

PN - ABL - 669



*Vector Biology
and Control Project*

**Review of the Data Collection System of the
Swaziland Malaria Control Unit**

September 1990

by

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1. Introduction

At the request of USAID/Mbabane and the Ministry of Health (MOH) of the Government of Swaziland (GOS), the data management system of the Malaria Control Unit (MCU) was assessed during September 1990. The request for this consultancy resulted from a series of meetings between USAID/Mbabane, the MOH, the Centers for Disease Control (CDC) and the director of the South African National Institute of Tropical Diseases (NITD) in November 1989. One of the major recommendations from those meetings was that insecticide spraying in the future should be based on malaria epidemiology and that the malarious areas should be stratified accordingly.

This assessment was conducted through interviews with the staff of MCU, the CCCD project, MOH, the malaria advisor supplied by NITD, Kobas La Grange, staff of NITD and regional health inspector, Siteki; field trips to Big Bend, Siteki, Sitsatsaweni and Mhlumeni; and review of MCU and MOH documents.

The scope of work for this assignment was to 1) review in detail the data being collected by the malaria program, 2) develop recommendations on how the malaria database might be expanded and used to target program activities effectively, and 3) assess the desirability and feasibility of computerizing malaria data, including requirements for hardware, software and staff training.

2. Review

Current malaria information system

The vast majority of the MCU database consists of data about spray operations and blood smear results. Recently attempts have been made to use these data to link direct spray operations to areas of highest endemicity. The goal of spray operations, however, continues to be to cover the whole lowveld. There are plans to begin spraying only in areas of high endemicity.

For the purpose of spray operations and blood smear collection the country has been divided into three sectors: north, central and south. These sectors are not divided along political boundaries and may contain several of the country's regions used by MOH/-Mbabane. During the month before our visit, a malaria sector office was established at Big Bend, which for the time being will serve the central and south sectors. There are plans to establish offices for the north and south sectors. Once established, these offices will conduct spray operations, blood smear collection and reading, and data form generation. Currently operations are managed at MCU headquarters at Manzini.

A special grid map scale 1:150,000 has been prepared, and localities are coded according to their coordinates on this map. These locality codes are used for both spray operations and blood smear result forms. Hospitals and clinics are also given codes based on which of the three sectors they are located in. Again, these locality and hospital/clinic codes differ from those used by the MOH database.

Spray operations

Four forms are used for spray operations, MC1-MC4 (Annex 1). MC1 is the basic data-entry form. When completed by the malaria field offices and health assistant, it contains information about total structures sprayed and not sprayed, amount of DDT or Baythoid H sprayed, the number of home-

steads visited and the number of inhabitants observed by district and locality. MC2 is a card left at each hut and lists visits by health assistants and field officers. The daily activities from MC1 are summarized on MC4, the "Daily Spray Report." When spraying is completed in a locality data is summarized again on MC4, the "Locality Completion Report."

Malaria epidemiological information

The majority of patients presenting at the country's approximately 60 hospitals and clinics with syndromes of malaria are treated with a full dose of Daraclor (150mg chloroquine + 15mg pyrimethamine). Fansidar is used for treatment failures. Clinical cases of malaria are reported to the MOH as part of its health information system (HIS). Where slide data are available, hospitals and clinics also report that information to the MOH. Following treatment, slides are sent to MCU in Manzini for examination.

During the December 1988 - May 1989 (1988/1989) malaria season, 11,450 slides were collected and examined using this passive-case detection (PCD) methodology. Of these slides, 2,694, or 23.5 percent, were positive for malaria. The slide positivity rate for PCD slides remained approximately 20 percent for the 1989/1990 season. Hence, 75 to 80 percent of treated cases are slide negative. There is some concern at the MCU that hospital and clinic staff are not using the same criteria to diagnose cases.

In addition to PCD slides, the MCU has a very aggressive active-case detection (ACD) program. One of the rationales for this ACD program has been that the majority of cases detected in this manner are asymptomatic. This further complicates the case definition question. The four components of ACD are the following:

- o **Active surveillance:** visiting homesteads in an area and taking blood smears from people who are sick or have a recent history of illness with signs and symptoms of malaria.

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- o **Epidemiological surveys:** taking random smears from all people in a 5 km radius of the homestead where malaria occurred.
- o **Special surveys:** mass blood smears are taken at refugee camps (see below), schools and whole villages.
- o **Follow up:** smears taken at regular intervals from treated patients to ascertain total recovery.

During the 1988/1989 malaria season, 49,445 slides were examined, of which 1,734 were positive. During 1989/1990 more than 63,000 were examined, with about the same positivity rate, 3.5 percent. Data about the patient age and sex are recorded and reported in the annual report.

An increasing percentage of malaria cases are classified as being imported, with most of these cases coming with Mozambican refugees. These refugees are housed in two centers in Swaziland. A blood smear is taken from every newly arriving Mozambican, and a presumptive treatment with Daraclor is given. MCU at Manzini examines the smears, and the positives are given full treatment. As many as 30 percent of Mozambicans tested positive for malaria in 1988/1989. Recent blood smear examinations have revealed a much higher rate. Although all Mozambicans are supposed to report to the two reception centers, countless others are crossing the border at other sites. During this consultancy, talks were held with the regional veterinarian in Siteki about the possible use of cattle check points along the border as sites for collecting smears from refugees. Two potential sites, Sitsatsaweni and Mhlumeni, were also visited.

The MCU uses five forms for epidemiology: MC5, MC6 and MC8-MC10 (Annex 2). MC5 is the ACD form, and MC6 is the PCD form. MC8, Malaria Investigation Report, is used for follow-up. MC9 is the weekly sector PCD report, and MC10 is the weekly sector ACD report.

The MCU uses one additional form, MC7, for inventory control for drugs, slides and forms.

MCU's monthly malaria newsletter

The MCU publishes a monthly newsletter that lists hospitals by sectors and the number of slides sent for examination (Annex 3). It also contains vector control and entomology data. This newsletter is distributed to the MOH.

MOH health information system

The MOH, with USAID assistance through the primary health care project, has recently implemented a computerized health information system. This HIS is being decentralized to the country's four regional health offices. Included in this HIS is information about antenatal care, pediatric care, family planning and reportable adult diseases. Presumptive malaria, defined as a person having a fever (above 38° C) and chills, sweats or other signs and symptoms consistent with malaria, is included as a reportable disease. These malaria cases are reported directly to the MOH biostatistics section, not to the MCU, and they are not included in MCU statistics. This database is written in dBase III Plus. Staff of the regional offices have received computer training. There are plans to include the head of MCU in a computer training course.

3. National Institute of Tropical Diseases

South Africa supports a long-term malaria advisor to Swaziland and much of Swaziland's malaria control efforts. Discussions were held with Dr. C.F. Hansford, director; Ms. Hettie Muller, biostatistician, and other members of South Africa's National Institute of Tropical Diseases (NITD) about their computerized data management system (Annex 4). This system uses dBase III to collate the data received from the various authorities and describes the situation by regions for weekly and monthly reports. Weekly notifications are sent to the MOH in Pretoria by diskette to be included in the South African MOH information system. We discussed the development of the Swaziland malaria database and agreed that where possible, Swaziland's database would be compatible with the NITD's database.

4. Recommendations

1. Malaria information system

Malaria epidemiological surveillance and information systems, originally developed during the eradication era, have not been changed to reflect the current strategy of control. These systems have depended almost exclusively on blood smear data to direct spraying operations. The MCU has this type of data management system, but has expressed interest in expanding its database to be more in line with control strategy. The goal would be to establish a rapid monitoring system that would be sensitive not only to changes in the number and severity of cases but also to changes in relevant predictive or causal indicators of malaria. Such a system would allow more efficient stratification, and allocation of human, financial and material resources. It would permit the MCU to target its services to prevent outbreaks and epidemics rather than merely to respond to their occurrences.

It is recommended that the VBC Project supply an epidemiologist/health information specialist for four weeks to begin developing and computerizing the database. During this assessment, a sample computerized database was developed and demonstrated to the MCU staff (Annex 5). The MCU staff said such a database would be very desirable in Swaziland. Before the next consultancy, the MCU should analyze the system in detail. The VBC Project has prepared a guide for conducting this analysis, which has been given to the MCU (Annex 6). Hardware and software should be acquired before the consultancy.

2. Hardware and software

The MCU be supplied with a microcomputer. Specification for this computer should include an 80386 processor, 25 mHz, with a 60 mb hard disk, 2 mb RAM, one 5 1/4" 1.2 mb floppy drive, one 3 1/2" 1.4 mb floppy drive, internal magnetic tape backup, and an uninterrupted power supply.

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In addition, MCU should be supplied with a near-letter-quality (132 dpi), high-speed, wide-carriage printer.

Recommended software:

Word Perfect 5.1
dBase III+
Lotus 1-2-3
EPINFO
Harvard Graphics
Norton Utilities
DOS

3. Training

The MOH plans to give the head of the MCU basic computer training. As part of the scope of work for the future VBC consultancy, it is important that this training be coordinated with additional training of other MCU staff members. The consultant will train staff to use the database, enter data and generate reports.

4. Compatibility with MOH HIS

The malaria database should be compatible with the MOH database. Where feasible, both should use standard codes, especially locality and hospital/clinic codes so that MCU data becomes site-compatible with that of the MOH.

5. Future malaria information system development

The MCU has expressed an interest in developing a malaria geographic information system (GIS). The MCU currently maps its spray operations manually. I recommend that a GIS be developed after the computerized database has been established.

As decentralization of malaria control efforts proceeds, decentralization of the information system should be considered. Computers and software might be appropriate for the planned malaria sector offices.

Annex 1

Data Collection Sheets for Spray Information

**SWAZILAND MALARIA CONTROL
HUTCARD MC 2**

DATE	SPRAYMAN	H.A.	F.O.

INSPECTIONS

DATE	H.A.	F.O.	COMMENT

DISTRICT: _____
LOCALITY: _____

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SWAZILAND MINISTRY OF HEALTH Malaria Control Unit Manzini

Daily Spraying Report

Sector: Date:
 District: Field Officer:
 Locality: Vehicle Number:
 Code: Kilometers:

Foreman	Sprayman	Huts Locked	(A) Huts sprayed	(B) Other structures	(A) + (B) Total	Can refills	Inhabitaris	Number of homesteads
No.	No.							
	No.							
	No.							
Total	X							
No.	No.							
	No.							
	No.							
Total	X							
No.	No.							
	No.							
	No.							
Total	X							
No.	No.							
	No.							
	No.							
Total	X							
No.	No.							
	No.							
	No.							
Total	X							
Team Total	X							

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Foreman's Reports:
(Staff problems, refusals, etc.)

A. Foreman No.:

- 1.
.....
.....

Signature

B. Foreman No.:

- 1.
.....
.....

Signature

C. Foreman No.:

- 1.
.....
.....

Signature

D. Foreman No.:

- 1.
.....
.....

Signature

E. Foreman No.:

- 1.
.....
.....

Signature

Field Officer No.:

- 1. Checked and Certified correct.
- 2. Comments:
.....
.....
.....
.....

Signature

Annex 2
Malaria Case Detection Sheets

SWAZILAND MINISTRY OF HEALTH
MALARIA CONTROL UNIT, MANZINI

MCS

DATE:

ACTIVE CASE DETECTION AS ES SS FU

SECTOR: DISTRICT: LOCALITY: CODE:

CHIEF: INDUNA:

Slide No.	Name of Patient	Name of Householder	Area	Age	Sex	Sick	Was Sick	Not Sick	Treatment Given	Lab. Result
a										
b										
c										
d										
a										
b										
c										
d										
a										
b										
c										
d										
a										
b										
c										
d										
a										
b										
c										
d										

Inter Agencies

ACTIVE CASE DETECTION, MALARIA SYMPTOMS AND PRESUMPTIVE AND FULL TREATMENT

1. Ask if person feels sick. If the answer is yes, take a bloodsmear and give presumptive treatment.
2. If the answer is no, ask if the person had been sick during the preceding 2 months. If the answer is yes, take a bloodsmear and give presumptive treatment.
3. Ask if there are any foreigners (e.g. Mozambicans) present or in the vicinity. Always take a bloodsmear of such people and give presumptive treatment whether the person is sick or not.
4. If a person has any of the following symptoms, or had them recently, malaria must be suspected, a bloodsmear taken and presumptive treatment given:

Fever
Sweats (hot)
Chills (cold, shaking feeling)
Body pains
Headache.

5. PRESUMPTIVE TREATMENT

Birth - 11 months : 1 1/2 teaspoons syrup or 1/2 tablet
 1-3 years : 3 teaspoons syrup or 1 tablet
 4-6 years : 1 1/2 tablets
 7-11 years : 2 1/2 tablets
 12 years and over : 4 tablets

6. FULL TREATMENT

Age group	Day 1 No. of Tablets	Day 2 No. of Tablets	Day 3 No. of Tablets	Total Tablets
Birth - 11 months	1/2 or 1 1/2 tsp. syrup	1/2 or 1 1/2 tsp. syrup	1/2 or 1 1/2 tsp. syrup	1 1/2 or 4 1/2 tsp. syrup
1-3 years	1 or 3 tsp syrup	1 or 3 tsp. syrup	1 or 3 tsp. syrup	3 or 9 tsp. syrup
4-6 years	1 1/2	1 1/2	1	4
7-11 years	2 1/2	2 1/2	1	6
12 years and over	4	4	2	10

SWAZILAND MINISTRY OF HEALTH

MALARIA CONTROL UNIT, MANZINI

Passive Case Detection					Hospital/Clinic:		
Date	Slide No.	Patient's Name	Age	Sex	Name of Householder	Area	Lab. Result
	a						
	b						
	c						
	d						
	a						
	b						
	c						
	d						
	a						
	b						
	c						
	d						
	a						
	b						
	c						
	d						

Inter Agencies

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SWAZILAND MINISTRY OF HEALTH

MALARIA CONTROL UNIT, MANZINI

Passive Case Detection					Hospital/Clinic:		
Date	Slide No.	Patient's Name	Age	Sex	Name of Householder	Area	Lab. Result
	a						
	b						
	c						
	d						
	a						
	b						
	c						
	d						
	a						
	b						
	c						
	d						
	a						
	b						
	c						
	d						

Other Agencies

Handwritten mark

SWAZILAND MINISTRY OF HEALTH
MALARIA CONTROL UNIT, MANZINI

Order form for anti-malaria drugs, micro slides and forms

Name of Hospital/Clinic/Health Assistant:

Date:

Name of drug/item	Amount/Number on hand	Amount/Number required	Amount/Number issued
Chloroquine tablets			
Chloroquine syrup			
Daraclor tablets			
Daraclor syrup			
Daraprim tablets			
Daraprim syrup			
Fansidar tablets			
Quinine tablets			
Quinine (intravenous)			
Micro slides			
Forms MC6			
Forms MC7			
Forms MC14			

Inter Agencies

.....
Signature

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SWAZILAND MINISTRY OF HEALTH

MALARIA CONTROL UNIT, MANZINI

MALARIA INVESTIGATION REPORT

Case Number: _____

1. Full names: _____ Sex: _____ Age: _____

2. Nationality: _____ 3. Residential Address: (A) Sector _____

(B) District _____ (C) Locality _____ (D) Code _____

4. (a) Places spent overnight during incubation period:- Locality/Place From - To

0-7 days prior to commencement of illness		
8-12 days prior to commencement of illness		

(b) Other places visited during period 21 days to \pm 1 year prior to illness

5. Type of infection

P. falc.	P. falc. + gam.	P. mal.	Other
----------	-----------------	---------	-------

6. When did illness commence (date) _____

7. Where did illness commence (address) _____

8. Has patient ever had similar illness before

Yes	No
-----	----

9. If yes, when? - Give estimated date _____

10. Date when bloodsmear was taken _____

11. What treatment did patient receive (a)

Full	Presumptive
------	-------------

By whom _____ when _____

(b) Drug _____

(c) Quantity administered _____

12. Number of ES smears taken _____ Number of people treated _____

13. Number of huts/houses tested _____ Number of anophelines found _____

14. Extent of anopheline breeding in the vicinity

Much	Little	None
------	--------	------

15. Has the locality been sprayed?

Yes	No
-----	----

 If yes, when? _____

16. Has the hut/house been sprayed?

Yes	No
-----	----

 Number _____

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17. Other infections detected during the past year in the adjacent area

Case Number	Date	Place

18. Comments:

Signed _____ Rank _____ Date _____

19. Comments by responsible Health Inspector (probable source of infection, preventative steps taken, etc.)

20. Entered in register on (date) _____

Signed _____ Rank _____ Date _____

SWAZILAND MINISTRY OF HEALTH
MALARIA CONTROL UNIT, MANZINI

PASSIVE CASE DETECTION: SLIDE REPORT

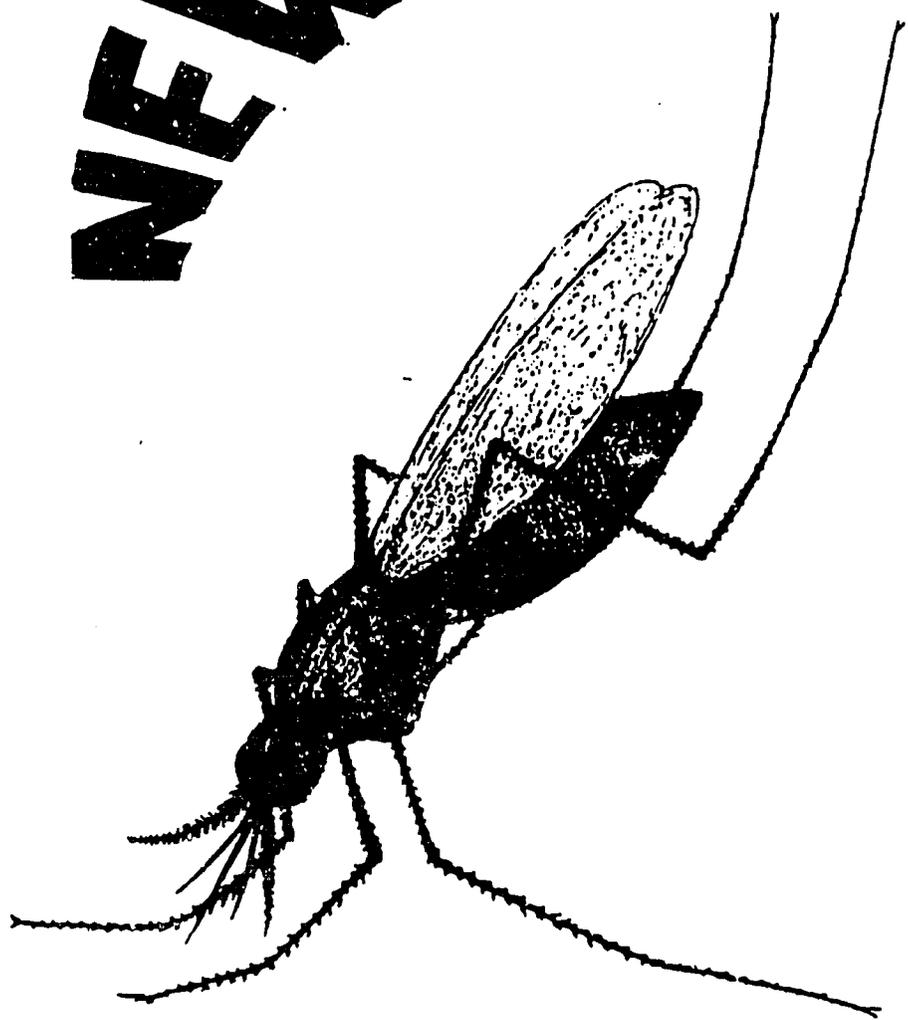
Sector:												Date:		Week:		Month:			
				Age Group															
Hospitals	Slides Ex.	Slides +ve	0-11 months		1-4 years		5-9 years		10-14 years		15+ years								
			Tot	+ve	Tot	+ve	Tot	+ve	Tot	+ve	Tot	+ve							
TOTAL																			
Clinics																			
TOTAL																			
TOTAL: Hospitals and Clinics																			

Annex 3

Malaria Control Unit Newsletter

MINISTRY OF HEALTH

NEWSLETTER



**MALARIA CONTROL UNIT
MANZINI
SWAZILAND**

FB

**HOSPITAL AND CLINICS TREATING MALARIA CASES AND TAKING BLOODSMears
SLIDES EXAMINED AND NO. OF POSITIVES FOR THE PERIOD...**

NORTH SECTOR			CENTRAL SECTOR			SOUTH SECTOR		
	Ex	+ve		Ex	+ve		Ex	+ve
PIGGS PEAK			MALINDZA (REF. C.)			HLATIKULU		
HORO			TIKHUBA	4	-	H.O.M.	11	-
NTFONJENI			SIPHOFANENI	23	-	NTJANINI		
MHLANGATANE			SINCENI	20	-	MATSANJENI		
BIJLANDZENI			SITHOBELA			LAVUMISA	1	-
LOMAHASHA	18	-	GILGAL			LUBULI		
VUVULANE	33	-	SIGCINENI			J.C.I		
MADLANGEMPISI			GOOD SHEPHERD	2	2	EKUPHUMULENI		
DVOKOLWAKO	41	-	MAFUTSENI	1	-	BHOLI	53	-
MANGWENI	32	1	ST. JULIANA			U S D F		
HEREFORD			SITEKI NAZARENE	3	-	R.F.M.	3	3
JACK'S			EBENEZER			OUR LADY OF SORROWS	4	-
EMKHUZWENI (EHC)	11	1	SIGCAWENI			ST. PHILLIPS	58	1
ENDZINGENI			MANYEVENI			EKWEZI		
FLORENCE			GUNDVWINI			NDZEVANE (REF. C)	168	4
MLIBA	2	-	MPAKA (RAILWAY)			MBUTFU		
BALEGANE			SIDVOKODVO	3	1	DLAKADLA		
SHEWULA	137	-	TAMBUTI	1	-	B B S E		
NGONINI			BIG BEND	54	-	NGCINA		
ROCKLAND			MPAKA CLINIC			ENKWENI		
TSHANENI			SITSATSAWENI	1	-			
MHLUME	4	-	GEBENI	3	-			
TABANKULU	4	-						
MLAWULA								
SIMUNYE	47	-						
MOBILE CLINIC	28	-						
TOTAL	357	3	TOTAL	115	3	TOTAL	298	8

	Ex	+ve
GRAND TOTAL	770	14

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Malaria Control Unit

P.O. Box 53
MANZINI
SWAZILAND
Tel. 52041

ACTIVITIES OF THE MALARIA CONTROL UNIT DURING NOVEMBER 1989

INTRODUCTION

Malaria transmission remain at a very low level. The hard rains we experience towards the end of the month will probably have a negative effect on the build-up of mosquito population due to larvae being washed away.

1. PARASITOLOGY

Passive Case Detection

Hospitals and Clinics submitted 770 bloodsmears for examination at our Manzini Laboratory. Only 14 were found to be positive (1.8%).

Active Case Detection

6496 bloodsmears were collected during active surveillance, special and epimiological surveys. The 50 positives were later traced and given full treatment.

2. VECTOR CONTROL

Spraying all dwellings in the malarious areas with residual insecticides continued. A further 29032 structures sprayed, bringing the total to 94654.

Spraying Statistics

Number of Homesteads visited:	5788
Number of Structures sprayed with DDT 75%:	23078
Amount of DDT 75% consumed:	3050 kg.
Number of Rooms sprayed with Baythroid H:	5954
Amount of Baythroid H consumed:	19,64 kg.
Number of Inhabitants protected:	40593

3. ENTOMOLOGY

Entomological work was disrupted by unfavourably weather conditions. However, towards the end of the month malaria vector mosquitoes (*An. gambiae sl.*) were collected in small numbers resting inside unsprayed huts as well as biting man outdoors.

GENERAL

All Hospitals and Clinics are requested to advise this office **Immediately** of any suspected outbreaks in their catchmen areas. Two or three cases from a locality may mean a serious threat to the health of the other inhabitants in the area which can be prevented by timely action from this unit. Your assistance in this matter will be highly appreciated.

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Annex 4
Description of NITD's Data Management System

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NATIONAL INSTITUTE FOR TROPICAL DISEASES, TZANEEN

August 30, 1990 (UPDATE)

COMPUTERISED SYSTEM USED FOR THE COORDINATION OF DATA
COLLECTED BY THE MALARIA CONTROL PROGRAMME

BACKGROUND

Malaria (*Plasmodium falciparum*, *ovale*, *malariae* or *vivax*) is a notifiable medical condition in terms of section 45 of the HEALTH ACT, 1977 (ACT No. 63 OF 1977).

The responsibility for the malaria control programme is shared by five authorities in Transvaal and two in Natal. The malaria control programme consists of three main components:

Firstly, the preventative measures comprise mainly of spraying of dwellings with residual insecticides and larvaciding of breeding sites of vector mosquitoes. Documentation of the handling of data concerning spraying activities is presented in paragraph 1.

Secondly, the monitoring measures comprise of entomological collections and identification of vector mosquitoes, bio-assays and active surveillance of possible human carriers of the disease. Documentation of the handling of data concerning active surveillance activities is presented in paragraph 2.

Thirdly the notification of all positive bloodsmear results of patients from Northern Transvaal region and the national states in Transvaal is handled by the Institute. (Active, passive and resistant cases). Documentation of the handling of this data is presented in paragraph 3.

3 COMPUTERISED SYSTEM FOR THE NOTIFICATION OF POSITIVE
MALARIA INFECTIONS IN THE RSA

3.1 INTRODUCTION

A drastic increase occurred in the total number of malaria infections in the country during 1985, from about 5000 cases per year to 12000 cases! The handwritten system was heavily overburdened and it was decided to purchase a micro computer

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for the handling of the data at the Institute. Notifications from the national states in Transvaal and Northern Transvaal region are co-ordinated at the Institute in Tzaneen and then forwarded to the relevant sections at head office in Pretoria.

The details of the computerised system to be used were finalised with the co-operation of the Directorate: Epidemiology at head office in Pretoria. It was decided that the software most suitable for handling the data would be a database and a copy of dBase 111+ was subsequently purchased. It was also decided that the same system would be introduced and used in Natal and Kwazulu.

3.2 OBJECTIVE

If computerised, the data received from the various authorities and individuals in a specific region could be collated with more ease to describe the broader picture of malaria in the region by producing the weekly and monthly reports with greater speed and accuracy. Another advantage would be that the weekly notifications could be sent electronically (i.e. per diskette) to Pretoria which would lessen the burden of data input on their side considerably.

3.3 DATA INPUT AND EDITING OF DATA

3.3.1 Data entry

3.3.1.1 Initial notification data is entered into the masterfile C:NATMAL.dbf which is kept in the directory C:\DBDOC. A copy of the structure of the file and descriptions of the fields used is presented herewith.

A separate record is used for every case which is uniquely identified by its case number and entered into the fields IDREG and IDREM. Initial notification data comprises about 80% of the record.

STRUCTURE OF C:NATMAL.dbf

Field no	Field name	Type	Width
1	COUNT	Numeric	1
2	WEEKNO	Character	2
3	IDREG	Character	1
4	IDREM	Character	7
5	BS_DATE	Date	8
6	NAME	Character	15
7	SURNAME	Character	15
8	RACE	Character	1

9	SEX	Character	1
10	AGE	Character	2
11	REPBY	Character	15
12	DETECT	Character	2
13	FU_SMEAR	Logical	1
14	PLASMODIUM	Character	2
15	NOTIDIST	Character	5
16	NOTILOC	Character	5
17	SOURCELOC	Character	8
18	SOURCESEC	Character	5
19	SOURCEDIST	Character	5
20	SOURCE	Character	3
21	PHASE	Character	1
22	DIED	Logical	1

** Total 107

FIELD DESCRIPTIONS OF C:NATMAL.dbf

1. COUNT - This is a counter variable which is always 1 for a proven malaria case.
2. WEEKNO - Week number in the year; range 01 to 52.
3. IDREG - This is a single character denoting the region from which the case is notified. One of the following letters is used:
 - W - N. Tvl region (white areas)
 - V - Venda
 - K - Kangwane
 - L - Lebowa
 - G - Gazankulu
 - Z - Kwazulu
 - N - Natal
 - R - Rest of RSA
4. IDREM - This is the remainder of the case number (unique identification of a case). The first character denotes the year, e.g. "7" for 1987. The second character contains either "A" (active detection) or "P" (passive detection). Characters 3 to 7 denote the unique number of the case in the given region for the year in question.
5. BS_DATE - Date of bloodsmear
6. NAME - First name of the case
7. SURNAME - Surname of the case
8. RACE - The population group is indicated by codes:
 - W - White
 - A - Asian

C - Coloured
B - Black
blank - Unknown

- 9 SEX - indicated by M for male
F for female
blank if sex unknown
10. AGE - age is indicated in years; range 0-99.
0 if a child is less than 1 year old
field is left blank if age is unknown

11. REPBY - Name of individual or institution reporting the case

12. DETECT - Method of detection of case indicated by codes:

01 - active ASA smear (symptomatic/ill)
02 - active ASB smear (was ill)
03 - active ASC smear (immigrant)
04 - active ASD smear (visitor)
05 - active ASE smear (routine smear)
06 - active ES smear (epidemiological smear)
07 - active SS/MS smear (mass survey)

10 - passive smear from a hospital/doctor
11 - passive smear from a clinic
12 - passive smear examined at NITD

13. FU_SMEAR - if a follow-up smear is done, and the result of the smear is positive, this field is denoted with "T" (logical field); else this field is not used

14. PLASMODIUM - Parasite type and presence of gametocytes are indicated by 2 characters. The first is a letter denoting the type of parasite (asexual forms) i.e.

F - Plasmodium falciparum
M - Plasmodium malariae
O - Plasmodium ovale
V - Plasmodium vivax
X - Mixed infection

The second position is only filled in by "G" if gametocytes are present as well.

15. NOTIDIST - Magisterial district from which the case is notified: first 5 letters of the name

16. NOTILOC - Locality from which the case is notified: first 5 letters of the name

17. SOURCELOC - Locality where case was infected: first 5 letters of the name
18. SOURCESEC - Sector where case was infected: first 5 letters of the name
19. SOURCEDIST - Magisterial district where case was infected: first 5 letters of the name
20. SOURCE - This is a summary of the source of infection of the case and is filled in as follows:

- LOC - local infection, including indigenous, introduced and induced cases
- MOC - case infected in Mocambique
- ZWA - case infected in Swaziland
- SWA/NAM - case infected in South West Africa/Namibia
- ZIM - case infected in Zimbabwe
- ZAM - case infected in Zambia
- MAL - case infected in Malawi
- TAN - case infected in Tanzania, etc
- UNT - case untracable/unclassified source

21. PHASE - indicates control strategy operative in area concerned
22. DIED - if case died due to malaria enter "T" (logical field)

3.3.1.2 When case investigation data is submitted, it is added to the original notification data. The specific record is located by using the two unique fields, IDREG and IDREM, by utilising routine 3 of OPSIELYS.prg. (app 1).

3.3.2 Data editing

3.2.1 Routine 2 of OPSIELYS.prg counts and lists the new data entries. Editing of the relevant records is then allowed.

3.3.2.2 Editing and checking of data before compilation of the FMCR

To ensure that all case investigation data have been received for a specific month, routine 1 thru 3 of MENU.prg (app 2) lists the records per authority for which the case investigation data are still outstanding. These lists are forwarded to the relevant authorities to request the case investigation reports of these cases. Cases are classified as untraceable when the case investigation reports are not received within four months of the month in which the bloodsmear was taken.

3.4 DOCUMENTS PRODUCED

MENU.prg and OPSIELYS.prg give access to the various routines employed to compile the various documents. Detail of these routines with references to the relevant paragraphs appear in appendices 1 and 2.

The masterfile, indexed in several ways, is the source file for the production of all the reports. At the end of each run, the temporary files created are erased.

3.4.1 Weekly register

A weekly register of the cases notified for a specific week is prepared and printed by routines 4 and 5 of OPSIELYS.prg using mainly the report function of dBase 111+.

Copies of this document are sent weekly to each authority participating in the malaria control programme in Transvaal and Venda, providing them with immediate feedback of the notifications from all the malarious areas in Transvaal and Venda. Fields listed are:

IDREG, IDREM, BS_DATE, NAME, SURNAME, SEX, AGE, RACE, REPBY, PLASMODIUM, NOTILOC, NOTIDIST.

It is envisaged to use more characters in NOTILOC field of the masterfile for greater clarity.

3.4.2 Weekly notifications: A:NATMALXX.dbf

The database file, NATMALXX.dbf, containing all fields of the notification data, is prepared weekly by routine 6 of OPSIELYS.prg on diskette which is sent to the Directorate Epidemiology in Pretoria where the data is incorporated into the national system for notifiable medical conditions. The "XX" in the filename represents the week number, ranging from 1 to 52. This file contains exactly the same data as the register mentioned above.

3.4.3 Weekly notifications of notifiable medical conditions per magisterial district (GW 17/3) (cases) to Directorate Epidemiology, Pretoria.

This document is compiled by routine 6 of OPSIELYS.prg using mainly the report function of dBase 111+. Fields listed per district of notification (i.e. NOTIDIST), are NAME, SURNAME, AGE, SEX, RACE, NOTILOC, BS_DATE, IDREG, and IDREM. Notifications are grouped by magisterial district of notification.

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3.4.4 Weekly notifications of notifiable medical conditions per magisterial district (GW 17/4) (deaths) to Directorate Epidemiology, Pretoria.

This document is only compiled when a death due to malaria occurs. Detail listed are name, surname, age, sex, race, residential address of the deceased, duration of illness and date of death.

3.4.5 Weekly summary of notifications (Mal 14)

This summary report is compiled by the second part of routine 6 of OPSIELYS.prg using mainly the summary report function of dBase 111+. At the end of a calendar month these weekly summaries are used in the compilation of the general monthly report.

3.4.6 Progressive Malaria Case Report (PMCR)

3.4.6.1 This document is compiled monthly, reporting on the number of malaria cases per magisterial district for the calendar year to date with respect to source of infection, detection method and species of Plasmodium involved. This report is only produced three to four months after the month in which the cases have occurred.

Routines 4 and 5 of MENU.prg are employed to compile the summary report yielding the total number of cases per magisterial district (i.e. district where infection originated) for the relevant month with respect to source of infection (i.e. whether cases were imported, originated locally or were untraceable), detection method and species of Plasmodium involved.

The summary report is used to compile the final PMCR which consists of two parts, i.e. the PMCR for areas in the attack phase of the malaria control programme and the PMCR for areas in the consolidation phase of the programme.

3.4.6.2 At the end of each calendar year a summary report in similar format to the monthly PMCR is compiled irrespective of the control strategy operative in the specific districts. Routines 8 and 9 of OPSIELYS.prg are utilised for this purpose.

3.4.6.3 After completion of the PMCR a complete database file containing initial notification and case investigation data is compiled and forwarded (on diskette) to the Directorate Epidemiology in Pretoria, thus informing them on the true source of the infections for a specific calendar month. The file is A:YYNATMAL.dbf where 'YY' represents the first two letters of the relevant calendar month (The months

of June and July pose a problem and for this reason we use 'JN' for June and 'JL' for July). Routine 7 of OPSIELYS.prg is utilised for this purpose.

3.4.6.4 The totals of the various categories in the tabulated PMCR are entered (per region) into the Framework spreadsheet files i.e. C:19ZZ_LOC.FW2 and C:19ZZ_IMP.FW2, storing the number of indigenous cases and number of imported cases respectively for the calendar year 19ZZ. These Framework files are kept in the directory C:\FWDOC. Please note that the untraceable cases are classified as local cases in these summaries.

3.4.6.5 At the end of the calendar year when all data have been received for that year, the masterfile is renamed to NATMALZZ.dbf where 'ZZ' denotes the last two digits of the year. Data for the current year is then entered into C:\DBDOC\NATMAL, the new master file used in all routine operations.

3.4.7 Seasonal data

The calendar year and the malaria season do not correspond. Therefore seasonal data files in the same format as the masterfile are compiled continuously to reflect the position since 1 July to 30 June, e.g. file C:\DBDOC\MAL90_91.dbf will be the file for the current season. Summaries of the PMCR compiled from this data give up to date information and will be distributed as preliminary PMCR to the various authorities involved. The information on outstanding case investigations can be assessed in more perspective with the aid of these summaries.

3.4.8 Resistant malaria

With the event of certain strains of Plasmodium falciparum parasites being resistant to chloroquin, it became necessary to keep record of such malaria cases.

A special data file, C:\DBDOC\RESMAL.dbf, was created for this purpose. To qualify for entry into the file a malaria case must be positive for trophozoites on a follow-up smear, i.e. bloodsmear done after the first course of chloroquin treatment. This treatment may be presumptive or a therapeutic dose of chloroquin (DARACHLOR = CHLOROQUIN + PERIMETHAMINE). The variables in C:\DBDOC\RESMAL.dbf are firstly listed per type and width and then described below.

STRUCTURE OF C:\DBDOC\RESMAL.dbf

Field no	Field name	Type	Width
1	COUNT	Numeric	1

2	IDREG	Character	1
3	IDREM	Character	7
4	NAME	Character	15
5	SURNAME	Character	15
6	SEX	Character	1
7	AGE	Character	2
8	REPBY	Character	15
9	NOTIDIST	Character	5
10	SOURCELOC	Character	8
11	SOURCESEC	Character	5
12	SOURCEDIST	Character	5
13	SOURCE	Character	3
14	SDATE1	Date	8
15	RES1	Character	3
16	SDATE2	Date	8
17	RES2	Character	3
18	SDATE3	Date	8
19	RES3	Character	3
20	SDATE4	Date	8
21	RES4	Character	3
22	SDATE5	Date	8
23	RES5	Character	3
24	SDATE6	Date	8
25	RES6	Character	3
26	SDATE7	Date	8
27	RES7	Character	3
28	TDATE1	Date	8
29	TREAT1	Character	6
30	TDATE2	Date	8
31	TREAT2	Character	6
32	TDATE3	Date	8
33	TREAT3	Character	6
34	TDATE4	Date	8
35	TREAT4	Character	6
36	TDATE5	Date	8
37	TREAT5	Character	6
38	STATUS	Character	1
39	RTYPE	Character	2

** Total ** 234

FIELD DESCRIPTIONS OF C:\DBDOC\RESMAL

Field no	Field name	Description
1	COUNT	This is a counter variable and is always = 1 for a case.
2	IDREG	Same as in C:NATMAL.dbf
3	IDREM	Same as in C:NATMAL.dbf
4	NAME	Patient's first name

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5 SURNAME Patient's surname

6 SEX Sex of patient (M/F/blank if unknown)

7 AGE Age of patient in years

8 REPBY Name of individual reporting case

9 NOTIDIST Magisterial district from where case
was reported

10 SOURCELOC Same as in C:NATMAL.dbf

11 SOURCESEC Same as in C:NATMAL.dbf

12 SOURCEDIST Same as in C:NATMAL.dbf

13 SOURCE Same as in C:NATMAL.dbf

14 SDATE1 Date of the first positive
bloodsmear expressed as mm/dd/yy

15 RES1 The result of the first bloodsmear
is recorded in 3 characters, the first
character indicates the Plasmodium
type; the second the number of
trophozoites present and the third the
number of gametocytes present per
microliter.

codes (for first character):

 F - Plasmodium falciparum

 M - Plasmodium malariae

 O - Plasmodium ovale

 V - Plasmodium vivax

 X - mixed infection

 blank, no trophozoites/asexual forms

codes (for second character):

 T - trophozoites present, count unknown

 1 - <26

 2 - 26-99

 3 - 100-499

 4 - 500-999

 5 - 1000-1999

 6 - >2000

codes (for third character):

 G - gametocytes present, count unknown

 1 - <26

 2 - 26-99

 3 - 100-499

 4 - 500-999

 5 - 1000-1999

 6 - >2000

16 SDATE2 Date of the second positive bloodsmear

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17	RES2	Result of second bloodsmear
18	SDATE3	Date of the third positive bloodsmear
19	RES3	Result of third bloodsmear
20	SDATE4	Date of the fourth positive bloodsmear
21	RES4	Result of fourth bloodsmear
22	SDATE5	Date of the fifth positive bloodsmear
23	RES5	Result of fifth bloodsmear
24	SDATE6	Date of the sixth positive bloodsmear
25	RES6	Result of sixth bloodsmear
26	SDATE7	Date of the seventh positive bloodsmear
27	RES7	Result of seventh bloodsmear
28	TDATE1	Date of the first treatment
29	TREAT1	Type of treatment is indicated in 6 characters . The first and fourth reflect the first letter of the drug(s) used in treatment,, allowing for 2 drugs used simultaneously
	codes:	B - Bactrim C - Chloroquin D - Darachlor F - Fansidar Q - Quinine P - Primaquin M - Mefloquin T - Tetracyclin
	note	The second/third and fifth/sixth characters denotes the number of tablets given for the drug indicated in the first and fourth character respectively. If the treatment is unknown, the letters UNKNWN are entered across the 6 characters.
30	TDATE2	Date of second treatment
31	TREAT2	Type of second treatment; codes as in TREAT1
32	TDATE3	Date of third treatment
33	TREAT3	Type of third treatment
34	TDATE4	Date of fourth treatment

(1)

35	TREAT4	Type of fourth treatment
36	TDATE5	Date of fifth treatment
37	TREAT5	Type of fifth treatment
38	STATUS	Status of patient at last entry to RESMAL.dbf is denoted as follows:
	codes:	T - still on treatment, follow up smear not done/still positive
		C - cured, follow up smear negative
		L - lost to follow up, unable to find for a follow up smear
		D - died
39	RTYPE	Type of resistance is indicated in 2 characters; The first is the first letter of the drug to which the parasite is resistant and the second is the level of drug resistance which is coded as follows:
	codes:	0 - not resistant
		1 - resistance type 1
		2 - resistance type 2
		3 - resistance type 3
		8 - other

3.5 BACKUP ROUTINE

Backup of the notification data is done in dBase 111+ by storing the data on diskettes. An example of the routine employed to create the backup files is included in appendix 3.

Two identical sets of backup diskettes are kept in two different storage places. The filenames are reflecting the year of notification, eg. MAL89_2.dbf is the second diskette with notification data of 1989. The backup file for the latest data is usually made on Thursdays.

A backup file of all deceased cases for a specific calendar year is kept in C:\DBDOC\STERFZZ.dbf where 'ZZ' denotes the last two digits of the specific calendar year.

Annex 5
Sample Database

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Structure for database: C:PCD.dbf

Number of data records: 14

Date of last update : 09/12/90

Field	Field Name	Type	Width	Dec
1	LOCALITIES	Character	5	
2	TYPE	Character	2	
3	SECTOR	Character	7	
4	DATE	Date	8	
5	WEEK	Character	2	
6	MONTH	Character	12	
7	HOSPITAL	Character	10	
8	SLIDE_EXAM	Numeric	4	
9	SLIDE_POS	Numeric	4	
10	O11TOT	Numeric	3	
11	O11POS	Numeric	3	
12	ONEFOURTOT	Numeric	3	
13	ONEFOURPOS	Numeric	3	
14	FIVE9TOT	Numeric	3	
15	FIVE9POS	Numeric	3	
16	TEN14TOT	Numeric	3	
Press any key to continue...				
17	TEN14POS	Numeric	3	
18	FIFTEENTOT	Numeric	3	
19	FIFTEENPO	Numeric	3	
** Total **			85	

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09/12/90

WEEKLY PCD REPORT

SECTOR	DATE	WEEK	MONTH	HOSPITAL	SLIDES EXAMINED	SLIDES POSITIVE
** +NORTH						
+NORTH	07/02/90	27	JULY	VUVULANE		6
** Subtotal **						6
** CENTRAL						
CENTRAL	07/04/90	27	JULY	TIKHULA		4
CENTRAL	07/04/90	27	JULY	BIG BEND		10
CENTRAL	07/05/90	27	JULY	SIPHO		1
** Subtotal **						15
** NORTH						
NORTH	06/29/90	27	JUNE	MANGWENI		7
NORTH	06/29/90	27	JUNE	DVOKOLWAKO		1
NORTH	06/29/90	27	JUNE	EMKHUZWENI		16
NORTH	07/02/90	27	JULY	MHLUME		11
NORTH	07/02/90	27	JULY	TAMBUNKULU		3
NORTH	07/02/90	27	JULY	SHEWULE		5
NORTH	07/04/90	27	JULY	MOBILE		6
** Subtotal **						49
** SOUTH						
SOUTH	07/05/90	27	JULY	RF111		1
SOUTH	07/05/90	27	JULY	ST PHILIPS		2
SOUTH	07/04/90	27	JULY	NDZEVANE		21
** Subtotal **						24
*** Total ***						94

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```

CASE UPPER(CHOICE)="E"
  QUIT
ENDCASE
RETURN      ^Z

```

```

**** Program: HQ EDITPRG.PRG ****
*Display menu for HQ editing*
SET TALK OFF
SET ECHO OFF
STORE " " TO CHOICE
DO WHILE .T.
CLEAR

```

```

?
?
?" *****"

```

```

?" *          GOVENMENT OF SWAZILAND          *"

```

```

?" *          MINISTRY OF HEALTH          *"
?" *          MALARIA INFORMATION SYSTEM    *"

```

```

?" *****"

```

```

?
?
?"          Task Code          Task"
?
?"          [A]          Edit SLIDE DATA"
?
?"          [B]          Edit WHO LT50"
?
?"          [R]          Return to Previous Menu"
?
?"          [Q]          Quit"

```

```

?
?
WAIT "          Enter your choice (type in task code) " TO CHOICE

```

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**** Program: HQMAIN.PRG ****
Display menu for DIRECTORATE data entry and editing

SET SCORE OFF
SET TALK OFF
SET ECHO OFF
SET STATUS OFF
STORE " " TO CHOICE
CLEAR

?
?
?" *****"
?" * GOVERNMENT OF SWAZILAND *"
?" * MINISTRY OF HEALTH *"
?" * *"
?" * MALARIA INFORMATION SYSTEM *"
?" *****"

?
?
?" Task Code Task"
?
?" [A] Add Records"
?
?" [B] Edit Records"
?
?" [C] Reports"
?
?" [D] Return to dot prompt"
?
?" [E] Exit"

?
WAIT " Enter your choice (type in task code) " TO CHOICE

DO CASE
CASE UPPER(CHOICE)="A"
DO HQADDPFG
CASE UPPER(CHOICE)="B"
DO HQEDITPRG
CASE UPPER(CHOICE)="C"
DO REPORT
CASE UPPER(CHOICE)="D"
CANCEL

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?"

[Q]

Quit"

?

WAIT "

Enter your choice (type in task code) " TO CHOICE

```
DO CASE
  CASE UPPER(CHOICE)="A"
    DO ADDPCD
  CASE UPPER(CHOICE)="B"
    DO ADDWHOLT50
  CASE UPPER(CHOICE)="R"
    DO HQMAIN
  CASE UPPER(CHOICE)="Q"
    QUIT
  ENDCASE
ENDDO
RETURN
^Z
```

```
**** Program: ADDPCD ****
* Add new records to PCD.DBF
SET SCORE OFF
SET TALK OFF
SET ECHO OFF
SET STATUS OFF
USE PCD
*Use custom format PCD.FMT
SET FORMAT TO PCD.FMT
APPEND
RETURN
^Z
```

```
**** Program: REPORT.PRG ****
*DISPLAY MENU FOR REPORT GENERATION*
SET TALK OFF
SET ECHO OFF
STORE " " TO CHOICE
DO WHILE .T.
CLEAR
```

?"

Task Code

Task"

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```

DO CASE
  CASE UPPER(CHOICE)="A"
    DO EDITPCD
  CASE UPPER(CHOICE)="B"
    DO EDITWHOLT50
  CASE UPPER(CHOICE)="R"
    DO HQMAIN
  CASE UPPER(CHOICE)="Q"
    QUIT
  ENDCASE
ENDDO
RETURN TO HQMAIN.PRG
^Z^Z

```

```

**** Program: HQADDMENU.PRG ****
*Display menu for HQ data entry *
SET TALK OFF
SET ECHO OFF
SET STATUS OFF
STORE " " TO CHOICE
DO WHILE .T.
CLEAR

```

```

?
?
?" *****"
?" *          GOVERNMENT OF SWAZILAND          *"
?" *          MINISTRY OF HEALTH              *"
?" *          MALARIA INFORMATION SYSTEM      *"
?" *****"
?
?
?"          Task Code          Task"
?
?"          [A]          Add to SLIDE DBASE
?
?"          [B]          Add to WHO LT50"
?
?"          [R]          Return to Previous Men
?

```

```

?
?"
?
?"
[A] SLIDE REPORT"
[B] LF3 REPORT"

?
?"
?
?"
[C] LF3A REPORT"
[R] RETURN TO PREVIOUS MENU"

?
?"
[X] EXIT"

?
?
WAIT " Enter your choice (type in task code) " TO CHOICE

```

```

DO CASE
  CASE UPPER(CHOICE)="A"
    DO REPPCD
  CASE UPPER(CHOICE)="B"
    DO REPLF3
  CASE UPPER(CHOICE)="C"
    DO REPLF3A
  CASE UPPER(CHOICE)="R"
    DO HQMAIN
  CASE UPPER(CHOICE)="X"
    QUIT
  ENDCASE
ENDDO
RETURN ^Z^Z

```

**** Program: REPPCD ****

```

SET SCORE OFF
SET TALK OFF
SET ECHO OFF
USE PCD INDEX PCD
*Use custom format PCD.FMT
SET FORMAT TO PCD.FMT
REPORT FORM PCD to printer

```

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```

@ 1, 27 SAY "SWAZILAND MINISTRY OF HEALTH"
@ 2, 28 SAY "CASE DETECTION SLIDE REPORT"
@ 3, 4 SAY "TYPE OF DETECTION:"
@ 3, 22 GET PCD->TYPE
@ 4, 4 SAY "SECTOR:"
@ 4, 11 GET PCD->SECTOR
@ 4, 24 SAY "DATE:"
@ 4, 29 GET PCD->DATE
@ 4, 42 SAY "WEEK:"
@ 4, 47 GET PCD->WEEK
@ 4, 53 SAY "MONTH:"
@ 4, 59 GET PCD->MONTH
@ 6, 2 SAY "HOSPITAL/CLINIC:"
@ 6, 18 GET PCD->HOSPITAL
@ 6, 30 SAY "TOTAL SLIDES EXAMINED:"
@ 6, 52 GET PCD->SLIDE_EXAM
@ 6, 57 SAY "TOTAL POSITIVE:"
@ 6, 73 GET PCD->SLIDE_POS PICTURE "999"
@ 7, 2 SAY "LOCALITY:"
@ 7, 11 GET PCD->LOCALITIES
@ 9, 4 SAY "0-11 MONTHS 1-4 YEARS 5-9 YEARS
10-14 YEARS 15+ YEARS"
@ 10, 4 SAY "TOT POS TOT POS TOT POS
TOT POS TOT POS"
@ 11, 4 GET PCD->O11TOT
@ 11, 14 GET PCD->O11POS
@ 11, 22 GET PCD->ONEFOURTOT
@ 11, 29 GET PCD->ONEFOURPOS
@ 11, 38 GET PCD->FIVE9TOT
@ 11, 44 GET PCD->FIVE9POS
@ 11, 52 GET PCD->TEN14TOT
@ 11, 58 GET PCD->TEN14POS
@ 11, 68 GET PCD->FIFTEENTOT
@ 11, 74 GET PCD->FIFTEENPO
@ 0, 0 TO 12, 79 DOUBLE
@ 5, 1 TO 5, 78
^Z

```

Annex 6
Guide for Developing the Swaziland MIS



 **VECTOR BIOLOGY & CONTROL**

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**Guide for the
Development of the Swaziland
Malaria Information System**

Barry A. Silverman, Sc.D.

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A requisite for successful health program management is the acquisition and timely use of appropriate information. Although the need for sound information for accurate decision-making is an accepted managerial concept, the flow of data and its use by managers is often impeded by externally-imposed deadlines, unexpected events and tedious, time-consuming tasks. In addition, management and health information are derived from various organizational levels and are not always linked to the decision-making process. Information flow is often unidirectional, flowing up the system with feedback often lacking or too late to be used for operational decision making.

The integration of information into Health and Management Information Systems (H/MIS) using relatively low-cost microcomputers offers the potential for effectively managing project information. The integration of information into H/MIS enables:

- More efficient and timely handling of health and administrative information
- The reduction of data duplication
- The rapid production of required reports
- Timely and comprehensive data analysis
- The ability to use data for predictive purposes
- The ability to use health and management information for stratification, which leads to efficacious allocation of human and material resources.

The Vector Biology & Control Project has adopted a seven-step process for the development of H/MIS that can be employed to develop the Swaziland Malaria Information System. These steps are:

1. System, Needs and Capability Analysis
2. Systems Design
3. System Specifications
4. Documentation Preparation
5. Training
6. Implementation
7. Evaluation and Systems Modification

System Needs and Capabilities Analysis

The specific tasks required to develop H/MIS can be characterized under these seven steps as follows:

- Review and document the current Malaria Information System
- Identify specific objectives, requirements, user problems and inadequacies of the current H/MIS.
- Assess staff and local support capabilities

Systems Design

- Assist in the design of an integrated information system.
- Assist in the preparation of a comprehensive management plan for the proposed new H/MIS.
- Define and design required manual, mechanical and electronic processing procedures.
- Design systems operating procedures.
- Design procedures for system maintenance and security.

Systems Specifications

- Develop specifications for computer hardware/software needs and options and make recommendations for system design.
- Establish staffing requirements and necessary personnel qualifications for effective operation of the Information Unit.

Documentation Preparation

- Prepare complete H/MIS documentation

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Training

- Design and implement H/MIS staff training and development programs.

Implementation

- Assist in the preparation and revision (as needed) of an implementation schedule for development of the H/MIS.
- Assist with coordination of system implementation.
- Conduct a pilot test of the integrated information system, conduct appropriate system comparisons and revisions, and coordinate the conversion to the new H/MIS.

Evaluation and Systems Modification

- Conduct periodic comprehensive evaluations and management reviews of the new system.
- Assist in the modification and fine-tuning of the H/MIS information system (as required) based on monitoring, evaluation and review methods established for the system.

The following guide has been developed to be used to analyze the current Swaziland Malaria Information System.

Guide for the Development of the Conceptual Model For the Swaziland Malaria Information System

This guide is to be used for the development of a conceptual framework for the current Swaziland malaria information system. Although the examples given apply to a malaria information system based on the collection and diagnosis of blood slides, the principles presented here are applicable to systems dependent on other disease indicators. The definition of the conceptual framework is the first step in the development of an information system. The elements of the information system and their interrelations must be defined prior to computerization of the system.

This guide has four sections, each one divided into two parts: (a) instructions and (b) examples. The four sections are:

1. List of forms and products: an inventory of all forms and reports and descriptions of their use within the malaria program.
2. A data flow chart: an exact scheme of the data flow and the duration of each phase of the flow. It is necessary to integrate the forms with the products identified in the previous section (No. 1). Section 2 consists of:
 - A. The flow chart
 - B. A 3-5 page description text of the flow chart
3. Elements of the information system of the malaria program - identifies the following:
 - A. the level within the program;
 - B. the decision makers, or managers of the program who receive the end products of the system;
 - C. the decision that is expected to be made;
 - D. the frequency or periodicity of the data;
 - E. the data that are essential for decision-making; and
 - F. the product or form that contains the data necessary for decision-making.

The task of this section is to link each element of data with a specific decision.

- 4. Code book of data: contains definition of the data elements that should be adopted before implementation of computerized information system.**

Instructions for Completion of Table 1: List of Forms and Outputs (Final Reports) Used In the Program

List the forms and products (final reports) used in the malaria program. Include an example of each and the instructions for filling them out in an annex. The following headings should be used for completing this table:

- A. **Name**: the official name of each form. If there is no formal name, assign a descriptive name to the form.
- B. **Identification**: the initial or code used to identify each form. If a code does not exist, assign one to the form.
- C. **Explanation**: the purpose or use of the form.
- D. **Quantity**: the number of "cards," or number of times that the form is completed for a period of time: per day, week, month or year. For example: if there are 10 regions for which the record is completed every week, there will be 10 copies of this form every week.
- E. **Responsible**: the title or position of the person in charge of:
 - 1. filling in the form;
 - 2. reviewing the form; and
 - 3. analyzing the form.

Instructions for the Completion of Table 2: Example of One of the Sections of the Information Flow

Table 2 is a flow chart of the forms described in table 1 indicating the actual duration of each phase in the information system (by direct observation).

The flow chart should use the symbols and methodology in the example. The flow chart also must be prepared by direct observation of the actual work and not be estimation in order to obtain an exact idea of the time or duration of each phase. In the design of the flow, the following parameters must be considered:

A. Phase in the flow:

1. **Entry:** Forms that are used for data collection ("input").

Example: Registration of the blood sample, with general patient data, and identification or code of the form.

This is symbolized by a horizontal rectangle.

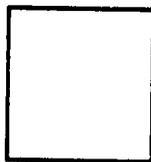


2. **Flow:** The movement of the forms from one point in the information system to another point until they reach their final destination or code of the form.

This is symbolized by an arrow indicating the direction of the flow.

3. **Process:** The phase in which the data are manipulated, analyzed, reorganized or combined. It is important to specify the average time that each data form stays at the different levels of the process or under the responsibility of each person in charge.

This is symbolized by a vertical rectangle.



Instructions for filling in Table 3

Elements of the information system of the malaria program

- A. **Level:** Level of the program (central, regional, local) where the decision is made.
- B. **Decision-makers:** Those (the managers) who are going to use the data of the system in the planning process, management, and decision-making.
- C. **Decision:** The specific decision that is going to be made by the program manager to target the resources (personnel, equipment and materials). It is very important to include the rule that is required to make a decision.
- D. **Frequency:** The periodicity with which the manager is going to make the decision to target the resources (weekly, monthly, semesterly, yearly).
- E. **Data:** The specific data required for the decision-making. The data are derived from the identified rules of column "C."
- F. **Product:** The form(s) required to make the decision in column "C."

Note: The purpose of this table is to emphasize the decision that is going to be made and the data necessary for decision-making. The information in the other columns of this table must be linked to the decision in column "C."

Instructions for Completing Table 4

Code book of the data required for decision-making in the malaria program. Include each element of identified data in column "E" of table 3.

This section is a distillation of previous work. The selected data elements are essential for management, monitoring and evaluation of the malaria program.

- A. **Name:** The name of the data element.
- B. **Characters:** Number of characters that have to be supplied for the data (see example).
- C. **Description:** The acceptable codes for each data. Include one code for the class: not available (see example).

Table 1. List of Forms and Reports used in the Program

(Example)

A. Name	B. Identification (Code)	C. Explanation	D. Quantity	E. Responsible
Register of Blood Smear	E-1	Individual register of the blood smear, result of the exam and treatment information	474,080/year	Filled: Laboratory Technician Reviewed: Notification Evaluator Analyzed: None
Daily Register of Blood Smears Examined	E-90	Daily register of blood smears registered to each microscopist to examine	365/year Revision:	Filled: Chief of Laboratory District Analyzed: Epidemiologist None
Weekly Blood Smear Report	E-9C	Weekly summary of blood smear	52/year	Filled: Chief of Epidemiology District Revision: District Epidemiologist
Monthly Report	E-9A	Monthly summary of blood smear	12/year	Filled: Sector Epidemiologist Revision: Sector Chief Analyze: Chief

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(Example)

Level

Days

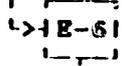
. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Local

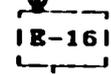
Lab Tech.



Microscopist

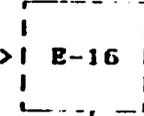


District Chief

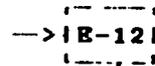


Regional

Epidemiologist

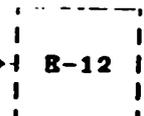


Sector Chief



Central

Epidemiologist



Director



2/1

Table 3. Elements of the Information System of the Malaria Program

(Example)

A. Level	B. Decision Maker	C. Decision	D. Frequency	E. Data	F. Product (Name/iden.)
Local	Chief of the Sector	Distribution of or radical treatments to disclosed cases.	Weekly	Documentation of positive cases by locality, municipal and sector (name of the patient, age, sex, location of residence). Name of species of parasite.	Positive control and radical treatments (E-8).
Central	Chief of Epidemiology	Distribution of insecticide equipment and personal.	Monthly	Notification or incidence by country, ecological zones and departments Population by department, blood smear cases. Rate X 1000 Inhabitants.	Monthly epidemiological report (E-9A) Monthly spray report (S-i).

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Table 4. Book of Codes

(Example)

A. Name	B. Number of Characters	C. Description
1. Name of the examination	1	0=negative, 1=vivax 2=falciparum, 3=mixed 9=not determined
2. Date of the blood smear day month year	2 2 2	01-31; 99=not available 01-12; 99=not available 1985 or more; 93=not available
3. Date of the examination day month year	2 2 2	The date should be the same day or later than the date of the blood smear
4. Delay	3	The difference between the date of the Blood Smear and the date of the exam. 999=not available
5. Age	3	Age in years, 999=not available
6. Sex	1	m=masculine, f=feminine, x=not available
7. Type of surveillance	1	1=passive; 2=active; 3=general health service; 8=other 9=not available
8. Region	2	(Codes)
9. Department	2	(Codes)
10. Municipal	2	(Codes)

A requisite for successful health program management is the acquisition and timely use of appropriate information. Although the need for sound information for accurate decision-making is an accepted managerial concept, the flow of data and its use by managers is often impeded by externally-imposed deadlines, unexpected events and tedious, time-consuming tasks. In addition, management and health information are derived from various organizational levels and are not always linked to the decision-making process. Information flow is often unidirectional, flowing up the system with feedback often lacking or too late to be used for operational decision making.

The integration of information into Health and Management Information Systems (H/MIS) using relatively low-cost microcomputers offers the potential for effectively managing project information. The integration of information into H/MIS enables:

- More efficient and timely handling of health and administrative information
- The reduction of data duplication
- The rapid production of required reports
- Timely and comprehensive data analysis
- The ability to use data for predictive purposes
- The ability to use health and management information for stratification, which leads to efficacious allocation of human and material resources.

The Vector Biology & Control Project has adopted a seven-step process for the development of H/MIS that can be employed to develop the Swaziland Malaria Information System. These steps are:

1. System, Needs and Capability Analysis
2. Systems Design
3. System Specifications
4. Documentation Preparation
5. Training
6. Implementation
7. Evaluation and Systems Modification

System Needs and Capabilities Analysis

The specific tasks required to develop H/MIS can be characterized under these seven steps as follows:

- Review and document the current Malaria Information System
- Identify specific objectives, requirements, user problems and inadequacies of the current H/MIS.
- Assess staff and local support capabilities

Systems Design

- Assist in the design of an integrated information system.
- Assist in the preparation of a comprehensive management plan for the proposed new H/MIS.
- Define and design required manual, mechanical and electronic processing procedures.
- Design systems operating procedures.
- Design procedures for system maintenance and security.

Systems Specifications

- Develop specifications for computer hardware/software needs and options and make recommendations for system design.
- Establish staffing requirements and necessary personnel qualifications for effective operation of the Information Unit.

Documentation Preparation

- Prepare complete H/MIS documentation

Training

- Design and implement H/MIS staff training and development programs.

Implementation

- Assist in the preparation and revision (as needed) of an implementation schedule for development of the H/MIS.
- Assist with coordination of system implementation.
- Conduct a pilot test of the integrated information system, conduct appropriate system comparisons and revisions, and coordinate the conversion to the new H/MIS.

Evaluation and Systems Modification

- Conduct periodic comprehensive evaluations and management reviews of the new system.
- Assist in the modification and fine-tuning of the H/MIS information system (as required) based on monitoring, evaluation and review methods established for the system.

The following guide has been developed to be used to analyze the current Swaziland Malaria Information System.

Guide for the Development of the Conceptual Model For the Swaziland Malaria Information System

This guide is to be used for the development of a conceptual framework for the current Swaziland malaria information system. Although the examples given apply to a malaria information system based on the collection and diagnosis of blood slides, the principles presented here are applicable to systems dependent on other disease indicators. The definition of the conceptual framework is the first step in the development of an information system. The elements of the information system and their interrelations must be defined prior to computerization of the system.

This guide has four sections, each one divided into two parts: (a) instructions and (b) examples. The four sections are:

1. List of forms and products: an inventory of all forms and reports and descriptions of their use within the malaria program.
2. A data flow chart: an exact scheme of the data flow and the duration of each phase of the flow. It is necessary to integrate the forms with the products identified in the previous section (No. 1). Section 2 consists of:
 - A. The flow chart
 - B. A 3-5 page description text of the flow chart
3. Elements of the information system of the malaria program - identifies the following:
 - A. the level within the program;
 - B. the decision makers, or managers of the program who receive the end products of the system;
 - C. the decision that is expected to be made;
 - D. the frequency or periodicity of the data;
 - E. the data that are essential for decision-making; and
 - F. the product or form that contains the data necessary for decision-making.

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The task of this section is to link each element of data with a specific decision.

- 4. Code book of data: contains definition of the data elements that should be adopted before implementation of computerized information system.**

Instructions for Completion of Table 1: List of Forms and Outputs (Final Reports) Used In the Program

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- E. **Responsible:** the title or position of the person in charge of:
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Instructions for the Completion of Table 2: Example of One of the Sections of the Information Flow

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A. Phase in the flow:

1. **Entry:** Forms that are used for data collection ("input").

Example: Registration of the blood sample, with general patient data, and identification or code of the form.

This is symbolized by a horizontal rectangle.

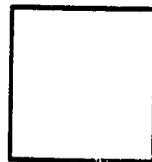


2. **Flow:** The movement of the forms from one point in the information system to another point until they reach their final destination or code of the form.

This is symbolized by an arrow indicating the direction of the flow.

3. **Process:** The phase in which the data are manipulated, analyzed, reorganized or combined. It is important to specify the average time that each data form stays at the different levels of the process or under the responsibility of each person in charge.

This is symbolized by a vertical rectangle.



Instructions for filling in Table 3

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- F. **Product:** The form(s) required to make the decision in column "C."

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Instructions for Completing Table 4

Code book of the data required for decision-making in the malaria program. Include each element of identified data in column "E" of table 3.

This section is a distillation of previous work. The selected data elements are essential for management, monitoring and evaluation of the malaria program.

- A. Name:** The name of the data element.
- B. Characters:** Number of characters that have to be supplied for the data (see example).
- C. Description:** The acceptable codes for each data. Include one code for the class: not available (see example).

Table 1. List of Forms and Reports used in the Program

(Example)

A. Name	B. Identification (Code)	C. Explanation	D. Quantity	E. Responsible	
Register of Blood Smear	E-1	Individual register of the blood smear, result of the exam and treatment information	474,080/year	Filled:	Laboratory Technician Notification Evaluator None
Daily Register of Blood Smears Examined	E-90	Daily register of blood smears registered to each microscopist to examine	365/year Revision:	Filled: Laboratory District	Chief of Epidemiologist None
Weekly Blood Smear Report	E-9C	Weekly summary of blood smear	52/year	Filled: Epidemiology Revision:	Chief of District Epidemiologist
Monthly Report	E-9A	Monthly summary of blood smear	12/year	Filled: Epidemiologist Revision: Analyze:	Sector Sector Chief Chief

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Level

Days

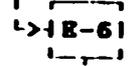
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Local

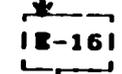
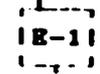
Lab Tech.



Microscopist



District Chief



Regional

Epidemiologist

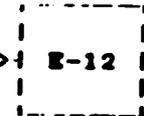


Sector Chief

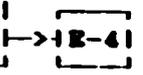
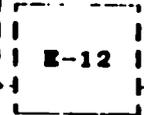


National

Epidemiologist



Director



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Table 3. Elements of the Information System of the Malaria Program

(Example)

A. Level	B. Decision Maker	C. Decision	D. Frequency	E. Data	F. Product (Name/Iden.)
Local	Chief of the Sector	Distribution of or radical treatments to disclosed cases.	Weekly	Documentation of positive cases by locality, municipal and sector (name of the patient, age, sex, location of residence). Name of species of parasite.	Positive control and radical treatments (E-8).
Central	Chief of Epidemiology	Distribution of insecticide equipment and personal.	Monthly	Notification or incidence by country, ecological zones and departments Population by department, blood smear cases, Rate X 1000 inhabitants.	Monthly epidemiological report (E-9A) Monthly sprar, report (S-1).

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Table 4. Book of Codes

(Example)

A. Name	B. Number of Characters	C. Description
1. Name of the examination	1	0=negative, 1=vlvax 2=falciparum, 3=mixed 9=not determined
2. Date of the blood smear day month year	2 2 2	01-31; 99=not available 01-12; 99=not available 1985 or more; 99=not available
3. Date of the examination day month year	2 2 2	The date should be the same day or later than the date of the blood smear
4. Delay	3	The difference between the date of the Blood Smear and the date of the exam. 999=not available
5. Age	3	Age in years, 999=not available
6. Sex	1	m=masculline, f=feminine, x=not available
7. Type of surveillance	1	1=passive; 2=active; 3=general health service; 8=other 9=not available
8. Region	2	(Codes)
9. Department	2	(Codes)
10. Municipal	2	(Codes)