AN EXPLORATORY STUDY OF FACTORS AFFECTING THE AVAILABILITY OF LABORATORY CONSUMABLES AT STATE-OWNED MEDICAL LABORATORIES IN HARARE PROVINCE, ZIMBABWE.

TSITSI KATUNGIRE

A mini-thesis submitted in partial fulfillment of the requirements for the degree of Masters in Public Health at the School of Public Health, University of the Western Cape.

Supervisor: Dr. Ehimario Igumbor

November 2011

AN EXPLORATORY STUDY OF FACTORS AFFECTING THE AVAILABILITY OF LABORATORY CONSUMABLES AT STATE-OWNED MEDICAL LABORATORIES IN HARARE PROVINCE, ZIMBABWE.

Tsitsi Katungire

KEYWORDS

Availability

Laboratory Consumables

Laboratory Diagnosis

Laboratory Logistics

Logistics Management Information System

Laboratory Procurement and Distribution

Laboratory Supply chain

Medical Laboratories

Qualitative Study

Zimbabwe

ABSTRACT

AN EXPLORATORY STUDY OF FACTORS AFFECTING THE AVAILABILITY OF LABORATORY CONSUMABLES AT STATE-OWNED MEDICAL LABORATORIES IN HARARE PROVINCE, ZIMBABWE.

T. Katungire

M. Public Health Minithesis, School of Public Health, University of the Western Cape.

The Zimbabwean government recognizes the critical role laboratories play in ensuring the health of the nation. Well-resourced and functioning laboratories are the *sine qua non* of effective diagnosis, treatment and clinical monitoring of medical problems such as HIV/AIDS, tuberculosis and malaria. In Zimbabwe, frequent unavailability of essential laboratory reagents and consumables have been reported but less well-reported are the factors associated with these "stock-outs" at medical laboratories. Applying qualitative research methodologies, this study sought to explore the bottlenecks to the availability of laboratory consumables at state-owned medical laboratories in Harare Province.

Semi-structured interviews were used to elicit stakeholders' perspectives and experiences with regard to the availability of laboratory consumables. These were complemented by observation of procurement, supply and distribution processes and individual follow-up interviews in 7 facilities where medical laboratory scientists were purposively selected. Rigour was ensured through data-source

triangulation, provision of thick descriptions of the setting, maintaining an audit trail and transcribing data verbatim. Data analysis identified recurring themes and key suggestions made by respondents.

A complex web of economic, human resources and supply chain factors affect laboratory commodity availability in Harare. Salient factors negatively affecting commodity availability included inadequate funding, human resources, poor communication and coordination among stakeholders, lack of transport, long lead times and limited inventory management skills.

A comprehensive approach to resolving the challenge is warranted through advocating for more funding, complementing donor efforts on staff retention, improved coordination and collaboration among stakeholders and re-designing the laboratory supply chain. Further research would assist in determining ways of efficiently utilizing the limited available resources.

November 2011

DECLARATION

I declare that *An exploratory study of factors affecting availability of laboratory consumables at state owned medical laboratories in Harare province, Zimbabwe* is my own work, that it has not been submitted before for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged as complete references.

Tsitsi Katungire

November 2011

Signed……..

TABLE OF CONTENTS

CHAPTER ONE

INTRODUCTION

1.1. BACKGROUND

The success of public health programs hinges in part on the provision of quality laboratory services (Mamo *et al.* ., 2008). According to the USAID (2008), laboratory services play a significant supportive role in a country's health system through disease investigation, identification, diagnosis and control of epidemics and communicable diseases. For example, early identification of disease facilitates rapid treatment and disease containment; thus preventing further spread of diseases (WHO, 2008). However, in order for laboratories to function and effectively carry out their roles, there has to be a continuous availability of essential laboratory commodities particularly reagents/ consumables and equipment to carry out laboratory investigations (USAID, 2008). In cases where supply shortages prevail thus rendering breaks in service provision, a comprehensive understanding of the factors compounding these shortages is warranted.

1.2. STUDY SETTING

This study took place in Zimbabwe's Harare Province. Zimbabwe is a low-income country located in the sub-Saharan part of Africa with a total population of 12,462,879 people (World Bank, 2009). Administratively, the country is divided into 10 provinces with 61.7% of the population residing in rural areas (United Nations, 2008). Harare province is the capital of Zimbabwe. The country's economy is diversified with a strong bias towards mining and the agricultural sector which play a significant role in generating

the country's income (DHS, 2008). The country is plagued by leading public health problems such as HIV/AIDS and Tuberculosis (TB) with the adult HIV prevalence rate currently standing at 14.3%, ranking among the highest in the world and a TB prevalence of 597 cases per 100 000 people (MOHCW, 2009). The Ministry of Health and Child Welfare (MOHCW) recognizes the importance of strengthening laboratory capacity as part of a comprehensive response to managing and curbing these priority diseases. As such the government through the Laboratory Services Directorate (LSD) provide services to both the public and private health sector. The LSD operates an integrated tiered network consisting of over 170 registered diagnostic laboratories in the country (MOHCW, 2009).

The MOHCW through the Government of Zimbabwe (GOZ) is the primary funder of all laboratory testing including diagnostic tests in medical microbiology, serology, immunology and histopathology. Hospitals augment the income from the MOHCW through charging clients who do not qualify for free treatment. The MOHCW also receives additional financial support from the National Aids Council (NAC) including assistance from developmental partners such as, the Clinton Health Access Initiative (CHAI), Global Fund, United Nations Children's Fund (UNICEF) through its Expanded Support Programme (ESP) and Center for Disease Control (CDC).

The supply chain for laboratory commodities in Zimbabwe varies depending on the type of commodity being supplied. There are two main channels for commodity flow namely the Ministry of Health and Child Welfare (MOHCW) Laboratory Directorate and own procurement by the medical laboratories/Service Delivery Points (SDPs). The MOHCW

has a centralized system that mainly supports the provision of laboratory consumables to enable the carrying-out of testing for HIV/AIDS programs. Commodities supplied by the MOHCW are aligned to the following tests: CD4, hematology and chemistry. For general laboratory supplies outside the above-mentioned three lines, the laboratory facilities procure using own funding. For the purposes of this research, focus was highly placed on laboratory consumables being managed and distributed from the MOHCW laboratory supply chain. Once laboratory consumables have been sourced, medical laboratories use their own transport to collect laboratory consumables from the two central storage areas situated at National Pharmaceuticals Company of Zimbabwe (Nat Pharm) and at National Microbiology Reference Laboratory (NMRL).

It is within this context that the provision of quality laboratory service is crucial in the wake of diagnosing priority diseases such as HIV, TB and Malaria, determining prevalence rates, treatment initiation and monitoring. Disruptions in laboratory service provision will mean fewer cases of diseases are diagnosed and slow initiation of patients on treatment thus impacting on the health of the entire population. Yet the provision of such services in the country has been challenged by periodic shortages of essential laboratory consumables thus hampering continuity of service provision. As stated by Tinago, Mandozana & Gomo (2009), about 55.6% of district laboratories and 100% of general hospital laboratories had inadequate laboratory supplies to perform clinical chemistry tests. This is further strengthened by Rabiner *et al.* (2009), whose findings showed 85% of district laboratories, 80% of provincial laboratories and 25% of central laboratories were stocked-out of essential chemistry reagents thus hampering laboratory testing services for patients. Stock-out in this instance refers to a total absence of a

particular commodity over a given period of time (USAID, 2007). Rabiner *et al.* (2009) further determined that the duration of these stock-outs was as long as 6-12 months. With the growing public health problems such as HIV/AIDS, TB and malaria, there is need to ensure laboratories are adequately stocked with essential consumables as these are prerequisites for diagnosis and treatment initiation.

As part of the steps being taken to improve the situation, a situational analysis of laboratory services was conducted in 2009 to determine the current state of medical laboratories and to highlight areas that needed improvement (Rabiner *et al.*, 2009). It is this study that highlighted frequent unavailability of laboratory consumables at the medical laboratories country-wide. It is perceived that the economic climate, absence of logistics data for projecting future needs and lack of supply chain training among laboratory personnel might be the leading factors exacerbating this problem. However, shortages of consumables is a multifaceted problem that requires a holistic approach in solving it hence an exploratory study was required to provide in-depth information that could inform future interventions.

1.3. PROBLEM STATEMENT

The periodic shortage of critical laboratory reagents and consumables currently being experienced at the medical laboratories negatively impacts on laboratory service provision. Such shortages translate into delays in testing, longer hospitalization and missed opportunities for outpatient testing (USAID, 2008). In essence, this translates into the inability of the laboratories to perform critical tests hence failure to identify and

diagnose diseases, and monitor treatment ultimately leading to an unhealthy population. At present, no systematic documentation of the factors contributing to these shortages in Zimbabwe is known to the researcher.

1.4. STUDY PURPOSE/ RATIONALE

The purpose of this research was to identify and describe the factors affecting the availability of laboratory consumables at state-owned medical laboratories in Harare province, Zimbabwe in an environment of expanding HIV/AIDS services. The information elicited from this study will be used to provide recommendations aimed at improving laboratory commodity availability to ensure provision of continuous quality services. Managing laboratory consumables has traditionally been a neglected area and now finds itself as a critical driver of success thus is at the forefront of strategic initiatives designed to strengthen essential public health programs.

1.5. STUDY AIM

The aim of this study was to investigate factors affecting the availability of laboratory consumables at state owned medical laboratories in Harare, Zimbabwe.

1.6. SPECIFIC OBJECTIVES

1. To obtain a preliminary understanding of the extent of laboratory commodity shortages
2. To identify and describe the factors (human capacity, finance and supply chain) affecting laboratory commodity availability at selected medical laboratories in Harare, Zimbabwe.

3. To describe the problems faced by laboratory personnel in managing laboratory consumables at medical laboratories in Harare, Zimbabwe.

1.7. OUTLINE OF THIS REPORT

Chapter 1: This chapter provides an introduction to the study in which the background, study setting, the purpose of the study, the problem statement, aim and objectives and the report outline is provided.

Chapter 2: This chapter provides a review of the literature related to this study. The literature review pivots on: the role of laboratories in public health, the need for constant availability of laboratory consumables at facilities, studies on factors associated with laboratory commodity shortages, general findings and conclusions drawn from other studies and a conclusion on the literature reviewed.

Chapter 3: This chapter presents the methodology of this study. It describes the study design, study population, sampling methods and strategy, data collection, rigour validity and reliability of the data instruments, data analysis, and applicability of study findings, study limitations and ethical considerations.

Chapter 4: This chapter outlines the findings from the study conducted

Chapter 5: This chapter discusses the findings of the research in the wake of reviewed literature. It does not detail every issue reported in the result chapter but selects the prominent and emerging ideas.

Chapter 6: This chapter concludes the research and provides recommendations on improving the availability of laboratory consumables in Zimbabwe in general and Harare province in particular.

CHAPTER TWO

LITERATURE REVIEW

2.1. ROLE OF LABORATORIES IN PUBLIC HEALTH

According to Dacombe, Squire, Ramsay, Banda and Bates (2006) laboratory services form an integral part of a functional health system through providing supportive services such as confirming diagnoses, enhanced disease management and providing essential public health information. In an environment of expanding HIV/AIDS programmes, laboratories provide critical supportive services such as disease diagnosis, selection of appropriate treatment regimens, detecting toxicities and monitoring patients on treatment (USAID, 2008). Laboratory tests are necessary to identify the causal agent of an epidemic hence such early identification facilitates rapid treatment and containment of the disease (USAID, 2008; WHO, 1998). Some of the major tests provided by public health laboratories include hematology, chemistry, microbiology and immunology.

Hematology tests are defined by Kelly (2008) as tests undertaken to study the problems with the blood and "blood forming organs" in the human body. These tests are carried out to provide proper diagnosis and disease treatment (USAID, 2008; Kelly, 2008). Chemistry tests assess chemical changes in the body with the aim of providing diagnosis, therapy and disease prognosis (Thompson, 1985). Examples of such tests are liver function, glucose levels and kidney function tests (USAID, 2008). Microbiology testing includes tuberculosis testing and malaria tests (DHSS, 2009).

2.2. THE NEED FOR CONSTANT AVAILABILITY OF LABORATORY CONSUMABLES AT FACILITIES

For laboratories to function effectively, they require a steady supply of key consumables to enable disease diagnosis and therapy (USAID, 2008; USAID 2009). The importance of a constant availability of health consumables in service provision is emphasized by Raja, Mellon and Sarly , "Inadequate availability of and access to essential health commodities are major barriers to the delivery of essential health care in developing countries" (Raja, Mellon & Sarly, 2006:3). In this regard the success of laboratory services and prevention, treatment and care programs, in turn, is contingent upon ensuring an uninterrupted supply of these reagents, consumables and equipment (USAID, 2006). Success of health programs therefore hinges in part on improving laboratory services and in ensuring a continuous availability of essential laboratory commodities.

2.3. STUDIES ON FACTORS AFFECTING AVAILABILITY OF LABORATORY COMMODITIES

Studies identified are not specific to shortages of laboratory commodities but provide an insight into perceived factors that might affect the supply of commodities in the general health sector. A study relating to this research problem was the identification of barriers "to the availability of essential drugs (EDs) at Primary Health Care (PHC) facilities in Lejweleputswa district" in South Africa (Moloto, 2006). The study was brought about by the persistent problem of poor availability or shortage of essential drugs with 60% of health facilities reportedly experiencing this problem. The overall objective was to identify barriers to the availability of EDs at PHC facilities. To answer the research

question, "why and how is there a shortage of EDs and also to determine the perceptions and attitude of those involved in the supply of EDs", action research methodology was adopted which allowed the finding of immediate practicable solutions to the problem. Data was collected through individual and small group interviews, observation, document review and the researcher's experiences. Findings were informed by the drug cycle and included the lack of proper guidelines for the procurement process, lack of adequately trained staff, poor quantification of commodity needs, poor inventory control and limited financing to procure the drugs. The strength of this study lies in data collection method triangulation and an audit trail of proceedings thus increasing its credibility. However, the study was conducted on one level of the health care delivery system (PHC facilities) hence the results may not be generalised to other levels.

In Algeria in 1994, a study was also conducted on the, "availability and price of drugs" (Touat, 1994). During this period, Algeria was facing serious financial constraints due to the "transition from a planned to a market economy" (Touat, 1994). The research questions that the study sought to answer included determining the magnitude of the shortage of drugs, how these shortages manifested themselves at the various levels of the system and lastly identifying the factors that "compounded" these shortages (Touat, 1994). Both qualitative and quantitative methodologies were employed to answer the research questions. Data was collected through a survey using a structured questionnaire and complemented by interviews with key stakeholders at all levels of the system. The findings from this study showed hospitals faced serious stock disruptions that hindered normal operation of their services and that availability of drugs also varied according to

location. Drug shortages were defined as the total absence of a product from the entire distribution network. Findings noted factors contributing to the shortages as the disorganization of suppliers' distribution network which was facing an increase in the number of hospitals and pharmacies, limited domestic production hence heavy reliance on foreign suppliers and inadequacy of information relating to the different types of drugs. The study concluded that stock unavailability was not inevitable thus can be greatly reduced by increasing supplier pool. Although this study did not have a specific focus on the availability of laboratory commodities, it provided insight into some perceived factors that might affect availability of commodities. Its strength lies in methodology triangulation (use of quantitative and qualitative methodology) thus increasing the credibility of the findings. However, the scope was limited in nature as it concentrated on two parameters; "availability and price", and hence might be biased towards factors of a fiscal nature. This is also in line with the background to the study where the country was at its lowest ebb financially thus results derived can easily point to economic depression as the main factor.

In continuation, a study done in Mopani district in Limpopo province in South Africa also focussed on, factors related to ED shortages at PHC level (Matse, 2006). This study was brought about by repeated reports of drug stock-outs at this level of the system. The study was primarily quantitative with minimal qualitative aspects with the overall objectives of determining which EDs where commonly unavailable and to determine factors associated with drug shortages. Structured questionnaires were the key data collection tool and analysis was done using quantitative analytical packages. Factors

identified included, weak procurement systems, poor estimation of needs, poor inventory management, "irrational use" and unreliable transport. The study heavily relied on quantitative methodology hence might not have allowed for in-depth inquiry.

However, limited work has currently been done focussing on laboratory supply issues. Most governments are now realizing the role of laboratories hence studies undertaken are mostly situational analysis (USAID, 2008). In Ghana, an assessment of the laboratory logistics system was conducted to, "ensure a continuous supply of critical reagents" (Addo *et al.* , 2006). Ghana like many sub-Saharan countries is in the process of expanding HIV/AIDS services and has acknowledged the role played by medical laboratories in providing a comprehensive strategy to curb the diseases. In this regard, assessing the laboratory system would identify areas requiring improvements. The study was conducted among laboratories at all levels of the system (central, regional and PHC levels). The objective was to assess public laboratory logistics. The study was qualitative in nature. Data collection was done through the use of a structured questionnaire and key informant interviews were also conducted with the stakeholders. Purposive and convenience sampling were employed to select the regions in which the sample size would be derived. Findings related to supply availability showed 40% of the facilities were stocked-out on the day of the visit with another 33% being stocked-out within the last 30 days. Stock-outs were defined as the total absence of a particular commodity on any given day. Most stock-outs were evident at regional level and these were attributed to inadequate funding to procure reagents. Laboratories were not reimbursed by the central level for the cost of a test particularly those of exemption programs resulting in shortages

of supplies which hindered provision of services. Projecting future needs was also cited as a contributory factor to shortages as data used to estimate future needs was stale and procurement was not done in a timely fashion and often inadequate quantities were procured. The study concluded that a separate budget line item should be established for supplies. This study though purported to be qualitative used quantitative data collection methods and analysis packages such as SPSS.

2.4. GENERAL FINDINGS AND CONCLUSIONS OF OTHER STUDIES

The general findings derived from available studies can be summed up as poor record keeping, inaccurate quantification, unsound procurement procedures, poor inventory management, bureaucratic procedures, budget limitations and inability of suppliers and overseas manufacturers to meet the local demand for commodities as affecting availability of laboratory supplies (Lijdsman *et al.*, 2004; Mmbando *et al.*, 2002; Nii Akwei *et al.*, 2006; Moloto, 2007). It is the above mentioned elements that the proposed study seeks to explore comprehensively thus providing an in-depth understanding of underlying factors affecting laboratory commodity availability at all levels of the laboratory system.

2.5. CONCLUSION

Finally, one can conclude that an uninterrupted availability of laboratory commodities where and when they are needed is crucial for the proper functioning of laboratories. This will ensure continuity in provision of services. The studies reviewed, drawn from a variety of settings in sub-Saharan African countries, indicate that adequate financing, sound procurement procedures, trained personnel, sound distribution network and a wide

supplier pool are some of the pre-requisites to ensuring the consistent availability of laboratory commodities. The importance of these factors in the laboratory supply chain system is context-specific and thus findings of the studies conducted elsewhere cannot be directly inferred to Zimbabwe. There is a dearth of research on the extent to which these requirements impact on the availability of laboratory commodities in Zimbabwe.

CHAPTER THREE

METHODOLOGY

3.1. STUDY DESIGN

The study employed qualitative research methodology based on a descriptive, exploratory rapid appraisal process to seek stakeholder's opinions and experiences regarding factors affecting commodity availability at medical laboratories. A qualitative study was selected as it strength lies in yielding in-depth and detailed data that provides a better understanding of the current problem (Bowen, 2005). A qualitative approach also seeks to collect evidence and provide a broad understanding of the research problem from the perspectives of the technical and administrative personnel involved.

According to Preissle (2008), a qualitative study allows one to get a fresh perspective on familiar phenomena. In this instance, periodic commodity unavailability is a familiar phenomenon; however this study enables the researcher and the stakeholders to get new insights into the underlying factors affecting commodity availability. Qualitative research through an exploratory rapid appraisal process provides an opportunity to quickly formulate recommendations to inform interventions for taking remedial actions. The outcome is an understanding of the experience from the perspectives of respondents selected for the study. The researcher chose qualitative study as it entails the use of semi-structured interviews which do not restrict the participants and enables probing as well.

A rapid appraisal approach also provides a quick insight into the issues affecting provision of laboratory services through capturing the views and experience of subjects

involved in the study over a short period of time. Such a research question requires a high level of flexibility and the ability to change the course when need arises hence a qualitative approach is well suited due to its flexibility and iterativeness. The pace of conducting the study also makes the qualitative assessment attractive for assessing programmes. It is also a low cost and adaptable approach making it ideal for this study.

3.2. STUDY POPULATION

The target population included all technical personnel (medical laboratory scientists, national laboratory logistician and warehouse/stores personnel) directly or indirectly involved in the management of laboratory consumables. The study population was derived mainly from public health medical laboratories in Harare province. The study population also include Laboratory Services Directorate (LSD) management including developmental partners offering laboratory supply chain technical assistance.

3.3. SAMPLING METHODS

The study employed a purposive type of sampling aimed at a rapid appraisal on a small number of prospective participants. Purposive sampling is normally used when researchers try to represent all important and relevant interest groups in a specific area under study (Katzenellenbogen, Joubert & Karim, 1997). The emphasis in qualitative studies is on data quality rather than quantity hence the objective is not to maximise numbers but attain saturation with new information or perspectives on the topic. As stated by Rice and Ezzy, 1999:45, "the aim is to describe the process involved in a phenomenon, rather than its distribution". In this instance, purposive sampling was used to draw participants from the following pre-selected groups:

a) Central level: MOHCW- LSD management (Director of laboratory services, NatPharm warehouse officer, and national laboratory logistician) and developmental partners providing support to the laboratory commodities supply chain.

b) SDP level: laboratory personnel particularly, medical laboratory scientists or laboratory technicians, personnel responsible for procurement, storage and distribution of laboratory consumables at public diagnostics laboratories.

Therefore, the eligibility criteria of the study sample were:

- Personnel working in diagnostics laboratories or central stores and/or
- Laboratory personnel managing laboratory inventory at all levels of the system

All these participants are individuals who offered the fullest and most relevant information regarding the research problem.

3.4. SAMPLE SIZE

The sample size is the number of units that will be studied in a study population (Friedman, Furberg & DeMets, 1998). Considering this is a qualitative study aiming for generating rich in-depth information, the sample size was determined when the researcher reached the point of data saturation thus when new cases were not providing any new information. However, the study sample consisted of 9 semi-structured interviews with the national laboratory logistician and medical laboratory scientists. Inclusive of this were 4 unstructured interviews with key informants such as the Laboratory Services Director, NatPharm Laboratory warehouse officer, and developmental partners. The respondents were drawn from medical laboratories in Harare,Zimbabwe. However, the researcher also visited two other laboratories (in Mashonaland Central) outside of Harare within a 100km radius to contrast the perceived factors that affected laboratory commodities in and out of

the province. Of these two laboratories one is a provincial laboratory and another district laboratory whilst all selected laboratories in Harare were central laboratories.

3.5. SAMPLING STRATEGY

Laboratory services are currently being provided through the national reference laboratories, central hospitals, provincial, district, mission and private laboratories thus they are over 170 diagnostic laboratories spread across the 10 provinces of Zimbabwe in an integrated tiered network. Each laboratory is manned by a medical laboratory scientist and or a state certified medical laboratory technician who is responsible for laboratory commodity management. All laboratory scientists manning the 7 selected facilities were interviewed to ensure the study adequately captures varying context specific views. The sample of state owned medical laboratories in Harare province was purposively selected with one National Microbiology Reference laboratory (NMRL), four central hospital laboratories being selected. In addition, one provincial and one district laboratory in Mashonaland Central were purposively selected thus interviews were conducted with representatives of the chosen facilities that met the inclusion criteria and were eligible from each subgroup.

3.6. DATA COLLECTION

The researcher's primary data collection method was the use of semi-structured interviews to collect qualitative data (Appendix 3) at SDPs and with the national laboratory logistician. English was used as the language for conducting the interviews. A digital voice recorder was used to capture all proceedings during the interviews and to facilitate transcribing. The audio of each interview was recorded using a digital voice

recorder. The main benefit of using digital as opposed to analogue recordings of interviews is that audio recordings from a digital recorder are of much higher quality than that from an ordinary analogue cassette tape. Good sound quality is important as the interest is not only with what the participants say but also with how they say it. Also, the process of transcription is speeded up using a digital voice recorder because of the instant and reliable access which digital recording equipment affords. A number of open ended questions were asked in relation to laboratory investigation done, critical laboratory supplies that are required and the frequency of stock-outs. Critical to the research was the need to elicit information on the laboratory commodity forecasting and quantification process, procurement, storage, distribution, the budgeting process and staffing. Such questions highlighted problematic areas in the management of laboratory consumables that eventually resulted in periodic unavailability of these consumables at the SDPs. Lastly, the researcher also explored the perceived factors affecting commodity availability from the respondents and how these affected quality service provision. These interviews were complemented by unstructured interviews with key informants (Director Laboratory Services, warehouse personnel and developmental partners) and field notes were taken.

3.7. RIGOUR, VALIDITY AND RELIABILITY

The following measures were undertaken to ensure that the results from this study are credible and can be trusted. Thick descriptions of the setting and participants were provided to ensure transferability (other researchers will be in a position to apply the findings of this study to their own) (Bowen, 2005). The research provides an account of

all “methodological and analytical decisions” thereby enabling others to assess the significance of the study hence improving the credibility of the research (Rice & Ezzy, 1999). In addition, the researcher triangulated data collection methods and sources through the use of semi-structured interviews complemented by key informant interviews and interviewing laboratory technical and administrative staff, developmental partners and staff responsible for warehousing and storage. This allows for a comprehensive view of the problem under study as opposed to the use of a single method and data source thus enabling the researcher to be more confident about the study conclusions hence increasing the credibility of the study. The researcher also tracked the proceedings during data collection to increase self awareness thus making his/her role accountable. This was accomplished through keeping a research diary and tracking notes thus ensuring credibility and trustworthiness through making the role of the researcher transparent. All limitations and assumptions during interpretation of findings are documented.

3.8. DATA ANALYSIS

Qualitative data analysis procedures were employed. The researcher undertook thematic analysis which entails familiarisation with the data collected through cross checking and reading and re-reading through the transcribed materials. Thematic frameworks were identified through noting similar or key issues that emerged which were then grouped into the same category to create a preliminary framework for data analysis. These were refined as they were applied to the data. The researcher also established linkages between identified themes. The results were interpreted by providing rich explanations. Lastly, the data was summarised and the most important information was used to illustrate the major findings from the study.

3.9. APPLICABILITY

Polit & Hungler (1991) refers to generalizability as the degree to which the study findings can be applied from the study sample to the entire population. In this regard, partial generalization of the study findings is possible to similar study populations this through the methodological qualities employed such as ensuring rigour, through provision of rich thick descriptions which can enhance future researcher's understanding in this field.

3.10 ETHICAL CONSIDERATIONS

Ethical clearance to undertake this study was obtained from the University of Western Cape's Senate Research and Ethics Committee. Approval was also sought from the Laboratory services Directorate. Participation in the study was also voluntary. Respondents were provided with background information through a letter explaining the research study and were given an option to opt out. Participants showed their consent through signing the Informed Consent Form. Confidentiality of information obtained was explicitly ensured using pseudonyms and data collected did not contain any personal identifiers of respondents. The data collected has been securely kept by the researcher and is being used only for the purpose of this research work.

3.11. STUDY LIMITATIONS

The scope of the study should have covered eliciting information from local and international suppliers of laboratory consumables but due to time and resource constraints this was not possible hence the findings lack perspectives from that angle.

CHAPTER FOUR

RESULTS

4.1. INTRODUCTION

This study used semi-structured interviews and unstructured key informant interviews to elicit information about the factors affecting availability of laboratory consumables at medical laboratories. A total of nine semi-structured interviews were conducted with respondents from the laboratory facilities (medical laboratory scientists) and the National Laboratory Logistician. The table below shows the number of laboratory scientists interviewed at the medical laboratories.

Table 1: Semi-structured Interviewees

Facility	**Number of Personnel Interviewed**
National Medical Reference Laboratory *(includes National Laboratory Logistician)*	3
Central Hospital Laboratories	4
Provincial Laboratory(Mash Central)	1
District Laboratory	1
Total	**9**

Medical laboratory scientists have the overall responsibility of managing laboratory consumables including ordering, receiving, inventory management and usage of these supplies at medical laboratories. Their direct role in managing laboratory consumables made them the most appropriate target group to elicit information on stock availability at SDP level.

Four key informant interviews with central level personnel (director laboratory services, warehousing personnel at NatPharm, and two developmental partner personnel) were conducted. Of these, participants were chosen to represent the range of key people involved in laboratory commodity management. Key informants were also important as they have the overall responsibility of coordinating all laboratory supply chain activities including forecasting, quantification, procurement and distribution at central level. The Director of LSD provides overall direction and policy on the provision of laboratory services at national level. The warehousing officer at NatPharm provided information on the storage of laboratory consumables, including highlighting which laboratory consumables were out of stock at the time of the study.

The following section presents results of the study:

Of the facility based laboratory scientists interviewed, 33% had a year's experience of managing laboratory consumables, with another 22% having 3 years and the remaining 33% having at least six years of experience. With regards to major tests conducted at the various laboratories, the responses highlighted laboratory testing in hematology, clinical chemistry, and medical microbiology. The following table shows the responses to type of tests conducted at the selected medical laboratories.

Table 2: Major Tests Done at the Selected Facilities

Level	Major Tests Conducted
NMRL	– Reference testing – CD4 Cell count – HIV surveillance – HIV DNA Testing – Early Infant Diagnosis – DNA PCR – Evaluation of tests kits
Central	– Basic Blood banks – ABO – FBC – CD4 profiling – AMC – Serology tests – TB microscopy – LFT
Provincial	– Full Blood Count – CD4 Count – Urine Microscopy +Culture – TB diagnosis-AFB microscopy – HIV testing – CSF microscopy + culture
District	– FBC reagents – Chemistry – CD4 – Sputum tests

Of the respondents interviewed 50% cited laboratory reagents as the critical requirement to enable the above tests to be undertaken. Equipment was also cited as key including human resources to conduct the tests, vehicles for transporting the reagents and lastly availability of funds. When these key requirements are not available, they then form barriers to providing quality services.

The following factors affecting laboratory commodity availability are clustered around four major themes **supply chain** factors (reported challenges in forecasting/quantification, long lead times, inadequate transport, poor stock management, inefficient procurement process), **human resources** challenges (inadequate manpower, lack of training in stock management, low motivation, limited appreciation of laboratory importance by key personnel in management positions), **financial** constraints (limited funding, no prioritization of funds for laboratory consumables) and lastly challenges in **communication and coordination** among key stakeholders.

4.2 SUPPLY CHAIN FACTORS

The continuous availability of laboratory consumables at both the central and the SDP level was found to be heavily influenced by supply chain factors such as forecasting, lead times, transportation and inventory management. These are discussed below:

4.2.1. Reported Stock outs by Respondents

All respondents indicated having experienced stock outs of critical lab reagents and related supplies within the last 6 months prior to the interviews. At central level warehouse, even at the time of the study they were out of stock of Partake Easy CD4 reagent while at medical laboratories, respondents pointed to being out of stock of Bio chemistry reagents, TB reagents and sputum reagents. The frequency of stock outs was reported to range from 2 weeks to 6 months at medical laboratories and central level respectively.

"sometimes we run into stock outs where at the central warehouse we might actually be having nothing…Partake Easy count CD4 reagent that's what we are stocked out of at the moment"

The occurrence of stock outs was perceived to be a major problem as it translated into work stoppages. Although some respondent resorted to borrowing laboratory consumables from the private sectors when encountering a stock out, they reported that such practices have negatively affected their working relationships as they cannot return borrowed consumables due to shortages.

" we have been facing a problem, like the guys from where we have been borrowing they are like saying you guys when are we going to get our kits back, because it is like the amount that we borrowed from them is now huge so they are now worried themselves that you guys when are you going to bring our reagent that you borrowed..so right now they has been a major problem and we are not quite certain when like the Government of Zimbabwe is going to bring in such reagents and with the state that we are in now, I don't know how our relations are going to be"

The above quote shows a lack of faith and uncertainty in the public sector's capacity to provide laboratory consumables at a continuous basis to meet the health needs of the population.

4.2.2. Delays in shipments coming in

The lead time is defined as the time it takes to place an order until it is received and is available for use. Respondents cited delays in shipments coming in or long lead times as a salient factor affecting commodity availability at national level. One respondent cited

the delays being as long as *"six months and onwards"* before a procured/ordered commodity is received.

> *" we have had experiences with HIV DR equipment, ever since I came we ordered them they are still not yet enough, they are still on the way but I am already here almost over a year and we are still waiting for things that are not coming"*

Another respondent has this to say:

> *"may I just tell you that we are just receiving the chemistry reagents after one year of placing the order, it's a long lead time and we haven't actually received the particular hematology reagents that we needed"*

Such long waiting times have made respondents believe the procurement system in place is inefficient in terms of delivering the right consumables at the right time and in the right quantity. The respondents therefore perceive the delays as a key factor resulting in stock outs of laboratory consumables as *"expected time of arrival for some commodities is not met religiously".*

From the respondents' perspective if products take a long time to be delivered, the problem goes beyond stock outs to having expired items on their shelves.

> *"it's like we are supplied with a lot of reagents so you would find that they will just expire at the same time….some delays that take place due to logistical arrangements for them to come in they will take a longer time, by the time they get here they will be left with a shelf life of maybe 6-12 months of which they will be like a bulk of them and we won't use all of them".*

Respondents however failed to provide perceived reasons why they were such delays though one respondent attributed it to a change in management of funds for the Global

Fund where the new managing partner United Nations Development Programme (UNDP) had long procurement cycles. At the time of the study no mechanism had been put in place to address this problem as deduced from responses from the respondents.

4.2.3. Perceived Lack of and Inadequacy of Transport

Almost all respondents cited the lack of and inadequacy of transport to deliver or collect the laboratory consumables from the central warehouse to their sites as a key factor that hampered commodity availability. Surprisingly, even facilities within less than a 20km radius cited lack of transport as a key factor that heavily impinged on supply of laboratory consumables. In cases where facilities had transport it was deemed unfit for the purpose *"our fleet is old and those that are active are overburdened…sometimes the cars have flattened tyres and need servicing or whatever, it's a big story".*

The following excerpts highlight the respondent's views on the magnitude of the transport problem at all levels of the system:

> *"but another issue is transport can you believe it, transport is a hindrance… the national laboratory logistician can have stocks and they will say come collect and we won't have transport to collect the staff".*

There was a general consensus among the respondents' views that transport when available could not be obtained timeously.

> *"really transport is an issue, I want to assure you, it's an issue, a very big one, you won't get it when it's needed, it's unheard of".*

One respondent at central level mentioned the absence of a distribution mechanism to move the consumables from the warehouses to laboratories as being attributed to limited

funding. He further reported that there were instances where he had to utilize his own vehicle without reimbursement due to the gravity of the problem *"I actually had to use my own vehicle without any compensation"*. The lack of transport thereof poses a hindrance in that even though the consumables may be available at central level, medical laboratory facilities might not have dedicated vehicles to collect their orders thus risking potential stock outs. In essence, lack of transport was perceived as a major contributory factor to stock outs.

> *"transportation is also a challenge, for instance if site places an order to say we want one, two or three things, we might have those things here at central level but sometimes the site itself might not be able to pick those things up … so that's one factor despite having commodities, transportation is a challenge".*

One can conclude from the participants' responses that erratic availability of vehicles, ageing fleet, poor maintenance and no scheduled deliveries has affected a consistent availability of laboratory consumables and related supplies at the medical laboratories. It takes long to obtain transport for the collection of these products thus laboratory facilities run the risk of being stocked out of essential consumables.

4.2.4. Stock Management

4.2.4.1. *Lack of stock control system/procedures*

All respondents mentioned the absence of stock control systems at the facilities. Only one facility was found to be using stock cards to manage the laboratory items but the quantities recorded were not a true reflection of the stock they were keeping. In addition, the respondents highlighted an absence of standard stock control mechanism such as

having maximum and minimum stock levels in place for managing laboratory consumables. They felt the absence of the procedures translated into the staff being unaware of the quantities of consumables they were keeping hence could run out of consumables without knowing it. Only when they needed to perform a test do they realize they are stocked out of that particular commodity:

> *"They are no minimums or maximum like just considering bacteriological department where they are concerned about enteric pathogens in that case, at times you would go there is nothing; at times you go maybe there's plenty of it, some we might not be using"*

On the contrary, one respondent even thought stock management was not essential if transport was readily available as they would then just send their vehicle to pick up consumables at the central warehouse if they find themselves stocked out. However, such views only applied when the central level had adequate supplies:

> *"we don't concentrate on that, why we don't concentrate on that is because if we see they are finished even now and when there is transport we just go and get them and bring them and maybe that's why we don't put more emphasis on that"*

4.2.3.2. No set ordering schedule

The majority of Service Delivery Point (SDP) level respondents mentioned that laboratory staff had the primary responsibility for determining what and how much of each laboratory commodity to order. However, all respondents cited an adhoc ordering system as they are used to sending an order anytime if they run out. Most respondents mentioned that they estimate quantities needed based on number of tests that will be

performed in the next month and do not necessarily take into cognizance the remaining stocks balances when determining the order quantity. Based on the response from central level personnel such practices gave rise to unrealistic ordering patterns:

> *"so you find that the orders we get here we definitely have to vet them because some of the quantities that we get are definitely out of this world and it's not a one site problem, all sites they have similar practices"*.

The SDP respondents felt that there was a need to have a standard system in place to facilitate systematic ordering:

> *" ....so that people really know how much stock they have got, how much they have used so that you predict this is our monthly supply so that you order confidently with enough buffer, otherwise you embarrass yourself today you order and tomorrow you call the supplier and say, no, no can you add one more here"*

4.3.3.3. Lack of training in Stock Management

The majority of the respondents perceived they lacked the necessary skills to properly manage the laboratory inventory. Only the national laboratory logistician reported to have undergone training in stock management. The rest of the respondents only had some basic information acquired during the time they had pre-service training and felt that it was not enough to ensure they did their jobs properly. They believed the system expected them to deliver but did not invest in trainings to ensure they are equipped to properly manage the laboratory consumables:

> *"most of us have been asked to manage and you are not equipped, you know, managers are not empowered with the relevant trainings"*.

The responses highlighted the weaknesses of the system in that regard, thus respondents felt a redress of the current system should be imminent if laboratory consumables were to be managed effectively:

> *"our system is not so strong, and ah the service delivery points themselves they are not well trained in stock management, in other words after the crisis that we had in 2007/2008 where we had the scarcity of these commodities people then adopted the issue of hoarding commodities to say if you have these can I have them in bulk so that in case you run out my stocks will be ok".*

Some medical scientist said that the trainings they undergo had no component on stock management. They reiterated the benefits of undergoing such training would translate into continuous service provision.

> *"if people are trained in inventory management, I think that's one factor that sometimes you don't even know what's in the store room so if people are trained…there won't be any work stoppages".*

All in all, the lack of proper stock management know- how negatively impacts on service provision as staff might not know the quantity of stock they are holding and whether there is a need for more until they are stocked out or are in an emergency.

4.2.5. Forecasting commodity needs

The majority of the respondents cited the need for central level to undertake a forecasting exercise that would inform the procurement of future needs. Predicting future needs can facilitate planning to ensure a continuous availability of laboratory consumables at medical laboratories. The importance of a forecasting exercise was deemed to assist in

proper planning and facilitating decision making thus can be inferred from the following response:

"they need to discuss with us how much reagents do you need for the whole year so that they can actually plan for the future"

A possible solution put forward by the respondents would be to undertake a medium to long term forecasting exercise that will predict laboratory commodity requirements for specified periods. This will then inform the funders on what is needed and when so that it aids in planning ahead taking into cognizance the perceived long lead times.

4.3. HUMAN RESOURCES

4.4.1. Inadequate Human resources

All respondents highlighted the issue of inadequate human resources as a factor affecting availability of a consistent supply of consumables. They felt the workload was heavy and was not matched with the personnel available. The staff shortages were so grave that one respondent highlighted the use of a general hand as laboratory stores personnel at the central level. The following quote highlights the magnitude of the problem

" there is some problems like especially in terms of manpower, we are not, there is staff shortage, like we are not having a proper stores manager…the guy doing that, that's not even his job, he is a general hand but is covering that area"

The respondents reiterated the effect of staff shortages as a delay in undertaking some activities or not doing them at all.

"If we look at it, I have to do the clearing, I have to attend the meetings, I have to do the distribution, I have to do this and that, I mean it's quite heavy, it results in some delays in doing one or two things"

Some respondents attributed the staff shortages to the economic hardships that the country was experiencing since 2007 resulting in mass exodus of skilled laboratory personnel:

"As you know very well for the past two years they have been an exodus of human resources for lab personnel in Zimbabwe due to economic hardships and all"

The lack of trained laboratory personnel is a significant constraint to providing basic laboratory services and thus impacts negatively on the availability of laboratory consumables.

4.4.2. Low Motivation

The medical laboratory scientists interviewed cited low motivation as a salient factor affecting availability of laboratory consumables. They reported that their salaries were low and that their counterparts who were funded by developmental partners/ Non Governmental Organizations (NGOs) were receiving better salaries than them while the MOHCW funded laboratory personnel had a heavy workload with little remuneration. Respondents felt not being motivated meant they did not put the required effort into the work they were doing. In as far as ensuring continuous availability of laboratory consumables at their sites, they lacked the drive to effectively manage the consumables. Low motivation was attributed to the following:

"some people are being funded by NGOs but some others are not being funded so it's not motivational, you find at the same time one who is not funded are doing most of the work there when some of these guys most of the times are being sent out for some trainings…so that has been one major problem".

Another responded pointed that, *"the staff are not motivated hence do not take their work seriously"*. Poor remuneration was noted as the key driver for a lowly motivated staff. The respondents firmly believed that this situation could be only remedied through improving salaries of laboratory personnel, *"they have to pay us, we love our country.*

4.4.3. Human Resources involved in the procurement process downplaying importance of laboratory services

A few respondents cited problems with key people involved in the procurement of laboratory consumables who they perceived had limited knowledge on laboratories consumables hence did not prioritize laboratory commodity procurement. As such, they felt this contributed to shortages as supply chain breaks were inevitable when laboratory consumables are not procured timeously and not treated with the importance and urgency they deserved. They described the problem as follows:

"One of the critical areas, like in terms of management like the people who are responsible like for procuring such things do not really appreciate the importance of buying such things. It's one major problem having people at key areas without the knowledge of what the core business is all about"

"like the people who sit on the procurement committee, some of them you find a laboratory scientist might be one but the other people if you tell them that you want this they drag their feet they prioritize some other things like maybe to buy medications instead of buying maybe lab reagents, maybe they might not really understand, really the importance like you cannot use other medication without proper diagnosis having been done".

Those respondents who brought this issue were in favor of having sensitization meetings with the key stakeholders involved in the procurement of laboratory consumables as it was deemed essential to improve their appreciation of the importance of laboratory services.

4.5. FUNDING

4.5.1. Inadequate funding

Almost all respondents were in agreement that availability of funds played a crucial role in ensuring commodity availability. One respondent thought lack of funding was the *"causal agent"* and all other factors were minor contributors to the stock out problems of laboratory consumables. Some believed the government and even the funding from developmental partners was insufficient to procure adequate laboratory consumables that met the needs of the population. The following excerpts on the lack of funding clearly expressed this:

"I think they should have funds, I think they don't have enough funds for their project as well because if you are having stock outs as national level then I think they don't have enough funds"

Another respondent clearly expressed the effect of not having funding as follows:

> *"Right now remember I said we are about to start HIV/DR but then we cannot really fully start because right now we **don't have money** for the Abbot Virus training"*

Suggestions were brought forward to improve the financial situation and ranged from decentralizing the budgeting and financial control for hospitals, laboratory personnel to have the overall responsibility of managing the laboratory commodity budget and advocating for more funds from developmental partners:

> *"finance should not be central especially for a hospital, laboratories should be allocated a certain portion".*

4.6. COMMUNICATION AND COORDINATION

Poor communication and coordination were also viewed as contributory factors to laboratory commodity shortages at both the central and the SDP level. Effective communication and coordination was deemed a crucial factor to facilitate the ordering, communication of discrepancies and general networking of key stakeholders managing laboratory reagents and related supplies. The national logistician did not even know how facilities were faring in the wake of the central level TB reagent stock out suggesting poor communication between the two levels. To emphasize the magnitude of poor communication, one respondent at central level revealed that:

> *"If they get a wrong commodity they don't even report back, if they don't get the commodity again from Nat Pharm they don't report back, they will only tell you*

probably when you meet somewhere else, somewhere different or probably after a month or two or three months afterwards or when they come for next supplies. So we have these problems that are there but they don't come to light on time".

Another responded reinforced the issue of poor communication between central level and SDPs:

" I think they need to discuss with people who use the reagents because sometimes we know our minimum and buffer but then they are unable to provide that. Maybe they need to discuss with us how much reagents do we need for the whole year so that they can actually plan for future…they also need to talk to us, but we know if we don't have the reagents when we should expect them and communicate, I think we need to communicate"

The problem of poor communication and coordination was also noted between central level and the suppliers/funders. The long lead times mentioned earlier were also viewed as being a result of the poor communication and coordination between the suppliers and the central level personnel.

Improved communication was deemed essential between the laboratory logisticians and the suppliers so the challenge can be addressed jointly:

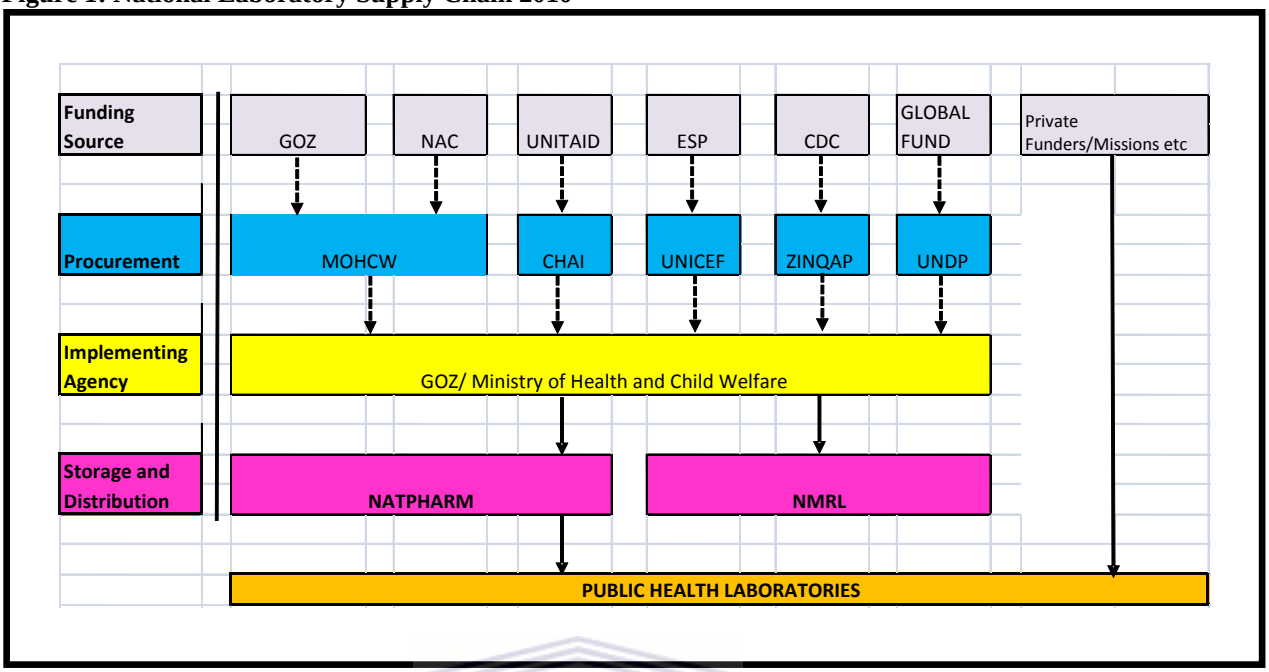
"Maybe if we just talk to them to say, how can we alleviate this problem of being very slow in the provision of whether it is reagents or equipment?"

TABLE 3: SUMMARY OF PERCEIVED FACTORS INFLUENCING AVAILABILITY OF LABORATORY CONSUMABLES IN HARARE, PROVINCE

S/N	Key Factors	Central Level	Service Delivery Points
1	Delays in shipments coming in	✓	x
2	Poor communication and coordination	✓	✓
3	Shortage of human resources	✓	✓
4	Lack of transport	✓	✓
5	Inadequate funding	✓	✓
6	Lack of inventory management procedures	x	✓
7	Skills gap in stock management	x	✓
8	Low motivation	x	✓
9	Poor planning	✓	✓
10	Key personnel downplaying importance of laboratory services	✓	x

The following diagram depicts the national laboratory supply chain at the time of conducting the study.

Figure 1: National Laboratory Supply Chain 2010



The respondents described the process of obtaining laboratory consumables as follows;

> "*What we do is we do some statistics first of all yes, and after doing some statistics we make our related requirements and write to the NMRL logistics officer, then we write our requirements ,then we sent the vehicle, that vehicle will bring our reagents here, if they are available".*

Another respondent has this to say:

> *If we are getting them from the Ministry like the CD4 reagents, we do our own stock take and then we see if we need some reagents then we order direct to them, it doesn't go through the system then they can just give us".*

All in all, laboratory consumables from the MOHCW are funded by multiple funding agencies with varying procurement mechanisms and then received and managed by the LSD.

CHAPTER FIVE

RESULTS: DISCUSSION OF FINDINGS

5.1. DISCUSSION

The study found that availability of key laboratory supplies and related consumables was affected by a number of key factors. These factors were either common or specific to both the central and service delivery point levels. A number of cross-cutting themes were identified which had a critical impact on laboratory commodity shortages being experienced at the two levels. These key themes were categorized as: funding, supply chain, human resources and communication/coordination and are discussed in this chapter.

5.2. SUPPLY CHAIN FACTORS

Supply chain factors refer to those factors that are concerned with the movement of consumables from the manufacturer through to the service delivery points where they are either used to provide a service or they are dispensed to users. With regards to this study, supply chain factors affected the availability of laboratory consumables with regards to the manner they were sourced, stored, transported and managed at all levels of the health system.

5.3.1. Reported stock outs

Stock outs of health consumables are not a result of a single factor but a hoard of multi-faceted factors. Almost all respondents reiterated the occurrence of stock outs of laboratory consumables which had a negative effect on service provision. This is in line with a study undertaken by Tegbaru *et al.* (2003) in Ethiopia where all health institutions

providing laboratory services had reported a shortage of laboratory consumables and related supplies. *"Almost all the health institutions reported shortage of common laboratory supplies and reagents. Common and simple tests were not even done due to severe reagent shortages"*

Shortage of laboratory supplies translate to work stoppages as was the case with the Ethiopian laboratories as stated above. Stockouts of reagents and supplies translate into the inability of a laboratory to perform tests. A study on the laboratory supply chain in Rwanda showed that 39 percent of laboratories surveyed reported stock-outs of HIV test kits, and 42 percent reported stock-outs of reagents over a six month period (Lijdsman *et al.* , 2004). In contrast, a similar study conducted in Ghana showed that stock outs were infrequent at facility level but more common at regional level and this was again attributed to lack of funding (Addo *et al.* , 2006).

5.3.2. Delays in Shipments Coming in

In this study the issue of delays in shipments coming in was reported a number of times as a key factor in not having a consistent supply of laboratory supplies at central level. It was a frequent occurrence to have consumables coming in after 6-12 months of having been procured/ordered from suppliers thus culminating in reported stock outs. This is in contrast to results of a similar study done in South Africa's Mopani district to ascertain factors affecting availability of essential drugs at health facilities where lead times was not reported as a factor affecting commodity availability (Matse, 2006). Given the multiple suppliers involved in providing laboratory items, careful planning and supply chain management is required to ensure that all potential obstacles to supply availability are redressed. In the Rwanda study, respondents attributed stock-outs to the inability of

suppliers and even overseas manufacturers to meet local demand for items (Lijdsman *et al.* , 2004).

5.3.3. Unavailability and Inadequate transport

An effective transport and distribution system is crucial to move the laboratory supplies from the central level to the service delivery points to make them available for use. Wentworth (1981) defined the goal of any physical distribution or transportation system as to provide the items in the right quantity as and when required to meet the needs of the end use. All respondents cited lack of transport and its inadequacy as a major factor compounding the occurrence of stock outs. This problem was perceived to be widespread irregardless of the distance of the facility in relation to the central warehouse. Sites within a 10km radius cited the same problem as sites as far as 100km away from the central warehouse.

A number of studies have also pinpointed to the lack of transport as a key impediment to health commodity availability. According to a study by Matse (2006), unreliable transport was a contributory factor to perennial problems of stock outs of essential drugs. He goes on to conclude that "*Transport is either difficult to plan and manage, or is inadequate to health care delivery. Unavailability of reliable transport systems contributes to drug shortages*". The findings are also similar to the study conducted in Ghana which found out that although facilities had vehicles generally they were not readily available for use by laboratory personnel when they required it (Addo *et al.* , 2006).

5.3.4. Reported Challenges in Stock Management

Proper management of laboratory stock (reagents, consumable supplies, and equipment) is crucial to ensuring provision of quality, uninterrupted laboratory services. The range of equipment, reagents, and supplies used in the laboratory creates many challenges to their management. Proper management of stock involves keeping records; monitoring the usage and ordering quantities that ensure facilities are neither under stocked nor overstocked. All facility respondents admitted to not having had formal trainings on commodity management thus could be deemed a contributory factor at the same time reporting an absence of a stock control system. A stock control system informs laboratory facility staff, when to order or issue, how much to order or issue, and how to maintain an appropriate stock level to avoid shortages and oversupply (USAID, 2007).

The occurrence of stock-outs learns itself as an important indicator of poor stock management.

5.4.1. Lack of Formal Training in Stock Management

All respondents reported a lack of a formal training in managing laboratory consumables. Poorly or insufficiently trained laboratory personnel can be costly to a public health program, because they can contribute to errors in test results, to the need for repeating laboratory tests, to shortened life of laboratory equipment caused by improper use, and to additional time needed for supervising staff. The findings are similar to a study done by Muko (2005), where findings revealed that "*the professionals who are expected to ensure proper purchase, utilization and appropriate usage of those drugs often lack basic knowledge on the management of drug supplies*".

5.3.5. Forecasting commodity needs

Accurately forecasting commodity requirements is critical as it gives an indication of the quantities of laboratory supplies to be used at a future date. Inaccurate forecasting will translate to under or over purchasing/ordering with the former also seen as a contributory factor to stock outs of laboratory consumables and related supplies. Deducing from the interviewees' response forecasting of laboratory consumables was not conducted, was not accurate or they were not consulted when it was conducted resulting in forecasting anomalies. This is similar to findings conducted in Rwanda were forecasting was poorly done and was seen as a contributory factor to the occurrence of stock outs of laboratory consumables (Lijdsman *et al.*, 2004).

5.3. HUMAN RESOURCES

Adequate human resources are fundamental to the provision of laboratory services and likewise for managing laboratory consumables. As put across by Birx, De Souza and Nkengasong (2009), "throughout resource-constraint areas, there are inadequately trained laboratory technologists and technicians". All respondents cited the shortage of laboratory personnel as a major factor contributing to the occurrence of stock out. One individual had multiple responsibilities which meant some tasks were left undone and this applied to the issue of laboratory commodity management.

5.3.1. Inadequate Human Resources

The majority of the respondents cited shortage of trained staff as a factor that negatively affected the management of consumables and provision of laboratory services. Reasons

brought forward resulting in staff shortages were noted as the economic crisis the country was plunged in hence resulting in a brain drain of laboratory personnel to neighbouring countries. In a study done by Polage *et al.* , (2006), 98% of the physicians interviewed did not order laboratory tests as a result of "*being too busy*". Human resources are an integral component of any health system. The human resources factor was also noted in a Rwanda assessment of the laboratory supply chain where "*Laboratories across the health system appeared to be understaffed, particularly at the district level*". However, in Harare, the shortage of human resources cut across all levels (central right through to SDP level).

5.4. INADEQUATE FUNDING

The availability of funding (its lack thereof) was cited by respondents as a salient factor compounding the shortage of laboratory consumables "*they are times that the Government of Zimbabwe say there are no funds and those are the times we will be having some problems".* From a supply chain standpoint, laboratories require financial resources to procure, store and distribute laboratory consumables. At least two respondents highlighted the existence of multiple funding sources at central level for the procurement of laboratory consumables and related supplies though it was evident that financing for laboratory consumables was not sufficient to meet the commodity needs. One respondent attributed the cause to "*lack of funds*" (Lijdsman, 2004). The findings are similar to a study conducted in Ghana (Addo *et al.,* 2006) where results showed that even though they were multiple funding sources at national level for laboratory supplies, the funding remained insufficient hence stock outs were frequent.

5.5. REPORTED CHALLENGES IN COMMUNICATION/COORDINATION

Effective communication ensures the transmission of information essential to facilitate informed decision making. The study results show poor communication between the medical laboratory scientists manning the laboratories and the central level including the national logistician. They also perceived poor communication and coordination between those responsible for procuring at national level and the suppliers.

"*It's really a communication thing, if you have a shortage due to your own poor planning, if you communicate with the national logistician he might run around and get you commodities*".

Overall, as concluded by Bates and Maitland (2006), laboratory services in Africa are highly affected by staff shortages, poor communication, inadequate equipment; low morale and lack of training that impinge on all those involved in delivering health care in poorer African countries.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1. CONCLUSION

The results show that provision of laboratory services in Harare, Zimbabwe is marred by frequent stock outs at both the central level and at medical laboratories. Factors perceived as compounding the problem are multi-faceted thus availability is negatively affected by long lead times, unavailability of vehicles to transport the consumables from the central warehouse to the service delivery points, poor stock management at the medical laboratories exacerbated by lack of training in stock management, inadequate human resources, lack of adequate funding and poor communication and coordination among the various stakeholders.

The results also indicate weaknesses associated with projections of needs and supply planning which exacerbate the problem of stock outs thus resulting in shortages.

Efforts to improve laboratory services should focus on improving availability of laboratory consumables where and when they are required. This can be achieved through ensuring the re-dress of key factors identified such as provision of adequate transport, providing pre and in-service training for laboratory scientists on stock management principles, and interventions aimed at staff retention. Finally, as with any health commodity management system, the logistics management of laboratory consumables cannot be successful without an integrative approach that involves communication and

coordination of all stakeholders and that includes consensus across all stakeholders on common goals and activities.

6.2. RECOMMENDATIONS

Supply Chain

- A review of the current laboratory supply chain is warranted which will culminate in the setting of standard re-order intervals, proper storage guidelines, reporting and ordering protocols, a stock control system and development of a standards operating procedures (SOP) manual which will act as a reference point for all laboratory personnel involved in the management of laboratory consumables.
- The LSD should consider mainstreaming the storage and distribution of laboratory reagents and related consumables into the existing essential medicine distribution systems (NatPharm system) thus ensuring guaranteed delivery of laboratory items from central level to the peripheral facilities.
- It is recommended that the national laboratory logistician should provide in-service training on stock management which will help improve the skills of medical laboratory scientists and technicians to effectively and efficiently manage the consumables.
- Develop a national list of laboratory supplies/ items that can be ordered from the central level and communicate these to all laboratories so they are aware of what to order.

Human Resources

- The MOHCW should consider interventions to strengthen the human resources for laboratory services by continuously training laboratory personnel through providing on the job trainings.
- The MOHCW should supplement the current efforts by development partners to retain laboratory personnel through the provision of incentives and attractive remuneration packages
- The LSD should assign a laboratory technical staff to Nat Pharm to assist in the review of orders from health facilities, to monitor quality of laboratory consumables in storage, and to assist with the management of laboratory supplies.

Funding

- The MOHCW through the LSD should advocate for more funding to support the human resource needs, commodity needs and transportation requirements to ensure quality laboratory service provision
- Laboratory consumables should be allocated a separate budget line and should be closely monitored to ensure proper utilization, addressing reagent shortages timeously.

Communication and Coordination

- Improved communication with the suppliers is recommended to enable the monitoring of the shipment status. Problems can be identified at an early stage and joint problem solving can be initiated to expedite deliveries

- Better coordination among the multiple stakeholders especially those providing funding to enable effective utilization of resources and to avoid duplication of efforts

REFERENCES

Birx, D., De Souza, M. & Nkengasong, J.N. (2009*). Laboratory Challenges in the scaling up of HIV, TB and Malaria Programmes:* The Interaction of Health and Laboratory Systems, Clinical Research and Service Delivery. American Journal of Clinical Pathology, Atlanta. USA *131*, 849-851.

Bowen, G.A. (2005). *Preparing a Qualitative Research-Based Dissertation: Lessons Learned*. The Qualitative Report. Western Carolina University: North Carolina

Burns, N. & Grove, S.K. (2004). *Understanding Nursing Reasearch.* Arlington: Texas

Dacombe, R.J., Squire, S.B., Ramsay, A.R.C, Banda, H.T. & Bates, I. (2006). *Essential Medical Laboratory Services: Their Role in Delivering Equitable Health Care in Malawi.* Malawi Med Journal 18(2): 77-79

Denzin, N.K., & Lincoln, Y.S. (1994). Entering the Field of Qualitative Research. In Denzin, N.K., & Lincoln, Y.S. (Eds.), *Handbook of Qualitative Research* (pp.1-17). Thousand Oaks, CA: Sage

Department of Health and Senior Services (DHSS), (2009). *Public Health and Environmental Laboratories.* State of New Jersey, [Online], Available: http://www.state.nj.us/health/ple/phelorg/shtml [Downloaded 29/06/09 14:21pm]

Central Statistical Office (CSO) [Zimbabwe] and Macro International Inc. (2007). *Zimbabwe Demographic and Health Survey 2005-06.* Calverton, Maryland: CSO and Macro International Inc.

Feagin, J., Orum, A. & Sjoberg, G. (Eds). (1991). A Case for Case Study. Chapel Hill, NC: University of North Carolina Press

Friedman, L.M, Furberg, C.D. & DeMets D.L. (1998). *Fundamentals of Clinical Trials.* Springer-Verlog: New York

Katzenellenbogen, J. M, Joubert, G & Karim, S. S. A. (1997). *Epidemiology. A manual for South Africa.* Cape Town: Oxford University Press.

Kelly, D.A. (2008). *Understanding Hematology Tests.* [Online], Available: http://healtharticles:us/articles/1387/1/ Understanding-Hematology-Tests/Page 1.html [Downloaded 02/07/09 21:00pm]

Lijdsman, C., Onyango, A., Gatera, S,. Saleeb, B., Tarrafeta, and. Gabra, M. (2004). *Assessment of the Health Commodity Supply Sector in Rwanda, September 2003.* VA: Management Sciences for Health: U.S. Agency for International Development.

Mamo, W., Yohannes, T., Mulugeta, A., Seyoum, E., Abate, M., Haje, W., Haile-Selassie, A., Feleke, G. & Tegbaru, B. (2008). *Antiretroviral Therapy Scale Up Through Building Laboratory Capacity in Resource Limited Setting.* PEPFAR Implementer's Meeting. Kampala, Uganda.

Matse, P. (2006). *Factors Associated with Drug Shortage in PHC Facilities in Mopani District of the Limpopo Province.* Johannesburg, South Africa

Ministry of Health and Child Welfare (MOHCW). (2009). *Zimbabwe National HIV Estimates.* Harare, Zimbabwe

Mmbando, D., Lema, K., Muyingo, S., Saba, J. & Reeler, A. (2002). *International Conference on AIDS.* Abstract B10584

Moloto, V. (2006). *Identification, Resolution and Monitoring of Barriers to the availability of essential drugs at Primary Health Care Facilities at Lejweleputswa District, Free State Province*. Johhanesburg, South Africa

Murray, C.L. & Lopez, A.D. (1997). Global Mortality, Disability, and the Contribution of Risk Factors: Global burden of Disease Study. *The Lancet, 349* [Online], Available:

http://www.thelancet.com/journals/lancet/article/PIIS0140673696074958 [Downloaded 29/05/08 12:35pm]

Nii Akwei, A., Adukpo, R., Bekoe, V., Boateng, S., Brown, R., Bruce, E., Diarra, A., Edah, P., Nicodemus, W., & Sroda, F. (2006). *Assessment of the Ghana Laboratory Logistics System and Services*. Arlington, VA.: U.S. Agency for International Development.

Polit, D. & Hungler, B. (1991). *Nursing Research: Principles and Methods.* New York: JB Lippincott

Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2006 Revision and World Urbanization Prospects: The 2007 Revision*, http://esa.un.org/unup, Saturday, July 17, 2010; 10:37:34 AM.

Rabiner, C., Patel, C., Whande, J., Matondo, I., Jain, D., Mtambara, A., Kwenda, B., Chitate, Y., Westerman, L. & Msipa, S. (2009). Zimbabwe: Laboratory Services and Supply Chain Assessment. Harare MOHCW, CDC Zimbabwe.

Rao, R., Mellon, P., Sarley, D. (2006). *Procurement Strategies for Health Commodities: An Examination of Options and Mechanisms within the Commodity Security Context*. Arlington, VA.: U.S. Agency for International Development.

Rice, P.R & Ezzy, D. (1999). Sampling strategies for Qualitative Research. *In Qualitative Research Methods-A Health Focus.* Sydney: Oxford University Press

Ridderhof, J.C., Van Deun, A., Kam, K.M., Narayanan, P.R. & Aziz, M.A. (2007). Roles of Laboratories and laboratory systems in effective Tuberculosis <word missing>. *Bulletin World Health Organization, 85*(5):354-9. [Online], Available: http://gateway.nlm.nih.gov/gw/Cmd?link [Downloaded 28/03/2009 12:15pm]

Rubin, A., & Babbie, E. (2001). *Research Methods for Social Work (4th ed.).* Belmont, CA: Wadsworth/Thomson Learning.

Supply Chain Management Systems (SCMS) (2009), *SCMS Supply Lines*. Virginia, USA [Online], Available: http://scms.pfscm.org/scms/docs/newsletters/February-2009 Supply lines. PDF [Downloaded 30/03/09 15:50pm]

Sjoberg, G., Williams, N., Vaughan, T. & Sjoberg, A (1991). *The Case Study Approach in Social Search.* In Feagin, J., Orum, A. & Sjoberg, G. (Eds.), (1991). A Case for Case Study (pp.27-79). Chapel Hill, NC: University of North Carolina Press

Tegbaru, B., Meless, H., Kassu, A., Tesema,D., Gezahegn, N., Tamene, W., Hailu, E., Birhanu, H. & Messele' T. (2004). *Laboratory services in hospitals and regional laboratories in Ethiopia.* Ethiopia Journal of Health Development, 2004:18 (1)

Thompson, J.H. (1985). *Medical Laboratory Technician-Clinical Chemistry and Urinalysis.* Air Univ., Gunter AFS, Ala. Extension Course Institute.

Tinago, W., Mandozana, G. & Gomo, Z.A.R. (2009). *A Situational Analysis of Laboratory Services in Zimbabwe.* (unpublished)

Touat, A. (1994). *Study of Availability and Price of Drugs in Algeria.* Bethesda, USA

USAID (2006). *Lessons Learnt in Managing Laboratory Supplies.* Arlington, VA: U.S. Agency for International Development.

USAID (2008). *Guidelines for Managing the Laboratory Logistics system: Version 2.* VA: U.S. Agency for International Development.

USAID (2009). *Supply Chain Strengthening as a Pathway to Improving Laboratory Services.* VA: U.S. Agency for International Development.

WHO, (World Health Organization) (2006). *Guidelines on Standard Operating Procedures for Microbiology*. Geneva, Switzerland.

World Bank (2009). *World Development Indicators*. Washington D.C. USA

9. Appendices

Appendix 1: Participant Information Sheet

UNIVERSITY OF THE WESTERN CAPE

School of Public Health

Private Bag X17 ● **BELLVILLE** ● 7535 ● South Africa
Tel: 021- 959 2809 2809, Fax: 021- 959 2872

December 2009

Dear Participant

Thank you for your keenness to learn more about this research. The following is an outline of the research project and your potential participation.

TITLE OF RESEARCH

Developing an understanding of the factors affecting availability of essential laboratory consumables at medical laboratories in Zimbabwe

PURPOSE OF THE STUDY

The purpose of this research is to provide an in-depth understanding of both the intrinsic and extrinsic factors that affect the supply and availability of laboratory consumables at the central main stores and medical laboratories country wide. Your participation will go a long way in ensuring such an understanding. Findings and recommendations from this study will be used to devise appropriate interventions to improve laboratory commodity flow at service delivery points (SDP) in the country.

THE INTERVIEW PROCESS

The study will be conducted in Zimbabwe and will include semi-structured interviews with laboratory personnel at both central and SDP level. It will also include key informant interviews with various stakeholders to allow for a comprehensive view of the underlying factors affecting commodity availability.

VOLUNTARY PARTICIPATION AND WITHDRAWAL

Your participation in this study is entirely voluntary thus you have the right to refuse to participate. If you chose to participate, you are however, free to withdraw your participation at any time during the course of the interviews. In addition, if you feel the issue under discussion is sensitive and thus you are uncomfortable in continuing the discussion, please feel free to say so.

BENEFIT AND COSTS

They are no direct benefits attached to this study. However, the information obtained from the research will go will provide a basis for devising appropriate interventions to improve commodity flow at the central main stores and peripheral medical laboratories in the country.

CONFIDENTIALITY

Your personal information will be treated with the utmost confidentiality and will not be disclosed. Records of your participation will be kept in secure area and will only be destroyed after completion of the study.

INFORMED CONSENT

Prior to commencing the interview, I will require a signed consent form to acknowledge your willingness to participate. The consent form is attached to this information sheet to enable you to review it and make a decision as to whether you can participate in the study.

QUESTIONS

If you have any further questions or require more information pertaining to this study, do not hesitate to contact me on the following details:

Tsitsi Katungire

Student Number: 2823171

Cell phone: + 264 81 330 1269

Email: tmusadaidzwa@yahoo.co.uk

tkatungire@na.pfscm.org

Telephone (w): +264 61 305390

Fax Number: +264 61 305398

I am accountable to Ehi Igumbor, my supervisor at UWC. His contact details are +267 21 959 320 or eigumbor @uwc. ac.za

Appendix 2: Informed Consent Form

Date: ……..

Interviewer: ……..

UWC No: ……..

Tel: …….Fax: …….

E-mail address: ……

Institution: ……

Interviewer's pseudonym: ……...

Place at which the interview was conducted: ……..

Thank you for your willingness to participate in this study and granting me permission to interview you. What follow is the purpose and the process of this interview. You are asked to give your consent both in writing and verbally on tape prior to my conducting the interview.

1. Interviewer Information

My name is Tsitsi Katungire; a student at the University of Western Cape undertaking a Masters Degree in Public Health. One of the requirements to be awarded with this qualification is to conduct a mini-thesis in my area of interest and in this regard, I will be studying factors affecting availability of laboratory consumables at public health laboratories in Harare province, Zimbabwe. I am accountable to Mr Ehimario Igumbor, my supervisor who is contactable at +27 21 959 3520 or c/o SOPH fax: +27 21 959 2872

Here is some information to explain the purpose of my interview.

2. Purpose and contents of the Interview

The purpose of the interview is to gain some insight into the factors affecting availability of laboratory consumables at central main stores and Service Delivery Points. Interview will mainly focus on logistical, financial and human capacity factors among others.

3. The Interview Process

To ensure all information gained in this interview is entirely captured, I will be recording the whole interview. I will be using an interview guide to provide direction on the issues to be discussed. It is my hope that at most this interview will take one and a half hour to complete.

4. Anonymity of contributors

At all times, I will keep the source of the information confidential and refer to your words by a pseudonym or invented name which I would like you to choose. See name above, I shall keep any other records of your participation locked away at all times.

5. Things that may affect your willingness to participate

The interview may touch on issues which might be sensitive, if there is anything that you would prefer not to discuss, please feel free to say so. I will not be offended and there will be no negative consequences if you would prefer not to answer a question. I would appreciate your guidance should I ask anything which you see as intrusive

6. Agreement

6.1 Interviewee's agreement

You will be asked to give your consent below.

6.2 Interviewer's agreement.

I shall keep the contents of the above research interview confidential in the sense that the pseudonym noted above will be used in all documents which refer to this interview. The contents will be used for the purposes referred to above, but may be used for published or unpublished research at a later stage without further consent. Any deviation from this agreement will be renegotiated with you.

Participant's Signature: _____

Date: _____

Place: _____

Interviewer's Signature: _____

Appendix 3: SEMI-STRUCTURED INTERVIEW GUIDE –SDP level

AN EXPLORATORY STUDY ON FACTORS AFFECTING AVAILABILITY OF LABORATORY CONSUMABLES AT STATE OWNED MEDICAL LABORATORIES IN HARARE PROVINCE, ZIMBABWE

Name of Interviewer: _____

Date of Interview: _____

Name of Person being interviewed: _____

Title and Facility Name: _____

Good day. My name is Tsitsi Katungire; I am currently studying at the University of Western Cape undertaking a Masters Degree in Public Health. One of the requirements to be awarded with this qualification is to conduct a mini-thesis in your area of interest and in this regard, I will be studying factors affecting availability of laboratory consumables at public health facilities in Zimbabwe. The overall objective is to be able to identify and describe these factors in-depth thus provide insights in devising appropriate interventions. All the information obtained will remain strictly confidential and your answers will never be identified so please feel free to be candid in your responses. I would like to use the results of this study to provide recommendations on improving the supply of laboratory consumables at the national level. If you have no objection, I would like to start asking you the questions about commodity availability at this facility. ***Begin the interview if permission is granted.***

1. How long have you been working at this facility?
2. Can you describe to me some of the laboratory services/tests that are provided at this facility?
3. In your opinion, what are the most important requirements in providing laboratory services?
4. What do you deem as barriers to providing quality services based on your experience?
5. In your opinion, what items do you consider essential and should always be in full supply at this facility?
6. Who is the principal person responsible for managing laboratory supplies at this facility?
7. What are the major problems related to supply you have experienced in the past years?

_____

_____

_____

.

8. What laboratory supplies have been unavailable during the past year? List up to five, including frequency and duration.

	Commodity Stocked Out	Frequency	Duration
1			
2			
3			
4			

5			

9. Who are the main suppliers of your laboratory consumables?
10. Describe the process that is followed when obtaining laboratory consumables from our supplier?
11. Describe the following procedures:
    a. Commodity selection
    b. Procurement (where applicable)
    c. Storage of consumables
    d. Distribution
    e. Budgeting
    f. Staffing of logistics personnel
12. What do you consider to be the major factors affecting availability of laboratory supplies? *(Need for further probing)*
13. What would you consider to be the least factors but also influencing commodity availability at your sites
14. Any other factors that you think might indirectly affect availability of consumables?
15. Describe your coping mechanisms in the event of a stock out situation?
16. In your opinion, what can be done to redress these identified factors and improve commodity flow?

Any additional comments:

THANK YOU FOR YOUR PARTICIPATION

Appendix 4: LSD Clearance Letter

Telephone: 798537-60

Telegraphic Address
"MEDICUS", Harare
Fax: 729154/793634 (702293) FHP
Telex: MEDICUS 22211ZW

ZIMBABWE

MINISTRY OF HEALTH
AND CHILD WELFARE
P.O. Box CY 1122
Causeway
Harare
Zimbabwe

06 December 2010

Harare Central Hospital
Parirenyatwa Central Hospital
Chitungwiza Central Hospital
BRIDH
NMRL
Bindura Provincial Hospital
Concession District Hospital

Attention: Director of Operations
Principal Medical Laboratory Scientist

RE: TSITSI KATUNGIRE: INTERVIEW ON FACTORS AFFECTING THE AVAILABILITY OF LABORATORY COMMODITIES

This serves to confirm that the above has passed through my office and has been authorised to conduct a supply chain interview in your laboratory. This is in line with improvement of the supplies that you are getting through the National laboratory Logistics Unit (MOHCW).

Your cooperation is greatly appreciated.

Thank you.

D. Mangwanya
Director Laboratory Services

SECRETARY FOR HEALTH & CHILD WELFARE
DIRECTOR LABORATORY SERVICES
2010 -12- 06
P.O. BOX CY 1122, CAUSEWAY
ZIMBABWE