

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
SCHOOL OF INFORMATION STUDIES FOR AFRICA

*AN INFORMATION RETRIEVAL SYSTEM FOR HEALTH CARE SERVICES IN
SOMALIA: A STRATEGY FOR IMPLEMENTATION*

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT
FOR THE DEGREE OF MASTER OF SCIENCE IN INFORMATION SCIENCE

BY
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IN SOMALIA: A STRATEGY FOR IMPLEMENTATION.

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DEDICATION

*To my beloved
daughters Ayan and Hoodo.*

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ABSTRACT

Somalia has been characterized by a complex emergency situation since the end of the 1980s. Shortly before the former president was ousted out of power, with the disintegration of the country in 1991, the government collapsed, and various clans took charge of the different parts of the country. In general, Somalia has no viable information systems in all fields of economic development, and serious security problems have made these difficult, if not impossible. In the absence of centralised government and the present security situation, it was not possible to cover the whole country, therefore, this study was conducted in the Northwest zone of the country.

The North-West Zone of Somalia (Somaliland) has been in reconstruction and development phase since 1993. A local administration was established, and at the time this study was carried out, security problems were less serious than in many of the other parts of Somalia. With the support of international relief agencies the central health authority was re-established and the basic health services were restored. Today, the management, of these services are hampered by the lack of reliable, timely and relevant information. The status of the health of the people in the zone is assessed on the basis of scanty information which has been routinely collected from health facilities and special surveys. Although, there were a lot of improvements in the collection of basic health data, yet it was difficult, if not impossible, to, analyze and calculate reliable indicators from the available data and provide ways of measuring the health needs of the people and the impact of health care services.

The scope of this study was to examine the current health information system with the view to come up with suggestions and recommendations of the possible ways by which the system can be improved for better services.

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LIST OF ABBREVIATIONS

ARI	Acute Respiratory Infection
CDD	Control of Diarrhoea Disease
CHW	Community Health Workers
DBMS	Database Management System
DFD	Data Flow Diagram
EPI	Expanded Programme on Immunization
GDP	Gross Domestic Production
HIS	Health Information System
HP	Health Post
LAN	Local Area Network
MCH	Maternal and Child Health
MOHL	Ministry of Health and Labour
NGO	Non-Governmental Organisation
OPD	Out-Patient Dispensary
ORS	Oral Rehydration Salt
PHC	Primary Health Care
TBA	Traditional Birth Attendant
UNCHS	United Nations Centre for Human Settlements
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation.
UNICEF	United Nations Children's Fund.
WAN	Wide Area Network
WHO	World Health Organisations

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Health care is the set of actions which aim at the improvement of individual and collective health levels. Whether medical care policies and procedures achieve their aims, and to what extent they achieve them, are questions of major importance to clinicians, epidemiologists, general medical scientists, administrators of medical care and health policy makers. These questions are of particular relevance in the education and training of medical personnel and of planners for medical care (Karhausen, 1978:1).

There is a good old proverb "Health is Wealth". Therefore, the prosperity of a nation lies undoubtedly in the well maintained health of the people since they are the primary wealth of a nation. Health as a state of complete physical, mental and social well-being has not only been the common concern of users, but also of the suppliers of health services who may be politicians, administrators, healers, such as, physicians, nurses, midwives, auxiliaries, community workers and traditional practitioners (Dhongade, 1990).

Despite a lot of effort at health care delivery services, the general health status of the teeming majority of the people of Africa and the level of health care throughout the world still remains a source of discontent, in some cases total dismay (UNICEF, 1995). Where security is compromised as a result of war, civil unrest, or natural disasters, the challenges multiply.

In Somalia, several years of drought coupled with extended civil unrest, the collapse of the government, and the destruction of the country's infrastructure created a

situation in which thousands of persons are reported as malnourished and dying. Relief workers were experiencing extreme difficulties in providing aid because of lack of accurate information and insecure conditions. The recent civil unrest, led to the destruction of health infrastructures and other services throughout the country. In the absence of health care infrastructure, including an adequate number of hospitals, clinical laboratories, functioning surveillance systems, and health records, the health status of the population was generally described through epidemiologic studies of random samples of the population. Because of lack of centralized government, the country has broken up into zones each held by heavily armed militia, except the north west zone, which after the fall of former regime of Somalia in 1991, declared itself as independent Republic of Somaliland. The names Somaliland and Northwest zone of Somalia, are interchangeably used in this study and refer to the same area.

The zone's administration and international relief organizations restoring health activities, who are the major sources of the health input in terms of funds, medical equipment and supplies of drugs, addressed the revival of health programs as one of their major areas of priority.

The formal zonal office for health activities was re-opened to operate in a full scale of ministerial body. The agency is the official institution responsible to organize all activities directly related to health services development for the whole zone. The agency, with collaboration of the relief agencies set up a community based health system; a system which allows the full participation of the communities in improving their basic services. In 1990 the health infrastructure was almost non-existent; by 1992 there were only seven Maternal Child Health (MCH) centres. During that year the number was increased to 16 and today there are 40 MCHs, 125 Health posts and 8 hospitals (MOHL, 1996). This high

rate of health facilities expansion created a lot of problems in terms of planning; such as provision of adequate services and supplies.

Timely, accurate, relevant and also adequate information required by users to enable them perform their tasks smoothly or effectively, is through having a reliable information system. To promote the efficiency and the effectiveness of the health care system, the Ministry has instituted basic information system in the areas of health needs and coverage. To date, information is being collected from health units of five regions. Such information is intended to assist the management of both Ministry and donor agencies to have the necessary information on hand before or while designing their programmes. This will help them to have same vision regarding health care service needs, sub-sectoral priorities, and regional equity in programme and project selection.

The health information section under the department of planning of the Ministry of Health and Labour is responsible to run the current information system. It is required to assemble and analyze data concerning:

- the status (and its determinants) of the health of the population in the zone;
- the status of the health care delivery system and the use of that system by the residents;
- the effect of the health care delivery system on the health of the people;
- the number, type, and location of the health resources, including health services, manpower, and facilities;
- the patterns of utilization of the health resources.

To do this, the Ministry of Health and Labour (MOHL) together with the international donor agencies in this sector prepared specialized forms (Appendix I) which solicits data on the health status, morbidity and mortality patterns, malnutrition and health

care services. These forms are distributed and filled at facility level and returned to the central health authority on monthly basis. The departments of the Ministry (PHC and planning) also conduct district level surveys through which health data and information for specific diseases and problems are collected. For the last five years this information was being collected and aggregated at central level manually.

1.2 STATEMENT OF THE PROBLEM

The collected information is not easily accessible because of lack of an efficient retrieval system. Most of these data are either in a form of filled forms or in reports scattered in the offices of those who have carried out the surveys. It is difficult at best, if not impossible, to calculate reliable simple indicators from available data. This has resulted that the state of the health is assessed on the basis of scanty information which has been routinely collected from health facilities and surveys. A failure to provide accurate information, at the right time and in an appropriate form, have reduced the effectiveness of the existing system.

1.3 JUSTIFICATIONS

Information is a vital resource which a manager needs in order to understand the health problems, make plans, strategies and to set objectives to solve the problem, to organize and coordinate the implementation of those plans, to control and monitor the results and to take decisions accordingly. The main problem areas in which health information is needed include identification of major health problems, setting priorities, formulating goals and objectives of health programmes, allocation of resources, selection

of strategies for delivery of services, and evaluation of health programmes and services. If management and planning of health care services is weak, problems occur in the areas of referral and feedback, transport and communication, drug and equipment supply, supervision and training, and health status of the community.

Epidemiological studies conducted in Somalia between September 1991 and early 1993 provided valuable information on the magnitude of mortality and acute malnutrition rates and on the most common causes of death, which were mostly preventable conditions such as measles and diarrhoea. Given the challenges of Somalia, it appears that much was learned through these studies, and action was taken on at least some of the information. However, greater attention to documentation of these studies in a form which easily accessible, could have provided to the policy makers more useful information (Boss et al, 1994).

The role of information technology, particularly the personal computers, as a means of facilitating information handling, is necessary to move straight into effective and appropriate solutions to some of the problems of information storage and retrieval. Information retrieval systems have become almost synonymous with computers (Rowley, 1993: 113). Their design is becoming increasingly dependent on computers and telecommunications. The computers have the advantage of storing large amount of health data, quick update, analysis on specific diseases or health facilities with graphs and trends, queries, automatic reports and location of data onto map.

A preliminary observation made at the Ministry shows that a number of computers were donated to the Ministry by international organizations but the level of utilization has been found to be mainly secretarial or word processing services. In mid of 1996, UNICEF provided one computer, photocopy machine and stationery supplies to the health information section (UNICEF, 1996). However, the activities of the existing health

information system are still carried out manually. Attention was not given to the application of information technology other than word processing at all. Therefore, in order to meet the requirements of the organisation as well as information needs of the users, there is a need for an improved system. Given this understanding, therefore, an information retrieval system must be developed in order to facilitate storage, access and exchange of health information.

1.4 OBJECTIVES

1.4.1 General objective

The general objective of this study is to investigate, analyze and study the existing health information system with a view to come up with a proposal and a set of recommendations for establishing an information retrieval system, which will enhance and strengthen the efficiency and effectiveness of health care services by facilitating access to timely, relevant, accurate and reliable information to the planners, decision makers, administrators and health professionals.

1.4.2 Specific objectives

For the purpose of achieving the general objective of this study, the following specific objectives have also been considered:

1. To assess the existing health information system in order to plan its improvement.
2. To conduct a survey of the existing health information system, and processing mechanism.

3. To investigate the major components of the existing health information system; including data collection, storage, analysis, presentation and dissemination methods.
4. To identify the information needs of the end-users specifically those who are involved in the health care delivery process.
5. To examine the sources of information and the main type of collected data; selected indicators; intervals at which data are collected, collection and transmission methods.
6. To find out the status of current system in terms of qualified manpower, training opportunities and availability of information/computer specialists.
7. To design a prototype of an information retrieval system with various prototype databases and user friendly interface which could improve the effectiveness and efficiency of storage, retrieval and dissemination of the health information.
8. To propose and recommend the strategy that will be employed in order to implement the proposed system for provision of better services.

1.5 SCOPE AND LIMITATIONS

1.5.1 Scope

The concern of this study was to examine the existing health information system in order to come up with an information retrieval system that will facilitate access to health information, which in turn, might improve the provision of health care services. This study will focus on the improvement of the current existing health information system of Ministry of Health and Labour in Northwest zone of Somalia (Somaliland). However, the

results of this study might provide a useful background information for similar studies for any other parts of the country.

1.5.2 Limitations

The North-West Zone of Somalia (Somaliland) has been in a reconstruction and development phase since 1993. A local administration was established, and at the time this study was carried out security problems were less serious than in many of the other parts of Somalia. It was therefore decided that the North-West Zone would serve as the area where this study would be conducted. Hence, the study has been conducted mainly within the central office of the health authority, five sub-regional health offices and eighteen district health offices. The scope of the study also took into consideration the time and financial limitations faced by the researcher. Due to the time limitation a prototype of the proposed system which consist three different prototype database and user interface were developed.

1.6 SIGNIFICANCE OF THE RESEARCH RESULTS

The outcome of this study will be a viable information retrieval system. It is hoped the new system will facilitate the efficiency of the existing manual information system in providing the users to have readily available information at their disposal. In that case, it might be possible for them to implement an effective health care system. The results of this study might also be a good starting point for any other study regarding the development of a comprehensive national health information system for the whole country in the future. Although health is important for everybody, the information generated by the system might be, particularly of potential resource to several groups of users directly

or indirectly involved in the development of health care services. These include the following:

- **Senior health policy makers, managers and planners**

These are considered those individuals in designing, planning and implementing health service programmes. They need statistical information for making decisions.

- **Health professionals**

These users require information for treatment and diagnosis of the diseases. They are interested in case-fatality rates, duration of diseases, and geographical variations of the appearance of diseases.

- **Health facilities and local government institutions**

The information generated by the system will also be distributed to health facilities in order to ensure appropriate feed-back. Concerned institutions in the local governments also need to access the health information in order to raise awareness-commitment.

- **UN agencies, NGOs and Donors**

United Nations agencies like World Health Organisation (WHO) and United Nations Children's Fund (UNICEF) who are providing support to health care services need background information for making situation analysis and for relief and planning purposes.

National and international non governmental organisations also need health information to help them to understand the local health problems. Donor governments or agencies need information in order to monitor ongoing projects and the measure impact of the completed ones.

1.7 METHODOLOGY

1.7.1 Data collection methods

The two main sources of data in social science research come from the inner world of library and the outside world of living people. We may label these two main sources simply, the 'paper' and 'people' (Wilkinson, 1984). No single method may provide all the necessary information; therefore, several methods may have to be used to get a more complete picture (Seetharama, 1990:24). To come up with a reliable and valid research outcome, the general method which has been used to collect the data for this study was a survey method. However, analysis of documentary sources were also applied to supplement the above method. Survey tools were selected to ensure that the most appropriate data for the research are collected. These were:

1.7.1.1 Questionnaires

Questionnaires were found to be most appropriate to employ in data collection for this study. Using this approach it was possible to cover, a large number of people spread over a large territory. They are also more economical in terms of money, time and energy. The method of collecting data by mailing the questionnaire to respondents is most extensively employed in various fields of social science (Kothari, 1990: 124).

Therefore, in order to approach the most possible target groups, to gather quantitative data as well as to secure data of a qualitative nature, questionnaires were distributed to the various selected individuals and organizations involved in health care services.

The questionnaires were designed based on consultation with the methods documented in literature (Appendix 3). However, the content was built in order to meet the objectives of the study and to collect information about:

- Users and their information needs. Particularly the persons involved in health care services; managers/health officers, medical practitioners, and community health workers.
- The problems and limitations of the existing system, and how could it be improved;
- Reactions from the users about the possibility of automating the system in terms of storage and retrieval;
- Sources of health data.

Initially the questionnaires were pretested on four Somali medical internship students at Black Lion Hospital and friends and colleagues in SISA. Modifications were made, updated and final questionnaires were produced and dispatched.

Since the formal postal system is not functioning in Somalia, the 55 questionnaires were sent through UNICEF Somalia zonal office in Hargeisa, and then distributed to the individuals in the health centres. Another 20 questionnaires were hand delivered by the researcher during the vacation of January-February 1997 (Sampling discussed in 1.7.2).

1.7.1.2 Interviews, discussions and inquiries

Given the time limitation, in this study a direct interview has been conducted with the head of the HIS section of the Ministry of health and labour.

The purpose of the interview was to determine the limitation of the existing system, available resources in terms of information technology and skilled personnel. The interview was conducted between January 30, 97 and February 12, 97.

Informal discussions were also made with some of the top management of the international agencies working in this area; namely the Resident Project Officer and the acting health and Nutrition officer of UNICEF, Dr. Erasmus Morah and Mr. Awil Hagi Ali Gure respectively. Dr. Ajab from World Health Organization (WHO) and Signor Paulo of Cooperazione Internazionale Italiana (COOPI). Points of discussion included the existing ways of generating funds and potential financial resources for the computerization of the existing health information system.

Inquiries were also made from the participants of the health information system workshop held in Hargeisa between 4 to 11 July, 1996. The inquiries were mainly about the problems experienced by the data collectors from the health units at district level. The workshop was jointly organised and sponsored by World Health Organisation and United Nations Children's Fund.

1.7.1.3 Observations

In order to eliminate the subjective bias of both the interview and find out what is currently happening, an unstructured observation was used to observe the level of utilization of information technology in the day to day activities and its availability, accessibility in the various departments of the Ministry.

1.6.1.4 Documentary sources

Since the paper sources provide the social or behavioural scientist with a wealth of usable information (Wilkinson, 1984:144), it is often uneconomical to spend time and energy mounting field surveys to collect information readily obtainable from authentic 'paper' sources. Therefore, in order to supplement the questionnaires, analysis of the current documentary formats used to collect health data from health units was also employed.

Time constraints prevented the researcher from making as thorough investigation of the system as he wished, but this will in no way affect the outcome of the study. Again, another approach, which enabled conclusion to be drawn from a sample of past and present results of the current system, was record searching. This involved looking through written records to obtain quantitative information, and to confirm or quantify information already supplied by respondents.

1.7.2 Sampling

Sampling was made in order to increase the representativeness of the individuals involved in every level of health care system. The personnel list of Ministry was used to identify the major individuals involved in the health care services from the central level of the Ministry of Health and Labour up to local level of villages. According to their professional categories, the population was subdivided into three different categories. These were managers, planners and health officers within the departments of the Ministry and regional/district health offices, medical practitioners at facility level, and community health workers delivering health care services in the health centres and mobile teams

In the surveys conducted by mailed questionnaire the non-response is generally very high (Koul, 1993: 120). Therefore, in order to cushion the sample size and cover non-responses, a 21% of the above size, which makes a sample of 75, was added to stabilize the sample.

A stratified random sampling was chosen to be appropriate sampling technique for this research. This was performed by subdividing the population into three different strata according to their profession. As explained above, the population is 149 users out of which 20% are managers, planners and health officers, 32% are medical practitioners, and 48% are community health workers. In order to make our sample more efficient, stratification of the total sample was done in such a way that each type of user is represented in the proportion it has in the population. And then, from these selected strata, the constituent elements were sampled randomly. The following table is summarizing the process.

Table 1.1. Stratification of the sample.

Level	Population	%	Sample
Managers, planners and health officers	30	20%	$0.2 \times 75 = 15$
Medical practitioners	47	32%	$0.32 \times 75 = 24$
Community health workers	72	48%	$0.48 \times 75 = 36$
Total	149	100	75

1.7.3 Data analysis methods

Of the several tools available at the disposal of the researcher in analysis and design of the information systems, structured tools and techniques such as data flow diagrams (DFDs), data dictionary and entity relationship modelling were used to analyze the system as well as specify its design. The prototyping approach was used to develop a preliminary

model of the proposed system. In the survey analysis, the collected data were recorded into the SAS (Statistical Analysis System) computer program. Initially the survey results were entered into the system. There after, it was analyzed. Wordperfect (version 5.1) was used to type the report of the thesis, Coreldraw (version 4.0) and Harvard graphics, to draw the graphic charts. In addition, dBase IV was used to create prototype databases and as well as the design of the user interface.

1.7.4 Data sources

In the process of carrying out this research the following data sources were consulted:

- Medical library of Faculty of Medicine of Addis ababa University;
- The Health Information Section of the Ministry of Health and Labour in northwest zone of Somalia;
- British Council Library in Addis Ababa;
- United Nations Economic commission for Africa library, Addis Ababa;
- United Nations Children's Fund (UNICEF) documentation centre. Hargeisa, Somaliland;
- Other Addis Ababa University libraries;

1.8 ORGANISATION OF THE THESIS

The thesis begins with an introduction chapter on health care services and its importance for the people. It emphasises on the current situation of health status of the people of Somalia, the efforts of health authorities and international organisations to restore the health facilities destroyed during the civil disorder, it also highlights the

Last but not least, chapter seven is about conclusion and recommendations. The conclusion is drawn from study results of the existing system, its weaknesses and constraints; while the recommendations provide the specific actions that should be taken to overcome the limitations of the existing health information system.

CHAPTER TWO

NORTH-WEST ZONE (SOMALILAND): BACKGROUND INFORMATION

2.1 GENERAL BACKGROUND

2.1.1 Introduction

The Somali Republic, born on 1 July 1960, was created out of the merging of British Somaliland and Italian Somalia. Located in north-east Africa (Known as the horn of Africa) with an area of approximately 638,000 square Kilometres. Somalia is situated between Arabian peninsula on one end and the Africa continent on the other (The Europa World Year Book, 1994).

Somalia's population, estimated at around 7.11 million (The Europa World Year Book, 1994) is considered an ethnically and culturally homogenous people with one language (Somali) spoken throughout the country and one religion (Islam) practised by the entire population. The Somali society, however, can be categorized along tribal lines, nomad versus agrarian and coastal people, and divisions between people from the northern part of the country who were subjected to British colonial influence and people of the south that were controlled by Italian colonialism.

For the past 25 years, the politics of Somalia have experienced some difficulties. The political instability in Somalia can be traced back to the 1969 military takeover of the state when Siyad Barre assumed power in a bloodless coup from the elected civilian government and ruled the country for more than 20 years. The civil war which broke out from the Northern part of the country in 1988, was extended to the rest of the country.

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Following the overthrow of Barres' regime on January 1991, the country has broken up into zones each held by heavily armed militia. Only the northwest, the self-proclaimed Somaliland based on the old British protectorate, has anything like recognisable government, with police, courts, even taxes. All the factions are clan based. Each group has objectives: control of a road, port or airstrip, and all (except in Somaliland) retain sense of Somalia as a nation-state (Somalia, 1996).

2.1.2 Historical Context

Somaliland became a protectorate in 1887. Some seventy years later independence was granted on 26 June 1960. Somaliland existed as an independent state for five days until it joined Italian Somalia on 1 July 1960, to form Somalia. However, a three years of civil war (following ten years of guerrilla warfare) ended in 1991.

2.1.3 Geographical location and population

The Northwest Zone (Somaliand) is a group of five regions: Awdal, W. Galbeed, Togdheer, Sanaag and Sool. Geographically, the zone is approximately 176, 000 square KM in extent. The boundaries of the Zone are red sea to north, rest of Somalia to the south and east. Ethiopia to the South-West and West, and Djibouti to the North-West (Nathanail and Samater, 1993).

The overall population of the five regions is about 1,100,000 of which about six percent are concentrated in the two west-central regions of W. Galbeed and Togdheer. Approximately 45 percent of this population are urban, six percent rural and sedentary, and 49 percent nomadic.

2.1.4 Political and administrative framework

The Northwest has a functional administration, which includes a democratically elected president, together with representatives of two houses of law-makers, also elected by delegates of elders from 18 districts comprising the five regions. Among the zone's other instruments of civil governance are a body of ministries and departmental directors who negotiate and sign project agreements with aid agencies, are responsible for implementation activities.

2.1.4.1 Security and stability

Despite that clan conflicts were in some areas, relative safety and stability have prevailed throughout the zone since 1991, when area declared itself as the independent state of 'Somaliland'.

2.1.4.2 Government institutions

The administration's 18 ministries and their departments are rapidly developing system. Previously scattered civil servants (especially health workers and teachers) are being recruited and re-trained under their respective sectors (UNICEF, 1996).

2.1.4.3 UN Agencies and Non-governmental organisations (NGOs)

There are 15 international NGOs and eight United Nations agencies resident in the zone, most of these in Hargeisa and Borama. This is the highest concentration of

international presence in any one zone throughout Somalia. Probably to further encourage this trend, the administration recently offered office premises to a number of UN agencies (UNCHS, UNESCO, WHO). There has also been a significant increase in the number of local NGOs.

2.2 ECONOMIC INFRASTRUCTURE AND OTHER SERVICE SECTOR

Generally, the economic infrastructure of the country was severely damaged by the war. Yet, a national economy still exist and internal trade flourishes. Businessmen, linked by satellite telephones or radios, move food and other goods around, across all political borders. They export camels, sheep and goats, and import guns, medicines and khat, the amphetamine leaf chewed by Somalis (Somalia, 1996). The relative stability of self-proclaimed republic of Somaliland, contributed to improvement in the economy of that territory, with an estimated increase in GDP per head of 20% in 1991-94 (Dolly, 1996).

The Somali shilling is still in use in many other parts of the country, with no government to print more, it retains its value even as the notes blacken and disintegrate. However, in mid to late 1994, the Northwest administration introduced a new Somaliland currency and a central banking system.

2.2.1 Information infrastructure

Atherton defines information infrastructure as " the national capabilities for making knowledge and information accessible, for the transfer of knowledge and information and therefore for putting knowledge to work.. " (UNESCO, 1977:1). The infrastructure has several components: users of information; physical resources (including libraries, archives,

and other information centres or documentation units); and skilled information workers (UNESCO, 1974).

The library and information services in Somalia have not taken into account the information needs of the majority of the population (rural and urban oral society in which linguistic communication is predominantly unwritten). Services, moreover, were confined to the capital city and out of the reach by the people living in the other regions of the country (Abdulla, 1996).

However, the above infrastructure was either damaged or totally destroyed during the civil war. After the war any public building (libraries, schools, government ministries) which were intact were used to accommodate displaced and needy families. For example, the only available public library in Hargeisa, the capital of Somaliland, is now occupied by police force. It is being used as police station dealing security matters rather than information provision.

Somalia information workers could be characterized generally as untrained staff with no significant knowledge of information processing and service promotion (Abdulla, 1996).

There were several attempts to train nationals abroad, but most of these were doomed to failure (UNESCO, 1982:16-17). Failure can be attributed to the "brain drain phenomenon" inspired by the political and economic conditions to see training abroad as an opportunity to leave Somalia (Abdulla, 1996).

2.2.2 Transport and telecommunications

Currently in the zone, for the movement of people and goods by air, three local airlines based in Djibouti fly regularly to multiple locations in the five regions. These are

Daallo Airlines, InterSomal Airlines and Djibouti Airlines (Putavia). Road transport to regions, especially using public means, is possible and relatively safe. With the assistance from the European Union and UNCTAD, the Berbera sea port is prospering steadily, providing more and more services.

In the zone, it is now possible to make international telephone calls from Hargeisa, through direct dialling, which were never possible before the civil war. Two private companies offer business service in this sector. A number of private operators have installed power lines and are currently selling electricity.

2.2.3 Mass media

In the zone, there are two fully functional radio stations, in Hargeisa and Borama, and several newspapers (at least 7) are published daily in Hargeisa and other regional capitals.

2.3 HEALTH CARE SYSTEM

The brief overview of the principle characteristics of Somaliland health care system presented in this section is designed to provide an overview picture to the health care system such as institutions, services and providers, and the organisational arrangements, which are the focus of the health care services. The emphasis is describing the health system as it exists at present. In using the phrase 'health care system' we are conscious of the fact that the services, institutions and organisational arrangements described here are concerned primarily with the treatment and care of those who are ill.

2.3.1 Health care services

The civil war of 1988-1991 in the Northwest zone destroyed total health infrastructure. The health of people in the zone has improved gradually since 1991, owing much to the rapid recovery of the economy. The basic health services are existing at district level. It has been estimated that only 30 percent of the health infrastructure have been rehabilitated. Although they are supported by international agencies both United Nations and NGOs, yet the people accessible to these services are less than 20% of the population of the country (MOHL, 1996). A lack of a functional referral system, poor information system and apathetic attitudes of the beneficiaries contribute to under-utilization of the existing services.

2.3.1.1 Hospital care services

In general, hospitals are institutions that provide inpatient accommodation together with medical, nursing and other services. In the zone, most hospitals cater predominantly for patients whose treatment and care is of relatively short duration. Hospitals also provide accident and emergency and other outpatient services. UNICEF 1991 - 1995 health statistics reported that there were 14 hospitals in the zone but seven are presently functioning. Hospital-based health services are in the process of rehabilitation in Hargeisa, Berbera, Borama and Las Anod.

2.3.1.2 Private health care services

Health services are provided outside hospitals to individuals in a variety of settings by wide range of health practitioners medically qualified persons, in either general or specialist practice or in some cases a combination of both, are responsible for a high proportion of all these services. The private health care services plays an important role in the increase the availability of alternative care to those who can afford and at same time reduce the demand of public health services.

Most doctors in Somaliland work in private practices, that is, they are self-employed. There are several private clinics and pharmacies which are providing health services in major cities. Their total number is not yet known, but in the private health sector of Hargeisa, the Ministry had registered 70 pharmacies, 30 laboratories, and about 65 clinics (MOHL, 1996). Regardless of their impressive numbers, most of these institutions lack suitable equipment to provide the necessary health care services.

2.3.1.3 Public health care services

The phrase public health is used here to describe those activities that are focused on communities and other groups of people rather than on individuals. These services are almost always provided by government and include environmental health measures, health education, health promotion and other disease-prevention activities, including basic health services, safe motherhood, CDD/ARI/Malaria and immunisation programs. Currently, there are 40 Maternal and Child Health centres, and 125 health posts (HP) which complement the overall health infrastructure.

2.3.1.4 Traditional medicine practices

Traditional medicine in Somaliland, which is an heritage of various influence from the Arabic peninsula as well as from the Bantu culture, is transmitted through oral education and by close observation and practice. Female traditional healers often serve as birth attendants. On the other hand, male healers are referred by people and sometime serve as judge. Their power is often embedded with the "Sheikh" position. Their fees are in-kind and depend on the "cured" person gratitude. Traditional healers, therefore, continue to provide the first line and are the only available form of health care in some communities.

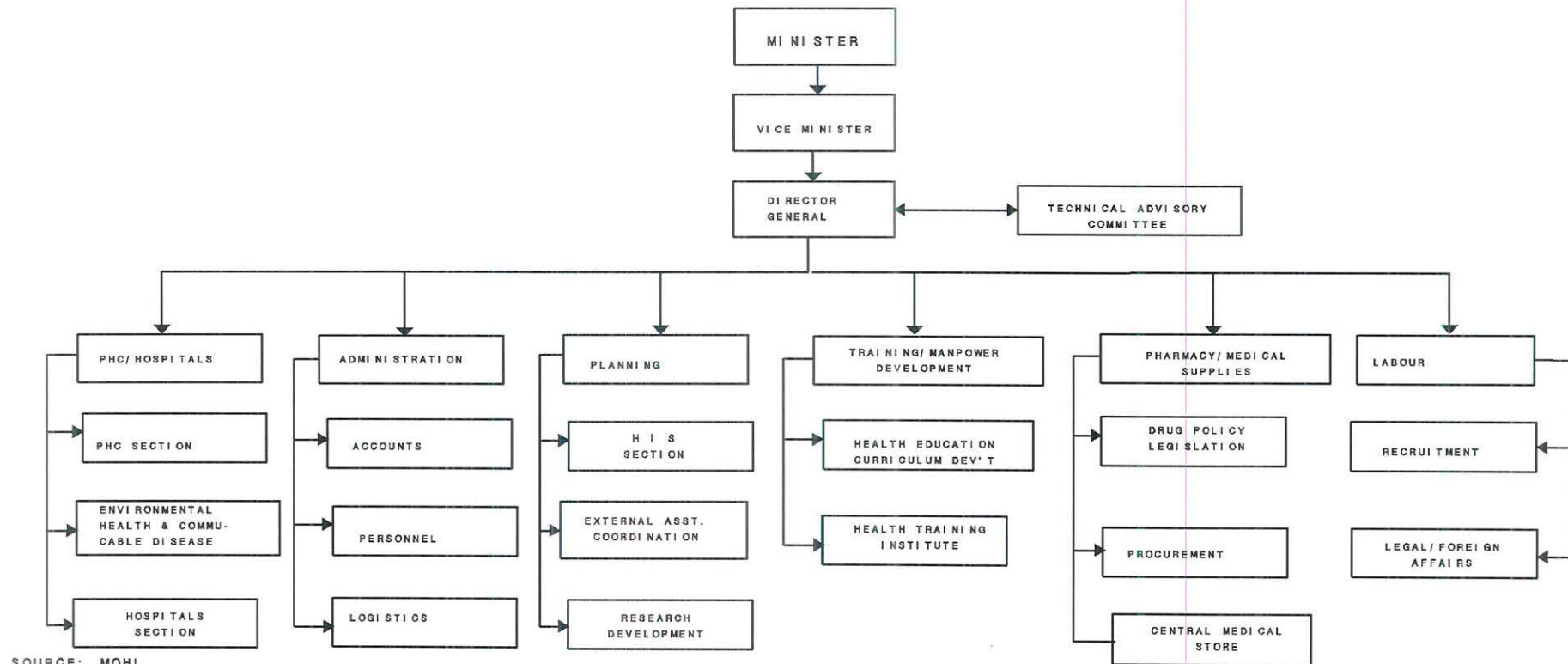
2.3.2 Health institutions

The health care system closely follows the administrative set-up in the zone. Health services are organised in a hierarchy, headed by hospitals at regional and district levels and with the main referral centres found in Hargeisa. Below this level, there is a network of health centres (MCHs) and health posts, which are most peripheral health facilities.

2.3.2.1 Central health authority

The Ministry of Health and Labour (MOHL) is the central health authority responsible for all health care services. In the central administration of the MOHL there are: a Minister who represents the political structure of the government; a Vice Minister; a Director General who acts as the chief coordinator executive body; and six departmental directors which run the specific ministerial assignments. These include the Department of

THE STRUCTURE OF THE MINISTRY OF HEALTH AND LABOUR (MOHL)



SOURCE: MOHL

CHAPTER THREE

HEALTH INFORMATION SYSTEM: AN OVERVIEW

3.1 INTRODUCTION

This chapter provides a general information about health information systems: its definition, goals and use; its role in health care services at national and district level; common problems associated with these systems in terms of data collection and reporting, data analysis and presentation as well as the use of the information generated by these systems; and new challenges for health information. This information was obtained through literature review from various sources as quoted in the text.

Information is defined as ideas, facts, imaginative works of mind and data of value potentially useful in decision making, question answering, problem solving, and which can reduce uncertainty (Kaniki, 1992). Like information another central concept of this chapter is that of a system. A system is a set of elements or components that are formed and interact to accomplish goals or objectives (Stain, 1992: 5). The elements themselves and the relationship between them determine how the system works. Systems have inputs, processing mechanisms and outputs. An information system is a set of interrelated elements or components that collect (input), manipulate and store (processing) and disseminate (output) data and information as well as a feed back mechanism.

3.2 HEALTH INFORMATION SYSTEM

In the practice of medicine the collection of previous experience and information has always been existed. In the 19th century a lot of information from different sources in medical and social fields was systematically brought together to the advantage of

decision making in public health and the treatment of individual patients. But both the expansion of medicine as a science and the increasing complexity of the organisation of health care delivery have resulted in the task of mastering the increasing flow of information by carefully selecting and integrating the relevant facts. The need for improved information systems in recent years has been made for critical by the steady growth in size and complexity of organisation of data (Hartgerink, 1978: 50).

The concept of health information system incorporates a continuous flow of specified information and the possibility of integrated presentation of facts from different sources. There may be epidemiological reasons for setting up a health information system as well as a general medical purpose related to a disease and treatment of patients (Hargerink 1978, 49). However, the primary purpose, together with a medical purpose, may well be the need for operational information about health care delivery.

3.2.1 Definition

For the purpose of this study an attempt by the World Health Organisation (WHO) to define a health information system (HIS) seems adequate: "HIS is the combination of vital and health statistics from multiple sources, used to derive information about the health needs, health resources, costs, use of health services, and outcome of use by the population of a specified area" (WHO, 1984).

3.2.2 Goals

One of the goals for a health information system is to provide the medical practitioners the type of information that would help them take the best possible decision

about any single patient under their care. The other goal lies in the fact that effective functioning of health administration, of planning and of control demands readily available information and that this information is indispensable for adequate policy making. The purpose behind HIS is to provide management with information on which to base decisions on change, in order to meet the goals of health system. The main purpose of the HIS is to help monitor the health system's progress towards health care services (Zwarensten and Barron, 1992).

3.2.3 Sources and categories of health information

The sources which can provide an input into a health information system are manifold. From the epidemiological point of view, birth and death certificates, medical records of sickness episodes, notification of diseases and spacial disease registers, laboratory reports and outbreak investigations can all be considered as possible sources of health information which can be transferred to a health information system (Scott; Kursch, 1988). But also routine data reported by the health facilities and field personnel and from special surveys such as public health programmes can provide data for a more integrated health information system. One under-utilized source of secondary health information is material reported in publications of central or regional government departments by research agencies and by sector such as education and agriculture that are closely related to health.

There are two main categories of information gathered on health care: one is the facts directly related to condition of the individual patient and the other comprises data from the organisation of health care delivery. The facts directly related to the individual

patient together with his identifying characteristics are usually called the medical record (Donaldson, 1993:1).

3.2.4 Use of Health Information System

There are three main domains where health information systems have been successfully developed: epidemiology, management and planning (WHO, 1994). Accurate recording of sickness episodes and storage of such records is of value for future treatment of the individual patients: in this way a health information system is of use to the individual doctor.

To provide support for management and planning activities is often the goal when a health information system is established. The idea is that a mixture of information from the organisation of the services and from medical reports on patients can provide a better understanding of real needs, usage and efficiency of the health provision.

The use of health information systems varies at different levels of the organisations of the health services. All information is of course generated at the level of actual health care delivery, but some of it is only meaningful at certain levels of administration, control and planning.

3.3 THE ROLE OF HEALTH INFORMATION SYSTEMS IN THE HEALTH CARE SERVICES

An information system plays a critical role in a health care system in achieving equity, effectiveness, and efficiency (Hussein et al, 1993). It helps to:

- ◆ Identify who is to be served, what are their needs, and where they are;

- ◆ identify problems in implementation;
- ◆ monitor progress;
- ◆ show whether the programme is having any effect, including impact; on health status; and
- ◆ show the cost of providing the services.

3.3.1 National health information systems

A national health information system is important for health policy making and planning, especially with regard to the allocation of health resources at country level, the monitoring of health services and programmes, and evaluation of their impact in improving health status of the people (Taylor, 1992). The national information system needs to provide information on the nation's demographic situation, on its health and disease profile, and on the distribution, costs and utilization of the health services and programmes, showing trends over time.

National health information system is also needed for the planning of special health programmes and for the monitoring and evaluation of primary health care. It is also needed on the contribution that intersectoral action can make to the improvement of health, although this is a commonly neglected area of concern (de Kadt, 1989).

The role and scope of national health information systems vary enormously from country to country and there is little agreement on the form they should take. Almost every country has its unique requirements for health information and its own national system for collecting and distributing the information. In addition, national information support to district health systems is a largely undeveloped area of activity (WHO, 1994). There is controversy concerning the value of the health information that "data-led" national

information systems provide, particularly regarding its availability and usefulness for decision-making processes at local levels (Sandiford, 1992).

3.3.2 District health information systems

District health systems are concerned mainly with day-to-day implementation and management of health services and they may play a smaller role in the choice of health priorities or the evaluation of progress towards health for all. Although it is widely agreed that more relevant and timely operational information is necessary to implement the primary health care strategy at district level, there remains a wide-ranging debate on what information is required and how it should be collected, utilized and controlled (WHO, 1994). It is commonly emphasized that more "action-led" management information is needed at both national and district levels (Sandiford, 1992).

3.4 COMMON PROBLEMS IN HEALTH INFORMATION SYSTEMS

According to World Health Organisation (1994) problems that are commonly seen in routine health information systems are listed below:

3.4.1 Data collection and reporting

- Health service staff are required to do excessive data recording and reporting.
- Many of data recorded and reported by health service staff are not needed for the tasks the staff perform.

- Data routinely reported by health service staff are frequently considered of dubious validity and not reliable.
- There is inconsistent recording of diseases because case definitions are not clear and procedures are not standardized.
- Many countries continue to tolerate incomplete registration and certification of deaths.

3.4.2 Data analysis, presentation and communication

- When information is needed for planning and monitoring purposes, considerable efforts are needed to extract the precise information required.
- Health information systems do not provide reliable information about people who have no access to health services or about those who use the private sector.
- There is a growing tendency for aid agencies to ask for information geared specifically to their own purposes, which can place an extra burden on the job of data analysis.
- Increasing use of general and special-purpose surveys to capture data that should be part of routine reporting serves to lessen reliance on routine data.
- Despite considerable investment in computers and data processing, little use is being made of informatics to analyze data in routine service reports.
- Little attention is given to improving the presentation and dissemination of the information once it has been processed.

3.4.3 Using health information

- Data may accumulate at higher levels of the system, particularly at the central (ministry or national headquarters) level, but little is analyzed and fed back to districts.
- Little attempt is made to present the information in the form of comparisons that are readily understood at district and sub-district levels.
- Insufficient effort is made to formulate new indicators for use specially at district level.
- Considerable staff time is spent at the different levels of the health system handling data and reports yet few apparent improvements are seen in services and programmes.
- There is frequently poor dissemination and use of the information among community groups and the general public.
- At district level there is insufficient training and development of skills in data analysis, presentation and use.
- Efforts to strengthen national health information system have often produced little improvement and have sometimes made the problem worse.

3.5 NEW CHALLENGES FOR HEALTH INFORMATION

Many information specialists and managers tend to see district health profiles, indicators and reports as the final products of the information system. However, for the health system as a whole these are only intermediate steps that are meaningless if they are not communicated to and used by decision-makers (WHO, 1994). If information systems

do not contribute to health improvements, it is hard to justify their expense. Information should be the basis for improving the administration of health resource, as quickly and effectively as possible, in the pursuit of national and district health priorities (WHO, 1994).

In the context of new public health action, it is increasingly important to develop capacity to collect, analyze and present information related to equity, quality and efficiency of health services. This information is needed to assess these factors accurately and thus help policy-makers, health managers and politicians to define the priority elements of new public health action. This information is also needed to monitor the impact of measures to influence these factors (WHO, 1994).

3.6 THE ROLE OF COMPUTERS IN HEALTH INFORMATION SYSTEMS

Computers and associated technologies are spreading rapidly in almost all countries and are commonly seen as an essential component in the development of information systems, particularly those supported by external aid agencies. There is a considerable amount of practical experience of the advantages of using computers in information and management in both developed and developing countries (de Kadt, 1989). The handling and processing of large volumes of data collected by routine health information system are made manageable, as is the transfer of both raw and analyzed data between national and district levels. Improving this transfer is often given high priority by central epidemiology and statistics units. Although they may speed up data processing and transfer, this alone does not overcome defects in the original system (WHO, 1994). The decision to use more computerization provides an excellent opportunity to review and overhaul the whole information system.

Experience has shown, however, that the use of microcomputers also has disadvantages and that expectations have probably been too high. Besides the initial capital costs, which are frequently paid by international donor agencies, recurrent and replacement costs are high and problems may arise concerning choice, standardization and maintenance of the equipment. Adapting software packages to the local situation requires effort and time. Staff need training and, once they are trained, it may be hard to retain them in the health sector as they are in great demand by other organizations. All this means that the necessary time, financial resources and sustained effort are largely underestimated, which can result in some disillusionment in central government department (WHO, 1994).

3.7 SUMMARY OF THE LITERATURE REVIEW

An attempt was made in this chapter to define the health information system, what it is supposed to do and who uses it for what purpose. The role of information systems in the health care services, at national level as well as district level. Common problems associated with the health information systems adapted in many countries have also been discussed. It has been also observed that computers have an advantageous role in improving the HIS systems. But, they can also be a hindrance if their application is not carefully analyzed and designed to determine the requirement of the system in advance. Bearing in mind that, it will be wise to start analysing the existing system in order to define its requirements to enable us to design an improved system.

CHAPTER FOUR

ANALYSIS OF THE EXISTING HEALTH INFORMATION SYSTEM (HIS)

4.1 INTRODUCTION

The development of National Health Information System (HIS) began in 1991. During that year a joint committee of MOHL, NGOs and UN agencies developed surveillance forms to be used in Hospitals, MCHs and other health facilities. Unfortunately these have not been fully utilized by all the health staff of the five regions. Only two regions (Awdal and W/galbeed) were providing regular reports. The recording forms were distributed for use and comments but revision did not take place until 1993. From that time the information system has been modified to meet the changing needs of the programme.

On the basis of the above situation, a detailed analysis of the existing system was carried out in this study. The analysis was taken in form of gathering and documenting information about the requirement of the system as well as well the users. The overall emphasis was to uncover some of the inherent problems and limitations of the existing system and to determine the extent to which the system is achieving organisational goals and objectives. Therefore, the analysis discussed in this chapter was carried out to:

- ◆ conduct an information needs and sources assessment at the central and regional levels for the health information system including health and disease data, programs/services, and facilities.
- ◆ collect facts primarily concerned with the current system and how it operates, which includes: details of inputs to and outputs from the system; how information

is stored; volumes and frequencies of data; and specific problems experienced by users.

In addition to the above, the analysis also aimed to collect and analyze data about the information needs of prospective users, as well as developing the requirements for an improved information system.

4.2 PRESENTATION AND ANALYSIS OF THE SURVEY RESULTS

This section specifically provides the survey results, their interpretation and analysis. The main objective of the survey was to identify health information needs and sources as well as strengths and weaknesses of the existing system.

The methods for data collection which have been applied in this study were discussed in chapter one. However, the survey was based on a range of fact-finding methods. A questionnaire was distributed to the prospective respondents. The questionnaire was used to identify the frequency of use of the system, information needs and sources, perceived weaknesses of and suggestions on ways to improve the system. Given the time, financial and logistics problems, it was not possible to cover the entire population. Out of the 75 questionnaires which were distributed, 51 (68%) were received, of which 43 of them were usable copies. In order to make the analysis easy and precise, the questionnaire results were arranged in a tabular and graphic formats.

Table 4.1. Frequency of use of the system by the users

Use of the system	Frequency
Very often	2
Irregularly	4
Rarely	17
Not at all	20
Total	43

When only users who are currently using the system were distributed according to their professional category, the results were as follows:

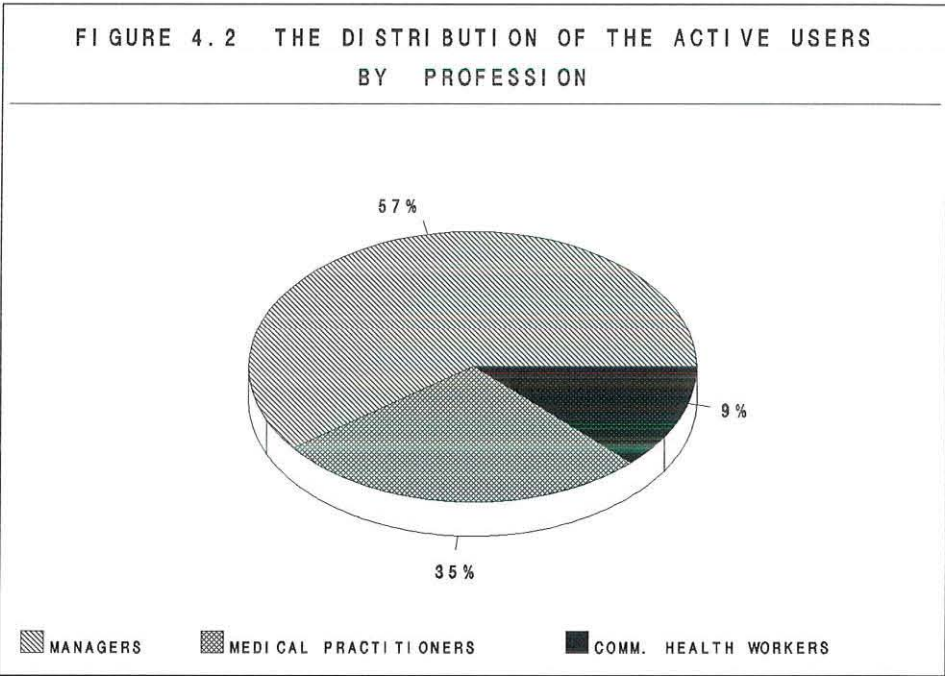


Table 4.2 The distribution of the active users of the system by profession

Category	Total
Managers and regional health officers.	13
Medical practitioners.	8
Community Health Workers.	2
Total	23

As Figure 4.2 shows, 57% of the current users are managers and regional/district health officers. 35% are medical practitioners.

When asked to rate how they are satisfied by the services offered by the system, 52% of those who are currently using the system said that they are not satisfied with the services at all as shown in figure 4.3.

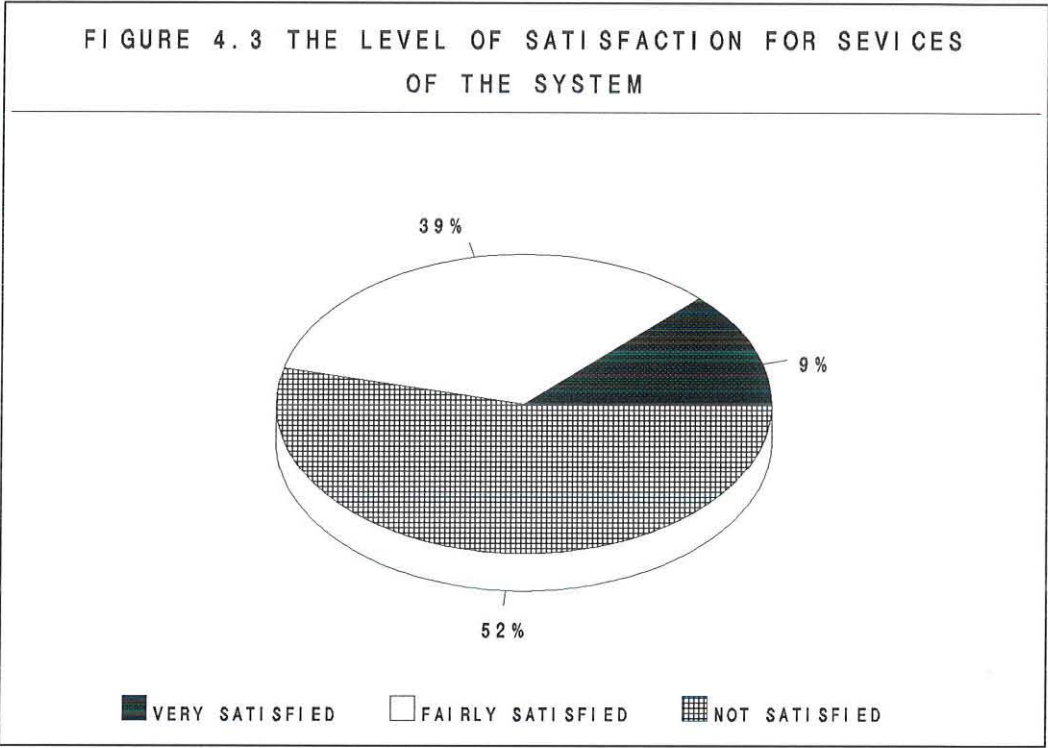


Table 4.3 The level of satisfaction for services of the system

Ratings	Frequency
Very satisfied	2
Fairly satisfied	9
Not satisfied at all	12
Total	23

When users were also asked to state reasons of the dissatisfaction, if there is any, their responses were grouped as follows.

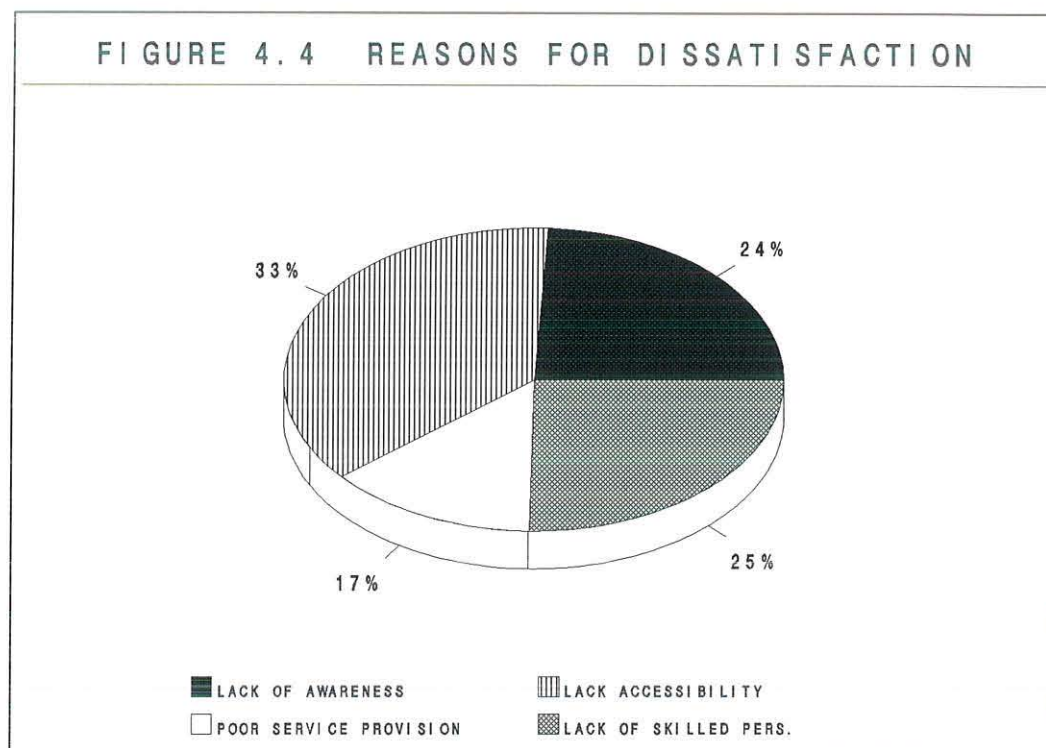


Table 4.4 Reasons for dissatisfaction

Services of the system	Responses
Lack of awareness of the services	18
Lack of accessibility	25
Poor service provision	13
Lack of skilled staff in the section	19
Total responses	75

(Note: Some of the respondents indicated more than one reason, hence making the total responses more than 43)

As shown in figure 4.4, 33% of the responses were that they cannot easily access the information they need from the system. Another 24% claimed that they do not know what is already available in the system. Another reason which 25% of the responses indicated is that there are no skilled personnel who can handle the provision of the services.

When the users were asked to suggest in their opinion ways by which the existing information system could be improved, their responses were organised as follows.

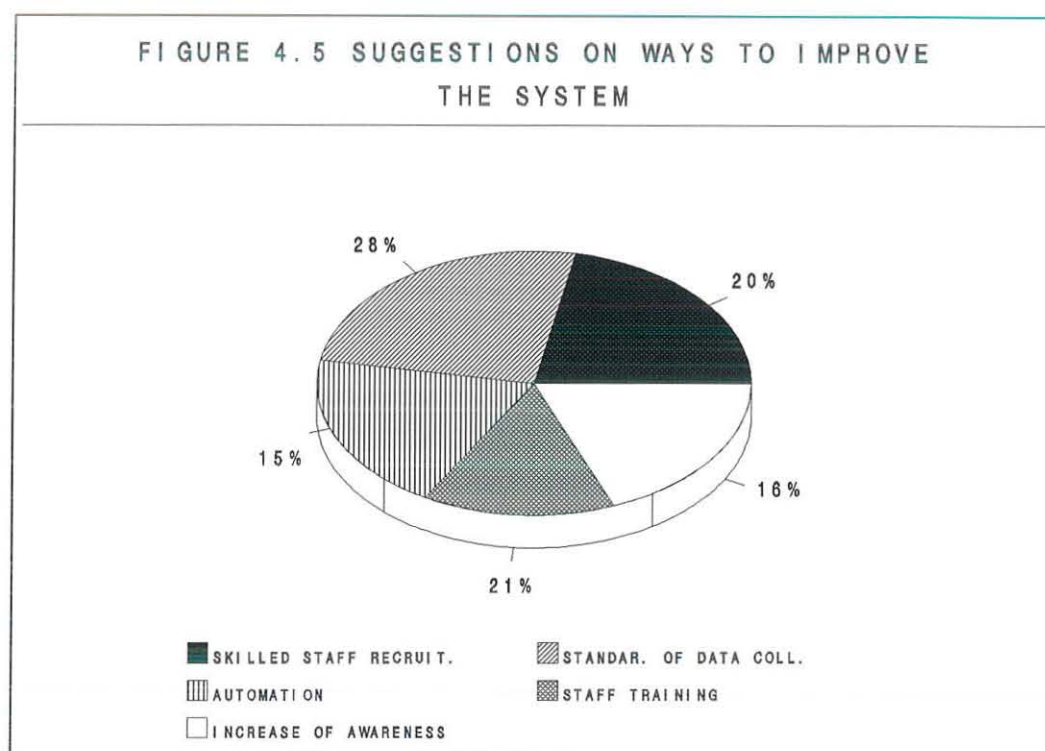


Table 4.5 User's views of the improvement of the existing system

Suggestions	Responses
Automation of the system.	13
Standardization of data collection methods.	25
Recruitment of skilled staff at HIS section.	18
Training of data collectors from health units/services/surveys.	19
Increase awareness	14
Total responses	89

(Note: Some of the respondents suggested more than one option, hence making the total of responses more than 43)

As shown in the figure 4.5, 15% of the responses claimed that use of the information technology might improve the services rendered by the system; the reason might be the users to some extent understand the potential of IT and its implications in relation to the problem. Another 28% said standardization of data collection methods is also needed. And finally 20%, 16% and 21% suggested respectively that recruitment of

additional skilled staff at Health Information System (HIS) section, increase of awareness and training of data collectors at lower level for basic skills in information gathering.

4.2.2 Information requirement determination

The concept of information needs has been a difficult task (Ehikhamenor and Apalayine, 1996). According to Kaniki (1992) the words 'information' and 'needs' which make up the concept of information needs are themselves difficult terms to define and understand. To him both words are rather abstract and intangible terms. For pragmatic operational definitions of this study an attempt by him to define both terms seems adequate: "information is defined as ideas, facts, imaginative works of mind and data of value potentially useful in decision making, question and answering, problem solving, etc, and which can reduce uncertainty". The need is defined "as a state of lack of desirable commodity (i.e.information) necessary to deal with a situation as an individual sees fit" (Kaniki, 1992).

In order to determine the information requirement for the provision of health care services, detailed analysis of information needs of the individuals involved in providing these services and the possible sources of this information was carried out. Following are the findings of the analysis:-

4.2.2.1 Information needs

In the questionnaire the respondents were asked to indicate as many as possible their areas of information needs from a given multiple choice list. The responses have been grouped according to predefined professional categories of the respondents. Each

respondents had chosen more than one type of information. The responses of the managers and regional/district health officers are shown in table No. 4.6.

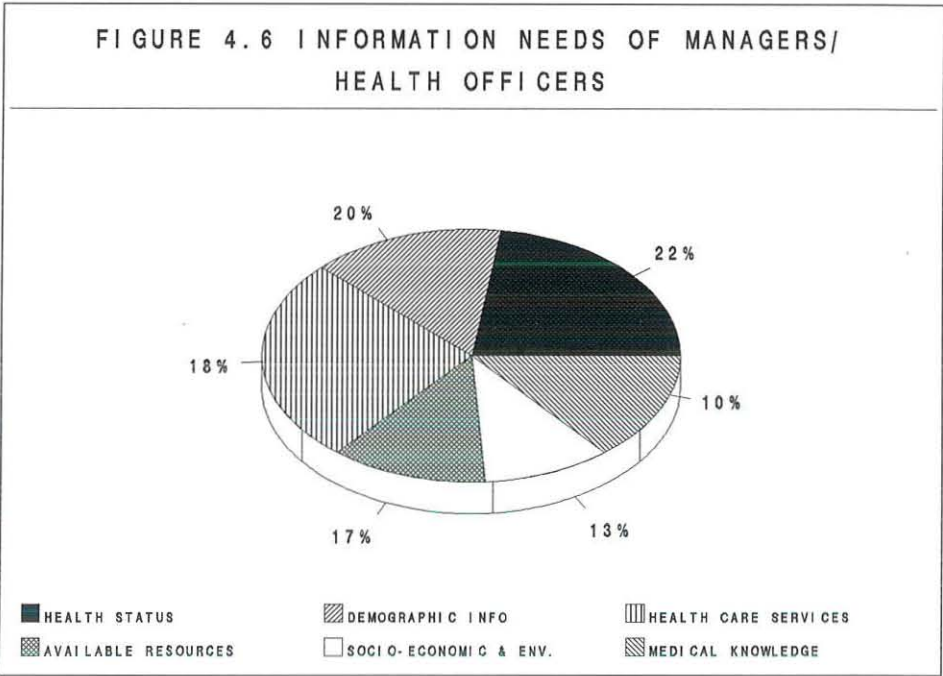


Table 4.6 Information needs of managers/health officers

Information needs	Responses (n=13)
Health status (morbidity, mortality and epidemic diseases)	13
Demographic information (population size, vital statistics, migration patterns, returnees and growth rate).	12
Health care services (access, utilization and coverage)	11
Available resources (capacity and distribution)	10
Socio-economic and environment (water and sanitation)	8
Medical knowledge	6
Total responses	60

(Note: Some of the respondents in this group had chosen more than one item from the list, hence making the total responses more than 13)

As shown in table 4.6, the managers and health officers indicated that they need information about health status of the people, demographic information, health care services, and available resources.

The medical practitioners when asked to indicate their area of information needs from a given list, their responses are tabulated as shown in table 4.7.

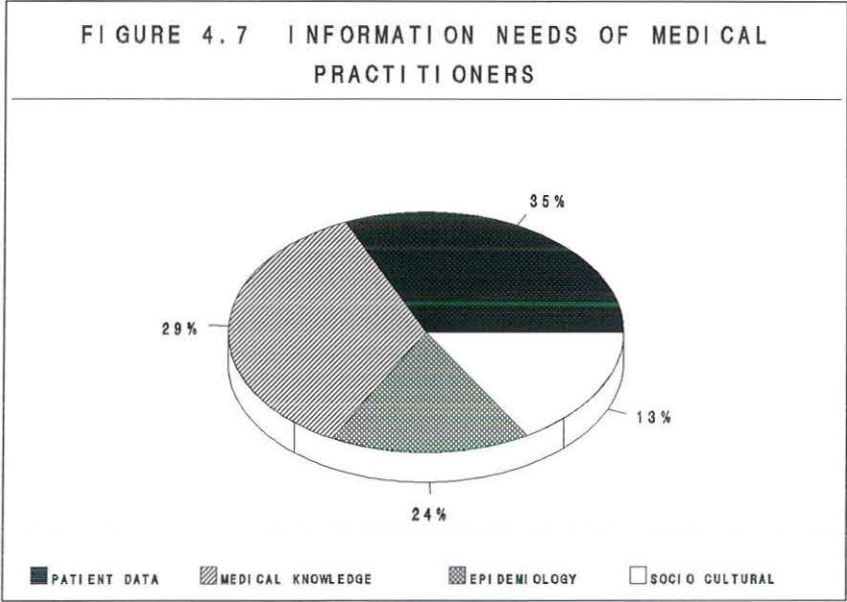


Table 4.7 Information needs of medical practitioners

Information needs	Responses (n = 22)
Patient data	22
Medical knowledge	18
Population statistics	15
Socio cultural	8
Total responses	41

(Note: Some of the respondents had chosen more than one item from the list, hence making the total responses more than 13)

As seen in figure 4.7, all the respondents of this group require information about patients, medical knowledge. In addition, 15 of the respondents of this group also prefer epidemiological information.

The community health workers, when they were asked to indicate their area of information needs, they responded as presented in table 4.8. Most of the them responded

that they need information about maternal and child health services and medical knowledge.

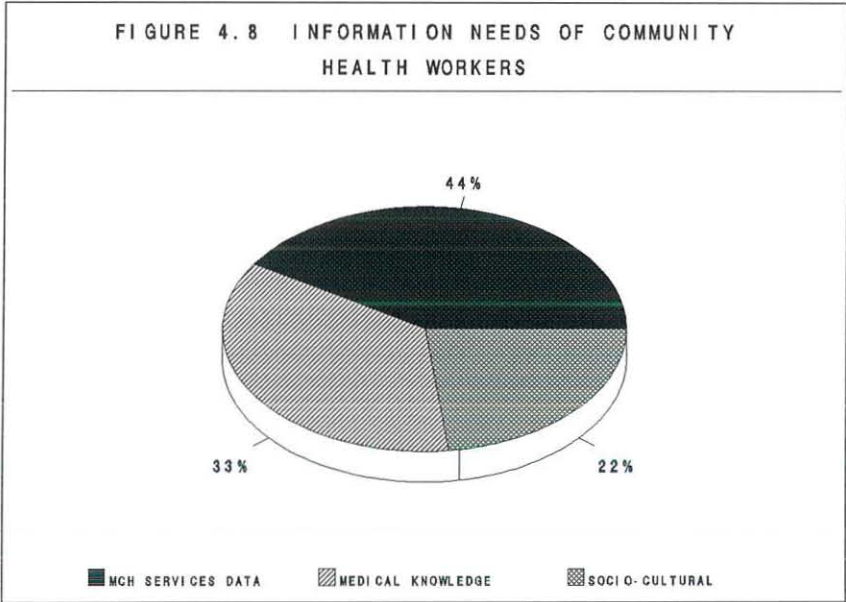


Table 4.8 Information needs of community health workers

Information needs	Responses(n =8)
Maternal and child health care data	8
Medical knowledge	6
Socio-cultural	4
Total responses	18

(Note: Some of the respondents had chosen more than one item from the list, hence making the total responses more than 8)

4.2.2.2 Information sources

When the managers and other health officers were also asked to indicate where they normally get the information required to support their work they indicated as follows.

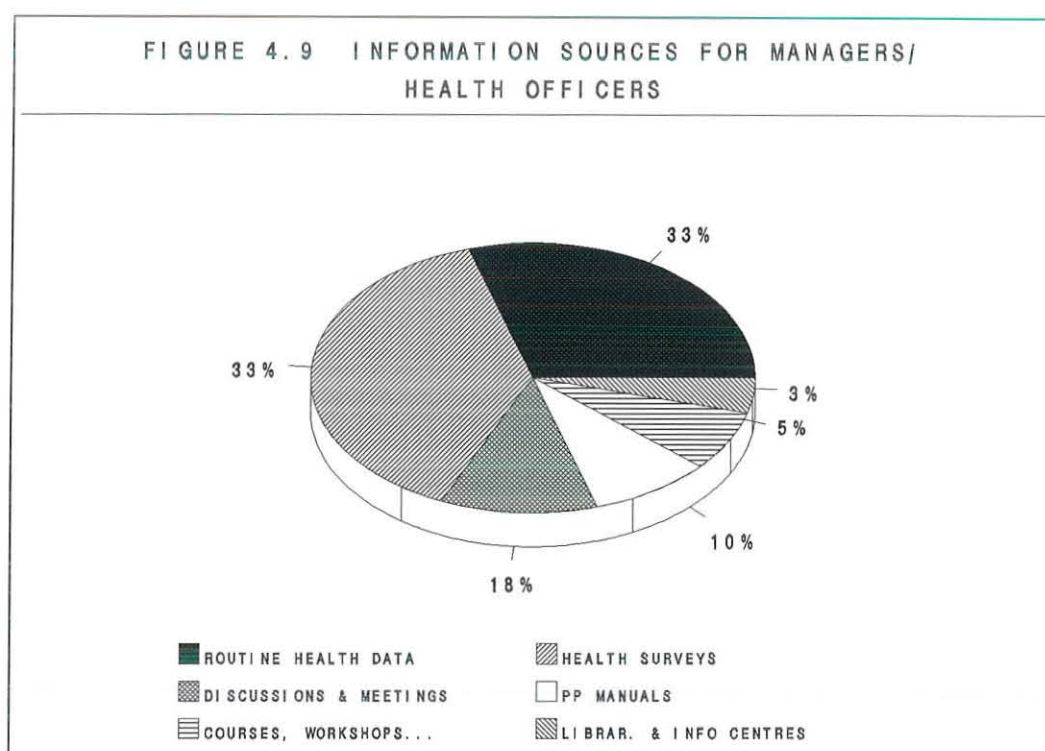


Table 4.9 Information sources of managers/health officers

Information sources	Responses(n = 13)
Routine data from health facilities	13
Results of health surveys	13
Discussions and meetings with health personnel, and consultants.	7
Policy and procedure manuals	4
Courses, seminars and workshops	2
Libraries and information centres	1
Total responses	27

(Note: Some of the respondents had indicated more than one source from the list, hence making the total responses more than 13)

Table 4.9 shows that all of the users of this category receive the health information from health units, health surveys, while 7 out of 13 obtain through discussion and meetings with health personnel, and consultants. In addition 4 of 13 respondents also said they consult policy and procedure manuals, while only 1 out of 13 use libraries and information centres.

For the medical practitioners when they were asked to indicate where they normally get the information from a given list, their responses are tabulated as follows.

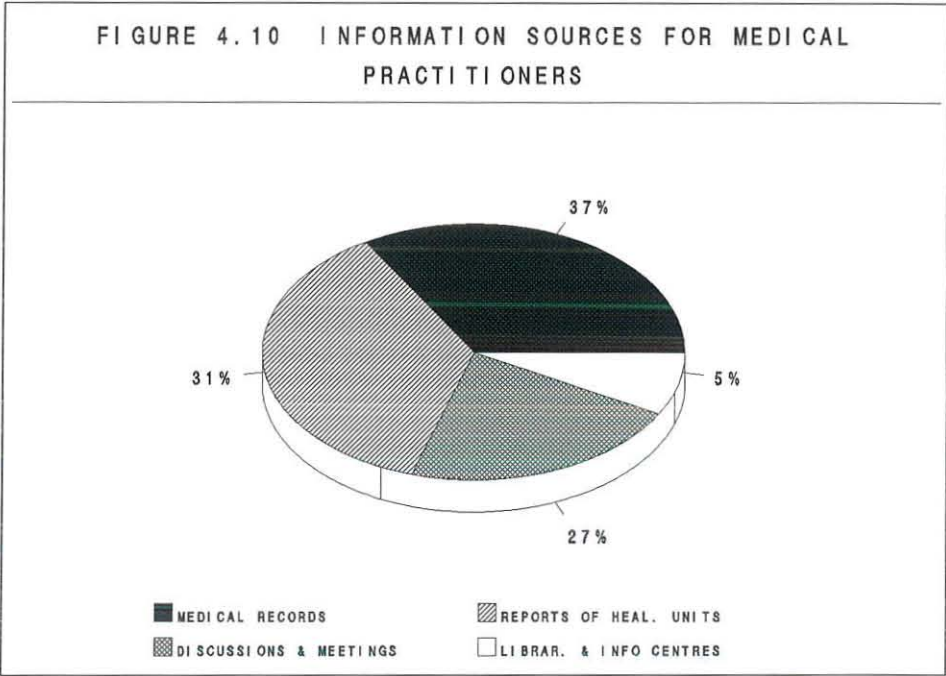


Table 4.10 Information sources for medical practitioners

Information sources	Responses(n = 22)
Patient medical records	22
Reports from health units	18
Discussion with colleagues	16
Libraries and information centres	3
Total responses	37

(Note: Some of the respondents had indicated more than one source from the list, hence making the total of responses more than 22)

As seen in table 4.10 the main sources of information for medical practitioners are the medical records of the patients, reports from health units and discussion with their colleagues. 3 out of 22 said they use information centres of other Ministries and international organisations.

When community health workers were asked to indicate from a given list the sources of information they use in order to carry out their duties, their responses were as follows.

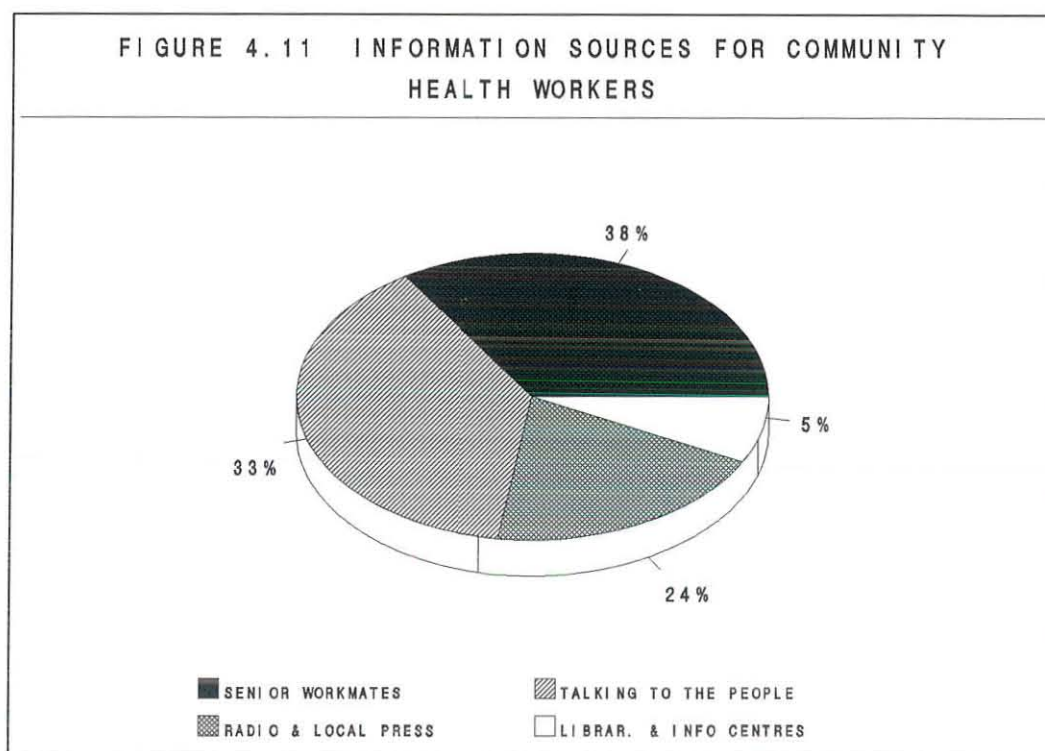


Table 4.11 Information sources of community health workers

Information sources	Responses
Senior workmates and colleagues	8
talking to the people	7
mass media (Radio, Local papers)	5
Library/information centre	1
Total responses	21

(Note: Some of the respondents had indicated more than one item from the list, hence making the total of responses more than 8)

All of them, as seen in table 4.11, responded that they get the information from workmates and colleagues in the field. 7 out 8 indicated talking to the people as source of

their information, while 5 out of 8 reported mass media (radios and local papers). Only 1 out of 8 use information centres.

4.2.3 The available resources

The health information section is within the department of planning and comes under the director of planning. Although UNICEF rehabilitated an office in the Ministry of health for the section, still the room is poorly furnished. As a result of the interview with the head of the section, and also confirmed with observation, the available resources in the section are as follows:

4.2.3.1 Information technology

For the computers and their accessories, the available resources in the health information section is only one microcomputer AST 486, recently provided by UNICEF, An Epson LQ 1050 line printer and one photocopy machine. However, the software which is in use in all departments of the Ministry are MS-DOS operating system, Wordperfect 5.1, dBase IV, and Qpro.

Information technology especially computers are lacking in various health units meant to provide data to the existing system. These include hospitals, MCHs and health posts. However, although Hargeisa Central Hospital has acquired computer equipments as a donation from a Japanese NGO, they have not yet been installed, due to lack of personnel to make the installation.

4.2.3.2 Information manpower resources

The national officer responsible for the health information section has the title of health information officer. He is the only one available in the section, there are no other support staff. He had secondary education and 8 month pharmacy course for assistant pharmacist. He is computer literate e.g. Wordperfect, dBase, Lotus 123, and Qpro. However, he lacks the skills that can enable him to handle the information management services. He needs training on public health as well as designing and management of information systems with technical expertise in the development of computer applications.

4.2.4 Interpretation

From the above analysis, it can be seen that most of the users do not use or they rarely use the existing manual system, and the reasons stated by the users were that there was lack of awareness of what is available in the system from the side of the users, inaccessibility of information, poor service provision and lack of skilled manpower. They also described that they do not know how far the collected data from the health facilities are accurate. For example PHC officers indicated that when they wanted to have a statistical report for specific disease, they were always asked to come back for it several times, and if they obtained it there are lot of miscalculations in aggregated data. There is no standard and easy format for producing the final report. One of the reasons described by the health officers working in facilities situated outside of Hargeisa, where the central office of the Ministry is located, were that there is no reliable communication between the health units and the central Ministry. Most of these problems were cross-checked with the interview conducted with head of the information section himself. Also, as in Table 4.2,

the study also observed that the use of the existing system mainly was limited to the decision makers, managers, health officers and medical practitioners. The reason is that the community health workers are mainly working in the remote and rural areas. Because of the existing infrastructure, the current system is only limited to provide information services for the individuals in the Ministry and in the urban facilities. The study also revealed that the majority of the users are in favour for the improvement of the system, in terms of storage and retrieval.

Information requirement usually varies with the organisational level of health services. The higher level usually require less detail than the levels at which health care is delivered.

In determining the information needs of the users and the sources of the health information, it was seen that the managers and health officers at central, regional and district level require information about health status of the population, health care services, availability of resources in terms of financial and human. The reason is that the planning of health care services is concerned with resolving the dilemma of scarcity of resources. Planners of the programmes, for instance, require enough information for planning. They need to know the health needs of the population, the available facilities and resources to meet those needs. Whether necessary interventions are feasible and sustainable; culturally, politically, administratively, and technically is prior requirement before those programmes are implemented.

For the information requirement, in the case of medical practitioners, it was observed that this group requires information about health status of the patients, population statistics, socio cultural and medical knowledge. The medical practitioners normally need this information in order to keep up to date their knowledge of controlling diseases as well as treating patients.

The community health workers responsible for delivering health care services at local levels, all of them said they need information about maternal and child health care services, medical knowledge, and socio-cultural situations. As it has been established in some other studies, the information seeking pattern of this group is influenced by their low level of academic and professional qualification (Ehikhamenor; Apalayine, 1996). Most of community health workers are secondary and diploma level. Besides, they also had language problem in filling the questionnaire which means that language barrier is also influencing their information seeking pattern.

The main information sources used for the managers and health officers are from the reports of health units, policy and procedure manuals, discussions and meeting with health personnel and consultants, and also the results of the health surveys. For the medical practitioners their information sources were mostly medical records from patients, reports of health units, and discussion with colleagues. The information about the patients data, the usual sources for obtaining this information are from the patients, from his or her family and friends and the medical records.

Community health workers used to obtain information from various sources. One of these is the mass media specifically the use of radio and local newspapers. This has been used with some effect in delivering information to community. The information of the maternal and child health care services is also provided through the use of posters. This was used successfully in the campaign against certain diseases like Cholera. The community health workers were also acquiring information from senior work mates and discussions with people and sometime courses, seminars and workshops they attend.

The community health workers presently collect the information which is used at all levels. They always need a feedback from central system in order to promote the

collection of data. However, as presented in table 4.2, they are not the major users of the existing system.

All the three groups, namely managers and regional/district health officers, medical practitioners and community health workers, indicated that they do not consult the libraries and information services, and the reason for their low ratings is most probably due to the lack of availability of the libraries and information services in this part of the country. Priority has not yet been given to the rehabilitation and reconstruction of the library system in the country by the authorities, since the civil disorder of 1991.

Having identified the information requirement of the users, and the main sources of this information, the next step is to look in detail whether the existing system is capable of meeting these requirements.

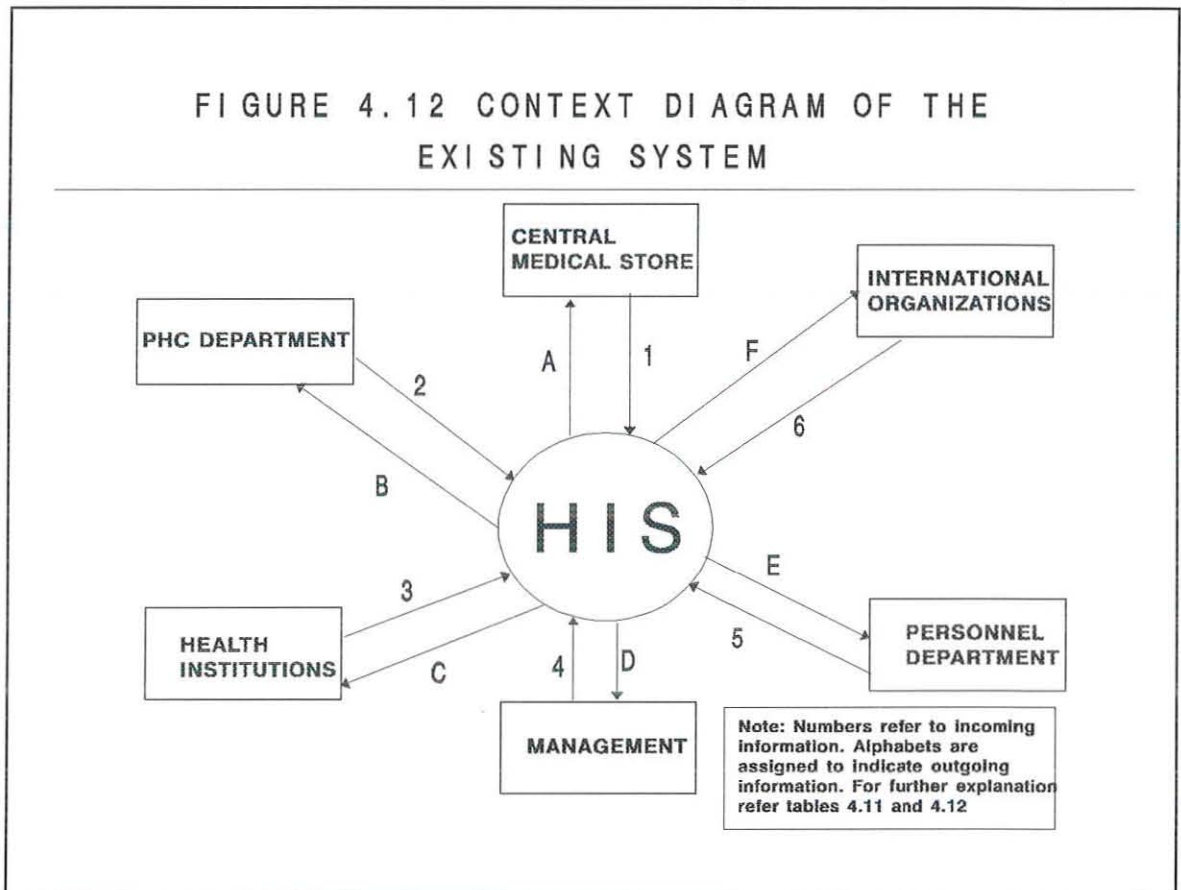
4.3 THE EXISTING HEALTH INFORMATION SYSTEM

The current health information system at the Ministry of Health and Labour (MOHL) covers the whole spectrum of data relating to all health facilities and processes in the Northwest zone.

The unit was set up in 1993, although reporting process from health units, started as early as 1991, with the objectives of providing for the collection and feed-back of morbidity and mortality data, and maintaining disease surveillance. The basis of reporting system are monthly returns at all levels of the health services. In order to look into the components of the existing system, structured tools and techniques such as data flow diagrams (DFDs) were used to document the existing system in terms of inputs to and outputs from the system; how the information is collected, stored, retrieved and processed; the flow of information between sources and destinations.

4.3.1 Overview of the present system

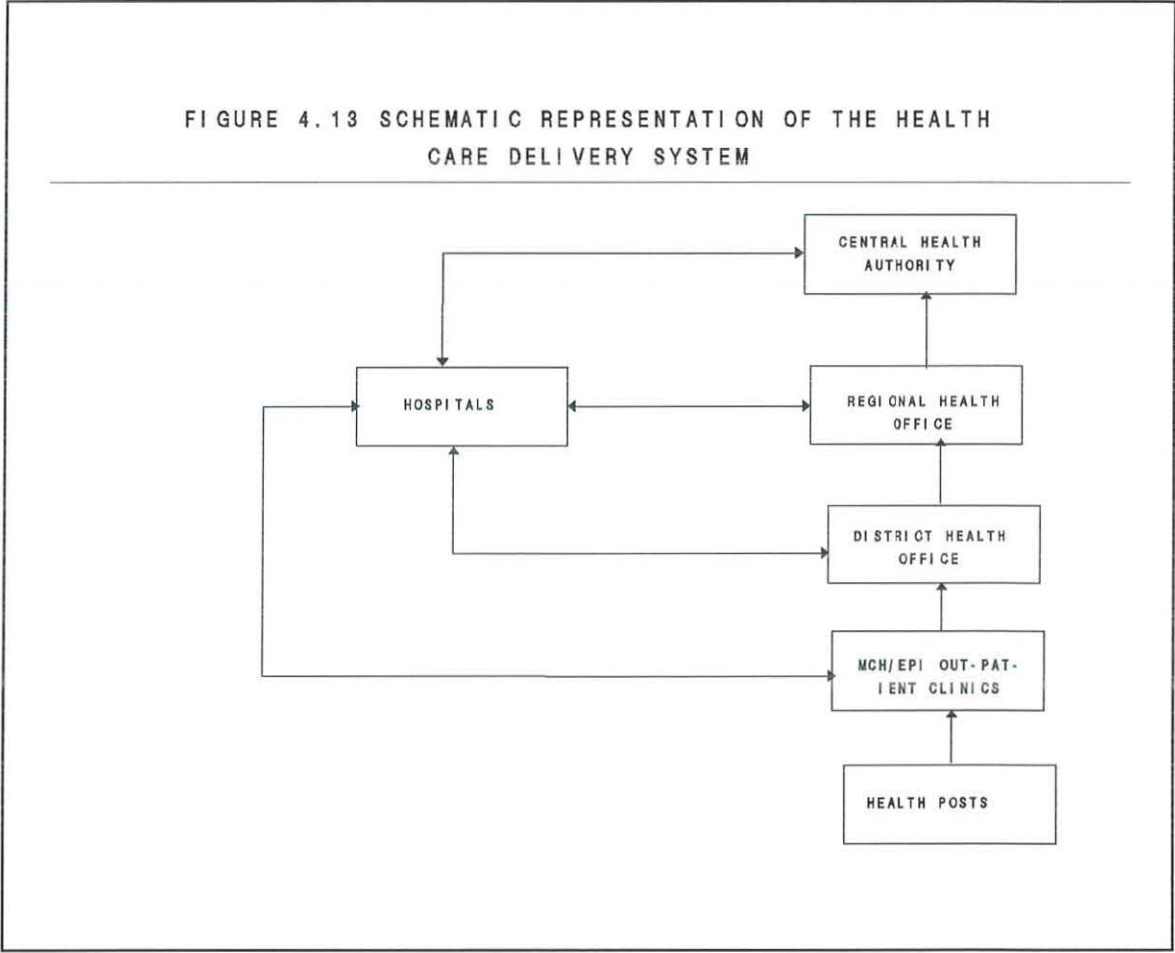
The context diagram of the health information system (shown in figure 4.12) shows the boundaries of the system under study. The context diagram consists of a single process symbol (drawn as a circle) that represents the entire health information system, and it shows the data to and from the external entities. The figure shows, the entities (drawn as



rectangular boxes) which represent the sources of data that enter the system and recipients of data that leave the system. These include the management, health and health related institutions, central medical store, PHC and personnel departments of the Ministry and international organisations. Some of these entities provide health data while others provide health related data. In figure 4.12, because of the space limitation, the inputs and outputs from the system were labelled with alphabetical letters and numbers. the corresponding meanings of these letters and number are shown in tables 4.12 and 4.13.

4.3.1.1 Current information flow

Currently, the health data flow is only one way from the peripheral to the central level. No analysis is done on the collected data at any level of the health services. There is no feedback and practically no meaningful supervisory services. However, the reporting system is in line with level of the health care delivery system and it is schematically represented in the following figure.



As shown in Figure 4.13, the health posts are lowest level of health care delivery system. They are managed by community health workers (CHW) and traditional birth attendants (TBA). Maternal and child health centres (MCHs) are district level health facilities, they are managed community nurse worker and they provide maternal and child health services such as assisting deliveries, immunization programmes and nutritional assessment of the children. The reporting forms designed by the Ministry are sent to the above mentioned health facilities such as hospitals, Maternal and Child Health Centres

(MCHs) and health posts. These forms are used to summarise the daily recorded health data in the registers. The forms are filled by nurses working in the health facilities. They are sent to the central office on monthly basis. However, it is difficult for the health facilities at local level to access the original data they have sent to the central office (if it became necessary). The reason is that there is no reliable communication between the central system and the local facilities. In the overview diagram earlier shown (Figure 4.13) the major inputs, outputs and the sources and recipients (destinations) are illustrated in the Tables 4.12 & 4.13 below:

Table No. 4.12 Information flow to the system

SN ¹	Data going to the system	Source of the data
1.	Amount of essential drugs received, dispatched and balance in the stock.	Central medical store.
2.	Results of special surveys for specific diseases. Results of outbreak investigations.	Department of Primary Health Care.
3.	Monthly data from health posts on specified diseases, deaths of any cause by age and sex, live births and still births. Monthly data from MCHs on specified diseases for under 5 year age group, antenatal and postnatal visits, EPI, live births, still births and low birth weight and nutritional status of under five years age group. Hospital reports contain admissions, discharges, deaths, emergency and elective surgery, live births, stillbirths, low birth weight, vaccinations of newborns. Injuries/ deaths caused by land mines.	Health institutions
4.	Instructions on data to be collected, the collection methods and formats, indicators to be selected, intervals which data are to be collected.	Management.
5.	Number of human resources available, their qualifications and specialization areas.	Department Personnel.
6.	Details of assisted projects. Supplies of essential drugs. Training programmes, workshops, seminars.	International relief organisations

¹. Serial Number correspondent to the numbers in the context diagram

Table No. 4.13 Information flow from the system

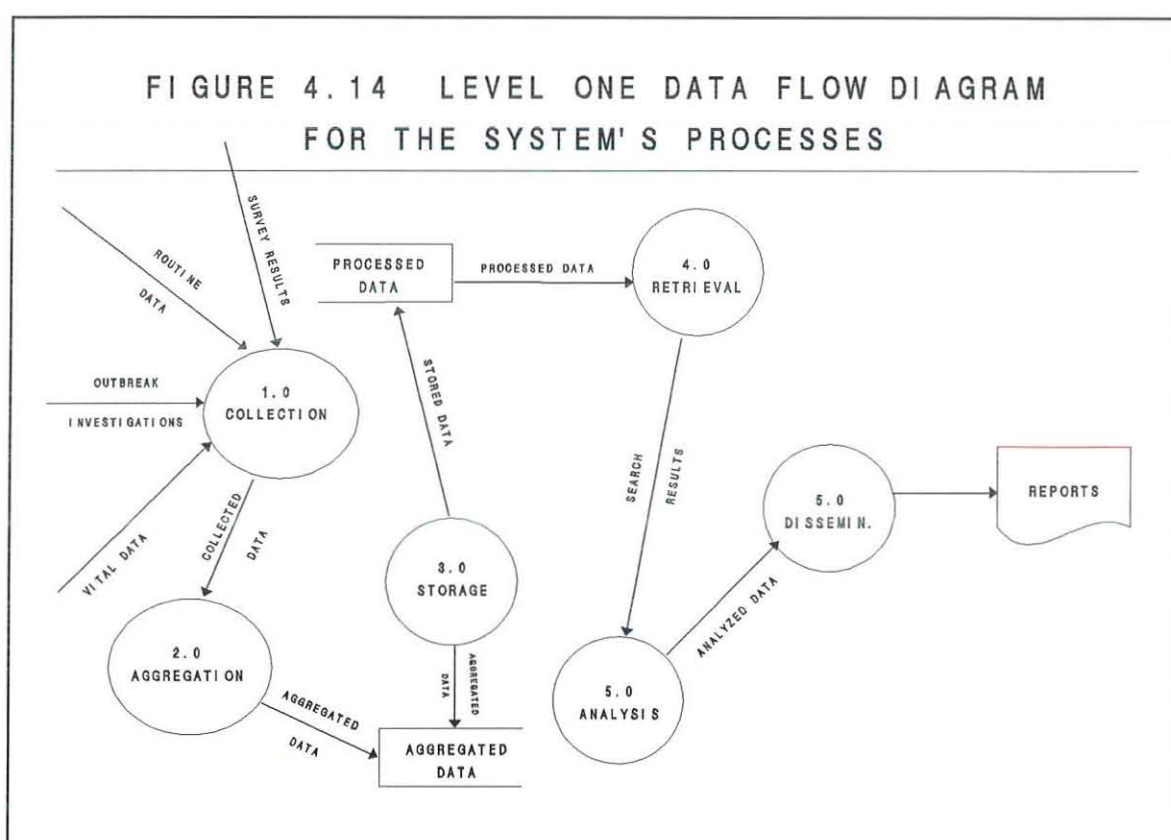
SN ²	Information from the system	Recipients
A	Drug utilization, needs and distribution.	Central Medical store
B	Common causes of morbidly, disability, mortality and locally epidemic diseases.	Department PHC
C	Pregnancy: contraceptive prevalence by methods, antenatal clinic attendance by trimester, deliveries by trained personnel. Postnatal clinic attendance. Nutrition: low birth weight, breast feeding prevalence at six months, malnutrition prevalence at 12 months. Immunisation coverage. Communicable disease control: percentage of people with malaria or measles, episodes of diarrhoea and acute respiratory receiving treatment, prevalence of HIV infections, tuberculosis under treatment, major epidemic diseases.	Health institutions
D	Indicators for evaluating the performance, and the impact of health care services. Information for decision making, for monitoring the progress towards stated goals and targets.	Management.
E	Human resource, allocation and utilization.	Personnel Department.
F	Background information for the health needs of the populations. Number and distribution of governmental and nongovernmental facilities, personnel and programmes. Progress reports, evaluation and impacts of the projects Available services, supplies and areas of intervention.	International organisations.

² . Serial alphabets corresponding to the alphabets in the context diagram.

4.3.2 System's processes

A process is a sequence of related activities, or a sequence of related tasks which make up an activity (Modell, 1988: 147).

In the process of provision of health care services, the processes of capturing, analysing and disseminating health information are the acquisition, recording, storage, retrieval, and dissemination of health information to the users. These are



diagrammatically illustrated in Figure 4.14. The processes are as follows:-

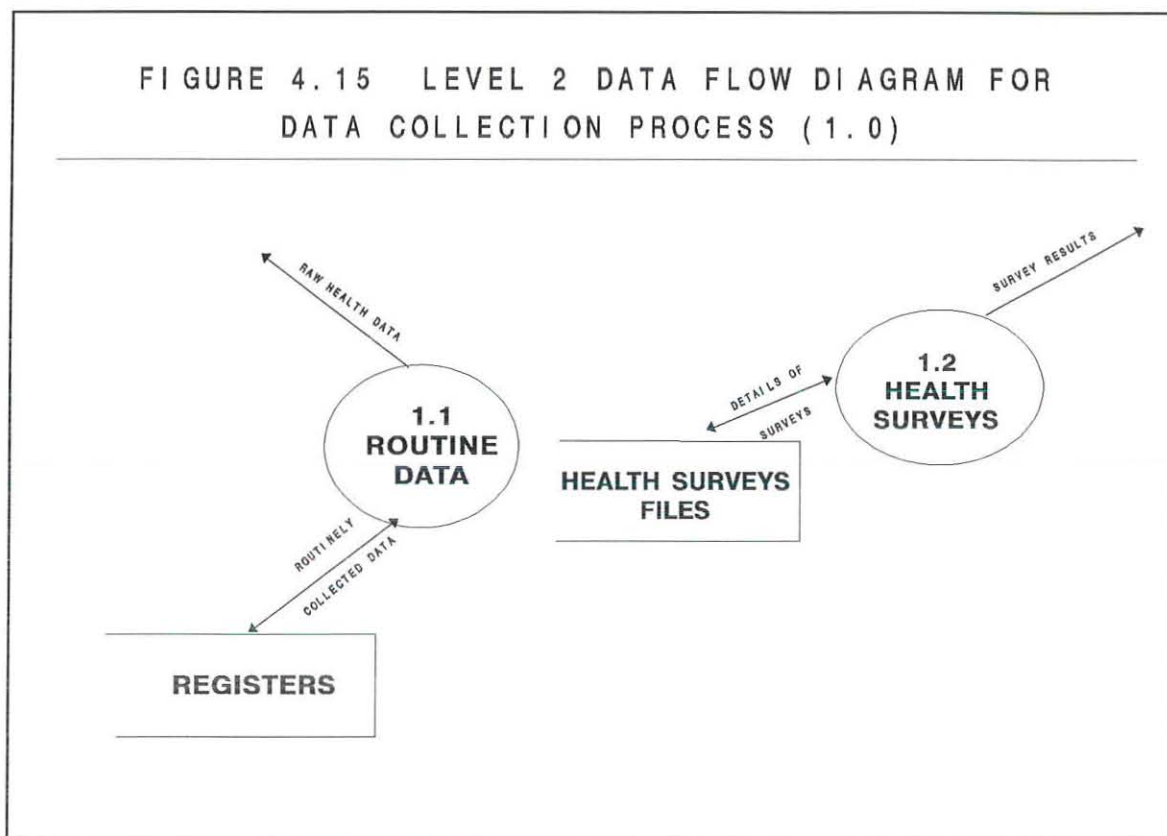
- **Data collection process (1.0):** This process is on the collection of health data from health units. These activities are carried out by personnel responsible for health delivery in health facilities and mobile teams within the community. Data are collected on health status of the population (incidence, prevalence, fatality of

certain diseases, morbidity and mortality rates), health resources (human, financial, equipment, and supplies) and health services (individual treatments, immunization, distribution of ORS and ORT, Iron and vitamin A).

- The process of recording/aggregation (2.0) : The health personnel working in the health facilities extract the data to be reported from the registers and summarize them in the forms designed for the purpose. There after, the aggregated data are sent to the central level for further action.
- The process of storage at the central level (3.0): The aggregated data is received on monthly basis from the all health units at local levels. The data are classified and sorted manually at the health information section of the central Ministry. From there it is stored manually.
- The retrieval process (4.0): The stored information is searched and retrieved for meeting specific purpose of information requirement.
- The Analysis/presentation process (5.0): Raw data is only of use after analysis and transformation into information. Analysis of information can occur at a variety of levels, from that of the original collector to that of a user at the central level. In this case the analysis was supposed to take place at central level. The retrieved information in previous process is analyzed manually, consolidated and presented in a specified format.
- The transmission/dissemination process (6.0): The analyzed and presented information is distributed to the various users in the health care system as well as related sectors.

4.3.2.1 Data collection process

As contained in Figure 4.15, the process of data collection



is broken down into two sub-processes of data collection. These are as follows:

- **Routine health data collection (1.1).** Data collection at district level is generally organised as a component of the national health information system, which is the only system that attempts to provide a comprehensive set of data. The central level obtains its information from the routine data reported by the health facilities and field personnel. Public health surveillance systems are also another source of routine health data collection at district level even though such data are sometimes collected directly nationally or regionally. Formal health related data is also obtained from vital registration, such as death and birth registration and certification. Since there is no special authority for this task, health facilities such

as hospital and maternal child health centres report assisted deliveries and deaths by diseases of specific age groups. Hospitals also report the deaths.

- Health surveys(1.2): Departments of the Ministry such as primary health care and communicable control diseases conduct special surveys on specific purpose (specific diseases, malnutrition for specific age group) at district level and sometimes at regional level. The outbreak investigations are another source of health data. These investigations are carried out when certain outbreak of diseases are reported such as cholera and meningitis. These investigations also report death rates by these epidemic diseases.

4.3.3 Limitation of the existing system

Based on the researchers observations together with the interview conducted with the head of the health information section as well as the directors of the other departments, the study revealed the following shortcomings inherent with the existing system:

1. There is no efficient information storage and retrieval system. All activities are manual resulting in:
 - a lot of paper work that leads to erroneous aggregations and missing of data.
 - delays and untimely provision of information.
 - more time and efforts, as well as difficulty or impossibility of calculating reliable simple indicators from available data.
 - duplication of data in different files;
 - a lot of man-hours are spent on routine and clerical activities.
 - too bulky files, difficult to handle and are many in numbers.

2. At the central level (i.e health information section), no analysis of any kind is carried out on the data collected nor is any use made of the data, because of lack of reliable information retrieval system for data analysis.
3. Existing system is ill-equipped, understaffed, and hardly suitable to provide data for managing the national, regional and local levels.
4. Presentation of information is often neglected, there is no simple standard way to present the information to the users, no useful indicators are calculated from collected health data.
5. It is difficult for the health facilities at local level to access from central office of the Ministry the original forms they have formally completed.

In order to solve some of these problems, a systems development whose components are spelt out in the design part of the study was proposed.

4.3.4 System's requirements

In order to improve the system's efficiency and effectiveness, the following are the requirements of the system:

- **Performance requirements**

The current work is done manually, and it involves a lot of processes with relatively huge amount of paper work. This has resulted in low response time and throughput. Thus there is a need to improve the response time and throughput by introducing an automated information system.

to the existing problems. However, the use of computers, as a means of facilitating information storage and retrieval, is necessary to achieve this efficiency. According to Rowley (1993, 113), the information retrieval systems are becoming synonymous with computers. Computers can be used to reduce too much paper works, numerous clerical operations. It also facilitates resource sharing and smooth communication. In this regard, it would also be possible for the system to take the opportunity of the HealthNet information services, which is freely provided by the SATELIFE (an international non-profit organisation based in Cambridge, Massachusetts) and other electronic connectivity programmes.

Designing and maintaining programme-specific databases at the Ministry of Health can help ensure that routine reports being submitted by health service facilities are checked, analyzed and incorporated in the national situation summaries and monitoring reports. A national database would make it possible to provide useful feedback to the reporting units at district level which should gradually improve the completeness and quality of the data.

CHAPTER FIVE

THE DESIGN OF THE PROPOSED SYSTEM

5.1 GENERAL SYSTEMS DESIGN

Information retrieval is the process of selecting information from store (Vickery, 1987: 116), and the system that stores information and retrieves it in response to user queries is defined Information Retrieval System (IRS) (Chowdhury, 1994). This chapter, in a sense, is a continuation of the previous discussion and proposes the design features of the proposed information retrieval system for health care services, in accordance with some of requirements specified in chapter four. It also describes the basic design components comprising functions, inputs and outputs, databases, user interface and the prototype of the proposed system.

In order to meet the requirement of the system, the following design activities are to be done:

- to define the objectives of the new system;
- to create a database structure;
- to design the user interface;
- to develop the prototype of the system;

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- to create a database structure;
- to design the user interface;
- to develop the prototype of the system;

5.1.2 Objectives of the new system

5.1.2.1 General objective

The general objective of the system is to improve the process of collecting, storing, retrieving and disseminating information on health care services and to ensure that information made available is precise, exhaustive and accessible with minimum delay, presented in a manner more convenient to the respective users and the service is provided at the minimum cost.

5.1.2.2 Specific objectives

In order to achieve the general objective of the system, the system will have the following specific objectives:

- to coordinate, centralize, analyze, update, store and disseminate health information;
- to provide an effective means of retrieval of data when it is required;
- to facilitate inquiries handling, data updating and browsing services for processing and presentation of the information related to health status, and health needs of the population;
- to reduce manual activities as well as physical storage requirement;
- to provide user friendly interface; and
- to provide facilities for backup and recovery.

5.1.3 Systems functions

The prime objective of any information system and services is to provide right information to the right person at the right time. The functions of the proposed information retrieval system are as follows:

5.1.3.1 Enhanced data entry and storage

The system will accept the routinely collected data from health facilities as well as health surveys. Usually this will be a monthly return of raw data in report forms from health units, through district health offices. The system is expected to provide enhanced data entry and storage in terms of recording and storing the collected data on monthly basis.

5.1.3.2 Data access and analysis

The system is expected to offer a relatively straightforward interface, via a query language that allows inexperienced end-users to search the database in the course of ad hoc enquiries. The system is designed in such a way that search results can be analyzed based on calculations of certain standard indicators on a regular basis such as indicators of morbidity and mortality. The following are some examples of indicators, which the system could provide:

Pregnancy: antenatal clinic attendance, delivery by trained personnel and postnatal clinic attendance;

Nutrition: low birth weight, malnutrition prevalence;

Immunization: coverage of the vaccination of children; and

Communicable disease control: percentage of people with malaria or measles episodes of diarrhoea and acute respiratory infection, receiving treatment, prevalence of HIV infection, tuberculosis and etc.

5.1.3.3 Generation of output for action

The health information would be widely used if it were presented more clearly and comprehensibly (WHO, 1994). For instance, the system is expected to generate automatic reports from the database in a more easily understandable means such as tabular format, and charts and graphs showing access and coverage. The generated output is expected to:

- indicate to the health professionals the extent of coverage of the population and which components of the health care services are effective and which are not;
- assess the causes of deaths in the target population. The death module, for instance, would facilitate the analysis of mortality data, enabling better understanding of causes of deaths. The module would also help to identify risk factors which in turn will be used to identify areas that are high risk for mortality;
- assess clinical morbidity in terms of generating an automatic reports of the morbidity pattern rather than one analyzed on monthly basis manually;
- assess nutrition impact and provide reports to see if the programme has had an impact on nutrition status of the children.

5.1.4 Databases to be developed

As it has been mentioned in chapter one, the information currently being used comes via two main routes, routinely collected data and health surveys. Therefore, in order to meet the requirement of the system and facilitate the organisation, storage, analysis and presentation of the collected data, there is a need to design source databases at central level. According to (Rowley, 1990: 68-69), a source database contains the original source of data and can be numeric, full-text and text-numeric database, which the user, after successful consultation, do not need to seek information in an original source. These databases consist of specialized databases, which contain health statistics data. They are as follows:

5.1.4.1 Health statistics database

The basis of routinely collected data are monthly returns provided by all levels of health services. Within the hospitals in the zone, there are records departments staffed by clerks with specific responsibility for maintaining both patient records and aggregate returns.

At the level of the PHC villages, reporting is carried out by community health workers and TBAs using tally forms. Similarly, at maternal and child health centres, a tally sheet is used to report a range of conditions, including reportable diseases divided into cases aged under and over five years. At the end of each month, these various tally sheets are used to produce totals for forwarding to the regional office, and from there the information is passed to health information section at the central office in Hargeisa.

In addition to that, two levels of information are available through the activities of the maternal and child health centres. First, there are monthly returns based on child health, antenatal care, postnatal care, and immunization services. The material for these returns is derived from registers kept at the health centre or dispensary, including a birth register. The second level of information refers to individually held records, specifically child welfare cards and antenatal and postnatal cards. Therefore the first database is health statistics database, which contains this information.

5.1.4.2 Health surveys

The basic objective of planning and conducting health surveys is to determine the occurrence and distribution of selected environmental, socioeconomic, and behavioral conditions important to disease control and well-being. Surveys become essential as a basis for analysis when data sources are lacking (Green, 1991: 28). In the case of health information section at central health authority, surveys are conducted to determine the immunization levels, the incidence and prevalence of diseases, health care utilization patterns and population demographic characteristics. These surveys provide valuable information to management of both the Ministry and international donor agencies working in this sector. Therefore, the second database which is being proposed is the health surveys database.

5.1.4.3 Profile of health projects

The health care services of the zone depend largely on the assistance from the international donor organisations. These organisations provide the major health input;

supplies of essential drugs and medical equipment, logistical supports, training of the health professionals, incentives for the health staff and funding of the water and environmental sanitation projects. In an area where data and documentation are scarce, and records of previous projects nonexistent, it is necessary to circumvent these problems for better programme implementation. Therefore, the third database developed, concerns the profile of health projects.

5.2 DETAILED DESIGN

The process of developing a database model that accurately reflects the organisation's functioning and implementing that model by creating a database requires an appropriate methodology. Traditional systems analysis provides a possible approach, but the staged database approach offers a better solution (Ricardo 1990, 55).

The staged approach was chosen in this study to design the required databases of the system. This approach involves two different stages namely logical design and physical design.

5.2.1 The logical database design

The logical model of the proposed databases was formulated. Because of the characteristics of the hardware and software which are not static and changing over time, the model was developed with flexibility in order to minimize the need for such changes. The model of the proposed system describes all the entities or objects that must be stored in the required databases. This was done by modelling all the data of the system.

The **top-down approach** was followed in modelling the logical data of the system. The entities of the system were identified, and attributes were attached to them after ensuring that the entities and their relationships are correct and that they correctly model the organisation rules and support the information needs as well.

The forms and reports of the existing manual system, used to collect and aggregate data and reports, as well as the interview in which users described the desirable reports, forms and queries, were used to identify the entities of the system. Typically this has been done by collecting one copy of every type of a form and report. From these system's inputs and outputs every data item that appears is listed. This has resulted in a list of all the data that are important. The relationships between these items were identified. The entities and attributes of the system are indicated below. The attributes underlined are primary keys linking the entity with another entity. According to Shepherd (1990, 141), it is general convention to capitalize the names of the entities and attributes, and use underscore between words. Following are optimized normal relations obtained from logical data model of the system.

- Health statistics database

ASSISTED DELIVERIES (DATE, NAME, STILL_BIRTH, LIVE_BIRTH, LOW_BIRTH_WEIGHT)

NUTRITIONAL STATUS OF CHILDREN (DATE, NAME, AGE_IN_MONTHS, MORE_THAN_80%, BETWEEN_70-79.9%, LESS_THAN_70%³)

³. The nutritional status of the children under five years of age is currently measured by the proportion of the weight-for-height in percentage, and is recorded into three different categories. The children with proportion of more than 80% (MORE_THAN_80%), between 70- 79.9% (BETWEEN_70-79.9%) and less than 70%

- Health surveys databases

HEALTH SURVEY (SURVEY_CODE, TYPE, SURVEY_DATE, TITLE, SAMPLING_STRATEGY, SAMPLE_SIZE, TARGET_POPULATION, FOCUS_OF_SURVEY, DURATION, DATA_PROCESSING_DATE, REPORT_AVAILABLE)

SURVEY_REPORT (S_DOC_NO, SURVEY_CODE, AUTHOR, ABSTRACT, DOC_LOCATION, DATE)

DEPARTMENTS (DEPARTMENT_CODE, DEPARTMENT_NAME)

- Health projects databases

PROJECT (PROJ_CODE, PROJECT_TITLE, DURATION, DESCRIPTION, LOCATION, COST)

FUNDING_AGENCY (PROJ_CODE, FUNDING_AGENCY_NAME, ADDRESS, TYPE)

IMPLEMENTING_AGENCY (PROJ_CODE, IMPLEMENTING_AGENCY_NAME, ADDRESS, TYPE)

BENEFICIARIES (PROJ_CODE, TOTAL_POPULATION_AREA, NUMBER_OF_HOUSEHOLDS, NUMBER_OF_FAMILIES, CHILDREN_5-12_YRS_OLD)

PROJECT DOCUMENT (DOC_NO, PROJ_CODE)

PROJ_PROPOSAL (PROJ_CODE, PROJ_TITLE)

PROJ_AGREEMENT (PROJ_CODE, STARTING_DATE, COMPLETION_DATE)

MANAGEMENT (MANAGER_CODE, MANAGER_NAME)

5.2.1.2 Data dictionary

A data dictionary is a collection of data about the data. Its purpose is to rigorously define each and every data element, data structure, and data transform. The contents of the data dictionary are sometimes called meta data (Davis, 1994: 81). In order to show a detailed view of the data, and how data are used in the system, a data dictionary was compiled. This dictionary contains name, type, size and short description of all data elements of the system. The data dictionary of the system is given in appendix II.

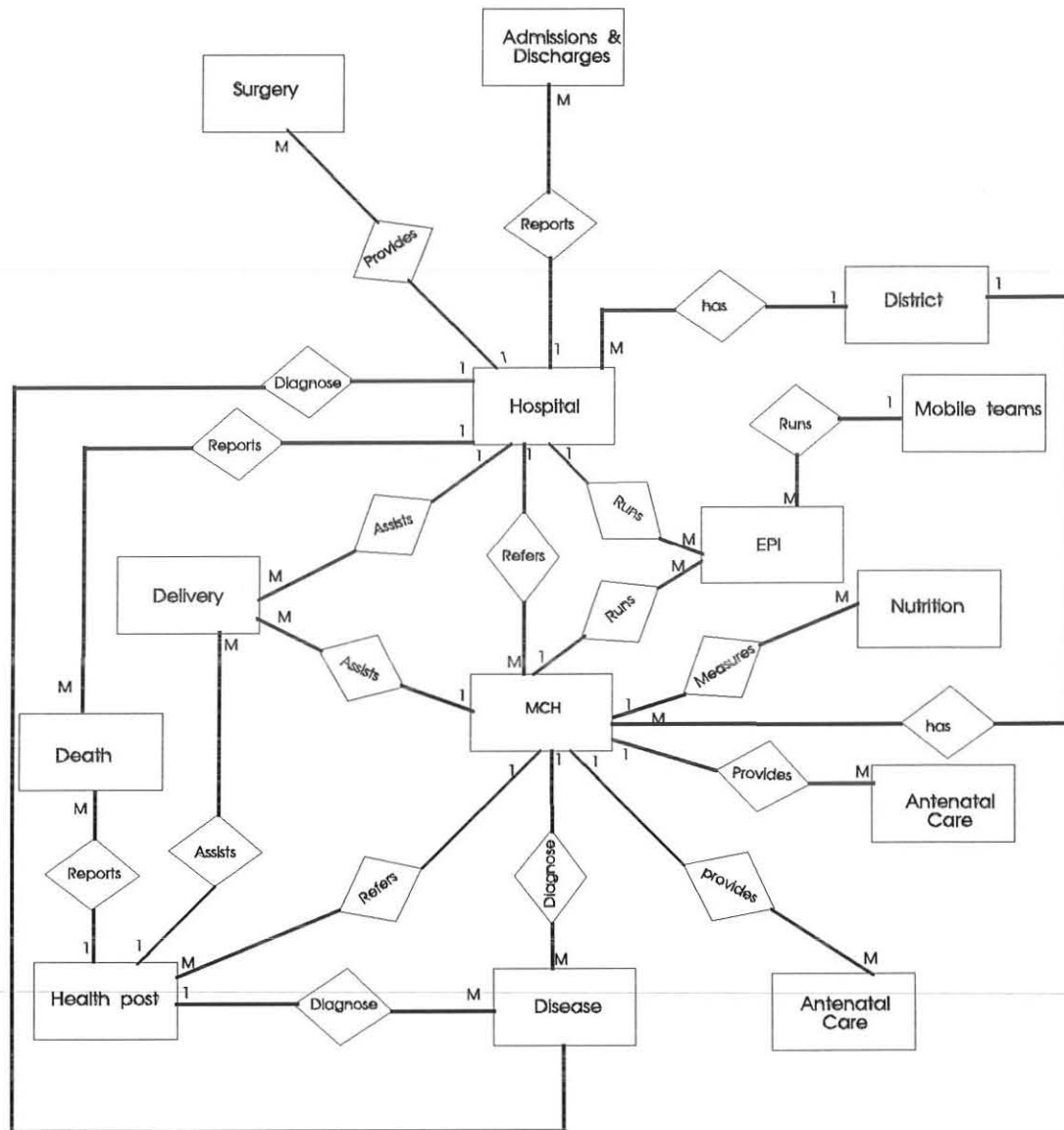
5.2.1.3 The entity relationship model

In designing the logical model, there is a need to develop a graphical representation of the system's entities.

In order to show how system's primary entities are related an entity relationship (E-R) diagram was drawn. Each relationship has been considered and resolved in a way that satisfies the requirements for the potential user's of the new system. Due to the space and time limitation, only the entity-relationship diagram of the health statistics database was attached here and explained as shown in figure 5.1. In the figure, the rectangular boxes are showing entities, while diamonds are showing the relationship. As shown in E-R diagram, most of the entities are related in one-to-many-relationships (1:M). According to Shepherd (1990: 55), one-to-many-relationships means that one entity occurrence of the first entity class is associated with many occurrences of the second. Conversely, each occurrence of the second entity class is associated with up to one occurrence of the first. Following is the explanation of how the entities of the system are related.

- Many health posts in different villages refer to only one Maternal and Child Health centre (MCH) in the district. On the other hand only specific activities done by one health post is referred to one Maternal Child Health Centre.
- A health post assists many deliveries. But only one specific delivery is assisted by one particular health post.

Figure 5.1 Entity- Relationship diagram for health statistics database



- At the same time a health post diagnose many diseases and reports them on monthly basis. But only one specific disease for particular group of people in a specified period of time is diagnosed by only one health post.

- A Maternal Child Health centre diagnose different diseases and reports them to central office on monthly basis. But only one specific disease on a particular month is reported by one centre.
- A Maternal Child Health centre monitors the nutritional status of children under five years and reports on monthly basis to central office in three different groups of ages. But only one nutritional status of specific group of ages of children is monitored by one particular centre.
- A Maternal Child Health centre provides antenatal care services to mothers and reports on monthly basis to the central office. But only one type of specific antenatal care (e.g abortion) in particular month is provided by only one specific centre.
- A Maternal Child Health centre also provides postnatal care services of mothers and reports on monthly basis as well. But one type of specific postnatal care is provided and reported by only one specific centre.
- A Maternal Child Health centre also runs Expanded Program on Immunization (EPI) for under five years children. And specific vaccination against one disease in a specific period of time (i.e BCG) is provided by one centre.
- A mobile or outreach team also runs EPI for rural and remote areas who are not accessible to the health facilities. But only one EPI program for specific period is run by only one mobile team.
- A hospital reports deaths for under and over five years age group (such as deaths by land mines or maternal deaths). But only one specific death in certain period is reported by only one particular hospital.

- A hospital also reports monthly admissions and discharges of inpatients. But only one particular admission or discharge in specified period of time is reported by only one particular hospital.
- A hospital provides surgery for inpatients and only one surgery for particular person in specified date is provided by one hospital.
- A hospital also diagnose different diseases, but only one particular disease in specified period of time is diagnosed by only one hospital.
- A district might have more than one hospital, and one specific hospital is administered by only one district.
- A district can also have more than one Maternal Child Health centre, and one particular Maternal Child Health centre administered by only one district.

5.2.2 Physical design

In section 5.2.1, a logical model which was independent of the physical implementation of database was developed. The model was designed in such a way that database could be implemented in any hardware and database management software. The entities and attributes of the system were identified and their relationship was also defined. This section gives emphasis to how that model could be implemented in a particular database management system. Because of the advantages it has over the hierarchical and network model, the relational model was chosen in this study to implement the physical design of databases. The physical design of the system depends on the kind of the relational database management software and hardware used.

However, dBase IV, which is available at the Ministry, was used to design physically the prototype databases. Dbase IV has its own limitations, and it is not suitable

to implement the large systems such as this one. However, it was used to demonstrate the potential advantage of the system to solve some of limitations of the existing system. It has also used in order to show the prototype of the system to the management of the Ministry. Input and output formats were also designed. In addition, a menu-based user interface system which will help the user of the system without difficulty has been designed.

5.2.2.1 Presenting relational tables to files

In order to map the logical data with relational model, both entities and relationships are represented by relations, which are physically represented as tables or two-dimensional arrays, and attributes as columns of those tables. Therefore, the following files are to be created (table 5.1).

Table. 5.1. Health statistics database files

File description	Access points
Assisted deliveries	Name, date
Reported deaths	Name, date, cause
Reported diseases	Name, date, disease_name
EPI for under five YRS children	Name, date, Antigen
TT for women of child bearing age	Name, date, doses
Hospital admissions and discharges	Name, date
Hospital surgeries	Name, date
Antenatal care	Name, date, Antenatal_cases
Postnatal care	Name, date, Postnatal_cases
Nutritional status of children	Name, date, Age_in_months
Health surveys	Survey_code
Health facilities	Name
Profile of districts	District_name
Health projects	Proj_code

Table 5.2 Health surveys database

File description	Access points
Health surveys	Survey_Code
Surveys report	S_Doc_No
Departments	Department_code

Table 5.3 Health projects database

File description	Access points
Health projects	Proj_Code
Project document	Doc_No
Management	Manager_code

5.2.2.2 Input/output format design

The design of the input and output formats were considered in accordance with user needs, in terms of data entry and output requirements.

The forms for the routine reporting from the health facilities have undergone several revisions in the last 5 years. Donor agencies have considerable influence in the number and contents of the forms to be used so that the agencies can obtain the sort of information that they require for internal use. This is specially so when the viability of the health services depends to a large extent on the support of the donor agencies and the national health authority are not in a position to provide useful health information.

According to Deria (1996), the reporting forms were further refined in July 1996, in format and content. It was agreed that, for reporting purpose, the national health authority would use only the forms attached in the appendix I. These are, namely; the hospital out patient dispensary (Adult and paediatric) and health centre disease surveillance forms, death and birth registration forms, reporting forms of vaccinated women and children, and hospital admission and discharges reporting forms.

In this regard, the input forms for the proposed system will take into consideration those recommended forms. The forms are typically used to capture data. A form image will be displayed on the screen and used as template data entry. Completed forms can also be scanned or the data can be input to the computer through keyboard.

The system is also expected to extract data from database files and generate reports in different formats. However, the required output were designed in accordance with user requirements and provide useful information to the users. The different report lay-outs are discussed under prototype development in section 5.3.1.3.

5.2.2.3 Record Structure

The normalized logical data structures were converted into physical data structure that will be stored and manipulated by the system. The field attributes (data types, and field lengths) were extracted from the data dictionary. Given this information, a complete set of data description was prepared. The structure of each file in the databases was designed in dBase IV. These are shown in appendix III.

5.2.2.4 User interface

A user interface is a point in the system where a human being interacts with a computer. The interface can incorporate hardware, software, procedure and data (Davis, 1994: 403). The user interface for the proposed system serves as both a connector and separator, linking the user to the computer and protecting the computer from the user.

In designing the user interface of the proposed system, the data flow diagram of the processes and the data dictionary were used to complete a list of data elements that are

input by or output to users. In addition, a prototype of the required reports, forms and screens were designed.

5.3 PROTOTYPE DEVELOPMENT

It is not possible to obtain all the information one needs to create a complete logical model just by conducting interviews, and studying the present system. Some processes are difficult to explain. Another problem is that many people have difficulty conceptualizing their needs. In such cases, prototyping is a powerful alternative or supplement to logical modelling. The basic idea is to build a reasonably complete working physical model of the system (Davis, 1994: 193-94).

In this study, prototyping consists of building a prototype system (a model of the actual system),- which, to the user, will look much like the finished product. The screen painter, menu builder, and report generators of dBase IV were used to create an on-screen example of a possible menu or interactive display screens.

According to Stair (1992, 408), the advantages of a prototype system are:

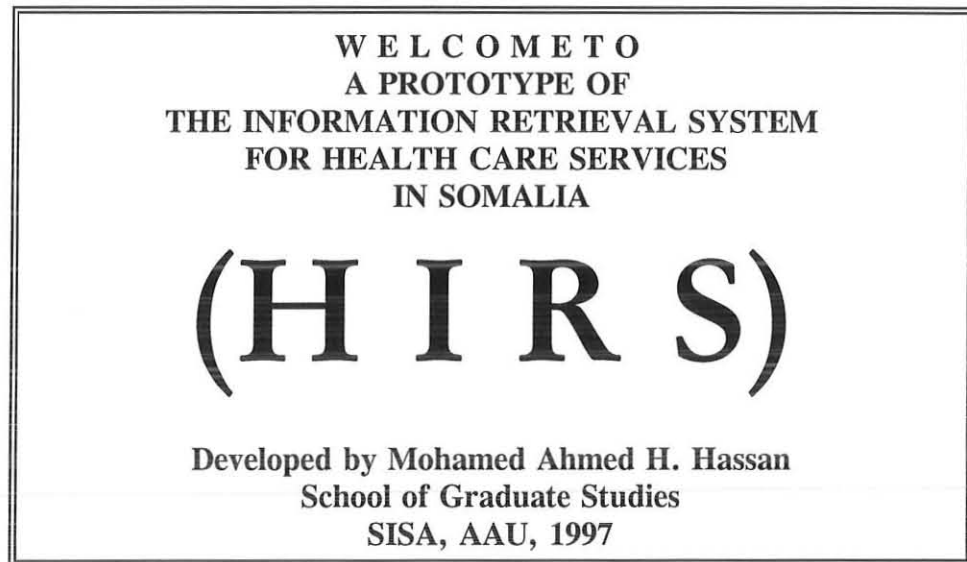
- It enables the user to physically sit down and use the system, finding glitches he or she might not have thought of without a working model;
- It makes the system more flexible to change, because users are disposed to change their minds about what they want.

5.3.1 User-system interface design

This involves the design of the mechanisms through which the user interacts with the system. It consists of menu design, input and display designs, and output layouts.

5.3.1.1 Menu design

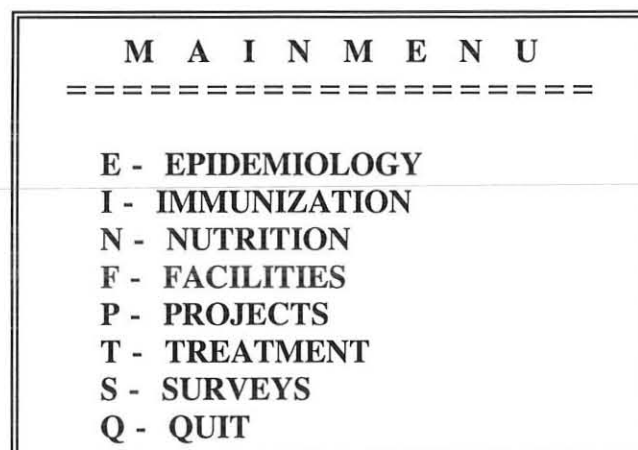
The system will have a series of menus. When the user login on the system, he/she will be presented with the following welcome screen.



Press Enter to continue

- **Main menu**

By pressing <CR> the system will present the main menu. The main menu consists eight different options, namely, epidemiology, nutrition, expended programme on immunisation, health Facilities, projects, treatment, health surveys, and exit to welcome screen.



Use up and down arrow keys to highlight. Press first letter or ENTER to select your choice. F1 - Help.

If the user selects one of options of main menu, the different sub-menus for the databases and possible processing options will appear.

- **Epidemiology menu**

If the user selects the first option, for instance, a pop-up menu for epidemiology databases will appear. This menu consists of four different options; reported diseases, deaths, assisted deliveries and exit to main menu.

EPIDEMIOLOGY ===== A - Assisted deliveries D - Reported diseases T - Reported deaths E - Exit to main menu

Use up and down arrow keys to highlight. Press ENTER to select your choice. F1 - Help.

- **Options menu**

In choosing one of the above databases from epidemiology menu, for instance, a horizontal bar menu for the possible options will appear. This menu also consists five options as follows:

Updates	Search	Reports	Maintenance	Exit
----------------	---------------	----------------	--------------------	-------------

Use up and down arrow keys to navigate the menu. Press ENTER to select your choice from attached sub-menu. ESC- To go back previous menu. F1-Help.

Each item in the menu has its own pop-up sub-menu which changes with the database in use. This menu is attached in every database and, it will allow the users to append, edit, delete, display, and recall the records of databases, make queries, generate reports and maintain the databases for making regular back-up copies.

5.3.1.2 Screen Design

The most common computer interface is composed of the display unit and the key board. A screen design which simulate a paper form, with more dynamic images is needed. Because the screen is linked to a computer, it will electronically verify the data as they are entered, and that can have a significant effect on data integrity. The following are some of the entry screens designed for the system:

Data entry screen for reported diseases

REPORTED DISEASES	
=====	
DATE :	/ /
NAME OF FACILITY:	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
DISEASE :	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
UNDER FIVE YRS :	9999
OVER FIVE YRS :	9999
TOTAL :	999999.99

Data entry screen for reported deaths

REPORTED DEATHS	
=====	
DATE :	/ /
NAME OF FACILITY:	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
CAUSE :	XXXXXXXXXXXXXXXXXXXX
UNDER FIVE YEARS:	9999
OVER FIVE YEARS :	9999
TOTAL :	999999.99

Data entry screen for vaccination of under five
years children

EXPENDED PROGRAMME ON IMMUNIZATION FOR CHILDREN UNDER FIVE YEARS AGE	
=====	
DATE :	/ /
NAME OF FACILITY:	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
ANTIGEN :	XXXXXXX
0-11 MONTHS :	9999
12-59 MONTHS :	9999
TOTAL :	999999.99

NUTRITIONAL STATUS OF CHILDREN UNDER FIVE YEARS OF AGE	
=====	
DATE : / /	
NAME OF FACILITY :	XXXXXXXXXXXXXXXXXXXXXXXXXXXX
AGE IN MONTHS :	XXXXXXXXXXXXXXXXXXXX
MORE THAN 80% :	9999
BETWEEN 70 -79.9% :	9999
LESS THAN 70% :	9999
TOTAL :	999999.99

5.3.1.3 Report layouts

The data that are used to generate a report are usually stored or indexed by one or more key fields. In this case, the district name and date serve as the key. Because the source records are accessed in key order, the detail lines for all records with the same key value are grouped together in the report. Some of the major types of reports needed by the system are:

- On-demand report for specific item such as incidence of new disease in a population at risk in a certain period of time.
- Summary or trend reports such as example mortality of say land mines, morbidity and malnutrition prevalence of the last three years.
- Detailed report of every disease, deaths, treatment, vaccination, growth monitoring of all districts in the zone.

The following are some of the lay-outs of the reports that the system will generate:

Ministry of health and labour
Immunization coverage of North-West Zone by District
As of Jan - Jun 1996

District	Antigen	12-23 Months old	Measles coverage
Borama	Measles	125	7.81
Hargeisa	Measles	238	6.61

Ministry of Health and Labour
Infant mortality by district
1995

District	Total deaths of children under a year old	Infant mortality rate*
Hargeisa	53	0.21
Las Anod	43	0.33

* Infant Mortality Rate = $\frac{\text{Number of deaths all children under a year old} \times 1000}{\text{Mid year population of the district}}$

The system is also expected to retrieve data from database files and display them in graphic format. However, since dBase IV, cannot generate graphic charts, the results of the query file can be saved as database file and this can be exported to some other application such as spreadsheet program, where graphical charts can be displayed. For instance, EPI info can be used directly to read database files and generate different graphic formats such as the following:

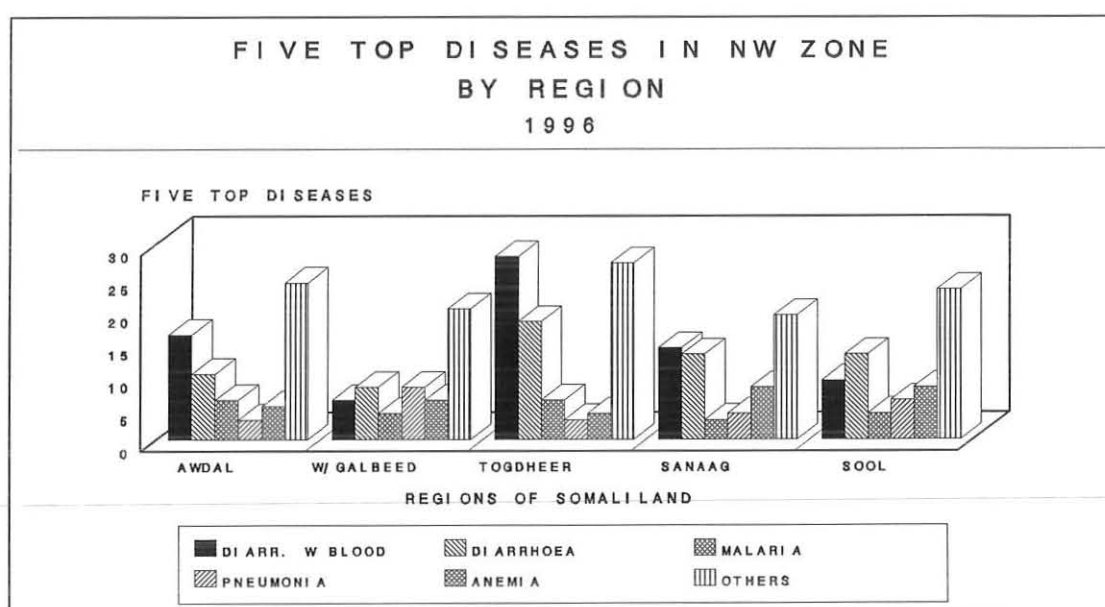


Figure 5.3

CHAPTER SIX

IMPLEMENTATION STRATEGY FOR THE PROPOSED SYSTEM

6.1 INTRODUCTION

The main objective of this study was to propose an information retrieval system for health care services, which could be developed and implemented at the central health authority of Northwest zone of Somalia. As the management of both Ministry and international donor agencies are very much aware of the advantage of such systems. The proposed system is designed to meet their needs once they decide to implement the project with the following strategy for consideration.

Since the current system is at central level, it is proposed that a pilot computerisation project be implemented at the central level. According to the requirements discussed earlier, a central computer system should be maintained in the health information system section. The HIS section will be the coordinating centre of all HIS services in the country.

Since the prevailing requirement is to develop organisation-wide information system, a high level technical committee could be put in place to assist the further development task of the proposed system. The composition of that group might comprise the management, a health information officer, a network manager and librarian or documentalist. An external technical consultant might be also needed to obtain technical expertise and advice in the installation of the system.

6.2 SYSTEMS REQUIREMENT

The proposed system requires resources and adequate long-term funding for necessities such as trained staff, computers, supplies, communication equipment and staff development, reports and communication costs. The requirement of the proposed system in terms of hardware, software, personnel and financial resources are as follows:

6.2.1 Hardware requirements

It is important in planning for computerization, that the hardware and software selected are sufficiently flexible to meet both present and future needs of an organisation. Computerized systems are dynamic, rather than static (Johnson, 1992). Hardware must have the capacity to handle growth of the system for at least three to five years. The size of the proposed databases for the system will increase according to the number of materials added to the collection. The hardware required to implement the proposed system must be compatible with the Database Management System. Personal computers, compatible with IBM are suggested for the system. Installation of such computers will ensure compatibility with the already installed computers in the department as well as the other departments of the Ministry, hence facilitate information resource sharing.

It is also preferable, in order to take the advantage of the electronic communications, particularly the Healthnet information services, that Wide Area Network should be introduced to connect the health information system to regional or international health community. This can also be used to provide services and connect the health workers to communicate with and get information from their colleagues in the region and world wide. A Local Area Network is preferable within the premise of the Ministry to

render services internally. In that case additional computers might be needed, preferably ones with built in CD-ROM drives.

Similarly, as services increase and more computers are acquired more printers will also be needed. In order to generate reliable reports with high quality graphics and charts at least one Laser printer is needed at the moment.

6.2.2 Software considerations

A computer-based information system, like the one which is being recommended for implementation here, requires application software or programs to operate (O'Leary and Williams, 1989: 401). A customisation of one of the commercial database management system might be feasible for the proposed system because:

- giving training for the users will be easy and cost-effective;
- since the programmers are around the vicinity of the system, the maintenance cost can be minimized;
- having contractual agreement (turn key systems) with the firms requires very high investment.

The software must be flexible in order to accommodate additions and/or changes to the system as the needs arise. However, to set up a flexible computerized system, a good database management program is required. At the moment as it has already been indicated in the previous chapters, dBase IV is currently available in the Ministry and it can be used to implement the system. However, in order for the system to be able to generate different reports in a variety of formats the output generated by dBase can be

exported to one of the spreadsheet programs. Therefore, a spreadsheet program such as Lotus 123, Microsoft Excel and QuatroPro, will be desirable.

In order to facilitate the interfacing between the results of the field surveys and central database management system, the study suggests Epi Info to be used for field surveys so that the files generated by the program can be easily embedded to the central database system. Epi Info is a series of microcomputer programs for handling epidemiological data in a questionnaire format and also for organizing study design and results into text that may form part of written reports. A questionnaire can be set up and processed in a few minutes, but Epi Info can also form the basis for a powerful disease surveillance system database with many files and record types. It includes the features most used by epidemiologists in statistical programs such as SAS or SPSS and database programs like dBase combined in a single package which is freely distributed by World Health Organisation and Centre of Disease Control in Atlanta.

Database management programs are essential for establishing viable computerized information storage and retrieval systems. However, one should not overlook the importance of other packages in the information system. Other software packages required to support implementation of the proposed system include, word processing software package for instance, WordPerfect version 5.1 for text processing purposes and some utility and antivirus programs for file and hard disk management purposes. A mapping system for application of health facilities, staffing coverage, and disease characteristics, will also be of immense benefit.

6.2.3 Possible fund sources

After estimating the costs and final decision has been reached on the type of the system to install, funds should be solicited from the Ministry. Presently, the government allocates 15% of the national budgetary plan for the health sector. The plan has been put in action since 1995. This initiative will, for sure, set a new health system into a new perspective towards a comprehensive and sustainable development. Under the current situation the average of this budget will be mostly utilised as running cost like salaries, and other overhead expenses. A budget allocated to development of the system from the government seems not feasible at the moment because of financial limitations. The feasible approach is to consult the donor organisations. As the donors have been supporting many projects in the sector, particularly the establishment of the health information system, this can be one of the projects to be presented. Therefore, a proposal for fund raising should also be prepared for submission to international organisations. It has to be recalled that there are a number of projects funded by UNICEF and WHO, and at same time both of them are assisting the structure of the HIS system in terms of training regional data collectors and providing equipment.

6.2.4 Staffing

As already discussed, the present system is understaffed. The system will certainly need full time staff to run it, therefore, one of the first decisions to be made is the size and type of staff required for the level of service wanted. The absolute minimum to begin with is one professionally trained person in information management services, assisted by a Network manager and librarian/documentalist and a number of full time clerical assistants

while the following is the minimum additional staffing requirement to operate the proposed system in order to meet effectively the demands of the health care services:

- Health information officer
- Assistant/Network manager
- Librarian/documentalist
- Clerks/Data encoder(s)
- Messenger/Cleaner

The health information officer must possess qualifications in Public Health at level of master's degree and a complementary degree or certificate in information system design and management with proven technical expertise in the development of computer applications. The network manager might poses a university degree in computer science or electronic engineering with particular reference to networking. The librarian/documentalist might possess qualifications in Library and Information Science at the level of first university degree but must be computer literate.

The Health Information System officer will report to the Director of Planning of the Ministry. The overall responsibility of HIS officer will be to work with the planning department of the Ministry of Health and Labour (MOHL) to develop a nation wide health information system and to computerize specific aspects of the HIS. This work will involve all divisions of the Ministry of Health and Labour at the national level, plus regional health offices and potential users, from health providers to facility managers to national policy makers. The HIS officer will play a key role to :

- Decide what new information will be required at local level particularly for monitoring the equity, coverage, quality and efficiency of health interventions as the country undergoes major health system reforms.

- Develop a detailed implementation plan and budget for the development of the computerised health information system.
- Plan with the consultation of the management the physical arrangement of the space and selection of the furniture and equipment as well as selecting the personnel and assign duties.
- Supervise the installation and maintenance of all hardware and software at the health information system section.
- Assess the availability and uses of information at the present time, and for defining the information flow, training and technology options that must be considered in designing the new HIS.
- Recommend appropriate software, to develop or supervise the development of software applications, to help with the design of computer friendly forms and registers, and to train MOHL staff to use both the computerized and the manual elements of the system.
- Develop components to support HIS including: proposals of computers and software, and their distribution and use; development and testing of forms, registers, information flow and feedback mechanisms; guidelines and manuals for personnel development; mapping; support of in-country training workshops and on-the-job training; and specification participant training for computer personnel.

A full-time assistant of computer supervisor or network manager might also be employed to supervise the operations of the network. The duties of such a supervisor would include:

- Assist in recommending appropriate computer technology for the new system and develop procurement and maintenance plans for all hardware and software.

- Supervise and monitor network operations and performance, making or recommending any necessary adjustments.
- Database management including regular taking of back up copies of the databases, and ensuring that they are uniquely labelled to prevent overwriting or erroneous deletion of files.
- Develop a training package in conjunction with necessary manuals or any documentation needed by the users and train trainers to deliver the package at regional and facility level.
- Assist in improving data collection process, methods of analysis, use of computers and presentation and communication of the health information.

6.3 IMPLEMENTATION PHASES

A detailed timetable of training, installation, and other activities needs to be agreed and finalized. The time table should cover the various aspects of implementation.

6.3.1 Procurement and Installation of Hardware and Software

Procurement invariably takes a considerable length of time. Purchasing procedures, tendering for suppliers, waiting for equipment to be supplied and delivered all add to the general time frame required. It may take one year to receive the equipment as a result of both donor agencies procedures. However, once the equipment is received, both hardware and software must be installed. Installation of hardware may often require designing physical facilities to support the system.

The central computer system requires a secure environment from dust and heat. Other issues to be addressed include ensuring that adequate power supply, lighting and cabling system are installed.

Once the hardware and the software have been installed, testing of the system should be done to ensure that all equipment are in good condition and are well integrated with the software packages installed.

6.3.2 Personnel training

Once the system has been installed and ready to start operating, the users of the system should be trained on how to use the system. When the system is ready for implementation, emphasis should switch to communication with the health information system staff and users. Open discussion with the staff is important from the beginning of the project. During the implementation phase, all the staff concerned will be appraised of the objectives and overall operation of the system. They will need training on how the new system will change the detailed performance of their duties, and need to understand how their role relates to the system as a whole. Both personnel and users require training at different levels to be able to operate and successfully interact with the system. An organised training programme, which include visits, seminars, conferences, demonstrations, courses, workshops and seminars should be conducted to provide on the job training.

6.3.3 Testing plan

It is always necessary to test the system before full implementation. This is done to test the performance of the system in the real environment. All aspects of the new system must be carefully planned and coordinated, the hardware and software thoroughly tested, the essential databases created and loaded and staff well-oriented and trained.

6.3.4 Database Creation and conversion of files

The approaches which might be adopted for conversion of files may include complete changeover, which involves the old system being replaced by the new system. This approach is often adopted only if the new system and the manual system are not too complex. A complete changeover might be the appropriate approach for the implementation of the proposed system.

As soon as it has been decided which system is to be used, the task of converting records from the existing system to the appropriate form and format for the new system should be undertaken. If testing of the system is successful and the staff have been trained, the necessary databases should be developed.

Conversion of data might be a very expensive exercise since the existing system is manual. In order to reduce costs, phased conversion might be used. However, before starting this activity, the conversion procedures and selection of the keying method should be carefully chosen.

6.4 SYSTEMS MAINTENANCE

Even when the new system has become operational there may be a need for some system design activity.

However, proper management and maintenance of the system is required for the system to offer reliable services. Among other things, proper documentation, strong security measures and evaluation procedures are necessary.

6.4.1 Documentation

When several persons are involved in the execution of a system, it is very important that the system be documented. A manual that presents data entry standards, data structures, report formats, abbreviations, procedures, etc should be developed. This manual may then be used for training purposes and to record the details of decisions that have been made during implementation of the system. This type of manual should be maintained in word processing format to facilitate easy changes and updates for the manual. When several persons work on a system, not every detail is easily remembered. The database manual assists staff to maintain consistency within the system and to understand better the design of the system to enhance retrieval from it. As modifications are made to the system, then the system documentation must be updated accordingly to reflect the changes.

6.4.2 Security measures

There should a strong measures that will strengthen the security of the computer system and the data it contains. These are:

- Back-up copies of the databases should be maintained and stored in a secure place.
 - In order to assuage the problem of power fluctuation Uninterruptible Power Supply (UPS) and Voltage stabilisers are also required.
 - Administrative control for accessing the databases, documentation materials are also needed.
-

6.4.3 System Evaluation Procedures

Once the system has been successfully installed and has started operating, procedures for system evaluation should be developed. The first evaluation of the system should be performed immediately after implementation to check whether everything is working well.

Evaluation of the system should be performed periodically for instance twice or at least once a year, in order to evaluate and determine whether the system is meeting the requirements of the users, and hence the objective of the system. Any required improvements or enhancements should be made according to the changing objectives and policy of the health care system of the country and consequently the users' needs.

CONCLUSION AND RECOMMENDATIONS

7.1 INTRODUCTION

By way of concluding the results of this study, it is perhaps salutary to remind ourselves of the saying: "The information you have is not what you want. The information you want is not what you need. The information you need is not what you can get".

The health care services whether they concern development or emergency relief, are much connected with economic development and population growth. This has, however, been hampered by the capacity of many countries to provide basic social services. Internal conflicts and population movements create further challenges. Many nations cannot afford to meet the increased demand for basic health care and even face problems in maintaining the capacity of the existing health care system.

The importance of information in the above situations cannot be over-stressed. The collection of storage and presentation of health information are made available through established information systems. Without information system, national health planning and management would be practically impossible.

This chapter provides the summary of the findings of the study as well as the conclusion and recommendations. The section for recommendations emphasizes the imperative actions to be taken to improve the existing system.

7.2 CONCLUSIONS

In this study, it was observed that in recent years the Ministry of Health and Labour (MOHL) with the assistance of international donor agencies has been making remarkable efforts to set up a comprehensive national health information system, which is able to supply a range of essential health information for national health policy, planning and management. However, the system faced a number of problems such as lack of reliable information storage and retrieval facilities for data analysis and presentation. These challenges emphasize the critical need for a reliable and useful information system.

This study was undertaken with the aim of proposing an information retrieval system that will facilitate easy access to the available health information in Somaliland. A survey of the activities involved in the provision of health information services at the Ministry of Health and Labour in Northwest Zone (Somaliland) was carried out. The problems associated with the existing health information system in terms of providing the necessary information for the individuals involved in the provision of health care services in the zone were investigated. In the survey, the information needs of the end-users and the sources of health information were also assessed.

The results of the survey showed that the information needs of the users vary according to their professional categories in the health care delivery system. For instance, the managers (at central and intermediate level) require general information about health status of the population, the access, coverage and quality of health care delivery services and available resources (finance, human, equipment and medical supplies). Medical practitioners at facility level need information about individual patients, epidemiological information and medical knowledge or recent developments in the field. The community health workers, mostly need information about maternal and child health services. It was

observed that the main sources of this information are routinely collected health data from health facilities and health surveys. It was discovered that the flow of this information is only one way from the peripheral to the central level. No analysis is done on the collected data at any level of the health services nor any use is made of the data. There is no feedback and no meaningful supervisory services.

The findings of the study further revealed that highly coordinated information services that take the identified information needs as well as the sources into consideration is very necessary for the success of national health care services.

From the results of system analysis and the survey, the level of application of information technology of the Ministry was perceived to be very low. Despite that there are some computers in the different departments of the Ministry, yet they are mostly used with secretarial services. There is no organisational information system/information technology (IS/IT) strategy. The available skilled personnel in all levels of the existing health information system are in acute shortage. Furthermore, the system is cut off from the rest of the world in terms of electronic communication for instance healthnet information services.

Considering the requirements of the system, an information retrieval system is proposed. The system consists of different databases, and user interface. Three different databases for basic health care services are proposed and their structure are logically developed. There is a need to further develop drug, personnel and bibliographic databases in the future. As part of the objectives of this study a prototype of the system was developed to demonstrate how the existing system could be improved with the use of information technology. Dbase IV, which is available at the Ministry and at SISA, where the research was carried out, was used to implement the prototype databases as well as the interface design.

If the system is to be implemented, there are certain things which need to be prepared before such implementation is carried out. These are spelt out in chapter six of the study.

In a nutshell, an analysis of the present situation at the Ministry of Health and Labour concerning its information needs revealed that the present manually based information system is inadequate to meet the demand of users. Therefore, the study suggests that the first critical priority is to employ an improved information retrieval system. It has been shown, that this can be achieved by upgrading the Ministry's present information system outfit to make it function as an effective and efficient information system.

7.3 RECOMMENDATIONS

Based on the findings, the study strongly recommends some of the major issues to be considered:

- The responsibility of the implementing the system should rest on the health information system officer under supervision of the Director of Planning of the Ministry.
- In line with the above point a detailed implementation plan and budget for the development of the computerised health information system should be developed.
- Project proposal for fund raising should be prepared and submitted to donor agencies. However, to sustain donor funded and supplied equipment for the system, the Ministry should consider in the future, the possibilities of generating funds internally for the system.

- There is a strong need for the Ministry to formulate and adopt organizational IS/IT strategy.
- The basic and essential infrastructural facilities (i.e., office, furniture, fittings and equipment) should be provided for the establishment of the central computer system.
- Regular communication between the health information system section at the Ministry and the personnel in the field should be promoted to disseminate information.
- Since the quality of the health data collected greatly depends on the skills and motivation of those health workers who collect the data, it is recommended that some programmes providing for basic skills in information gathering, management, use and communication should be developed for them and be incorporated in their professional training or as an initiation course for staff already in the services. The idea is not to make them information specialists, but to improve their resourcefulness and information dissemination ability in their work situation.
- Development of a sound mechanism for the flow of information from health units at local level to the central level.
- There is strong need to possible network the system in the future with the local input centres so as to facilitate the accessibility of these centres the centres the information in the central data bank.
- Information infrastructure in the country should be developed to facilitate networking of the systems to accommodate.
- Through joint activity at central and district levels, analytical tools, methods and mechanisms must be developed and strengthened to facilitate analysis and use of

information at the level of data collection, so that staff are enabled to assess district health status and health services performance and monitor health progress.

- Similarly the use of improved methods for presenting health information and communicating it to all levels of the health services, other sectors and political authorities must be developed and encouraged.
- National Drug Management Information System should be set up and incorporated with the National Health Information System.
- The healthnet information services should be introduced since they are free of charge and experiences have shown that it is very useful in areas where telecommunication infrastructure is poor.
- Based on the fact that users require information about medical knowledge, it is the recommendation of the study that the Ministry should not attempt to build a huge library collection, rather it should set up a documentation centre with a core collection of basic materials.
- The study also recommends that in order to meet the information needs of the medical staff (doctors, physicians, qualified nurses and other health professionals), a detailed study of their information needs should be carried out.
- Through cooperation between central and district authorities, essential data needed to address the health concerns at the districts must be identified. District health information system must be developed to facilitate data collection at the local level.
- Existing information system should be strengthened and improved at district and national levels to provide information which can be used to reflect the specific needs and priorities of both districts and country and to address the corresponding problems. The study further recommends the decentralization of the health information system. Development of such system would largely facilitate to meet

the information requirements of the decentralized health care system and ensure better health services.

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APPENDICES

APPENDIX I

Sample of reporting forms

The vaccination of under 5 years children

Name of the Reporting facilities: _____			Month/Year: _____
District: _____			Region : _____
Antigen	NO_UN_5YRS	NO_OV_5YRS	Total

The TT vaccination of women child bearing age

Name of the Reporting facilities: _____			Month/Year: _____
District: _____			Region : _____
Doses	Pregnant	Non-pregnant	Total

The disease surveillance form

Name of the Reporting facilities: _____			Month/Year: _____
District: _____			Region : _____
Disease	NO_UN_5YRS	NO_OV_5YRS	Total

APPENDIX II

Survey questionnaire

School of Information Studies for Africa
Addis Ababa University
P.O.Box 1176
Addis Ababa, Ethiopia
Fax 251-1-553811
Tel 251-1-110433
E-mail MHassan@padis.gn.apc.org

Subject: **An information retrieval system for health care services in Somalia: A strategy for implementation.**

Dear Sir/Madam;

I am a graduate student at the School of Information Studies for Africa (SISA), Addis Ababa University, Ethiopia. I am conducting a research on "**An information retrieval system for health care services in Somalia: A strategy for implementation**".

My study among other things involves the investigation, analysis, and study of the existing health information system with a view to come with a proposal and recommendations for establishing a computerized information retrieval system, which will enhance and strengthen the efficiency and effectiveness of health care services by facilitating access to timely, relevant, accurate and reliable information to the planners, decision makers, administrators, and health professionals .

The information you provide in this questionnaire will facilitate the planning and development of a prototype of databases with more user friendly interface. Therefore, your contribution is well appreciated.

Information on how to fill the questionnaire

If the space provided is not sufficient for your answers, please use extra papers and indicate the question number to which you are providing an answer. In some of the choice questions, if you find more answers than one choice, please tick each choice. Moreover, if the choice given does not suit to your answer use the blank space provided at the end of the choice question and put your own answer.

Thank you in advance, in anticipation of your cooperation!

Your's Sincerely

Mohamed Ahmed H. Hassan

SURVEY OF HEALTH INFORMATION NEEDS AND SOURCES IN SOMALIA/SOMALILAND

Name(optional)

Position: Manager ☐ Regional/District health officer ☐

Medical doctor ☐ Nurse ☐ CHW ☐ TBA ☐

Name and place of work

Place/country where trained Year of graduation

What is your first language Second language

Third language

1. Which of the following sources do you use in order to get the information you need?

- A collection of basic medical textbooks in your hospital/place of work. []
- Medical journals regularly received by your hospital/place of work. []
- Medical journals which you receive on your own subscription(s). []
- The surveys results conducted by the department of the Ministry of Health. []
- The reports of the surveys or studies conducted by international organizations. []
- The reports by health unit representatives. []
- Individual patient medical records. []
- Routine monthly collected from health facilities i.e monthly malnutrition reports of under 5 years children from MCHs. []
- Policy & procedure manuals for the health authority. []
- Talking to the people. []

- Mass media (Radio, local press) []
- Attending courses, workshops, and seminars. []
- Consulting Libraries/information centres. []
- Discussion with colleagues. []
- Any other source (please specify).....
.....

2. What type of the following information do you think will satisfy your needs in order to carry out your duties?

- Health status e.g (common causes of morbidity, disability, mortality and locally epidemic diseases). []
- Demographic situation e.g. (population size, age and sex structure, vital statistics, migration patterns, immigration and returnees and population growth rate.) []
- Health care services e.g.(access, utilization, distribution, coverage and quality. []
- Available resources(allocation and utilization, capacity and distribution of governmental, nongovernmental and private facilities, personnel, equipment, buildings, drugs, sources of funds). []
- Socio-economic and Environment (Water and Sanitation). []
- Patient data (refers to a single person). []
- Population statistics (Aggregated patient data). []
- Medical knowledge. []
- Logistics information (How to get the job done). []
- Social cultural (knowledge on expectations and beliefs of others). []
- Others, please specify.....

3. Are you able to buy for personal use the textbooks you need?
Yes ☐ No ☐ if no, give reasons.
.....
4. a) Does your hospital/place of work regularly receive WHO or other free publications? Yes ☐ No ☐ If yes, please list
.....
.....
.....
5. Do you personally regularly receive WHO or other free publications?
Yes ☐ No ☐ If yes, please list.
.....
.....
6. Do you write any forms of reports? Yes ☐ No ☐ If yes at what intervals?
daily ☐ weekly ☐ monthly ☐ quarterly ☐ yearly ☐, other (please specify)
.....
7. If the answer of question No.6 is yes, what is included in the reports?
Numerical/Statistics data ☐
Performance reports ☐
Reviews ☐
Any other (please specify)
.....
.....
8. If the answer of question No. 6 is yes, are special forms/reports used for the preparation of reports? Yes ☐ No ☐. If Yes, please attach sample form.
9. Does your health unit generate a health data? Yes ☐ No ☐ If yes at what intervals? monthly ☐ quarterly ☐ yearly ☐, other (please specify)
.....
10. If the answer of the question No. 9 is yes, is the process of collection, storage and retrieval of the information is computerized? Yes ☐ No ☐

11. How do you presently use the services rendered by the health information system section at the Ministry of health and Labour.
- Very often []
 - Irregularly []
 - Rarely(occasionally) []
 - Not at all []
12. When you use the services by the health information system section how long on average does it take to receive the information you require?
- less than one week []
 - between one and two weeks []
 - between two and three weeks []
 - between three and four weeks []
 - more than five hours []
-
13. What is your reaction of the services offered by the HIS section?
- Extremely satisfied []
 - Very satisfied []
 - Reasonably satisfied []
 - Not satisfied []
- Any comments, or reasons for your reaction?
-
-
-
14. For what specific purposes do you require the information you seek from the information system?
- Decision making []
 - Design of health projects i.e PHC []
 - Clinical use []
 - Patient care []
 - Research []
 - Operational activities []
15. Do you think, in your opinion, a computer based retrieval system will improve the services rendered by the centre?
Yes [] No []
16. Have you regular means of communication with the office of the central Ministry?
- a) VHF Radio b) Ambulance
- c) telephone c) Others specify

17. Please suggest ways of improving the services of the health information centre.

.....

.....

.....

18. Do you had any difficulty in filling this questionnaire? Yes []
No []

19. Any other additional comments

.....

.....

.....

Thanks for your cooperation

APPENDIX III

Guidelines for the interview

1. What is the total number of staff and their qualifications working in the section.
2. What kind of services the system so far, provide to the end users?
3. How are the available health data in the system collected, stored, analyzed and presented?
4. What methods are used to collect the health data from the health facilities at local level.
5. How are the stored health data accessed if it is needed?
6. How long in average takes to process information on say for example specific disease pattern (Malaria) for particular area or district?
7. What standards are in use in order to generate the health indicators if there is any?
8. How are the analyzed data communicated to the end users?
9. How are the health officers from district/regional offices use the services of the system?
10. What are the current sources of the finance?
11. What are the information technology resources available in the system?
12. What limitations the system has in terms of meeting information needs of the users?
13. What plans do you have in the future?

APPENDIX IV

Data dictionary

DATA ELEMENT NAME	Type	Field length	Short description
DATE	date	8	This is the month and the year which certain health facility reports specific events like diseases.
NAME	char	25	Name stands for name of reporting facility i.e MCH or health post
STILL_BIRTH	num	4	It the number of still births in specified period of time.
LIVE_BIRTH	num	4	The number of live births in a specified period of time.
AGE_IN_MONTH	char	7	It is the age of under five years children expressed and grouped in months as follows: 0-11mon, 12-23mon, 24- 59mon.
MORE_THAN_80%	Num	4	It is the number of children whom their proportion of weight for height is more than 80%
BETWEEN_70_79.9%	num	4	It is the number of children whom their proportion of weight for height is between 70 - 79.9%
LESS_THAN_70%	num	4	It is the number of children whom their proportion of weight over height is less than 70 - 79.9%
ANTIGEN	char	7	It is kind of vaccine given to the children against certain disease such BCG, Measles, OPV.
0_11_MONTHS_OLD	num	4	The number of children less than one year vaccinated against certain diseases.
12-59_MONTHS_OLD	num	4	The number of children between one year to four years and 11 months vaccinated against certain diseases.
CAUSE	char	15	The name of the cause by certain death such as land mine, or cholera.

DATA ELEMENT NAME	Type	Field length	Short description
UNDER_5YRS_AGE	num	4	The number of deaths or persons affected by a specific disease who are less than five years old.
OVER_5YRS_AGE	num	4	The number of deaths or persons affected by specific disease who are over five years age.
DISEASE	char	10	The name of the diseases reported by health facilities.
REFERRALS	num	4	The number of patients referred to the hospitals for further treatments.
DOSES	char	4	Type of doses of tetanus vaccine given in number of women of child bearing age in a particular month.
PREGNANT	num	4	The number of pregnant women given by TT vaccine in a specific month.
NON-PREGNANT	num	4	The number of nonpregnant women given by TT vaccine in a specific month.
ANTENATAL_CASE	char	4	Antenatal cases treated such as anaemia or abortion in a specific month by a particular health facility.
POSTNATAL_CASE	char	4	Postnatal cases treated in a specific month by a particular health facility.
ADMISSIONS	num	4	The number of inpatient admission of the hospital for specific month.
DISCHARGES	num	4	The number of inpatient discharges of the hospital for specific month.
ELECTIVE	num	4	The number of elective surgeries done by a particular hospital in a specific month.
EMERGENCY	num	4	The number of emergency surgeries done by a particular hospital in a specific month.
TYPE	char	8	The type of the hospital such as referral hospital, district hospital or TB hospital.

DATA ELEMENT NAME	Type	Field length	Short description
BED_CAPACITY	num	4	The number of beds available in the hospital.
DOCTORS	num	4	The number of medical doctors in each hospital.
NURSES	num	4	The number of nurse in each hospital or MCH.
ADMIN_STAFF	num	4	The number of administration staff in the hospital
SUPPORT_STAFF	num	4	The number of support staff in the health facilities.
HEAD_OF_HOSPITAL	char	25	Name of the head of the hospital.
HEAD_OF_MCH	char	25	The name of head of the MCH.
COMMUNITY_HEALTH_WORKERS	num	4	The number of the community health worker at the MCH or health posts.
TRADITIONAL_BIRTH_ATTENDANTS	num	4	The number of trained traditional birth attendants in the MCH or health posts.
PROJ_CODE	char	15	The code of the health project.
PROJ_TITLE	char	35	The title of the project.
DURATION	char	10	Duration of the project or the survey.
DESCRIPTION	memo	-	Short description of the project.
COST	num	6	Cost of the project in US dollar (material and cash).
LOCATION	char	20	The location of the project
TOTAL_POPULATION_AREA	num	5	Total population of the project area.
NUMBER_OF_HOUSEHOLDS	num	4	Estimated number of household directly benefiting the project
NO_OF_FAMILIES	num	4	Estimated number of families directly benefiting the project

DATA ELEMENT NAME	Type	Field length	Short description
CHILDREN__5_12YRS	num	4	Estimated number of children between 5 - 12 years directly benefiting the project.
FUNDING_AGENCY_NAME	char	25	The name of agency funding the project.
ADDRESS	char	15	The address of agency funding or implementing the project.
TYPE	char	15	The type of funding or implementing agency, i.e NGO, UN agency, government agency.
IMPLEMENTING_AGENCY_NAME	char	15	The name of the organisation implementing the project.
DOC_NO	char	10	The project document number.
STARTING_DATE	date	8	The date the project started.
COMPLETION_DATE	date	8	The date the project finished.
SURVEY_CODE	char	10	The code of the survey.
SURVEY_TYPE	char	15	The type of the survey; household survey, special survey for specific disease.
SURVEY_DATE	date	8	The date of the survey was conducted.
TITLE	char	35	The title of the survey.
SAMPLING_STRATEGY	char	18	The sampling strategy which the survey was taken i.e. total population, two stages random sampling, cluster sampling.
SAMPLING_SIZE	num	5	The size of the sample from the population.
TARGET_POPULATION	char	25	The target population; town/district residents, displaced persons camp.
FOCUS_OF_SURVEY	char	10	The focus of the survey; mortality, morbidity, nutrition
REPORT_AVAILABLE	char	15	The kind final report which is available; written report, survey forms.
SUR_DOC_NO	char	10	The document number for the final written report.

DATA ELEMENT NAME	Type	Field length	Short description
AUTHOR	char	25	The name of compiled person/ agency of the final report of the survey
ABSTRACT	Mem o	-	A short description about the survey.
DOC_LOCATION	char	15	The location of the document of final survey report.
DATA_PROCESSING_ DATE	char	8	The date the final report was compiled

APPENDIX V

Database Structure

Structure for database: C:\DBASE4\ADMISSIO.DBF

Field	Field Name	Type	Width	Dec	Index
1	DATE	Date	8		Y
2	NAME	Character	25		Y
3	ADMISSIONS	Numeric	4		N
4	DISCHARGES	Numeric	4		N
** Total **			42		

Structure for database: C:\DBASE4\ANTINAT.DBF

Field	Field Name	Type	Width	Dec	Index
1	NAME	Character	25		Y
2	DATE	Date	8		Y
3	ANTEN	Character	23		Y
4	NO_ANT_CAS	Numeric	5		N
5	REFERRALS	Numeric	6		N
** Total **			68		

Structure for database: C:\DBASE4\DEATH.DBF

Field	Field Name	Type	Width	Dec	Index
1	DATE	Date	8		Y
2	NAME	Character	25		Y
3	CAUSE	Character	25		Y
4	NO_UV_5YRS	Numeric	4		N
5	NO_OV_5YRS	Numeric	4		N
** Total **			67		

Structure for database: C:\DBASE4\DELIVERY.DBF

Field	Field Name	Type	Width	Dec	Index
1	NAME	Character	25		Y
2	DATE	Date	8		Y
3	LIVEBIRTH	Numeric	3		N
4	STILLBIRTH	Numeric	3		N
5	LOWBIRTH_W	Numeric	3		N
** Total **			43		

Structure for database: C:\DBASE4\DISEASES.DBF

Field	Field Name	Type	Width	Dec	Index
1	DATE	Date	8		Y
2	NAME	Character	25		Y
3	DISEASE	Character	25		Y
4	UN_5YRS	Numeric	4		N
5	OV_5YRS	Numeric	4		N
6	REFERRALS	Numeric	4		N
** Total **			71		

Structure for database: C:\DBASE4\DISTRICT.DBF

Field	Field Name	Type	Width	Dec	Index
1	DIST_NAME	Character	15		Y
2	REGION	Character	15		N
3	POPULATION	Numeric	4		N
** Total **			35		

Structure for database: C:\DBASE4\EPI-CH.DBF

Field	Field Name	Type	Width	Dec	Index
1	NAME	Character	25		Y
2	ANTIGEN	Character	7		Y
3	NO_0_11MON	Numeric	5		N
4	NO_12_59MO	Numeric	5		N
5	DATE	Date	8		Y
** Total **			51		

Structure for database: C:\DBASE4\EPI-WO.DBF

Field	Field Name	Type	Width	Dec	Index
1	DATE	Date	8		Y
2	NAME	Character	25		Y
3	DOSES	Character	3		Y
4	PREGNANT	Numeric	4		N
5	NONPREGNAN	Numeric	4		N
** Total **			45		

Structure for database: C:\DBASE4\NUT.DBF

Field	Field Name	Type	Width	Dec	Index
1	DATE	Date	8		Y
2	NAME	Character	25		Y
3	AGE_IN_MON	Character	5		Y
4	MORE80PWH	Numeric	4		N
5	B70TO79PWH	Numeric	4		N
6	LESS70PWH	Numeric	4		N
** Total **			51		

Structure for database: C:\DBASE4\POSTNAT.DBF

Field	Field Name	Type	Width	Dec	Index
1	POSTNATAL	Character	23		N
2	CASES_SEEN	Character	5		N
3	REFERRALS	Numeric	3		N
** Total **			32		

Structure for database: C:\DBASE4\SURGERY.DBF

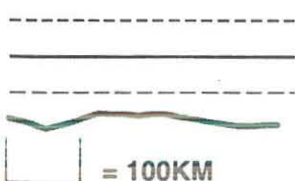
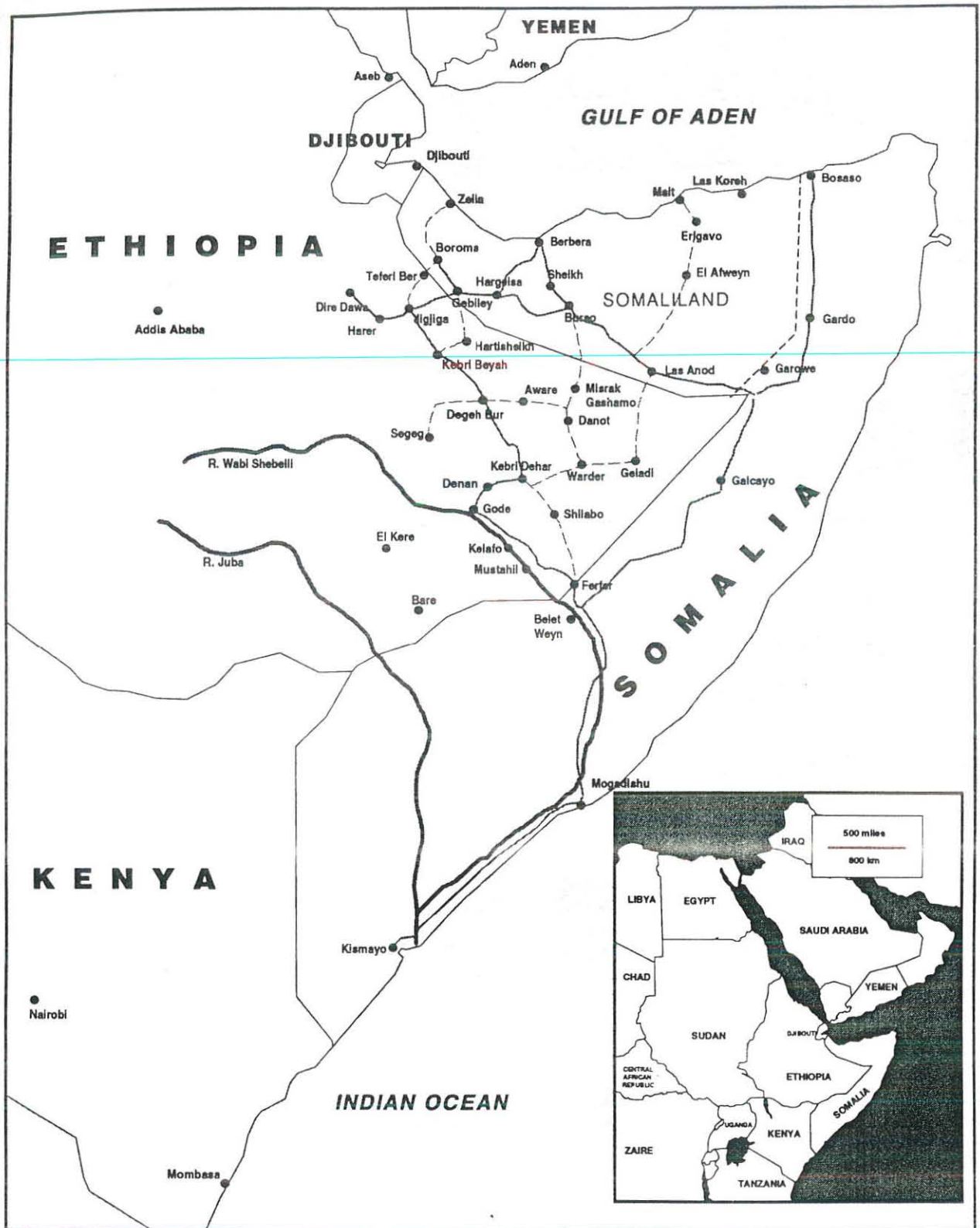
Field	Field Name	Type	Width	Dec	Index
1	DATE	Date	8		Y
2	Name	Character	25		Y
3	NO_ELE_SUR	Numeric	4		N
4	NO_EME_SUR	Numeric	4		N
** Total **			42		

Structure for database: C:\DBASE4.2\FACILITY.DBF

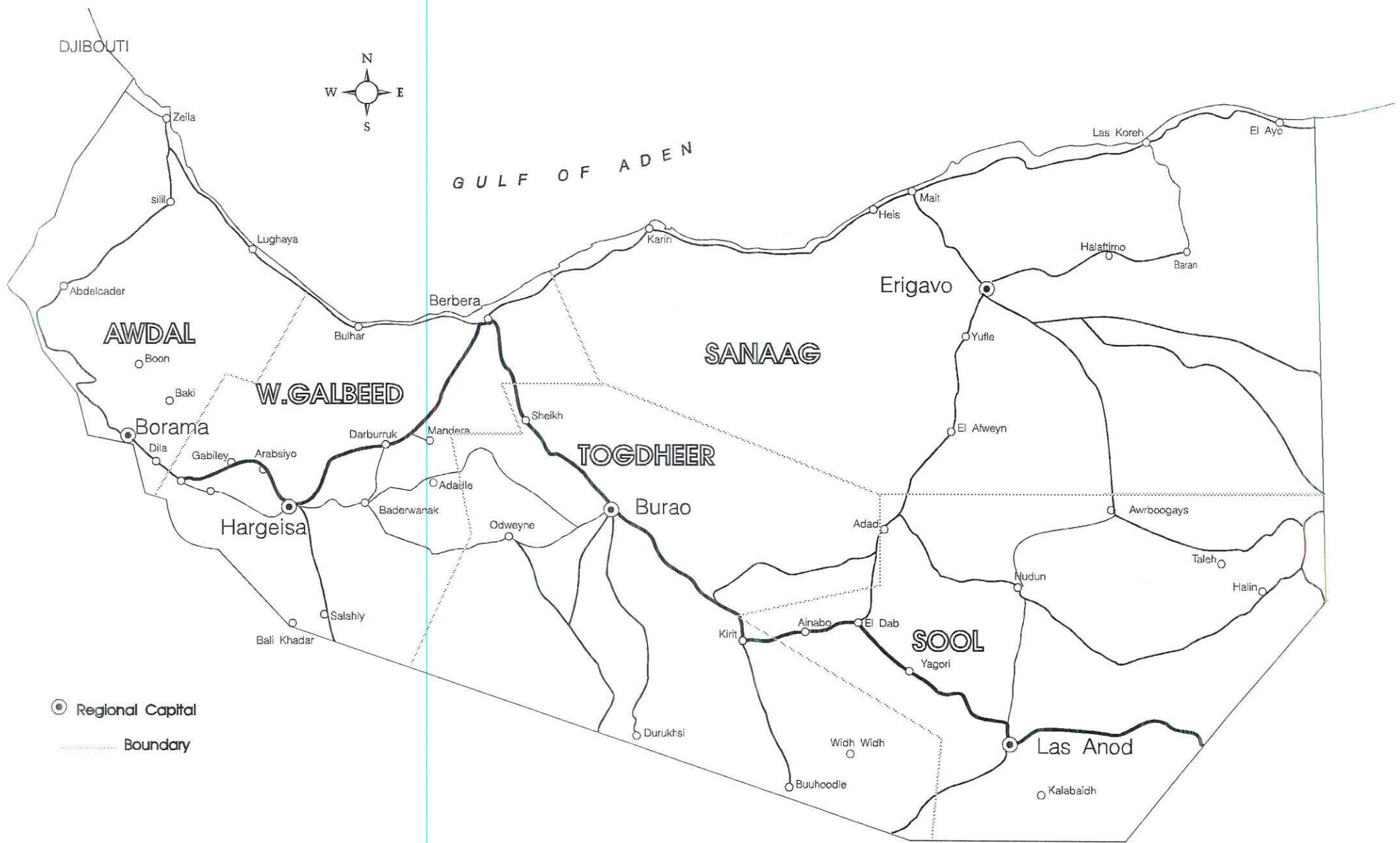
Field	Field Name	Type	Width	Dec	Index
1	NAME	Character	25		N
2	DIST_NAME	Character	15		N
3	REGION	Character	15		N
4	TYPE	Character	15		N
5	BED_CAPACI	Numeric	4		N
6	DOCTORS	Numeric	4		N
7	NURSES	Numeric	4		N
8	CHW	Numeric	4		N

9	ADMIN_STAF	Numeric	4	N
10	SUPPO_STAF	Numeric	4	N
11	HEAD_FACIL	Character	15	N
**	Total	**	110	

THE HORN OF AFRICA



Somalia / Somaliland border
Main road
Secondary road
River
Scale

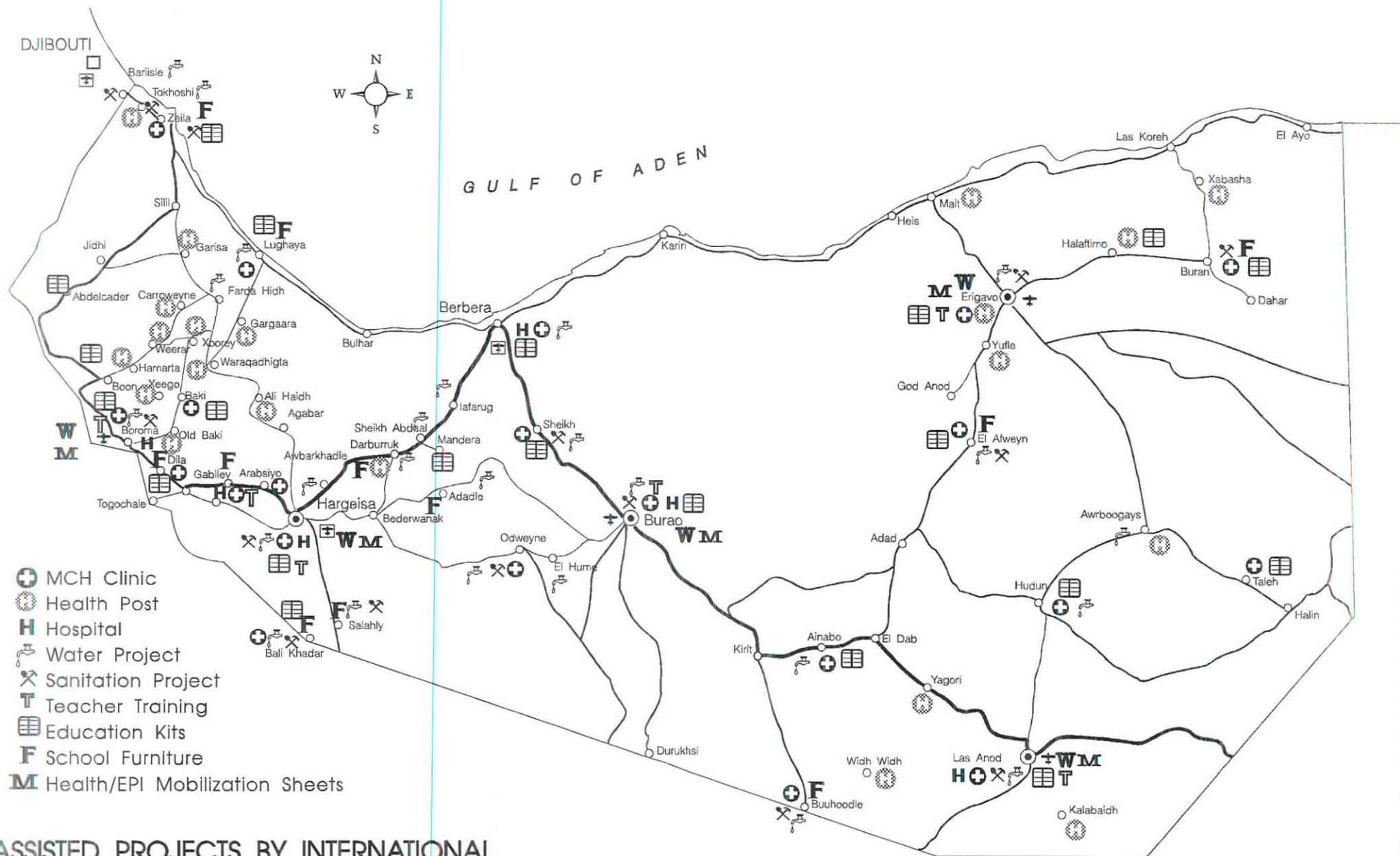


Regions of North West Somalia (SOMALILAND)

unicef Hargeisa

0 25 50 75 100 150 200

kilometres



- ⊕ MCH Clinic
- ⊙ Health Post
- H Hospital
- 💧 Water Project
- ✂ Sanitation Project
- T Teacher Training
- 📖 Education Kits
- F School Furniture
- M Health/EPI Mobilization Sheets

ASSISTED PROJECTS BY INTERNATIONAL
RELIEF ORGANISATIONS IN NORTHWEST SOMALIA
AS FEBRUARY 1994

