild Flingtorp  
C/o International Office  
Private Bag 0022  
University of Botswana  
Gaborone

Dear Sir/Madam,

**REQUEST FOR PARTICIPATION IN APRIL 4<sup>TH</sup> 2008 RESEARCH**

Permission for you to directly invite employees in the Department of Public Health to participate in your study is hereby granted.

The divisions have been notified of your intention and relevant communication has been directed to them.

Good luck.

Yours faithfully

A handwritten signature in black ink, appearing to read 'M. Balosang'.

M. Balosang  
for/DIRECTOR - PUBLIC HEALTH

## SAVINGRAM

From: The Director  
DHAPC

  
for Director

To: Coordinator  
PMTCT Program  
**Attention: K. Keapoletswe**

Ref: DHAPC 20/42/8 B II

29 March, 2008

**Re: Public Health Information Use by Managers in Botswana (a research study)**

1. Please find a permit from the Health Research Unit granting Ms. R. Flingtorp permission to conduct the research titled as above. Ms. Flingtorp also brings with her the detailed research proposal.
2. The research to be conducted, if done as outlined, will give the DHAPC (and other MOH Departments) some insight into data flow and use within the PMTCT; Mental Health; MCH; and EPI programs. To complete the data gathering as permitted by HRU, Ms. Flingtorp will need to conduct interviews with senior program officers. She will also need assistance with data gathering.
3. Ms. Flingtorp leaves Botswana in the first week of May 2008, and will therefore need our prompt assistance. Please afford her the necessary help. I may be contacted for any clarifications that may be required.

Thank you.

Princess Marina Hospital  
P.O. Box 258  
Gaborone Botswana



Tel: 3621400  
Fax: 3973776  
Email: ygureja@gov.bw (chairman)  
chakawa@hotmail.com (secretary)

**PRINCESS MARINA HOSPITAL  
INSTITUTIONAL REVIEW BOARD**

Our Ref: PMH2/08-03

Date: 31<sup>st</sup> March 2008

**Ragnhild Flingtorp  
c/o International Office  
University of Botswana  
P/Bag 0022  
Gaborone, Botswana**

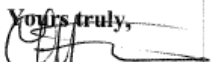
**Re: Public Health Information use by managers in Botswana. A comparative Case  
Study of Gaborone and Kgatleng Districts focusing on PMTCT, Mental Health,  
MCH and EPI Health progress**

I am pleased to communicate Ethics Committee's conditional approval of the protocol named above.

The approval is effective from the date of this letter provided you comply with the list of conditions given below.

1. Have formal approval from the HRDU of the Ministry of Health
2. Get permission from the head of institution in which the study will be performed.
3. Resubmission for re-approval of the protocol if there is expected or unexpected change at any time of the study.
4. A copy of the report at the completion of the study

On behalf of the Committee, I wish you success in this important endeavour.

Yours truly,  
  
**Chakawa Nthomiwa**  
Secretary  
3902526 (office)  
71420553(mobile)

cc. Medical Superintendent (PMH), HRDU

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## Appendix 2: Interview guide

The questions below should be perceived as a guide for the interviewer, and the sequence of the question are only a suggestion. Questions may be developed during the interview depending on how the conversation with the respondent proceeds. Follow up questions like what, which, how, why, when and where is likely to follow to cover the respondents meaning and thoughts as fully as possible. Some questions may also be left out. The questions below will be modified according to the role of the manager.

How they consider the timeliness, consistency, availability, correctness, completeness, reliability and accuracy of the data

What is your professional role?

What kind of health statistics do you have access to?

How is this accessible?

When did you last time look at statistical data, figure?

- Please describe the situation.

What data collection sheets did you last receive from the health facilities, e.g. last month?

- When was this?
- When were they sent from the facility?
- Had they been other places before you received them?
- Did you get the sheets within the deadline?
- If not, when did they arrive?
- How were they filled out?
- Was every filed of the sheet filled out?
- If not, what was lacking?
- Did you notice any errors?

How do you consider the statistics compared to the real situation?

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Do the sheets reflect the same issues as the same period last month, or last year?

What is your opinion of the quality of the data?

Did you receive any other data sheets last month?

Was this an ordinary month?

- if not, what was different?

What happened with these tools afterwards?

How are they stored?

Are the data made into reports?

To whom are the information disseminated?

In general, how do you perceive of the usefulness of data collected?

- the relevance of the data?
- the representativeness to the population?
- the amount of data collected?

Are there any indicators at the sheets you find unnecessary?

Are there any indicators you would like to have on the sheets?

When did you last time use statistical data?

- Please describe the situation and the purpose

Do you use statistical data in other situations?

- Please describe them and the purpose

Do you know if anyone else in your department uses the statistical information?

Do you use other department's information?

What do you perceive as the purpose of the data collection tools?

What are the strengths and limitations in the data collection process?

How can the data collection process be improved?

Have you received any kind of training in how:

- to fill in the sheets?
- to analyze the sheets?
- to use the information?

Have you received any other training?

How is resources allocated in order to secure the data collection and compiling?

- Money, human resources, time
- Where do the financial resources come from?

What kind of training do field workers get in order to:

- fill in the sheets?
- analyze the sheets?
- use the information?
- other?

What is your opinion on the relevance and usefulness of the training?

What is your educational background?

What is your age?

Remember to write down gender.

---

## Appendix 3: Letters of information and consent form

### Letter of information to interview objects

You are hereby invited to participate in a research study. The title of the study is 'Public health Information Use by Managers in Botswana'. The study is a comparative case study of Gaborone and Kgatleng Districts focusing on the health information system in the Prevention of Mother To Child Transmission (PMTCT), Mental Health, Diabetes, Mother and Child Health (MCH), and Expanded Program on Immunization (EPI) health programmes. The study will form the basis of my master thesis in MPh studies in Health Economics, Policy, and Management at the University of Oslo, Norway. My primary interest is the data collection process of the routine health data, the use of health information among managers, and how managers perceive the existing health information system in chosen districts and health programmes.

Participation in the study involves one interview, lasting for maximum 1.5 hour, taking place at a time and site of your choice (e.g. your office). The study will in total include about 30 interviews and observations of health managers and health workers in the districts of Kgatleng, Gaborone, Ministry of Local Governance and Ministry of Health.

The interviews will be accomplished in the period March 12<sup>th</sup> to May 12<sup>th</sup> 2008. The study will be completed by September 15<sup>th</sup> 2008.

The purpose of this project will be to gather information on how public health data in the Gaborone and Kgatleng districts are collected and give an assessment of the data collection sheets in use. Further, I want to explore where the collected data are sent and which of the collected data are used by managers and how it is used. This may reveal any differences between the two districts and/or the health programmes. In the long run, I hope the research will identify solutions to identified challenges, if any, and provide recommendations on ways to improve the health information system to health facilities, the government, donors and other concerned organizations.



The aim is that this study will contribute to further development of the understanding of the health information system in Gaborone and Kgatleng districts and the data flow between the districts and the described health programmes. By having access to more timely and reliable information you, your colleagues and superiors will be enabled to detect, assess and respond to public health events and needs more efficiently than today. If necessary, the health information system may be improved which in turn will make your daily work more efficient.

As a participant in this study you will be interviewed regarding your own experiences of health data and health information in your daily work. There are no anticipated costs, risk or discomfort associated with the study. The study does not include experimental methods.

Your participation in this study is entirely voluntary. You may freely withdraw from the study at any given time – before, during, and after the interview – for any reason that does not have to be stated. If you choose not to participate or withdraw from the study it will not lead to any consequences. If you withdraw from the study, all information about you will be destroyed. If new findings develop during the study you will be informed.

The interview will, with your permission, be taped and written down. The written material will be made anonymous. Some of the sentences from the interview might however be used in their entirety in research reports, in order to illustrate important areas of the health information system. Personal information like gender, age, and role/position will only appear in aggregated form in the research report. I emphasize that all possible precautions will be taken in order to secure your right to privacy and anonymity. The typed interviews and tape records will be kept in a secure environment during and after the study. Only the investigator and a research assistant will have access to unanonymized interview materials. The supervisors, and an external examiner (sworn to confidentiality), if required during the censorship, may get access to the transcribed, anonymized interviews. All tapes will be destroyed immediately after the study. Transcriptions from the interviews will be destroyed after five years. The investigator may in this period use the data materials in further education and/or research.

The results of this study will be presented in a written master thesis report, read by supervisors, researchers, and stakeholders such as the Health Research Unit, the Central Statistics Office, the Ministry of Health, and the Ministry of Local Government. The master

thesis will be published on the Internet. An abridged version will be created based on this report and sent to participants in the study. The results may also be presented in research journals, newspapers, and in person to other researchers and interest groups. Under no circumstances will your name or any identifying information be revealed. You will be provided with a minor written report of my findings within January 1<sup>st</sup> 2009.

This project has been reviewed by and received ethics clearance through the Health Research Unit, Ministry of Health. This office may be contacted through Ms G. Tubatsi, phone number: 3632466/3914467 or e-mail: gtubatsi@gov.bw, if you have any concerns about your rights resulting from your participation in this study. If you have any questions, or require any further information about the study, please contact the investigator: Ms Ragnhild Flingtorp, phone number: 74635682 (After May 12<sup>th</sup>: +47 40239634) or by e-mail: ragnhild.flingtorp@studmed.uio.no; or her supervisors, Professor Grete Botten, phone number: + 47 22845043 or by e-mail: g.s.botten@medisin.uio.no or Mr Johan I. Sæbø, phone number: +47 22840073, +47 22852410 or e-mail: johan.saebo@ifi.uio.no.

Yours sincerely,

Ragnhild Flingtorp,  
MPh Student

## Letter of information to observation sites

You are hereby invited to participate in a research study. The title of the study is 'Public health Information Use by Managers in Botswana'. The study is a comparative case study of Gaborone and Kgatleng Districts focusing on the health information system in the Prevention of Mother To Child Transmission (PMTCT), Mental Health, Diabetes, Mother and Child Health (MCH), and Expanded Program on Immunization (EPI) health programmes. The study will form the basis of my master thesis in MPh studies in Health Economics, Policy, and Management at the University of Oslo, Norway. My primary interest is the data collection process of the routine health data, the use of health information among managers, and how managers perceive the existing health information system in chosen districts and health programmes.

Participation in the study involves observation of the daily work of the staff involved in treating PMTCT, Mental Health, diabetes, MCH, and/or EPI patients at your clinic for 1 day. The observation will take place at a time of your choice. The study will in total include about 20 observation sites in the districts of Kgatleng and Gaborone.

The observations will be accomplished in the period March 12<sup>th</sup> to May 12<sup>th</sup> 2008. The study will be completed by September 15<sup>th</sup> 2008.

The purpose of this project will be to gather information on how public health data in the Gaborone and Kgatleng districts are collected and give an assessment of the data collection sheets in use. Further, I want to explore where the collected data are sent and which of the collected data are used by managers and how it is used. This may reveal any differences between the two districts and/or the health programmes. In the long run, I hope the research will identify solutions to identified challenges, if any, and provide recommendations on ways to improve the health information system to health facilities, the government, donors and other concerned organizations.

The aim is that this study will contribute to further development of the understanding of the health information system in Gaborone and Kgatleng districts and the data flow between the districts and the described health programmes. By having access to more timely and reliable information you, your colleagues and superiors will be enabled to detect, assess and respond to public health events and needs more efficiently than today. If necessary, the health information system may be improved which in turn will make your daily work more efficient.

As a participating clinic in this study the staff will be observed when entering and handling health data. There are no anticipated costs, risk or discomfort associated with the study. The study does not include experimental methods.

Your staff's participation in this study is entirely voluntary. They may freely withdraw from the study at any given time – before, during, and after the study – for any reason that does not have to be stated. Non-participation or withdrawal from the study it will not lead to any consequences. Any gathered information during the observation will be destroyed if the staff member chooses to withdraw from the study. If new findings develop during the study participants will be informed.

The written material from the observation will be made anonymous. Personal information like gender, age, and role/position will only appear in aggregated form in the research report. I emphasize that all possible precautions will be taken in order to secure the observed staff right to privacy and anonymity. The materials from the observation will be kept in a secure environment during and after the study. Only the investigator will have access to unanonymized materials from the observations. The supervisors, and an external examiner (sworn to confidentiality), if required during the censorship, may get access to anonymized materials. Unanonymized materials from the observations will be destroyed immediately after the study. Anonymized materials from the observations will be destroyed after five years. The investigator may in this period use the data materials in further education and/or research.

The results of this study will be presented in a written master thesis report, read by supervisors, researchers, and stakeholders such as the Health Research Unit, the Central Statistics Office, the Ministry of Health, and the Ministry of Local Government. The master thesis will be published on the Internet. An abridged version will be created based on this report and sent to participants in the study. The results may also be presented in research

journals, newspapers, and in person to other researchers and interest groups. Under no circumstances will observed staff's name or any identifying information be revealed. The participating health facilities will be provided with a minor written report of my findings within January 1<sup>st</sup> 2009.

This project has been reviewed by and received ethical clearance through the Health Research Unit, Ministry of Health. This office may be contacted through Ms G. Tubatsi, phone number: 3632466/3914467 or e-mail: gtubatsi@gov.bw, if you have any concerns about your rights resulting from your participation in this study.

If you have any questions, or require any further information about the study, please contact the investigator: Ms Ragnhild Flingtorp, phone number: 74635682 (After May 12<sup>th</sup>: +47 40239634) or by e-mail: ragnhild.flingtorp@studmed.uio.no; or her supervisors, Professor Grete Botten, phone number: + 47 22845043 or by e-mail: g.s.botten@medisin.uio.no or Mr Johan I. Sæbø, phone number: +47 22840073, +47 22852410 or e-mail: johan.saebo@ifi.uio.no.

Thank you for your time.

Yours sincerely,

Ragnhild Flingtorp,  
MPh Student

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## Consent form

I agree to take part in the study 'Public health Information Use by Managers in Botswana' being performed by MPh student Ms Ragnhild Flingtorp of the Department of Health Management and Health Economics, University of Oslo, Norway.

I have made this decision based on the information I have read in the letter of information. All the procedures and any risks and benefits have been explained to me. I have had the opportunity to ask any questions and to receive any additional details I wanted about the study. If I have questions later about the study, I can ask the investigator Ms Ragnhild Flingtorp, phone number: 74635682 (After May 12<sup>th</sup>: +47 40239634) or by e-mail: ragnhild.flingtorp@studmed.uio.no; or her supervisors Professor Grete Botten, phone number: + 47 22845043 or by e-mail: g.s.botten@medisin.uio.no or Mr Johan I. Sæbø, phone number: +47 22840073, +47 22852410 or e-mail: johan.saebo@ifi.uio.no.

I am aware that I may contact Health Research Unit, Ministry of Health, through Ms G. Tubatsi, phone number: 3632466/3914467 or e-mail: gtubatsi@gov.bw, if I have any concerns about my rights resulting from my participation in this study.

I understand that my participation is voluntary and that I may withdraw from the study at any time, without penalty, by telling the researcher that I withdraw.

---

Printed Name of Participant

---

Signature of Participant

---

Date

---

Investigator

## Appendix 4: Health Facilities

During the study I came across different lists of number of facilities in Gaborone. When I had started the recruiting of facilities I ended up at a clinic that no longer existed, hence the list anticipated to be the correct one was not updated. At the point of collecting timeliness data three additional clinics appeared on a list from the DHT, this might be due to use of other names and/or abbreviations, e.g. Tsholofelo Clinic is often referred to as Broadhurst III. Nevertheless, this indicates that the list used for sampling is erroneous. Despite this I have chosen this list of facilities as my basis for randomization of observation sites since this was the most complete list I got access to at the time. The list used in the sampling process is provided below.

Health Facility	Beds	Health Facility	Beds
Princess Marina Referral Hospital	507	Gaborone West Clinic	12
Gaborone Private Hospital	113	Sebele Clinic	0
BDF Village Clinic	0	Julie Molefe (Block 9)	0
Bontleng	0	Phase II Clinic	0
Broadhurst I	0	Extention II Clinic	0
Broadhurst II	0	STD Clinic	0
Broadhurst Traditional Area Clinic	0	UB Clinic (FET)	0
Extention 14 Clinic	0	Glen Valley Clinic	0
Extention 15 Clinic	0	Kgalagadi Breweries (Ltd) Clinic	0
Old Naledi	20	Segwana Clinic	0
Prison Clinic	5	Block 6 Clinic (Botshelo)	0
Broadhurst III (Tsholofelo Clinic)	8	Kgatelopele Clinic	0
UB Clinic (Main Campus)	0	_____	_____

(Source: *Sophie Mancey-Jones & Wendy Graham 1997:3*)

*Table 9.1: Overview of Health Facilities in Gaborone District*

## **Appendix 5: Data collection tools**

<b>MENTAL HEALTH FORMS</b>	<b>92</b>
<b>MCH FORMS</b>	<b>99</b>
<b>PMTCT FORMS</b>	<b>103</b>
<b>EPI FORMS</b>	<b>108</b>



## Mental Health forms

## Form 1: Mental Health official form, MH1053

HSU

		Ministry of Health
Republic of Botswana		MH 1053/Rev 2003
<b>Mental Disorders Out-Patient Register</b>		

This form is to be completed by Mental Health Personnel in Psychiatric units in all health facilities for each out-patient consultation for mental disorders. The facility sends this form with consultations for each month one week after end of the reporting month to Health Statistics Unit. See instruction on the back.

Name of facility	District	Month / Year	Page of total pages this month
LSDAH	Southern	April/06	

Consultation		Sex	Age	Main mental disorder	ICD-10 code (if coded by the facility)	New case	Repeat case	To be used by HSU
Serial number	Date							
1	28/04/06	M	1963	Mania	F30		X	
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

Instruction on the back.









CONFIRMED					TOTAL	SUSPECTED					Total			
Age	0-14		15-24		25-44	45 +	Age	0-14		15-24		25-44	45 +	
Sex	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Totals														

**PART D: PATIENT REFERRALS**

IN-REFERRALS	MALE	FEMALE	OUT-REFERRALS	MALE	FEMALE
DISCHARGED FROM HOSPITAL/UNIT			REFERRED FOR ADMISSION		
REFERRED FROM OTHER HEALTH FACILITIES			REFERRED TO OTHER HEALTH FACILITY		
REFERRED FROM OTHER DEPARTMENTS			REFERRED TO OTHER DEPARTMENTS		

**PART E: FOLLOW UPS/HOME VISITS**

**PART D: STAFFING**

ACTIVITY	NUMBER	ACTIVITY	NUMBER
Home Visits		Mental Health Education	
Police/Prison		-Hospital	
School/College		-Clinic	
Work Place		-Kgotla	
Out Reach Trips (Other facility)		-Home/Family	
Court visits		-School/College	
Sanity Reports ZO4		-Other	
Social Work		Inservice Education	

CATEGORY OF STAFF	IN	OUT
Psychiatrists		
Medical Officers		
CMHNs		
General Nurses		
Enrolled Nurses		
Social Workers		
Occupational Therapists		
Mental Attendants		

Psychology		- Base Station	
Occupational Therapy O.T		- Outreach	
Other		- other	

Other		


**PART G: PSYCHOTROPIC DRUGS AVAILABLE: YES ----- NO-----**

**PART H: Number of Deaths-----**

**COMMENTS:**

**MCH FORMS**

*Form 3: Out-patient and Preventive Health Statistics Tally Sheet, MH1046*



**Out-Patient and Preventive Health Statistics  
Mother Child Health/Family Planning (MCH/FP) Tally Sheet**

This form is to be completed by facilities with outpatient and preventive services, and used for each consultation/visit on monthly basis. Each consultation should be recorded.

Health Facility: \_\_\_\_\_ Month: \_\_\_\_\_ Year: \_\_\_\_\_

		Family Planning																																					
Method	Type	New										Repeat																											
		1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10																		
Pill	Low dose																																						
	New Repeat																																						
	Total																																						
	High dose																																						
	Total																																						
	Progesterone only																																						
	Total																																						
IUCDs	Copper T																																						
	Total																																						
	Other IUDs																																						
	Total																																						
Injections	Depo																																						
	Total																																						
Condoms	Male																																						
	Total																																						
	Female																																						
	Total																																						
Nor-Plant																																							
	Total																																						
Other FP																																							
	Total																																						
		Post Natal Care																																					
Total		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	34	35		

Instruction on the back





## Form 4: Midnight Census Register, MH001

Republic of Botswana		Ministry of Health	
<b>Ward Midnight Census Register</b>		MH 001/Rev 2003	
The census information is to be completed on each ward in each in-patient service facility every day by midnight.		<b>Ward Midnight Census Slip MH 001</b>	
Facility and Ward:		Date:	
<b>Admissions</b>	<b>Transferred into ward</b>	<b>Facility</b>	
1.	1.	<b>Ward</b>	
2.	2.	<b>Date</b>	
3.	3.		
4.	4.		
5.	<b>Back from temporary leave</b>	<b>Patients</b>	
6.	1.	Inpatients from previous day	
7.	2.	Add Admissions	
8.	3.	Add Transferred into ward	
9.	4.	Add Back from temporary leave	
10.	<b>Deaths</b>	<b>Subtotal</b>	
11.	1.	Minus Discharges	
12.	2.	Minus Deaths	
13.	3.	Minus Absconded	
14.	4.	Minus Transfer-Outs	
15.	5.	Minus To temporary leave	
16.	<b>Absconded</b>	<b>Total Remaining</b>	
17.	1.	<b>Lodgers</b>	
18.	2.	Lodgers from previous day	
19.	3.	Add Admissions	
20.	<b>Transferred out of ward</b>	<b>Subtotal</b>	
21.	1.	Minus Discharges	
	2.	<b>Total Remaining</b>	
<b>Discharges</b>	3.	<b>Newborn</b>	
1.	4.	Newborn from previous day	
2.	5.	Add Newborns	
3.	<b>To temporary leave</b>	Add BBA	
4.	1.	Add Transferred into ward	
5.	2.	<b>Subtotal</b>	
6.	<b>Lodgers admitted</b>	Minus Discharges	
7.	1.	Minus Deaths	
8.	2.	Minus Absconded	
9.	3.	Minus Transferred out of ward	
10.	4.	<b>Total Remaining</b>	
11.	5.		
12.	6.		
13.	<b>Lodgers discharged</b>		
14.	1.		
15.	2.		
16.	3.		
17.	4.		
18.	5.		
19.			

**Guidelines to facility for  
completing the Midnight  
Census Ward Register  
MH 001/Rev. 2003**

The census information is to be completed on each ward in each in-patient service facilities every day at midnight on form MH 001.

**How to fill in this form**

Information from Midnight Census Ward Register MH 001 is used when completing information on form MH 002.

Transferred, in this form, is only within the health service facility from one ward to another. If a patient is taken/referred to another facility then record as a discharge both in the Midnight Census form MH 001 and In-Patient form MH 017. Exception, if the patient is expected to come back to the hospital within 14 days, the case should be recorded as temporary leave.

In cases where a patient is on leave with permission, e.g. for a weekend, the case should be recorded as temporary leave. In cases where a patient has absconded from the facility, it should be recorded as abscond. After 14 days, cases with temporary leaves who have not returned should be recorded as discharged in the in-patient form MH 017 and on the register for psychiatric in-patient MH 2030. Patients who absconded should be recorded as discharged within 24 hours.

To get patients by midnight add admissions, transferred into ward and back from temporary leave to the number of patients from last night. Then subtract discharges, deaths, absconded, transferred out of ward, to temporary leave. Same procedure applies for newborns.

An example: In-patients from last day is 12, and 7 admissions, and 2 transferred into ward and 1 out of ward, 1 death and 1 abscond, and 3 discharged. By midnight number of patient will be 15,  $[(12+7+2) - (1+1+1+3)] = 15$ .

Fetal death (stillborn) in the section for newborn is defined as a fetus born showing no evidence of life, irrespective of the duration of pregnancy (gestation period).

Newborns Delivered		Neonatal death	
1.		1.	
2.		2.	
3.		3.	
4.		4.	
5.		5.	
6.		<b>Stillbirth (fetal death)</b>	
7.		1.	
8.		2.	
9.		3.	
10.		4.	
11.		5.	
12.		<b>BBA (Born before arrival)</b>	
13.		1.	
14.		2.	
15.		3.	
16.		<b>Newborns transferred into ward</b>	
17.		1.	
<b>Newborns Discharged</b>		2.	
1.		3.	
2.		4.	
3.		<b>Newborns absconded</b>	
4.		1.	
5.		2.	
6.		<b>Newborns transferred out of ward</b>	
7.		1.	
8.		2.	
9.		3.	
10.		4.	
11.		5.	
12.		<b>Total remaining at midnight</b>	
13.		Patients	
14.		Lodgers	
15.		Newborns	

## Form 5: Maternal and Perinatal Monitoring Tool, MH3132

Latest version as of February 2 2007 program?

MH 3123

**MATERNAL AND PERINATAL MONITORING TOOL: MONTHLY SUMMARY REPORT**  
 MONTH: \_\_\_\_\_ YEAR: \_\_\_\_\_

NAME OF DISTRICT: \_\_\_\_\_

FACILITY NAME \_\_\_\_\_

1. Total number of deliveries			
• SVD			
• Caesarian section			
• Breech			
• Vacuum extraction			
• Forceps			
2. Born Before Arrival at the facility			
3. Multiple deliveries			
4. Live Births( make sure you include BBAs )			
• Weight less than 2.5 kg			
• Weight more than or equal 2.5kg			
5. Stillbirths:	macerated	fresh	
Below 1000g			
1000g - 1500g			
1500g- 2500g			
Above 2500g			
6. Number of Congenital Abnormalities			
7. Maternal complications			
• Eclampsia			
• Pre- Eclampsia			
• Anaemia			
• Post Partum Haemorrhage			
• Obstructed Labour			
• Ruptured Uterus			
• Sepsis			
• Ante Partum Haemorrhage			
• 3 <sup>rd</sup> Or 4 <sup>th</sup> Degree Tear			
• Vaginal Fistula			
• Other _____			
8. Maternal deaths			
9. Perinatal deaths			
< 1000g			
1000-1500g			
>1500g			
10. Neonatal deaths			

COMMENTS \_\_\_\_\_

NAME: \_\_\_\_\_ DESIGNATION: \_\_\_\_\_ SIGNATURE: \_\_\_\_\_ DATE \_\_\_\_\_

 MAIL TO: RESEARCH AND EVALUATION SECTION, SRH UNIT. P/BAG 00269, GABORONE. FAX ; 3902092  
 TO BE REPORTED BY THE 7<sup>th</sup> OF EVERY MONTH

## PMTCT FORMS

## Form 6: Facility Monthly Report from MCH units

## PMTCT-Guidelines

## Appendix 4.14A: District/facility monthly report forms

## FACILITY MONTHLY REPORT FROM MCH UNITS

Report for the month of	Today's date	Year	Facility	District
<b>VARIABLES</b>				<b>NUMBER</b>
<b>ANTENATAL</b>				
New ANC attendees				
Women pre-test counselled/individual/group educated				
Women HIV tested				
Women tested HIV-positive				
• Post-test counselled				
• Women evaluated for ARV regimen by CD4 cell count				
• Started on ZDV				
• Started on HAART				
Women tested HIV-negative				
• Post-test counselled				
HIV test results pending				
Pregnant women who register already on HAART				
<b>CHILD WELFARE</b>				
Infants who completed 4 weeks of ZDV				
Infants starting Cotrimoxazole				
Infants tested for HIV				
• Infants tested HIV-positive				
• Infants referred for ARV				
• Infants tested HIV-negative				
• Infants tested, results pending				
• Infants completed 12 months of age on formula				
<b>POST-NATAL</b>				
PNC attendees				
Women with known HIV status from ANC				
Women tested at PNC clinic				
HIV-positive (total of above 2 variables)				
• Women evaluated for ARVT at PNC by CD4 count				
• Women referred for ARVT (CD4 <200)				
• Women with CD4 >200 referred to the ARV clinic for monitoring				
HIV-negative				
Women already on ARVT at PNC visit				
Women evaluated for IPT this month				
Women enrolled on IPT				
<b>PARTNER TESTING</b>				
Partners tested				
Partners tested positive				
Partners tested negative				
Partners tested, results pending				
Partners referred to ARV clinic				
<b>STOCK MANAGEMENT</b>				
ZDV tablets dispensed this month				
Infant formula tins dispensed this month				

1. Only report services that occurred during the month of the report unless otherwise stated

## Form 7: Facility Monthly Reports from Maternity Units

## PMTCT - Guidelines

## Appendix 4.14B: District/facility monthly report forms

## FACILITY MONTHLY REPORT FROM MATERNITY UNITS

Report for the month of	Today's date	Year	Facility	District
-------------------------	--------------	------	----------	----------

VARIABLES	NUMBER
Number of women who delivered	
Women with negative HIV test from ANC	
Women with positive HIV test from ANC	
Women who took ZDV during ANC	
Took ZDV less than 2 weeks before delivery	
Took ZDV 2...4weeks before deliver	
Took ZDV more than 4 weeks before delivery	
Women who took ARVT during ANC	
Took ARVT less than 4 weeks before delivery	
Took ARVT 4...12weeks before delivery	
Took ARVT more than 12 weeks before delivery	
Women tested during labour / delivery	
Women with positive HIV test during labour/delivery	
Women with negative HIV test during labour/delivery	
Women who took only ZDV during labour	
Women who received only NVP during labour	
Women who received both ZDV and NVP during labour	
Infants who received NVP only	
Infants started on ZDV only	
Infants started on both ZDV and NVP	
Infants started on infant formula	
HIV-positive women opting to breastfeed	
HIV-positive women opting to formula feed	
<b>STOCK MANAGEMENT</b>	
ZDV tablets dispensed this month	
ZDV syrup dispensed this month	
ZDV vials administered this month	
NVP tablets dispensed this month	
NVP syrup dispensed this month	
Infants formula tins dispensed this month	

REPORTING OFFICER:	DATE:
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## Form 8: Report form for babies on formula feeding

REPORT FORMS FOR BABIES ON FORMULA FEEDINGFACILITY [REDACTED] MONTH FEBRUARY

VARIABLES	NUMBER
BABIES BELOW <del>6</del> MONTHS	3
<i>2 months</i>	3
BABIES ABOVE <del>3</del> MONTHS	23
DROP INNS / VISITORS	2
GRADUATED	2
NUMBER OF TINS DISPENSED THIS MONTH	106
CURRENT TOTAL	29

## Form 9: Routine HIV testing: Monthly Report

OC - DHS

## ROUTINE HIV TESTING: MONTHLY REPORT FORM

Name of district: \_\_\_\_\_ Name of reporting facility: \_\_\_\_\_

Year: \_\_\_\_\_ Month: \_\_\_\_\_

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

## 1. Reasons for testing: fill in the total number in boxes below

Clinical Suspicion    PMTCT    Med Exam    STI    VCT    Rape    Needle/Surgical Injuries    TB    Other

## 2. Complete the table below:

AGE: IN YEARS	<1		1-4		5-14		15-19		20-29		30-39		40-49		50-59		60&>		TOTAL	
SEX: (M=male: F=female)	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Number offered HIV test																				
Number tested																				
Number positive																				

3. Total HIV tests performed: ELISA \_\_\_\_\_ RAPID TEST \_\_\_\_\_ PCR \_\_\_\_\_

Reporting officer: \_\_\_\_\_ Designation: \_\_\_\_\_

The report should be sent to AIDS/STD Unit: MoH on the first week of the following month.



EPI FORMS

Form 10: Immunization Tally Sheet and Vaccine Stock Control Report, MH1036

MH 1036/Rev '94

**Expanded Programme on Immunisation**

Immunisation Tally Sheet and Vaccine Stock Control Report

Council \_\_\_\_\_ Facility CWT Hall Month \_\_\_\_\_ Year \_\_\_\_\_

**BCG: Primary Vaccination**

0 - 11 Months																									If Applicable														
																									1 - 4 Years					5 - 14 Years									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	11	12	13	14	15	16	17	18	19	20	6	7	8	9	10
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	21	22	23	24	25	26	27	28	29	30	11	12	13	14	15
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	31	32	33	34	35	36	37	38	39	40	16	17	18	19	20
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	41	42	43	44	45	46	47	48	49	50	21	22	23	24	25
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	51	52	53	54	55	56	57	58	59	60	26	27	28	29	30
Total																																							

**Hepatitis B**

0 - 11 Months																									1 - 4 Years										5 Years +				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	11	12	13	14	15	16	17	18	19	20	6	7	8	9	10
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	21	22	23	24	25	26	27	28	29	30	11	12	13	14	15
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	31	32	33	34	35	36	37	38	39	40	16	17	18	19	20
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	41	42	43	44	45	46	47	48	49	50	21	22	23	24	25
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	51	52	53	54	55	56	57	58	59	60	26	27	28	29	30
Total																																							

2 - 11 Months																									1 - 4 Years										5 Years +				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	11	12	13	14	15	16	17	18	19	20	6	7	8	9	10
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	21	22	23	24	25	26	27	28	29	30	11	12	13	14	15
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	31	32	33	34	35	36	37	38	39	40	16	17	18	19	20
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	41	42	43	44	45	46	47	48	49	50	21	22	23	24	25
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	51	52	53	54	55	56	57	58	59	60	26	27	28	29	30
Total																																							

9 - 11 Months																									1 - 4 Years										5 Years +				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	11	12	13	14	15	16	17	18	19	20	6	7	8	9	10
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	21	22	23	24	25	26	27	28	29	30	11	12	13	14	15
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	31	32	33	34	35	36	37	38	39	40	16	17	18	19	20
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	41	42	43	44	45	46	47	48	49	50	21	22	23	24	25
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	51	52	53	54	55	56	57	58	59	60	26	27	28	29	30
Total																																							

**Measles**

9 Months																									10 - 11 Months										12 Months +				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	11	12	13	14	15	16	17	18	19	20	6	7	8	9	10
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	21	22	23	24	25	26	27	28	29	30	11	12	13	14	15
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	31	32	33	34	35	36	37	38	39	40	16	17	18	19	20
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	41	42	43	44	45	46	47	48	49	50	21	22	23	24	25
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	51	52	53	54	55	56	57	58	59	60	26	27	28	29	30
Total																																							



**Vaccine Stock Control**

Vaccine	Doses in stock first of month (physical count) and batch	Doses received during month and batch	Doses used during month	Doses discarded during month due to...				Doses in stock end of month (physical count) and batch
				Open vial Policy	Cold chain Problem	Expired	Other	
BCG								
DPT								
OPV								
Measles								
DT								
TT								
HBV								
Other:								

**T.T. Antenatals**

1st Injection																																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
																																							Total

2nd Injection																																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
																																							Total

3rd Injection																																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
																																							Total

4th Injection																																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
																																							Total

5th Injection																																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
																																							Total

**Drop-out Rates**

<b>DPT</b>	$\frac{(DPT^1: \quad) - (DPT^3: \quad)}{(DPT^1: \quad)} \times 100 = ( \quad \quad ) \%$	<b>OPV</b>	$\frac{(OPV^1: \quad) - (OPV^2: \quad)}{(OPV^1: \quad)} \times 100 = ( \quad \quad ) \%$
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**Coverage Rates**

<b>BCG, Measles, DPT, OPV (Percent coverage of children under 1 year for current month):</b> Formula: $\frac{\text{Doses of vaccine given} \times 12}{\text{Population under 1 yr.}} \times 100 =$	BCG: %	Measles: %	<b>Tetanus Toxoid (Percent coverage of expectant women for current month):</b> Formula: $\frac{(TT^{2nd\ dose} + TT^{Booster}) \times 12}{\text{Expectant women}} \times 100 = ( \quad \quad ) \%$
	DPT <sup>1</sup> : %	OPV <sup>1</sup> : %	
	DPT <sup>2</sup> : %	OPV <sup>2</sup> : %	
	DPT <sup>3</sup> : %	OPV <sup>3</sup> : %	

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## Appendix 6: Analysis of data capturing tools

### Mental Health

The Mental Health programme uses two different data collection tools, one official form sent from the health facilities to the HSU, and another, unofficial form sent to the health programme administration in the MoH only. The official tool, with the code MH1053, is easy to understand. The form is broken up into single ICD-10 codes, age groups, gender, and new or repeat cases for both attendances and admissions. The unofficial form has in addition seven other parts. The described duplication indicates that health personnel must fill out most data elements twice. Mental Health is the only health programme that uses internationally accepted disease codes in the reports. Dividing the cases into new and repeat cases enables the estimation of incidence and prevalence. MH1053 has a limited coverage of the population of the mentally ill since it only covers out-patient data. Hence, the most severe ill patients are not officially registered. Mental Health is also aggregated at a third form; this report is not sent to the Mental Health programme in the MoH.

### MCH

Three different forms are in use in the MCH programme; ward midnight census (MH001), maternal and perinatal monitoring tool, and out-patient and preventive health statistics (MH1046), see appendix 5. Only one form, MH017, is sent to the HSU. MH3123 is easy to understand and to fill out. MH1046 is large and complex. This makes it not user-friendly, and particularly the antenatal care section in the form is too small to include all cases during a month. This is confirmed by several observations. The sub-total boxes are however a good tool for summarizing the number of cases in a quick manner.

The morbidity data in form MH017 are covered by other forms. MH001 and MH3132 overlap somewhat, born before arrival, maternal deaths and neonatal deaths occur on both forms. MH3123 also overlap with MH017 in ways of delivery. Also MH1046 overlaps with MH3123, however MH3123 provide more specific maternal complications. According to the short list of MCH indicators provided by WHO (Mancey-Jones 1997, World Health Organization 2006b) women attended by skilled personnel during antenatal and delivery are not clearly visible from the data collection sheets. Syphilis, infertility and abortion indicators

are missing completely. Some indicators, like anaemia in MH3132 can advantageously be made more concise by indicating targeted haemoglobin level ( $< 10$  g/dl). Generally the indicators selected is effective for decision making by providing information about the most important issues in MCH; type of delivery, live births, low birth weight, maternal complications, mortality ratios and family planning methods. Number of postnatal, antenatal and well-baby care visits provides a basis of the size of the population served and reached which is important in resource allocations.

The MCH programme staffs miss the possibility to group the age of the pregnant women to capture adolescent pregnancies. Today women are grouped as below 15 and 15-49 years of age meaning that 15-18 year olds are classified as adults. Variables that capture males, marital status, and level of education are requested. The manager however sees the work load this will bring on to the nurses in the facilities as a restraint.

## **PMTCT**

The PMTCT health programme in the MoH receives three different forms from the PMTCT coordinator; two from MCH units and one from maternity units. The forms are sent to the national programme office, but none are reported further to the HSU. The MCH unit form is to be filled out by numbers according to 33 variables, clustered into five different groups. The other concentrates on breast feeding. The maternal units reports 24 variables. All forms are relatively easy to understand, however they appear somewhat unsystematic. At the MCH unit form, two variables, (1) new ANC attendees and (2) postnatal care (PNC) attendees, overlaps with data collected by the MCH programme. In addition all HIV tests (positive and negative), and persons offered test are covered by the Routine HIV Testing form reported to the Department of AIDS Prevention and Care which the PMTCT health programme is a part of. According to WHO guidelines of PMTCT programme monitoring (World Health Organization 2006a; World Health Organization 2008c) the data collected by the MCH unit form is highly relevant. Variables included in the forms that are not requested by the WHO guidelines are pre- and post-test counselling, women evaluated and referred to further treatment and partner testing. To target the positive women, their partners and further possibilities for treatment is however highly relevant and important in the development of the PMTCT programme. HIV positive pregnant women are used as a proxy to number of infants born to HIV-infected mothers on the MCH unit form. Hence the true number of infants born

to HIV-infected mothers is uncertain due to abortion, stillbirths, and multiple pregnancies data are excluded from the statistics. The guidelines recommend that both infants on formula feeding, exclusively breastfed and mixed fed children should be reported in order to create a picture of the feeding practices distribution. Monitoring the stock level of ZDV and formula is important, however the amount left and also numbers for cotrimoxazole and HAART are missing. The forms are relatively effective for decision-making.

PMTCT is the only programme consciously trying to make their tools more efficient and user-friendly for both managers and health workers by cutting data elements. Which data elements to be excluded are not yet determined.

## **EPI**

The EPI monthly vaccination report is a tally sheet covering BCG, hepatitis B (three doses), measles, three doses of DPT and polio (OPV), tetanus toxoid, in addition to vaccine stocks, drop-out rates and coverage rates, appendix 5. The tool is simple and easy to use and covers all the targeted diseases the babies are routinely immunized against. It is thereby highly relevant. The sheet does not overlap with other forms and no data elements lacking. There might however be a problem to obtain a reliable number of the children of under one year and of expectant women, required to calculate the coverage rates. The information obtained potentially provides an efficient basis for decision-making regarding vaccines to be ordered, and evaluate the coverage in the target population.