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REACH

RESOURCES
FOR CHILD
HEALTH

Technical Assistance in Cold Chain & Inventory Management

Republic of the Philippines

August 17 - September 27, 1991



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Cold Chain & Inventory Management
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Grateful thanks are extended to these officers, and to all others concerned for their patience, generous efforts and kindness, which contributed greatly to the success of the mission.

ACRONYMS

BHS	Barangay Health Station
DOH	Department of Health
EPI	Expanded Programme on Immunization
FHSIS	Field Health Service Information System
HIS	Health Intelligence Service
IEC	Information, Education, Communication
MCHS	Maternal and Child Health Services
NIC	National Immunization Committee
NVD	National Vaccination Day
REACH	Resources for Child Health Project
RHU	Rural Health Unit
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VCCM	Vaccine Cold Chain Monitor Cards
WHO	World Health Organization

I. EXECUTIVE SUMMARY

A. Background

The Maternal and Child Health Services division of the Department of Health has been developing a computerized information system in support of EPI cold chain and logistics since August 1987. To date, the computerized system has never been operational.

In this, the second of two consultancies requested by the DOH from USAID/REACH, efforts were primarily directed towards ensuring a functioning manual information system, and designing management tools which would assist in monitoring and managing the EPI.

This report describes the newly recommended information system, and details the materials and management aids developed to support cold chain and logistics activities.

B. Main Findings

- The information system as originally designed has several limitations and still requires major revision to enable it to function satisfactorily. Work was abandoned on this system, and a new design was proposed.
- The proposed, simplified information system overcomes the limitations of the original system, and employs an epidemiology and database programme which is already in use at Maternal and Child Health Services (MCHS).
- Field testing of the proposed system was initiated in one region of the country, but at the time of writing, tests were not complete. An additional trial period, followed by a detailed assessment of the outputs, will be required.
- Serious shortcomings were identified in the areas of ordering, storage, and distribution of vaccines. Follow-up action is needed to remedy these problems since this did not fall within the scope of work of the assignment.

C. Summary of Recommendations

The following actions are recommended:

- field test and evaluate the proposed information system, with a detailed assessment planned for mid-1992 to permit a decision on wider implementation;
- organize a training programme on vaccine logistics for central level staff responsible for the ordering, storing and distribution of national supplies;

- assess central cold chain and central and regional vaccine stores to determine requirements to substantially upgrade the quality and security of vaccine storage;
- introduce routine reporting using simple performance indicators at provincial and regional levels;
- perform evaluations of cold chain and logistics training programmes, following the guidelines proposed during the assignment.

II. PURPOSE OF VISIT

As detailed in the scope of work, the consultant was to:

- review EPI cold chain and vaccine inventory procedures and standardize data collected by each level of the reporting system. Focus on standardizing inventory categories, equipment status and vaccine management information.
- develop detailed guidelines for information to be entered into a computerized cold chain inventory system, and for the management reports that will summarize cold chain and vaccine data.
- work with EPI and cold chain managers in one region to determine programme indicators, report flow and reporting frequency required to meet management information needs at each level. Conduct a field assessment of the proposed system.
- assist in the revision of the cold chain & logistics portions of the Philippine EPI Manual (or of a separate Cold Chain/Logistics Manual, as decided).
- work with the national cold chain manager to develop a methodology for estimating the cold chain capacity currently required at each level and for assessing the impact when new and additional vaccines are introduced into the EPI.
- propose guidelines for the evaluation of cold chain and logistics training programmes conducted by the EPI.

III. BACKGROUND

A. Information System for Cold Chain Inventory Management

Since August 1987, the Maternal and Child Health Services of the Department of Health have been developing a computerized information system to support the management of EPI cold chain and logistics. The system was designed to monitor the national cold chain equipment inventory, supplies of vaccine and other immunization consumables, and to analyze information from VCCM (vaccine cold chain monitor) cards.

Work on the information system has been intermittent and the installation is still incomplete. To date, the system has never been operational. The computer programme is installed at the national EPI office, but is not available at regional, or other levels.

A manually-compiled national inventory of cold chain equipment was also initiated, but this too, remains incomplete.

A previous REACH consultancy carried out by Mary Church¹ in March 1990 reviewed the status of the information system and, in particular, the national cold chain inventory as it existed at that time. Many shortcomings in the system were identified, and recommendations for major revisions, involving substantial redesign of the computer programme, were made.

The initial activity for the present assignment was to follow-up on these recommendations, and to complete procedures for bringing the cold chain and logistics information system into operation.

B. Vaccine Inventory

Although a component of the original computerized information system, the vaccine inventory element has seen little development work, and the database module was never tested. The status of this module was not reviewed in detail by Mary Church.

Presently, monitoring vaccine supplies is carried out manually, and many problems in the supply and distribution of vaccines have been reported. Computerization of these tasks was proposed as a means of avoiding such problems.

C. Indicators, Reporting and Evaluation

The other activities outlined in the scope of work have not previously been the subject of specific REACH interventions. However, Mr. Alasdair Wylie, REACH resident EPI adviser from 1987-90, gave overall support to the DOH and MCHS during that period, and advised on several of these topics.

IV. METHODOLOGY & APPROACHES

A series of visits, studies and interviews were conducted at central, regional, provincial, district and health unit levels of the health service, and with other institutions and donor agencies involved in supporting EPI in the Philippines.

Region IV (Southern Tagalog) was used as the focus of detailed study, and two provinces in this region, (Quezon and Palawan) were visited to assess cold chain and logistics conditions and to field test proposed materials.

¹Review of Information System for Cold Chain Management in the Philippines; Mary Church, REACH, March 1990.

All work was undertaken in close cooperation with local EPI staff, and proposals contained in this report are a result of that cooperation.

V. TRIP ACTIVITIES

A. Review of present Cold Chain Inventory procedures

Given the weaknesses of the present information system as reported by Mary Church in 1990, the computer programme was examined and discussed with EPI central staff. No further development work had been undertaken on the programme since 1989, and the shortcomings identified by Ms. Church are still unresolved. In summary, the weaknesses of the existing system were described as follows:

Information needs: Information required for management of cold chain equipment and supplies was not well defined when work on the information system began in 1987. There were no clear descriptions of the information and reports that the system should provide, and the functional requirements and expectations remain unclear. The data to be entered into the system were not fully described, and the procedures for collecting data were not thoroughly tested.

Information Flow: (1) different inventory data is collected in different regions using different reporting forms. Separate systems are used in each region, which cannot communicate with that at the central level. Only general guidelines were given to regions on how they should assemble the required data. (2) the system design is static. Information contained in the system is only updated at predefined intervals and does not change as the facts change. (3) information is based on annual, regional inventories, and precludes data entry on procurement and disbursement of equipment and supplies from the central level. It also precludes comparisons of inventory status and needs between different regions.

Computerization: (1) data entry procedures are confusing and data elements are poorly grouped together on the screen. Basic information fields concerning a particular health facility (e.g.; population, electric supply, staffing levels, etc) are needlessly repetitive and must be entered separately for each inventory item. (2) reports generated are not very useful and are needlessly time consuming to prepare. (3) data structures are poorly organized and require more disk space than should be necessary.

In view of the limitations inherent in the design of the present information system, and the substantial revisions still needed to enable it to function in the required manner, it was proposed that a new and simplified system be designed. This proposal was discussed with senior staff at MCHS, and general approval was obtained.

B. Proposed Re-Designed Cold Chain Inventory System

General description: The proposed inventory system is intended to be computerized using EPI.INFO version 5.0 software. This software is an epidemiology and database programme designed jointly by WHO/Geneva and

Centres for Disease Control/Atlanta. The programme is already available and installed at MCHS.

The same basic inventory control programme will be used at all levels of the health service. Data collected will be fully compatible between levels. The initial inventory information entered will be based on a single, once-only inventory of all EPI equipment. These data will be continuously updated at all levels, as the information on equipment quantities or operational status changes.

Equipment categories within the information system will be based on those of the present manual inventory system, and utilize, as far as possible, coding conventions of the WHO/UNICEF EPI Product Information Sheets². These categories will be standardized at all levels, and current regional variations in data collection will be eliminated.

Data entry will cover all equipment by type, and will include information on the quantity distributed and quantity available, storage capacity, age, source of supply, general condition and operational status. Basic information on the health facility, such as the location address, location code, population served, electric power status and staff levels will also be managed. Much of the data entry will be coded to facilitate electronic processing.

Information output: Numerous information outputs can be provided by the inventory control programme, based on the data entry elements proposed. The following are suggested as some indicators which may be used for management, budgeting and procurement purposes:

- comparison of estimated capacity of cold chain equipment required at any health facility to that actually available, summarized by facility/district/province/region or nationally.
- comparison of quantity and types of equipment distributed from central level with that actually available at any facility; and summarized by district/province/region or nationally.
- analysis of operational status of all existing equipment by type and location, summarized at any level from district to national;
- prevalence and causes of equipment malfunction by type and location; summarized at any level from district to national;
- comparison of power source available at any facility with the power requirements of each type of equipment, summarized at any level from district to national;
- years of service given by any item of equipment compared to estimated whole lifetimes for that item; summarized by individual item, category of equipment, facility or summarized at any level;

²EPI Product Information Sheets-1989/90; WHO/UNICEF/EPI.TS/89.1

- cost estimates for providing or replacing equipment by type, health facility, or summarized by province, region or nationally;
- analysis of quantities and types of equipment supplied by source/donor and summarized by item and category or at any level.

Information flow: The proposed information system is dynamic, with immediate updating of all categories of information as they occur, and no dependence on fixed, pre-defined reporting periods. All health facilities will be required to enter data or report to the next higher level immediately the status or detail relating to any inventory item changes.

A 9-level reporting system using a common data format will pass information progressively from the periphery to the centre, with intermediate summaries and consolidation at each level. The levels of the reporting system are:

- 01..Rural Health Unit Inventory
- 02..District Store Inventory
- 03..District Summary
- 04..Provincial Store Inventory
- 05..Provincial Summary
- 06..Regional Store Inventory
- 07..Regional Summary
- 08..National Store Inventory
- 09..National Summary

Appendix 1 is a sample of reporting form 01, Rural Health Unit Inventory.

Information flow will be bidirectional. Details of procurement, distribution and donor/source for new equipment will pass down from the centre to the periphery, whilst information on the status and location of existing field equipment will pass progressively from periphery to the centre. Both types of information will appear simultaneously on the inventory.

Field testing: Region IV (Southern Tagalog) was selected as a test area for the proposed information system, and also for assessing programme management indicators which were developed in co-operation with the regional staff.

Visits were made to the regional office, and to one mainland and one island province. Copies of data collection forms 01 to 07 were prepared for all health facilities in the region, and briefing sessions were conducted with senior officers, and field staff at all centres visited to explain the objectives, procedures and expected outputs from the new information system. Data collection in the 2 provinces visited was estimated to be completed by the third week of September 1991, and it was planned that sample output summaries up to reporting level 05 (Provincial Summary) could be available before the end of the consultancy.

It is regretted that at the time of writing, no data was received from any of the areas of the test region.

Implementation: Introduction of the proposed information system, if accepted, should proceed in a controlled manner, and thorough field testing in selected areas will be essential before national implementation. Several factors will be of importance during the process of implementation:

(1) Briefing sessions and training will be required for all staff who will be involved in collecting and compiling data for the new information system. It will be necessary to carefully explain the objectives, procedures, data inputs and expected outputs of the system, and to ensure that staff at each level understand exactly what they are required to do. To assist in this process, an illustrated equipment identification guide has been drafted, together with instructions on completion of the various inventory forms. This guide should be produced in sufficient numbers for distribution to all health staff involved. The local UNICEF office have indicated that assistance with printing of the guide may be considered.

(2) For the present, and the foreseeable future, it must be recognized that computerization of the inventory will only be possible at central, regional and in most cases, provincial levels. Computers are not currently available at district, RHU or BHS levels, nor would it be feasible to provide them. Data collection and reporting from these levels will continue to be carried out on a manual basis. Reporting forms have been designed to permit this, while at the same time, interfacing with electronic data processing needs at higher levels.

(3) Some provincial offices, although provided with computers, have reported problems arising from computer breakdowns and maintenance. This appears to be a persistent problem, and provincial offices may sometimes need to use manual methods for consolidating data and preparing their reports. Such problems will not affect the overall viability of the proposed system, however, and should not be seen as a reason for delaying or withholding reports. Regular reporting will be essential in maintaining accuracy of the inventory.

(4) Currently, there is no electronic linkage between computers at different levels. Transfer of data is achieved either by hand-carrying, or mailing diskettes from one level to the next. Data transfer by telephone modem between provincial, regional and central levels should be considered as a means of upgrading the present system, and speeding up the flow of information.

Follow-up: After a suitable period of field testing, a detailed assessment of the status of the information system should be carried out to determine if the information system is ready for full scale implementation or if further modification is required. This assessment should be made after 6 to 9 months of field testing and should be planned for mid-1992.

C. Vaccine Inventory

Vaccine Monitoring Module: In addition to the cold chain equipment inventory module, the original computerized EPI information system contained a module to monitor the supply and distribution of vaccine. This module has never been

used and apparently was not tested during 1988-89 when development of the equipment inventory module was in progress.

In addition to the incomplete vaccine inventory information system at the EPI office, a second computerized health information system is under development by the Health Intelligence Service (HIS) division of the DOH. This system, known as Field Health Service Information System (FHSIS), will provide comprehensive data on quarterly accomplishments for all health programmes run by the department, and will also report the quarterly status of drugs and supplies including EPI vaccines, at regional level.

This information will be routinely passed to all sections, (including MCHS/EPI), as field reports are received and processed by HIS.

While this system has suffered a number of delays in development and implementation, it is now close to completion, and the first routine regional reports are currently being compiled by the HIS.

The vaccine data contained in these reports includes:

VACCINE TYPE	QUARTERLY SUPPLY	QUARTERLY DISTRIBUTION	BALANCE IN HAND	NEXT ORDER
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These data, together with quarterly immunization reports, will provide all the necessary information for EPI to monitor vaccine supplies and consumption rates at the regional level.

It was concluded therefore, that unnecessary duplication of reporting would be involved if the vaccine inventory module in the present EPI information system were to be implemented. Efforts would instead be better concentrated on using the available data from FHSIS to improve monitoring and control of vaccine supplies at regional and lower levels.

Vaccine Logistics problems: It was observed that very little monitoring and control of vaccine and other EPI consumables is carried out at present and a number of serious weakness in the logistics system exist. It appears that these problems do not arise from lack of information, but rather from a failure to correctly interpret and apply the available information to the management of vaccine supplies.

Specifically, the problems noted were:

- widespread reports at regional/provincial/district and RHU levels of insufficient and irregular supplies of vaccine, with frequent use of reserve and supplementary stocks to sustain normal EPI activities;
- no proper reserve stocks of vaccine routinely held at the national level; vaccine orders based on requirements only, with no allowance for central reserve stocks; similar situation at lower levels;

- unacceptably large and frequent variations in stocks of all vaccines at the central store and other levels, well beyond the limits of normal maximum and minimum stock quantities;
- no systematic monitoring of National/Regional/Provincial vaccine consumption rates at the central level; no long-range consumption planning or estimates; available data not used for planning purposes;
- no routine monitoring of real vaccine wastage rates at any level, but assumed, "standard" rates used throughout. National vaccine orders do not reflect actual needs;
- supplies of vaccine from overseas suppliers are not synchronized in time or quantity with deliveries from central store to the regions;
- central vaccine store not sufficiently involved in vaccine supply planning or placement of orders; and not informed in advance of requested delivery schedule of vaccine shipments from overseas.

These weaknesses are already serious, but will assume even greater importance as the EPI embarks on new strategies such as polio eradication, introduction of hepatitis B immunization and promotion of tetanus toxoid immunization for all women.

Vaccine Logistics Working Group: Many of these shortcomings were already recognized by MCHS, and a Vaccine Logistics Working Group was set up in 1990 to help resolve the problems. Membership comprised senior staff from the DOH, together with key representatives from the donor agencies with responsibility for vaccine procurement.

During its brief existence, numerous measures were proposed by this group to overcome a range of vaccine logistics problems, but regrettably, the group is no longer operative, and very few of the measures proposed have been adopted. The most important recommendations, and the present status of their implementation, are detailed in Appendix 2. A Comprehensive EPI Programme Review, conducted in February 1991,³ also identified many of these problems with vaccine logistics, but again, little action appears to have been taken to correct the situation.

The WHO Regional Technical Advisory Group on EPI and Polio Eradication has also established a vaccine working group, and made recommendations concerning support of vaccine logistics for countries in the region.⁴ As yet, the DOH in the Philippines has still to comply with these recommendations.

³Report of EPI Comprehensive Programme Review; DOH; May 1991.

⁴Report of the Technical Advisory Group on EPI and Polio Eradication; WHO/WPRO; April 1991.

Problems at Central Vaccine Store, Alabang: While assessing the vaccine supply and distribution situation at the central store, it was also noted that cold chain equipment at that level is in an extremely poor and fragile condition, and poses a danger to the entire national distribution system.

It was not within the scope of work of this consultancy to make a complete assessment of the central cold store, but it would appear to warrant a detailed study with a view to substantially upgrading the quality and security of vaccine storage at the national level.

The major points needing urgent attention would appear to be:

- serious structural weakness in roof, doors etc, of the two cold rooms used for EPI vaccine;
- very poor air circulation within the vaccine storage areas, due to inadequate design and siting of air-handling units; results in substantial local temperature variations in each cold room;
- lack of any standby cooling machinery on either of these two cold rooms; extremely old and fragile condition of the primary cooling systems in each case;
- lack of any proper temperature recording equipment on either store, and absence of any form of alarm system to warn of incorrect storage temperatures.

It was also noted that although a standby power generator is available on the central store compound, this is currently non-functional due to shortage of fuel.

The entire central cold chain was therefore assessed as being in an extremely vulnerable condition, and in need of urgent attention.

D. Programme Indicators

At present, the only routine reports passing between provincial, regional and central levels are quarterly immunization accomplishment reports. These are in addition to the FHSIS accomplishment reports however, which pass directly from provincial to central level, and by-pass the regional offices.

No indicators of programme performance are in use within regions, and although provincial EPI coordinators use a check list to guide their supervision, no routine reports summarizing provincial activities are forwarded to the regional level.

No routine reporting of the status of vaccine stocks and immunization supplies is carried out within regions, and in some cases, vaccines are distributed directly from the national store to the provincial or district level, again by-passing the regional office.

There are generally sound logistical reasons for such reporting and distribution procedures, but as a result, regional offices are sometimes not aware of problems within their own region, and are thus unable to provide the necessary support and follow-up.

It is proposed therefore, that a small number of key indicators be used to routinely report status of programme operations between various levels. The indicators proposed (see Appendix 3), include a number which are already used by the Western Pacific Regional Office of WHO for monitoring the EPI programmes of other countries in the region.

The indicators should be used by provincial coordinators to summarize activities on a quarterly basis to their respective regions, and by regional coordinators reporting, also quarterly, to the centre. Two versions of the proposed summary form, appropriate for these two levels of reporting, are shown in Appendix 3.

E. EPI Manual Revision

The present EPI manual is of a good standard, but requires revision and updating to reflect current policies and practice. A number of changes were proposed including:

- removal of the Cold Chain & Logistics section to form the basis of a smaller, separate manual for this topic;
- inclusion of a chapter on calculating vaccine stocks and needs at each level; (modification of present methodology for estimating vaccine needs, including the use of real vaccine wastage rates);
- inclusion of a storage time/temperature diagram for all vaccines, and a distribution schedule for all levels;
- inclusion of chapters on routine care and maintenance for electric, L.P. gas and kerosene operated refrigerators;
- inclusion of a chapter on packing and storing of vaccines in cold boxes, refrigerators and freezers;
- modification of the section on handling vaccines at the health centre, to reflect current MCHS recommendations and the point-of-use vaccine carrier;
- modification of vaccine stock forms to ensure routine consolidation of stock balances and physical stock checks.

F. Methodology for Estimating Required Cold Chain Capacity

The proposed cold chain inventory software outlined in Section B above will provide an automatic readout of the required cold chain capacity at any health facility or store, based on the population to be served, and on the frequency of vaccine supply.

The calculation used to determine cold chain capacity can be readily adapted when additional vaccines are to be included in an existing EPI schedule, or when new strategies or policies are introduced.

Appendix 4 gives details of the methodology developed for this purpose, and shows:

- the calculations used to determine present-day cold chain needs;
- a modified calculation, to determine additional cold chain requirements when hepatitis B immunization is introduced in 1992; and
- a calculation to determine the effects of national vaccination days on required cold chain capacity.

The effects on cold chain capacity of these various changes may be studied separately or cumulatively.

G. Evaluation of Cold Chain & Logistics Training:

Cold chain and logistics training programmes conducted by the EPI Division are based on the WHO/EPI technical series, and include modules on:

- calculation of vaccine requirements;
- storage and distribution of supplies;
- keeping records and calculating wastage;
- care and maintenance of refrigerators and freezers (electric, kerosene and gas-powered models);
- use and care of cold boxes and vaccine carriers;
- ordering and managing stocks of spare parts;
- vaccine quality control; and
- use of vaccine cold chain monitor cards;

A considerable number of these training courses have taken place in the Philippines since the commencement of the EPI programme, but no formal evaluation of the benefits of training has been undertaken. There are no guidelines available from WHO on evaluating these courses.

Proposed guidelines for a course evaluation were prepared, (Appendix 5) based on the content and objectives of the training programme and on some observations of field performance of former trainees. These guidelines have not been tested however, and may require further development before being adopted.

VI. CONCLUSIONS & RECOMMENDATIONS

In view of the many shortcomings in the original EPI information and inventory system, and the remaining need for substantial revision and redesign, it was proposed that further development work on this system be abandoned. This proposal was accepted by senior staff at the EPI central office.

Work commenced on a new and simplified information system, and the structures for data entry, information flow and information output were completed. Computerization will be limited to central, regional and provincial levels of the country. Manual data processing and information transfer will continue to be used at all lower levels for the foreseeable future. It is recommended that data transfer by telephone modem be introduced between provincial, regional and central levels.

Field testing of the equipment inventory system in one region of the country was planned, but promised data from field level health institutions failed to arrive on time, and only mock data has been used to test the system at the time of writing.

Thorough field testing and evaluation will be needed before full-scale implementation of the system is considered. It is recommended that a detailed assessment of the field testing be carried out in mid-1992, to determine if wider implementation is feasible or if further modifications are required. Some external assistance may be required with this assessment.

Introduction of a new vaccine inventory module was found to be unnecessary, but better use of available information is needed at central level for monitoring and management purposes.

Serious weaknesses were observed in the vaccine logistics system as a whole. Various organizations have made numerous recommendations for its improvement but their recommendations have not yet been implemented. Lack of staff knowledge and skills, rather than shortage of data are indicated as the cause of many of these problems. It is recommended that a training programme on vaccine logistics be conducted for central level staff involved in the ordering, storing and distribution of national supplies.

Serious problems were also noted at the central vaccine store, and the entire central cold chain was assessed as being in need of urgent attention. Time did not permit a detailed examination of the problems, and it is recommended that this should form the basis of a separate study. Terms of reference for such an assignment should also include an assessment of regional, as well as central, vaccine cold stores.

Indicators of immunization programme performance for use at provincial and regional levels were drafted, and a preliminary evaluation of a supervision summary, based on these indicators, was carried out in the test region. It is recommended that comments be invited from the NIC meeting in October 1991, with a view to adopting this supervision summary form on a national basis.

A series of revisions were proposed for the EPI manual, and it is recommended that the present cold chain and logistics chapters be removed to form the basis of a smaller, separate manual. This will allow for the addition of new, essential material, without requiring the production of the larger document.

A methodology for calculating cold chain capacity was developed which allows for the effects of additional vaccines in the EPI schedule to be assessed. It is recommended that this method be used for future cold chain planning purposes. The proposed cold chain inventory module already contains a built-in function giving an automatic readout of cold chain capacity, based on this same method of calculation.

Evaluation guidelines for cold chain and logistics training programmes were drafted, based on the course objectives and content. Time did not permit field testing of the protocol, however, and it is recommended that this be carried out before adoption is considered.

VII. FOLLOW-UP ACTION REQUIRED BY MCHS

1. Arrange printing of equipment identification guide booklet with possible UNICEF assistance.
2. Collect inventory data from region IV as soon as possible, and print output summary up to reporting level 07 (regional summary).
3. Analyze inventory outputs and determine which reports are needed on a routine basis for management purposes.
4. Plan detailed assessment of proposed information and inventory system for mid-1992.
5. Invite quotations and detailed proposals for supply and installation of telephone modems for linking provincial, regional and central level EPI offices.
6. Re-activate Vaccine Logistics working group and implement outstanding recommendations made during 1990 meetings.
7. Plan training programme for central staff involved in ordering, storing and distributing vaccines.
8. Plan urgent assessment of central cold stores at Alabang, with a view to upgrading the quality and security of vaccine storage.
9. Initiate drafting and editing of cold chain and logistics manual, together with revision of main EPI manual.
10. Conduct field testing of cold chain and logistics evaluation guidelines with a view to further development and adoption.

REGION: _____ PROVINCE\CITY: _____ LOCATION CODE: _____
 DISTRICT: _____ RHU: _____ ELECTRIC STATUS: _____
 TOTAL RHU POPULATION: _____ REQ'D COLD CHAIN CAPACITY: @ +4 _____ @ -20 _____

ITEM CODE	DESCRIPTION (& net cc cap. - R/F)	TOTAL THIS ITEM		YEAR ACQUIRED	SOURCE	EXISTING	EXISTING	OPERATIONAL STATUS				
		DISTRIBUTED	AVAILABLE			CC. CAP. @ +4 (LL)	CC. CAP. @ -20 (LL)	CONDITION	F	HF	DEFECT CODE	
R3/10	TC - 1050 R'LUX 0/378											
R3/21	RCW 42 RG R'LUX 24/1.6											
R3/22	RCW 42 RK R'LUX 24/1.6											
R3/24	TCW 1151 R'LUX 209/200											
R3/26	TFW 790/1 ICEPACK FREEZER					-	-					
R3/28	V 240 RR SIRIR 68/30											
R3/62	TCW 1990 R'LUX 60/11											
N-S1	90WOB REFRIGINATOR 44/18											
N-S2	CHEST FRZR W'HOUSE 0/120											
N-S3	WHITE WESTINGHOUSE											
N-S4	83WOB REFRIGINATOR 130/75											
N-S5	RR-58PP NATIONAL											
N-S6	SMALL NATIONAL (JICA)											
N-S7	OTHER TYPES _____											
CR1	COLD ROOM: 35 CU.M.											
CR2	COLD ROOM: /capacity											
R4/19	EPI/PF/1.5 POLYFOAM					-	-					
R4/36	MODEL 2 POLYFOAM					-	-					
R4/42	EPI/PF/2.4 POLYFOAM					-	-					
R4/53	RCW 2 ELECTROLUX					-	-					
R4/63	EPI/PF/0.7 POLYFOAM					-	-					
R4/64	MODEL 3 POLYFOAM					-	-					
R4/71	BACK PACK POLYFOAM					-	-					
R5/02	ICEPACK 0.4 LITRE					-	-					
R6/04	ALARM THERMOMETER ZBAL					-	-					
R6/06	CHART RECORDER ZBAL					-	-					
R6/26	MODEL 475 DIAL THERMO					-	-					
R6/27	MODEL 614 STEM THERMO					-	-					
R7/01	MARK 9 ALARM UNIT					-	-					
R9/01	MODEL 7509 STER. SINGLE					-	-					
R9/02	MODEL 7506 STER. DOUBLE					-	-					
R9/03	MODEL KC 5L STER. SINGLE					-	-					
R9/05	MODEL KC 8L STER. DOUBLE					-	-					
TOTAL												

NO. OF MIDWIVES: _____

PERSON RESPONSIBLE FOR EQUIPMENT: _____

MUNICIPAL HEALTH OFFICER: _____

APPENDIX 2

EPI Vaccine Logistics Working Group

Summary of Main Recommendations & Implementation Status

1) Coordination between MCHS/DOH and BPS Alabang:

- need to maintain reserve vaccine stocks of 25% at central level to guard against shortages when supplies are delayed;

Status: not implemented

- need for revised vaccine stock reporting forms from Alabang and lower levels to send to MCHS; better co-ordination between BPS Alabang and MCHS/DOH needed;

Status: not implemented

- introduction of vaccine monitoring graphs for use by MCHS/DOH to control BPS vaccine stocks and issues from 1990

Status: made but not used by MCHS

- need to collect information on vaccine wastage rates from lower levels(region/province/district) through new monitoring forms; need to estimate real national wastage rates for each vaccine based on results of regional/provincial/district figures;

Status: started but now discontinued; no data available

- need for regional vaccine reports to be comprehensive, and to include all deliveries made directly from BPS Alabang, as well as those passing through the regional offices;

Status: not known; reports very irregular

2) Vaccine Calculations, 1991-95:

- need for reserve vaccine stocks to be held at all other storage levels apart from BPS Alabang, calculated at 25% of supply period amounts;

Status: not implemented

3) Vaccine Distribution:

- need to reduce long vaccine storage periods at provincial level, and increase frequency of delivery from quarterly to monthly in principle; some flexibility allowed depending on distances from regional stores;

Status: unclear, but no directive issued on this matter

4) Vaccine Orders, 1992:

- need for new calculations of polio requirements in view of polio eradication target, and NVD's 1991-95;

Status: completed and orders placed

- need to specify exact amounts and dates for delivery in all future vaccine orders; need to ensure manufacturers/suppliers informed and can keep to the agreed schedule; need to check manufacturers contracts for conformity with needs;

Status: started but not complete

- need to prepare one-page guideline outlining steps in making vaccine orders, draft calculations, timeframe, etc;

Status: not implemented

- need for future vaccine orders to be vetted jointly by WHO/DOH working party;

Status: not implemented

- need to agree on sources of supply for all vaccines over the next 5 years to ensure continuous and sustainable deliveries;

Status: unknown

5) Follow-Up Actions:

- need for further and continuing meetings of vaccine logistics working group;

Status: not implemented; no meetings held for past 10 months

- need to present recommendations to director, MCHS, before submitting to NIC and preparing circulars for all regions;

Status: none so far

- presentation of vaccine logistics working group results to NIC

Status: no results for presentation this year

APPENDIX 3

Quarterly EPI Supervision Summary

From: Provincial EPI coordinator of: _____ Province;

To: Regional Director _____ Quarter: _____ 19 ____

Activities:

1) Number of supervisory visits planned during the quarter in this province: _____

Number actually carried out: _____ (attach schedule showing dates and places supervised)

Vaccine & Immunization Supplies:

2) Number of health facilities and stores visited: _____

3) Number of health facilities or stores visited which had vaccine stocks for any antigen below the 25% buffer stock level this quarter: _____

Types of vaccine in short supply: _____

4) Have any vials/ampoules of vaccine been discarded due to expiry in the province this quarter? (circle one) yes no

Vaccine _____	Number of doses _____
Vaccine _____	Number of doses _____
Vaccine _____	Number of doses _____

5) Number of facilities seen where insufficient needles & syringes were available: _____

Size in short supply: _____
Type (circle one) disposable or re-usable

Cold Chain:

6) Number of refrigerators checked: _____

7) Number of refrigerators seen which had temperatures outside the correct vaccine storage range this quarter: _____

Number seen which had correct temperatures recorded twice per day, every day during this quarter: _____

8) Number of completed temperature charts received from health facilities during this quarter: _____

9) Number of cold chain failures/breakdowns which occurred in the province this quarter: _____

Reasons for failure: _____
Number not yet repaired: _____

Records:

10) Number of health facilities visited this quarter where target client list was correctly updated : _____

11) Number of health facilities where the vaccine register was kept up to date, with RECEIVED, ISSUED and STOCK BALANCE columns correctly filled for each vaccine: _____

12) Number of health facilities where the cold chain inventory form was correctly filled and updated: _____

Surveillance:

13) Number of cases of the EPI target diseases occurring in the province this quarter:

Measles	_____
Diphtheria	_____
Pertussis	_____
Tetanus Neonatal	_____
Poliomyelitis	_____

Health Education:

14) Number of health facilities visited with inadequate IEC materials in the province this quarter: _____

Work Plan:

15) Number of supervisory visits planned during the next quarter for the province: _____

16) Any observations or matters for attention:

Signature _____ Date _____
(Provincial EPI Coordinator)

APPENDIX 4

Method for Estimating Cold Chain Capacity

For all of the calculations which follow, assume a unit population of 1000 persons, and that all children born in this population each year will be fully vaccinated (ie, 100% coverage). Storage volumes calculated are the net capacities in each case, expressed in c.c. where walk-in cold rooms are used (i.e. at central stores, and in most cases, at regional stores), the gross store capacity required can be found by multiplying the calculated net capacity volumes by the "grossing factor" of 3.0. This allows extra space in the store for walkways and permits access for loading and unloading.

Present-day Cold Chain Capacity Requirements

Step 1: Vaccine quantities/1000 population, based on present-day immunization schedule:

No. of doses for each vaccine =

No. of doses given x No. children/1000 x coverage x wastage rate
ie;

for BCG:	1	dose	x	30	children	x	100%	x	2.5	wastage	=	75	doses/1000
DPT:	3	"	x	30	"	x	100%	x	1.67	"	=	150	"
Polio:	3	"	x	30	"	x	100%	x	1.70	"	=	153	"
Measles:	1	"	x	30	"	x	100%	x	2.2	"	=	66	"
TT:	2	"	x	35	women	x	100%	x	2.0	"	=	140	"
BCG(Sch):	1	"	x	28	children	x	100%	x	1.4	"	=	39	"

Step 2: Vaccine Volumes/year/1000 population, based on currently-used vaccine manufacturers and package sizes:

Volume for each vaccine = No. of doses/1000 x packaged volume/dose

ie;

for BCG:	(75 + 39)	x	5.3	=	604cc/year	= 1182cc @ +4 C
DPT:	150	x	1.45	=	218 " "	
TT:	140	x	2.57	=	360 " "	
POLIO:	153	x	0.54	=	83 " "	= 292cc @ -20
MEASLES:	66	x	3.17	=	209 " "	

Step 3: Storage Volumes per level/1000 population, assuming that all levels maintain reserve stocks at 25% of their consumption during one supply period:

for central store; 4 x quarterly deliveries ; 25% reserve stock;

$$\begin{array}{rcl} \text{each delivery} & = & 1182\text{cc/year} \times 1.25 \text{ reserve} \\ (+4 \text{ C}) & \frac{\text{-----}}{4} & = 370\text{cc}/1000 \\ & & @ +4 \text{ C} \end{array}$$

$$\begin{array}{rcl} \text{each delivery} & = & 292\text{cc/year} \times 1.25 \text{ reserve} \\ (-20 \text{ C}) & \frac{\text{-----}}{4} & = 92\text{cc}/1000 \\ & & @ -20 \text{ C} \end{array}$$

for regional stores; 4 x quarterly deliveries ; 25% reserve stock;

$$\begin{array}{rcl} \text{each delivery} & = & 1182\text{cc/year} \times 1.25 \text{ reserve} \\ (+4 \text{ C}) & \frac{\text{-----}}{4} & = 370\text{cc}/1000 \\ & & @ +4 \text{ C} \end{array}$$

$$\begin{array}{rcl} \text{each delivery} & = & 292\text{cc/year} \times 1.25 \text{ reserve} \\ (-20 \text{ C}) & \frac{\text{-----}}{4} & = 92\text{cc}/1000 \\ & & @ -20 \text{ C} \end{array}$$

for provincial stores; 12 x monthly deliveries ; 25% reserve stock;

$$\begin{array}{rcl} \text{each delivery} & = & 1182\text{cc/year} \times 1.25 \text{ reserve} \\ (+4 \text{ C}) & \frac{\text{-----}}{12} & = 123\text{cc}/1000 \\ & & @ +4 \text{ C} \end{array}$$

$$\begin{array}{rcl} \text{each delivery} & = & 292\text{cc/year} \times 1.25 \text{ reserve} \\ (-20 \text{ C}) & \frac{\text{-----}}{12} & = 31\text{cc}/1000 \\ & & @ -20 \text{ C} \end{array}$$

for district stores; 12 x monthly deliveries ; 25% reserve stock;

$$\begin{array}{rcl} \text{each delivery} & = & 1182\text{cc/year} \times 1.25 \text{ reserve} \\ (+4 \text{ C}) & \frac{\text{-----}}{12} & = 123\text{cc}/1000 \\ & & @ +4 \text{ C} \end{array}$$

$$\begin{array}{rcl} \text{each delivery} & = & 292\text{cc/year} \times 1.25 \text{ reserve} \\ (-20 \text{ C}) & \frac{\text{-----}}{12} & = 31\text{cc}/1000 \\ & & @ -20 \text{ C} \end{array}$$

for RHU's or BHS's; 52 x weekly deliveries ; 25% reserve stock; all vaccines stored @ +4 C;

$$\begin{array}{rcl} \text{each delivery} & = & (1182 + 292) \times 1.25 \text{ reserve} \\ (+4 \text{ C}) & \frac{\text{-----}}{52} & = 36\text{cc}/1000 \\ & & @ +4 \text{ C} \end{array}$$

Additional Cold Chain Capacity Requirements When hepatitis B is included.

Step 1: In addition to the vaccine quantities detailed under the above section, there will now be the following need per 1000 population:

For hep B:

3 doses x 30 children x 40% coverage (in 1992) x 1.2 wastage = 43 doses/1000 in 1992 and increasing by 10% coverage per year to 100% coverage by 1998;

Step 2: Additional storage space @ +4 C will be needed, and distribution will be in the ratio: 10% single dose vials to 90% 10-dose vials.

ie; additional volume needed @ +4 C = 43 doses x 10% x 11.09cc/dose
+ 43 doses x 90% x 2.75cc/dose
= 154cc/year in 1992

with requirements rising by 10% per year to reach
= 387cc/year in 1998

thus; total cold chain requirements @ +4 C will be:

1182 + 154 = 1336cc/year in 1992
and rising to 1182 + 387 = 1569cc/year in 1998

total cold chain requirements @ -20 C will not be affected by introducing hepatitis B vaccine, and will remain as before at: = 292cc/year.

Step 3: Storage volumes per level/1000 population now become: (for 1992)

for central store; 4 x quarterly deliveries ; 25% reserve stock;

each delivery = 1336cc/year x 1.25 reserve = 418cc/1000
(+4 C) -----
4 @ +4 C

each delivery = 292cc/year x 1.25 reserve = 92cc/1000
(-20 C) -----
4 @ -20C

for regional store s; 4 x quarterly deliveries ; 25% reserve stock;

each delivery = 1336cc/year x 1.25 reserve = 418cc/1000
(+4 C) -----
4 @ +4 C

each delivery = 292cc/year x 1.25 reserve = 92cc/1000
(-20 C) -----
4 @ -20C

for provincial stores; 12 x monthly deliveries ; 25% reserve stock;

$$\begin{array}{rcl} \text{each delivery} & = & 1336\text{cc/year} \times 1.25 \text{ reserve} \\ (+4 \text{ C}) & & \text{-----} \\ & & 12 \end{array} = \begin{array}{l} 139\text{cc}/1000 \\ @ +4 \text{ C} \end{array}$$

$$\begin{array}{rcl} \text{each delivery} & = & 292\text{cc/year} \times 1.25 \text{ reserve} \\ (-20 \text{ C}) & & \text{-----} \\ & & 12 \end{array} = \begin{array}{l} 31\text{cc}/1000 \\ @ -20\text{C} \end{array}$$

for district stores; 12 x monthly deliveries ; 25% reserve stock;

$$\begin{array}{rcl} \text{each delivery} & = & 1336\text{cc/year} \times 1.25 \text{ reserve} \\ (+4 \text{ C}) & & \text{-----} \\ & & 12 \end{array} = \begin{array}{l} 139\text{cc}/1000 \\ @ +4 \text{ C} \end{array}$$

$$\begin{array}{rcl} \text{each delivery} & = & 292\text{cc/year} \times 1.25 \text{ reserve} \\ (-20 \text{ C}) & & \text{-----} \\ & & 12 \end{array} = \begin{array}{l} 31\text{cc}/1000 \\ @ -20\text{C} \end{array}$$

for RHU's or BHS's; 52 x weekly deliveries ; 25% reserve stock; all vaccines stored @ +4 C;

$$\begin{array}{rcl} \text{each delivery} & = & (1336 + 292) \times 1.25 \text{ reserve} \\ (+4 \text{ C}) & & \text{-----} \\ & & 52 \end{array} = \begin{array}{l} 39\text{cc}/1000 \\ @ +4 \text{ C} \end{array}$$

The above calculation of additional cold chain requirements for hepatitis b vaccines would need to be repeated for each year, since the 40% target for 1992 will increase by 10% each year.

Effects of National Vaccination Days

Polio vaccine used during National Vaccination Days will only be stored in the cold chain for short periods, ie, for approximately 2 weeks prior to each vaccination day. It may therefore be acceptable to store the vaccine at +4 C Normally, all polio vaccine should be stored at -20 C as far as possible. This calculation assumes short-term storage of NVD polio only at +4 C.

Step 1: Additional polio vaccine/1000 population/NVD =

$$1 \text{ dose} \times 120 \text{ children} \times 100\% \text{ coverage} \times 1.33 \text{ wastage} = 160 \text{ doses}/1000$$

Step 2: Additional volume per NVD/1000 population:

$$\text{number of doses}/1000 \times \text{vaccine volume}/\text{dose}$$

$$\text{ie, } 160\text{doses}/1000 \times 0.54 = 86\text{cc}/\text{NVD} @ +4 \text{ C}$$

Step 3: This amount of vaccine will be distributed only once for each NVD, and will not be repeated in each delivery period as is the case for other vaccines. Thus, storage space at each level will become:

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for central store;

$$\begin{array}{rcl} \text{each delivery} & = & 1182\text{cc/year} \times 1.25 \text{ reserve} + 86 \\ (+4 \text{ C}) & \frac{\text{-----}}{4} & = 456\text{cc}/1000 \\ & & @ +4 \text{ C} \end{array}$$

$$\begin{array}{rcl} \text{each delivery} & = & 292\text{cc/year} \times 1.25 \text{ reserve} \\ (-20 \text{ C}) & \frac{\text{-----}}{4} & = 92\text{cc}/1000 \\ & & @ -20 \text{ C} \end{array}$$

for regional stores;

$$\begin{array}{rcl} \text{each delivery} & = & 1182\text{cc/year} \times 1.25 \text{ reserve} + 86 \\ (+4 \text{ C}) & \frac{\text{-----}}{4} & = 456\text{cc}/1000 \\ & & @ +4 \text{ C} \end{array}$$

$$\begin{array}{rcl} \text{each delivery} & = & 292\text{cc/year} \times 1.25 \text{ reserve} \\ (-20 \text{ C}) & \frac{\text{-----}}{4} & = 92\text{cc}/1000 \\ & & @ -20 \text{ C} \end{array}$$

for provincial stores;

$$\begin{array}{rcl} \text{each delivery} & = & 1182\text{cc/year} \times 1.25 \text{ reserve} + 86 \\ (+4 \text{ C}) & \frac{\text{-----}}{12} & = 209\text{cc}/1000 \\ & & @ +4 \text{ C} \end{array}$$

$$\begin{array}{rcl} \text{each delivery} & = & 292\text{cc/year} \times 1.25 \text{ reserve} \\ (-20 \text{ C}) & \frac{\text{-----}}{12} & = 31\text{cc}/1000 \\ & & @ -20 \text{ C} \end{array}$$

for district stores;

$$\begin{array}{rcl} \text{each delivery} & = & 1182\text{cc/year} \times 1.25 \text{ reserve} + 86 \\ (+4 \text{ C}) & \frac{\text{-----}}{12} & = 209\text{cc}/1000 \\ & & @ +4 \text{ C} \end{array}$$

$$\begin{array}{rcl} \text{each delivery} & = & 292\text{cc/year} \times 1.25 \text{ reserve} \\ (-20 \text{ C}) & \frac{\text{-----}}{12} & = 31\text{cc}/1000 \\ & & @ -20 \text{ C} \end{array}$$

for RHU's or BHS's;

$$\begin{array}{rcl} \text{each delivery} & = & (1182 + 292) \times 1.25 \text{ reserve} + 86 \\ (+4 \text{ C}) & \frac{\text{-----}}{52} & = 122\text{cc}/1000 \\ & & @ +4 \text{ C} \end{array}$$

It will be noted that the effects of National Vaccination Days on the required cold chain capacity are proportionally much greater at lower levels of the cold chain, and result, at RHU and BHS levels, of storage needs almost 4 times greater than that required for the regular programme vaccines.

The above calculation of the effects of National Vaccination Days uses as the starting point the storage requirements of the current vaccines and has not also considered the additional cold chain capacity requirements for hepatitis b vaccine.

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APPENDIX 5

Evaluation of Cold Chain & Logistics Training Programmes

PROPOSED GUIDELINES

(Interview and assessment of the trainee to be carried out at his/her normal place of work)

1. When did the trainee attend the cold chain/logistics course? (circle one)
during current year/last year/2yrs ago/3yrs ago/more than 3yrs

2. What are the present duties of the trainee?

CC & Log manager/CC Technician/EPI Coordinator/MHO/DHO/FHO/RHO?
Other post(specify) _____

3. Are vaccine stock registers maintained and updated at this health facility, with RECEIVED, ISSUED and STOCK BALANCE columns correctly filled for each vaccine? (circle one) YES NO

Does each vaccine stock balance shown in the register agree with amounts actually in the refrigerator or freezer today? (circle one) YES NO

Is the stock balance for each vaccine today sufficient for the needs until the next scheduled delivery? (circle one) YES NO

4. Are real wastage rates for each vaccine calculated on a regular basis at this health facility? (circle one) YES NO

Are these calculated rates used for estimating vaccine allocations for future supply periods? YES NO

What wastage rates were calculated for the last reporting period at this health facility?

BCG (inf) _____
BCG (sch) _____
DPT _____
Polio _____
Measles _____
TT _____
Hep B _____

5. Are Vaccine Cold Chain Monitor Cards correctly used? (circle one) YES NO

Is data from these cards routinely entered on the vaccine stock registers? (circle one) YES NO

6. Are sufficient stocks of spare parts available for the types of refrigerators, freezers and sterilizers used at this centre? YES NO

Does the trainee keep a record of repairs carried out on equipment at this health facility? YES NO

7. Are sufficient stocks of immunization supplies available for the needs of this health facility? YES NO

Is there a register showing details of the amounts and dates of receipt and issue of immunization supplies? YES NO

8. Is the cold chain inventory form correctly filled for this health facility? YES NO

Do the items shown on the inventory correspond with those actually available in the centre? YES NO

Does the form indicate that cold chain capacity is sufficient for the needs of the centre? YES NO

9. Is routine maintenance correctly carried out on refrigerators and freezers? YES NO

Any excessive amount of evaporator ice evident today? YES NO

For kerosene equipment, does the burner have a clear, steady flame today? (circle one) YES NO

Is a spare container of kerosene/gas available? YES NO

Is the temperature record correctly maintained? YES NO

10. Are vaccines properly organized in the refrigerator, with each vaccine in an appropriate place, new and old stocks separated and air spaces for circulation? YES NO

Anything else kept in the refrigerator today? YES NO

Any expired vaccine in the refrigerator/freezer today? YES NO

11. Is there a plan for dealing with breakdowns and emergencies in the cold chain? YES NO

Is the plan realistic and appropriate for the situation at this centre? YES NO

12. Does the trainee's immediate supervisor feel that:

-the trainee has benefited from attending the Cold Chain & Logistics training? YES NO

-the trainee has shown improved performance since attending this training course? YES NO

-the course was relevant to the trainee's present duties? YES NO

-the trainee requires further training? YES NO

If Yes, on which topics is training needed?

Signed _____

Date _____

Title _____
(Officer conducting assessment)