

TECHNET
A Technical Network for Logistics and Health

**REPORT OF 1991
TECHNET CONSULTATION**
(WHO/EPI/LHIS/92.1)

International consultation of experts in logistics for health
to discuss technical developments in the EPI and
establish plans of action on priority issues.

Casablanca, Morocco
18-22 November 1991

LOGISTICS FOR HEALTH

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INTRODUCTION

The second Technet Consultation was held in Casablanca from 18-22 November 1991. Forty participants, who included staff members from WHO and UNICEF headquarters, Regional and country offices, independent consultants and representatives from a number of non-governmental organizations, took part. Several observers, mainly from the health offices in Morocco, also attended.

Mr Garry Presthus (EPI/SEARO) was elected Chairman for the session and the rapporteur's responsibilities were shared between five members — Allan Bass, Anthony Battersby, Nancy Cain, Rebecca Field and Michael Free. The presentations made during the meeting are summarised under the major topic headings in this report, followed by the recommendations proposed during the group discussions.

The meeting was opened by Dr Mustafa Akhmis, Secretary General of the Ministry of Health, who welcomed the participants to his country. Dr Akhmis expressed satisfaction that Morocco was the venue for the meeting. The country is proud of its progress in the EPI in recent years. Infant mortality has fallen from 120 per thousand to 50-60 per thousand. Social mobilization is undoubtedly the key to this success but the part played by the strong logistics systems in the country should not be overlooked.

Dr Akhmis recalled that Morocco was one of the first countries to use plastic syringes and steam sterilizers. Morocco has implemented computerized stock control and inventory systems at all levels of its health services and now seeks management indicators to monitor the efficiency of the logistic system.

Dr Zeribi, the WHO representative in Morocco, spoke of the global progress of the EPI since 1974. Although the EPI can claim today that 80% of the world's children have been immunized¹, there are still wide regional variations and low coverage in some areas of the world. It will be a considerable challenge to reach the last 20% and achieve the World Health Assembly's goal for the EPI by the end of the decade. In this context, he stressed the important role that Technet can play in coordinating the efforts of agencies, organizations and governments to resolve the logistic problems which are a serious barrier to progress in many countries.

¹Declaration of Universal Childhood Immunization made at the United Nations, New York, 8 October, 1991.

REVIEW OF MAJOR ISSUES AFFECTING TECHNET

The main task of the 1991 Technet meeting was to look at new developments and review progress since the previous meeting. On this basis members set up new priorities, made recommendations established plans of action and undertook responsibilities.

Since the Technet meeting in March 1990 one of the most significant global events to take place was the formation of the Children's Vaccine Initiative (CVI) task forces. It has been proposed that Technet assume the responsibilities of "Taskforce 5" and that Technet reports become routine presentations to the CVI Management Committee. Taskforce 5 is the group assigned to simplify issues concerning the storage, handling and delivery of vaccines.

In 1991, for the first time, the Unicef Programme and Supply Divisions were represented at the EPI Global Advisory Group (GAG) meeting. Three issues of particular importance to Technet were included in the recommendations from that meeting:

- The cost and resource implications of EPI strategies are to be analysed and the trade-offs between different strategies will be studied.
- Inter-agency coordinating committees at Regional and global levels are to be established. This should result in an increased flow of donor funds and more donor participation in the policies of the programme.
- A Global Fund for New Vaccines is to be established. This should break the existing deadlock (caused by the high initial vaccine price) over the inclusion of hepatitis B in the programme.

EPI has entered an era of exceptionally high political visibility, support and global good will. However, the accumulation of ambitious targets for the present decade places a strain on the Programme's diminishing resources. This can only be resolved by setting priorities. Technet is well placed to assist in this procedure and to contribute to the control of recurrent costs by:

- making predictions of logistic impact of strategies;
- measuring efficiency in the use of resources;
- controlling recurrent costs;
- building up local revenue sources; and
- improving technologies used by the EPI.

UNICEF SUPPORT FOR THE EPI

Unicef is committed to reducing the disparities in immunization coverage, strengthening management capacities and addressing issues of sustainability and cost effectiveness. It supports the EPI goals of disease eradication, elimination and control by the end of the decade, specifically:

- Immunization coverage equal to, or greater than, 90% by the year 2000;
- Measles reduction in relation to current levels, 95% reduction of deaths and 90% reduction of cases by 1995;
- NNT elimination by 1995;
- Polio eradication by 2000.

During the coming decade, UNICEF will provide 20% of their budget to EPI and will continue to supply vaccines, cold chain equipment and training funds.

Unicef has increased its vaccine procurement budget from US\$ 47 million for 1990 to US\$ 50 million for 1992 to cover the increase in the number of doses from 967 million to 1,233 million. However, vaccine manufacturers have raised their current vaccine prices by 80%. As a result, the Unicef vaccine costs for 1992 will be around US\$ 90 million. This increase, plus the decline in Rotary funding for polio vaccine, is placing a strain on Unicef's capacity to maintain a steady level of funding for the EPI.

Whether this will result in less vaccine being made available to the EPI or reduced funds for other programme costs, it is yet another factor which stresses the vital importance of setting priorities and choosing cost effective strategies. Coverage "at any cost" is no longer an option!

In the discussion on this topic, several members cited evidence that Unicef support for the EPI at country level seems to be already waning -- for example, country budgets are reduced, the supply of vaccines has decreased and fewer staff are allocated to the EPI. Additional funds are needed to subsidise the disease eradication, elimination and control strategies in the field. If not, it will not be possible to achieve these targets or to increase coverage of the last 20% of children.

TECHNET COMMUNICATIONS

Based on one of the recommendations from Technet 1990, a bulletin board was set up on the UNET electronic mail system. An evaluation of its first year in operation shows that it was accessed at least once by two-thirds of the members but was not effectively used. Items of interest to Technet members were posted but, in most cases, the ensuing communications were sent on a person to person basis using fax, personal E-mail or telex. Such information exchanges were therefore not shared with other members.

One of the basic concepts of Technet was to create a technical network between members through communication and the exchange of information. Apart from the Technet meetings, which are expensive and therefore infrequent, the next best forum is the bulletin board. However, it can only achieve this goal if it is used regularly by all members.

To be successful, the bulletin board must channel relevant, useful and dynamic information — questions should be posed and answered, views offered and challenged, experiences shared. The information posted so far (on priority topics identified in 1990) should be regularly updated and reflect active exchanges; if not, members will tend to lose interest and stop using the bulletin board.

Access and on line costs are the main reasons why consultants are not using the bulletin board. Many of the WHO and Unicef field staff find that local administrative procedures seriously hinder free communication. Other difficulties include the poor quality of the telephone links in some countries — for instance, it was not possible to establish an international connection from Morocco during the meeting.

In spite of the limited use of the bulletin board, the other levels of communication between members have been generally high. Secretariat requests for opinions on problems and new developments have generated a good level of global interest.

Recommendations

Technet members should be granted full access to communications systems (Electronic mail, the Technet bulletin board, fax, telex, telephone, and postal systems) by their respective organizations to enable them to "network" on technical issues.

Technet members should be authorized by their organizations to informally communicate information and opinions on technical

issues to other Technet members without specific clearance or pre-clearance for each communication. Formal communication should follow regular procedures.

Non-organizational Technet members, such as independent consultants who are not supported financially, should receive reimbursement for individual Technet communication costs. They should be granted access to the Bulletin board and UNET E-Mail network with minimal charges.

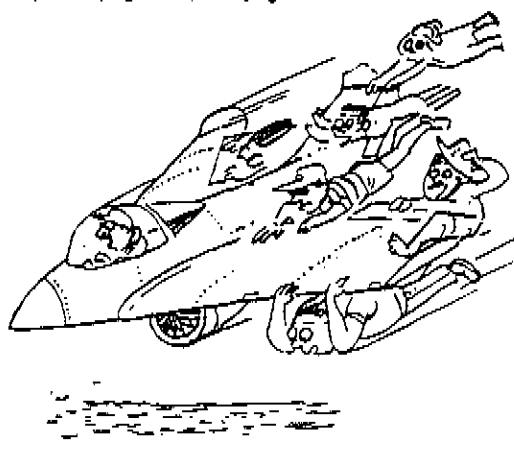
See Annex 1, para. 1: Streamline Technet Communications **Plan of action**

SENIOR LEVEL LOGISTICS PLANNING WORKSHOP

The aim of this workshop is to enable senior logistics and operations personnel to participate in the planning of the EPI and other primary health care interventions. The workshop participants will be set the task of defining problems, formulating strategy and planning activities, as in the WHO/EPI Senior Level Planning Workshop. A simulation of this procedure was presented and discussed.

The Technet members separated into four working groups to discuss and identify the characteristics of successful logistics management systems for equipment, transport, vaccine & supplies, and facilities. Each groups' comments will be taken into account in the preparation of the workshop materials. Once these materials are available in draft, copies will be circulated to Technet members for advance review.

Expensive programme, but "flying blind"!



EVALUATION OF LOGISTICS AND COLD CHAIN

Country surveys

Twelve surveys were presented and discussed. Members generally agreed that the process of conducting a survey helps to provoke change and a general increase in awareness of EPI logistics. Each of the current surveys have a different combination of objectives, including the following:

- establish an inventory of equipment;
- examine local recurrent logistic costs;
- evaluate standards of vaccine handling;
- evaluate equipment performance;
- assess injection and sterilization practices;
- assess adequacy of local transport;
- evaluate vaccine and supplies availability and distribution.

Some of these objectives are directly or indirectly linked with the process of establishing and maintaining equipment inventory systems and others are targetted at the quality of cold chain and logistic systems.

Equipment inventory surveys

Recent surveys in Latin America were used as a means to establish an equipment inventory in six countries and covered almost 100% of the health facilities delivering immunization. They were conducted by trained teams of investigators and were funded externally. The cost of this approach is high, ranging from US\$ 6,000 for small countries with easy communications to US\$ 90,000 for a large country with difficult communications.

In contrast, a survey to establish an equipment inventory in 100% of the health facilities in Ethiopia was achieved without any external costs. It was conducted by organising periodic meetings of district managers who, themselves, collected the necessary information.

The group discussions on inventory systems and the evaluation questionnaire at the conclusion of the meeting emphasised the impor-

tance placed on establishing national equipment and transport inventories so that spare parts requirements can be more efficiently forecast and equipment replacement can be well planned. However, it was also clear that:

- the alternative methods of establishing and maintaining national inventories need to be recorded and evaluated;
- the minimum content of information in these inventories needs to be standardised and, where computers are used, the structural format of such inventories should also be standardised.

Cold chain quality surveys

Some cold chain quality information was collected in Latin America during the inventory surveys which covered 100% of health facilities. However, members generally agreed that sample surveys, visiting only a representative proportion of centres, are quite sufficient to analyse the quality of logistic systems.

Since the first Technet meeting, which called for standardization of survey questionnaires, much standardization has taken place. The "Bass" questionnaires and analysis procedures were used as a basis for several of the surveys presented and have been accepted as a sound basis for future quality surveys.

In spite of the availability of survey methods and consultants qualified to help conduct them, the planning group devoted to this topic was reluctant to recommend that comprehensive quality surveys be conducted as frequently as EPI reviews. In countries where much progress is still to be achieved, it appears preferable to conduct small scale surveys using prioritized performance indicators, supervision check-lists or equipment performance assessments. In countries with well established systems, a single comprehensive survey can provoke a process of change which is adequate for many years.

The Cold Chain Monitor Survey is also an effective way to seek out problems in the vaccine cold chain in countries where management systems are well established. During the meeting a new software utility (EPIC-mate) was introduced. EPIC-mate improves and simplifies the process of analysing the monitor survey results by automatically generating graphic images of performance for each stage of the cold chain (See figure 1).

Current guides on how to run Monitor surveys and analyse the results need to be improved and updated in the light of experience gained in over 25 surveys of this kind.

Figure 1: Part of chart from EPIC-mate

LEVEL:1 TOTAL CARDS:277			
TRANSPORT FROM:Polio Ins.			
Cards with index changes:		Cards delayed	
+10c	+34c	-3cFW	>2 days
150	0	na	78
STORAGE AT: Region SES			
Cards with index changes:		Cards delayed	
+10c	+34c	+3cFW	>4 wks.
6	0	na	67
LEVEL:2 TOTAL CARDS:277			
TRANSPORT FROM:Region SES			
Cards with index changes:		Cards delayed	
+10c	+34c	-3cFW	>1 days
14	0	na	6
STORAGE AT: Distr. SES			
Cards with index changes:		Cards delayed	
+10c	+34c	-3cFW	>4 wks.
16	5	na	98

Indicators for the performance of the cold chain

Management indicators need to be defined and prioritised, both for cold chain quality surveys and to routinely monitor the efficiency of logistic systems. Three categories of management indicators were proposed:

- General indicators for the routine reporting system -- to point supervision to areas where it is needed.
- Indicators to diagnose problems in detail -- for evaluation surveys or supervision checklists.
- Indicators for special studies -- to help diagnose the causes of quality failures.

Indicators from all three groups appear in the current quality surveys. It is not yet evident which of the key quality indicators in these surveys belong in the routine reporting system, nor whether they represent all aspects of the logistics of the EPI.

Recommendations *National inventories of equipment and transport are a pre-requisite to systematic replacement and efficient spare parts procurement. A guide should be prepared on the methods for establishing and maintaining inventories.*

LEVEL:3 TOTAL CARDS:46				LEVEL:3 TOTAL CARDS:231			
TRANSPORT FROM:Distr. SES				TRANSPORT FROM:Distr. SES			
Cards with index changes:		Cards delayed		Cards with index changes:		Cards delayed	
+10c	+34c	-3cFW	>1 days	+10c	+34c	-3cFW	>1 days
0	0	na	0	2	0	na	2
STORAGE AT: Ambulatory				STORAGE AT: Polyclinic			
Cards with index changes:		Cards delayed		Cards with index changes:		Cards delayed	
+10c	+34c	-3cFW	>4 wks.	+10c	+34c	-3cFW	>4 wks.
9	0	na	21	11	3	na	39

Management indicators should be defined and prioritised so that:

- *the efficiency of health logistics can be routinely monitored;*
- *standard methods for surveying the quality of these systems can be selected at any level of detail. A guide on the analysis and interpretation of the survey results should be prepared.*

A recommendation should be made to the 1992 EPI Global Advisory Group on key logistic indicators which should be incorporated into health reporting systems worldwide.

Plan of action *See Annex 1, para.2: Monitor EPI Logistics.*

EQUIPMENT AND STOCK CONTROL SOFTWARE

The first Technet meeting called for the development and standardization of stock and inventory control software for vaccines, supplies, equipment and transport. As a result, the following three programmes are currently being developed:

Figure 2: Sample of graphic stocks output (SLM)

-13:54-----		S L M : Stocks & Logistics Manager V2.0		-----17/02/92							
date 17/02/92		Expiration Date Report		page 1							
ITEM #	Name	Months to EXPIRED						Expiry	Lot Number	Location	Stock Onhand
		0	3	6	9	12	15				
CHOL	CHOLERA VA	██████████						07/04/93	CHOL1	A2	107000
CHOL	CHOLERA VA	██████████						01/01/93	AAAAW	a1	10000
DPT	DIPHTHERIA	EXPIRED						01/07/91	DPT7	a2	50000
MEAS	MEASLES VA	██████████						11/11/92	MEAS3	A1	1200
MEAS	MEASLES VA	EXPIRED						01/01/92	MEAS8	a1	44000
TRIP	TRIPLE ANT	██████████						04/04/92	RAB4	a3	25000
TRIP	TRIPLE ANT	██████████						01/01/93	AABBCC	a4	2300

SLM: The Stocks Logistic Module (SLM) is a software package to control stocks and forecast vaccine and supply requirements. It aims to facilitate procurement, storage and distribution, and serves to provide clear signals to higher levels of management. It features a graphic presentation of stock levels and monitors expiry dates (see Figure 2). The software is available but is not yet in final form.

PRESAGE: An inventory and stock control package for transport, equipment and spare parts, in an early stage of development, which relates spare parts databases to information from workshop job cards. The consumption of spare parts relative to the age of specific models as well as information on staff/equipment performance, driver skills, workshop efficiency, etc. can be queried. It forecasts needs, fault analysis and unit costs and includes a rudimentary stock control function which can be replaced by SLM if required.

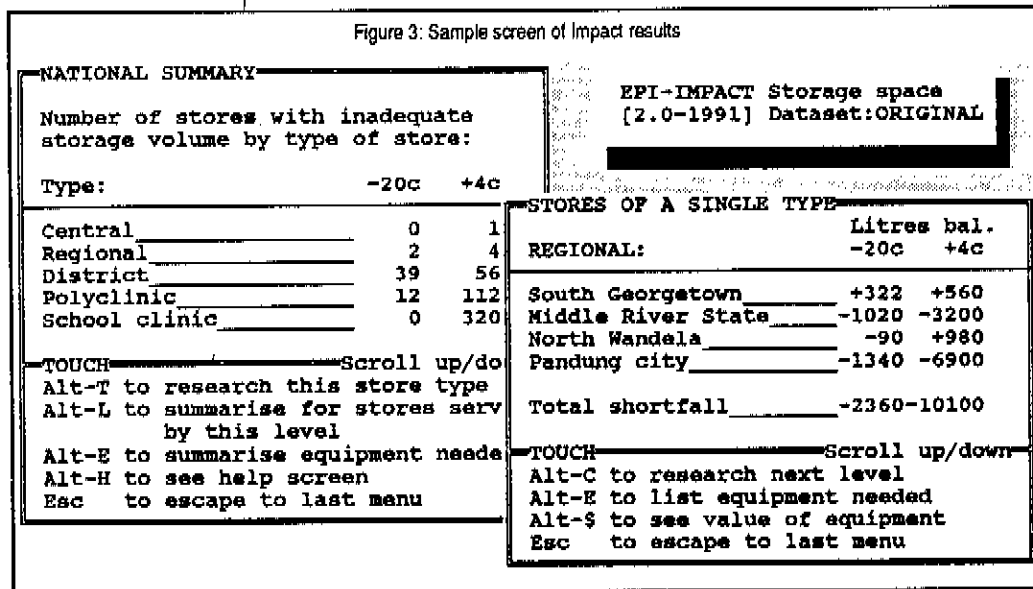
IMPACT: This software, also in an early stage of development, forecasts the impact of changes in EPI strategy on equipment needs. It relates immunization workload data to the equipment inventory of

every store, with model equipment lists for each type of vaccine store. On the basis of this information, it can predict the amount of additional equipment needed for any proposed change of policy or strategy. The software is in the second phase of development and will be available for testing during 1992.

In addition to the presentations on the above developments, a review was made of nine other logistic software packages, including one which is already part of the CEIS software and is installed in eight African countries. In general these systems lack clear and detailed specifications, they are inflexible, passive and under utilized.

One reason for under utilization which emerged from the discussions is that software is of little assistance in creating the necessary understanding and discipline in situations where systematic stock control procedures are not fully understood or practiced. Even in situations where stock control procedures are in operation, the software has not been designed with sufficient flexibility to adapt it to local administrative requirements.

Figure 3: Sample screen of Impact results



Recommendations

Manual stock and inventory procedures need improvement in many countries where computer software may be premature. Guidance on these procedures, currently available from WHO, should be strengthened, particularly at central and regional level.

In countries where good manual control procedures already exist, computer software can greatly improve the efficiency of the

system, provided it is flexible. Suitable software should continue to be developed and the structure and content of information should be standardised.

Software which is adopted or developed in collaboration with an organisation should be compatible with the current data structures of the CEIS. The collaborating organization should undertake to support its development in the long term.

See Annex 1, para. 3: Develop and test logistics management tools.

Plan of action

TRANSPORT

According to the transport objectives adopted during the 1990 Technet meeting, the following training materials have been developed. They were distributed to participants for comment:

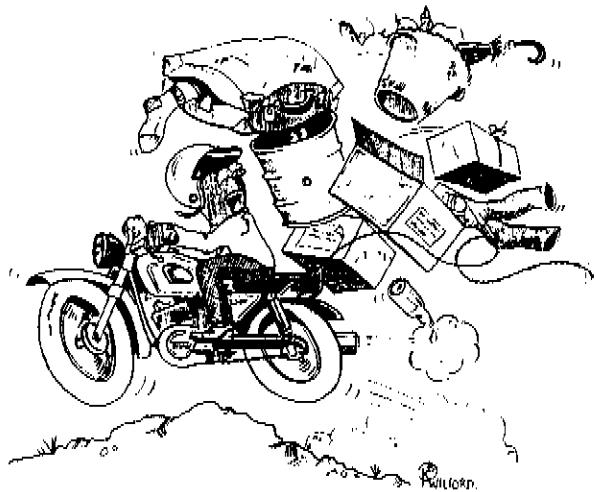
- Motorcycle rider instructor training
- Guidelines for introducing motorcycles for health
- Advanced driver training
- Transport for mid-level managers
- Bicycle maintenance and repair

During the past year, WHO and Save the Children Fund (UK) field tested the motorcycle rider training materials in courses in Ghana and Ethiopia. Further courses are already scheduled for 1992 in Burkina Faso, Cameroon, China, Egypt and Malawi. The rider and driver modules will be finalised in 1992 and a separate supplement on first aid at the site of a road accident is being developed.

Motorcycles and mopeds: Twenty-one motorcycle rider instructors were trained in three weeks in Ethiopia. They subsequently trained 208 riders in two weeks. Moped riders in Ghana were also trained. Each rider received a manual.

Bicycles: Bicycles are considered to be the most accessible type of personal transport in many countries of the world and are widely used in health programmes. A 40-hour course for bicycle riders has been prepared and conducted in Malawi. It covers the assembly, disassembly and repair of bicycles. It lists requirements for spare parts and tools and also includes a standard list of tools to equip a bicycle repair

Don't overload your motorcycle!



workshop for just US\$ 250. Nigeria has designed special racks and panniers for the bicycles of its primary health workers.

In an effort to ensure maintenance of bicycles, mopeds and motorcycles, several countries have established schemes that permit the rider to own his/her cycle after a number of years, provided certain conditions concerning maintenance are fulfilled.

Vehicles: The advanced driving course module for instructors of drivers of health service vehicles will be tested in

AMR and AFR during 1992. As with the motorcycle training materials, the course includes driving skills on and off road, preventive maintenance, trouble shooting and emergency repairs. The considerable potential to involve vehicle drivers in the repair of absorption type refrigerators during supervision trips to health centres is an aspect which should not be overlooked.

A **vehicle lifetime survey** is being developed to link vehicle inventories to data from workshop "jobcards". This serves as a basis to:

- forecast and budget for spare parts and vehicle replacement;
- detect and analyse unexpected failures and high accident rates; and
- assess performance of maintenance systems.

It will permit the maintenance costs for a complete fleet of vehicles to be forecast from an analysis of spare parts costs for vehicles in each age category. It also clearly shows the effect of renewing older vehicles which are relatively more costly to maintain than newer ones.

Technet members discussed the concept of a **Whole Life Contract** to guarantee the flow of spare parts and the funds for maintenance of donated vehicles. Considering the high value of donated vehicles on local markets, whole-life contracts need to incorporate resale and replacement policies. This will allow funds to be recuperated for vehicle purchase or maintenance contracts. Unicef and IAPSO are working together on this issue and their progress was described.

In discussion, one member cited Nigeria as a country where Unicef has provided funds to enable spare parts to be purchased locally. This experience has proved far more effective than a centralized system for importing spare parts specifically for health vehicles. In several other countries, service agreements with local agents have also proved to be an efficient alternative to an EPI based repair/maintenance system.

The Group supported the continued development and testing of transport management tools for mid-level managers and training for driver and rider instructors. However, members were reluctant to support the involvement of Technet in the general field of transport purchasing and maintenance. They see it as a highly problematic area in which many programmes have failed to make any progress. They are not only concerned about the casual provision and misuse of donated transport but, also profoundly pessimistic about finding solutions to several common problems, such as mis-allocation, theft and commandeering of vehicles.

The development and testing of training materials for driver and rider instructors, and of transport management tools for EPI managers, should continue with the participation of Technet members.

Recommendations

See Annex 1, para 4: Develop and test transport training.

Plan of action

VACCINES AND VIAL INDICATORS

Individual vaccine vial indicators

Two chemical indicators, HEATmarker and Browne model, were presented. They are both designed to be applied to individual vials of vaccine and to present the end-user with a clear indication of whether the vaccine has been exposed to excessive heat and should not be used. The HEATmarker shows the progression of heat exposure. It has an inner square of colour which changes gradually from white to a light shade of blue which then becomes progressively darker. The user compares the shade of the inner square to a blue outer reference ring. When the colour of the inner square is as dark as the outer ring, or darker, the vaccine should not be used. Variations of HEATmarker have been tested in many countries. Preliminary feedback has shown that health workers are able to interpret HEATmarker. Because of its progressive change, HEATmarker can also be used as a management tool for stock control.

The Browne indicator does not show a progressive change. It starts off a bright canary yellow and, when the vaccine reaches the point at which it cannot be used, it changes quickly to royal blue. With the Browne indicator it is easy to read when the vaccine should not be used but it is not intended for use in stock control.

Field trials have shown that some health workers do not believe vaccine vial indicators. The change in the indicators corresponds to the stability of the vaccine but many health workers have been trained to consider that vaccine is much less stable.

The group expressed uncertainty on how the vial indicators would be used. Some of the group saw the value of HEATmarkers' gradual colour change. Others were fearful that the gradual change might encourage sloppy work habits and undermine the cold chain once health workers realized how much heat exposure some vaccine could withstand.

The group were not yet prepared to make a recommendation in favour of one indicator over the other. They did, however, agree on the value of being able to recognize damaged vials, particularly for polio eradication.

Recommendations

Vaccine manufacturers should be encouraged to assess the feasibility of introducing both HEATmarker and the Browne indicator and to seek ways to overcome any production problems relating to installation.

In the event that all vaccine manufacturers consider it feasible to introduce both the HEATmarker and the Browne indicators at an acceptable cost, a selection of health workers and supervisors who have used both PATHmarker and HEATmarker should be asked which indicator they prefer.

Plan of action

See Annex 1, para. 5: Vaccine management.

Vaccine wastage associated with vial size

A study in Malawi, where immunization coverage has reached 80% and the wastage rate is 40%, has shown that switching to 10 dose vials would lower the vaccine wastage rates to 20%. This confirms several other studies that have been published throughout the past year.

However, wastage/cost is not the only issue in favour of the 10 dose vial. Studies on missed opportunities show that the average health worker is less willing to open a 20 dose than a 10 dose vial when a single child or woman comes to be immunized. 20 dose vials are therefore seen as one of the causes of missed opportunities. This may prove to be the over-riding factor in favour of choosing 10 dose vials, especially if immunizations provided outside organized sessions continue to be an important proportion of the total number of immunizations given.

In the struggle to achieve higher coverage, immunization sessions are held more frequently. This reduces the average number of patients per session and also merits the use of 10 dose vials. For example, a health center with a population of 30,000 or less which offers immunization more than once a week, should choose 10 dose vials.

Guidelines should be prepared that will allow countries to confirm which vial size to choose for each vaccine.

Recommendations

Tetanus Toxoid and Hepatitis-B vaccines beyond the cold chain

The current immunization coverage for tetanus toxoid (TT) is about 50%, excluding figures for China which does not use TT. If EPI is to raise this coverage, health workers—such as village midwives—need to be able to carry vaccine in areas where there is no cold chain.

Studies have been conducted to determine how long TT and Hepatitis B can be kept out of a refrigerator without compromising the vaccine. It has been found that, after 96 hours at 53°C, 83% of the vaccine is still viable but, after 3 hours at 65°C, only 20% is viable. Taking these results into account, as well as discrepancies between different manufacturers and different batches from the same manufacturer, we can conclude that TT can be safely used for up to 2 days at 45°C.

The effect of freezing TT is not as serious as previously thought. However, the Group considered that the managerial difficulties involved in using TT which had failed the shake test would be greater than any advantages. Such use should not, therefore, be recommended.

Hepatitis B is little affected by maternal antibodies so can be given very early in life. It is very stable; it can be stored for up to 3 years at 2°C to 8°C and can survive exposure up to 7 days at 36°C to 40°C. It is, however, sensitive to freezing and has a freezing point the same as that for DPT and TT vaccines.

The potential use of Hepatitis-B and TT beyond the cold chain was discussed. The Group agreed that field tests should be conducted in order to confirm if it is managerially possible to relax cold chain standards under certain circumstances and in certain countries.

Recommendations

Studies of the use of Hepatitis-B and TT beyond the cold chain should be conducted to assess the impact on immunization coverage, managerial feasibility and acceptability among health staff.

Impact of vaccine research and development on EPI logistics

The Research and Development (R&D) Unit within WHO/EPI Geneva is engaged in several areas of research in the EPI. Some of the topics, which have a direct impact on the cold chain and logistics, were briefly described at the meeting:

- **Finding a Polio vaccine which is as stable as measles:** Eleven proposals have been received for research into a more stable polio vaccine. These will be assessed with the aim of finding an indication, within a year, of whether it is feasible to pursue the development of such a vaccine.
- **Use of EZ¹ Measles vaccine:** EZ measles has many problems: it is too expensive, it is not available, its immunogenicity is doubtful and there appear to be long term mortality risks associated with it. There is currently a specific problem with measles vaccine in that manufacturers are not able to meet the full requirements of the global demand. The measles control initiative being undertaken in Latin America will take so much vaccine that there will be a shortfall, maybe up to 25 million doses in 1992, which could result in the supply to Africa being reduced to half of what it requires.

¹Edmonston-Zagreb strain measles vaccine.

HEALTH CENTRE REFRIGERATION

Explosions of Electrolux RCW42EK refrigerators

From January through May 1991, 29 Electrolux RCW42EK refrigerators exploded and/or caught fire — 27 in Indonesia, one in the United Kingdom and one in Ghana. The explosions in Indonesia resulted in the loss of one life and the destruction of several health centres.

In May 1991 Electrolux announced that it had identified three risk factors as possible causes:

- the burner modification kit,
- the Cosmos 8 burner, and
- the baffle.

Since the kit improves the performance of the refrigerator, Electrolux proposes that it is retained with important modifications and precautions to reduce the risk of fire:

Precaution: Check the Cosmos 8 burner for leakage.

Modifications: Install Electrolux modification kit, including:

- new fuel tank cap with a hole in it,
- new fuel tank equipped with shields.

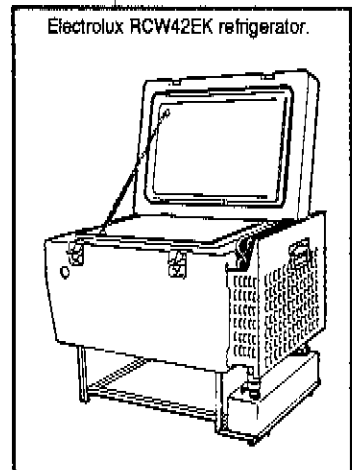
Electrolux will issue new instruction materials, a modification kit and a video tape to clarify and explain their instructions.

Since the explosions, the RCW42EK models using the burner modification kit have been removed from use. The great majority of these were located in Indonesia, but many are yet to be identified in the EMRO and WPRO regions.

Electrolux is planning to send technicians to Indonesia and Ghana to train EPI staff on the modification of the refrigerators. In Indonesia 3000 RCW42EKs will be safety checked and modified. Electrolux will also send replacement parts and training materials to other countries where the RCW42EK is being used.

Technet members have a role to play in ensuring that replacement kits for refrigerators in their respective countries are sent to their intended destinations and put to use.

The Group wanted assurance that Electrolux has indeed succeeded in solving the problem. They suggested that a modified model be field



tested before the modifications are accepted for refrigerators in routine use. Countries would be reluctant or unwilling to recommence use of the RCW42EK unless there is documented evidence of its safety under field conditions.

It was agreed that not all the RCW42EK units being safety checked and modified in Indonesia will reach the field within 6 months, but several hundred should be ready by then. Those models will provide a sufficiently large sample to ascertain the field effectiveness of the modifications. They will therefore be observed before WHO reissues *Product Information Sheets* and before Unicef accepts additional orders.

Recommendations

Until 6 months experience has accumulated in Indonesia, the RCW42EK should continue to be used without the burner modification.

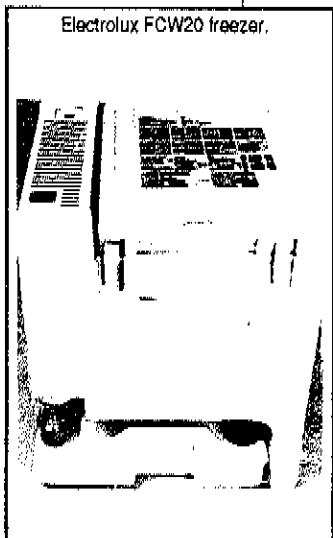
Special "post-distribution surveillance" efforts should be made to actively seek out and report on any problem behavior that might be encountered after the replacement kits are in use.

Plan of action

See Annex 1, para. 6: Refrigerators for the cold chain, 6.1.

Specifications for a new health centre refrigerator

Electrolux FCW20 freezer.



A Technet sub-group met to discuss the new design for a health centre refrigerator proposed by Electrolux to replace the RCW42 series. The most significant aspect of the change is Electrolux's decision to separate the freezer section from the refrigerator and to make two separate appliances, each with its own cooling unit. The freezer has already been introduced on the market as the FCW20.

The purchase price will rise to \$US 2,200 for the combined set and the fuel consumption will more than double that of the RCW42EK. However, in comparison to the RCW42EK, the temperature control is superior and it can store and freeze considerably more icepacks. The group considered these factors of critical importance for outreach immunization and disease outbreak containment. They agreed that such advantages outweigh the disadvantage of the increase in the purchase price and recurrent costs.

The Group studied a full scale model of the new refrigerator appliance. The interior has been organised with baskets and trays to facilitate systematic stock rotation. Although some members denied that stock

rotation was a problem in health centres, it was generally agreed that the trays proposed by Electrolux are an improvement. A number of other detailed design features were suggested by members and noted by the secretariat for discussion with Electrolux.

Solar (photovoltaic) refrigeration

Presentations were made on solar refrigeration reviews in Africa and experiences with solar energy for the cold chain in India, Indonesia, Myanmar and Thailand. A review in Uganda had compared refrigerators powered by bottled gas with solar refrigeration. A study in Mali had looked at the performance and cost of using kerosene refrigerators.

Failure rates for solar refrigerators are still high but there is evidence that the rate is falling. Figure 4 shows that the mean time between failures is impressively long for certain models in some countries.

A gradual fall in the price of solar panels has reduced the capital cost of solar refrigeration. However, solar panels are not a high proportion of the cost of the system (See figure 5) and the other components of the system do not appear to be decreasing in cost. Any prospects for a reduction in the overall system costs in the future will depend on the development of systems which require less, or no, batteries and the possibility of mass producing the high efficiency solar refrigeration cabinets.

The recurrent costs recorded during the reviews are a source of greater concern than the capital cost. The Uganda survey showed that the lifetime costs of solar refrigerators would be higher than that for standard non-solar alternatives, even if the solar purchase price was to fall to the price level of the alternatives.

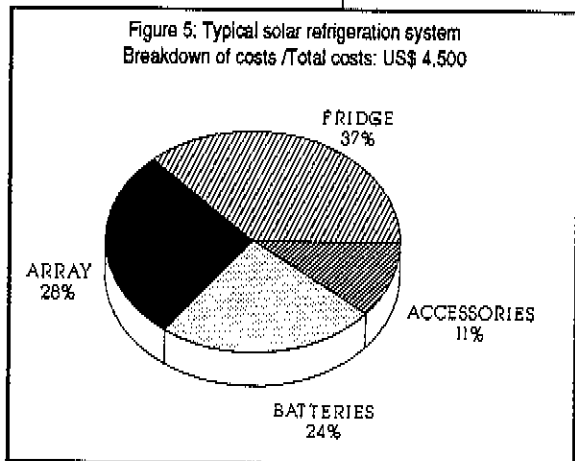
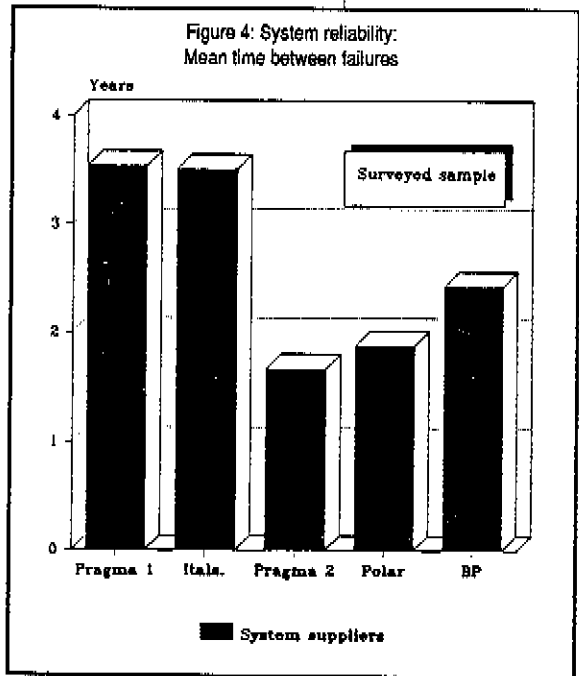
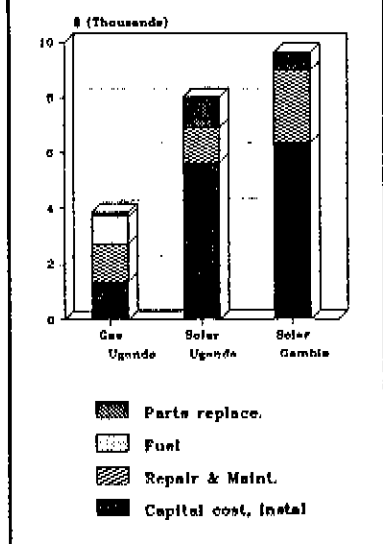


Figure 6: Life cycle cost of solar and gas refrigerators



Despite the increasingly long periods between failures, the maintenance cost of solar is high. The failure rate of kerosene refrigerators, on the other hand, is much higher and the maintenance cost lower. Kerosene refrigerators can be repaired more easily by local technicians with minimal basic skills.

A demonstration project in a health centre in Zaire, based on the concept of generating more solar energy than is required and selling the excess, has produced positive results. During the first seven months of operation, 36% of the EPI costs in the district were recovered through video shows and battery charging. (Civil unrest in the country suspended this activity before completion of the study.)

In summary, the critical factors governing the cost effectiveness and the sustainability of solar refrigeration for the cold chain appear to be:

- improvement in long term reliability as indicated by an increase in the mean time between failures;
- improvement in the accessibility of maintenance services whose costs should be more widely shared with other applications of solar energy outside the health services;
- the potential to generate revenue through community video, water pumping, lighting and other community services where it is practicable and politically acceptable;
- location of solar refrigerators more strategically so that they are able to serve a wider area, a larger population and, thus, have a greater vaccine throughput.

Solar powered video/TV for local community in Zaire. Used for education, information and income generation.



Recommendations *Guidelines for countries wishing to consider solar refrigeration as an option should be developed.*

Criteria for the development, implementation and evaluation of other solar technologies for Primary Health care should be developed.

Specifications for solar refrigeration system components should be strengthened.

Manufacturers/suppliers' guarantees on components should be improved.

Inclusion of sale of solar electricity components in solar refrigeration programmes should be generalized.

See Annex 1, para. 6: Refrigerators for cold chain, 6.2-6.4.

Plan of action

Solar thermal refrigeration

An ammonia/calcium chloride photothermic refrigerator, produced in Nancy, France, is currently being tested in Burkina Faso. The system is large (5 cubic metres, 100 kg) and the first unit, transported by truck to the field site, was damaged in transit. A replacement unit was subsequently transported to the site by air and assembled by local technicians. The system is arranged so that the absorption units are located outside the health centre buildings and the refrigerator inside. The unit produces ice and also stores vaccine. It costs US\$ 5,000. Early performance results from the tests are very promising.

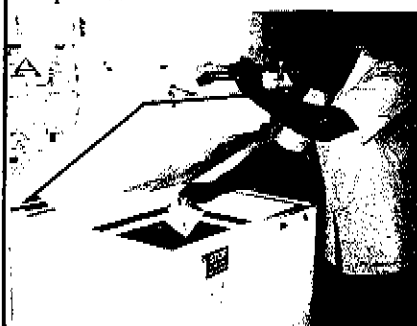
Solar collectors for two separate photothermic refrigerators being field tested at Boulsa Health Centre.



Performance of kerosene refrigerators

The performance of kerosene refrigerators in Mali has been shown to be poor. Five Sibir V240KE kerosene refrigerators used in a well managed programme were monitored for 15 months. For at least 20% of the time, refrigerator temperatures were above +8°C (up to 25°C). Temperature control is particularly poor when outside temperatures vary widely, where peak daytime temperatures are high (above +35°C) and where the construction of health buildings is inappropriate (See figure 7).

Using "Stop!Watch" to monitor refrigerator temperature.



The situation is significantly worse than that suggested by temperature readings made manually, twice each day (See figure 8). This emphasizes the importance of monitoring the temperature continuously with STOP!watch indicators.

Figure 7: Temperature profiles
Percentage of time that temperature was above 8°C

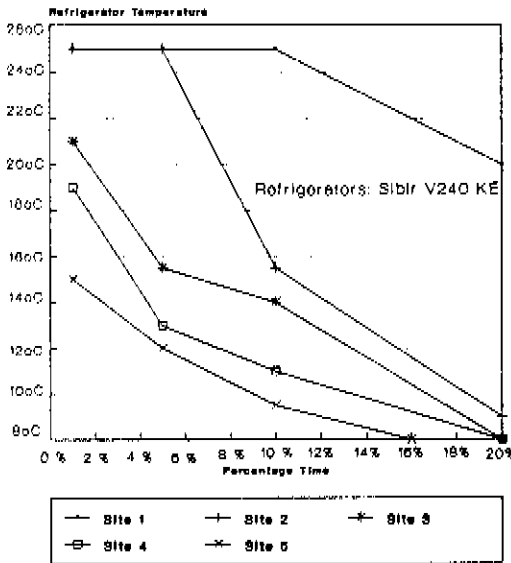
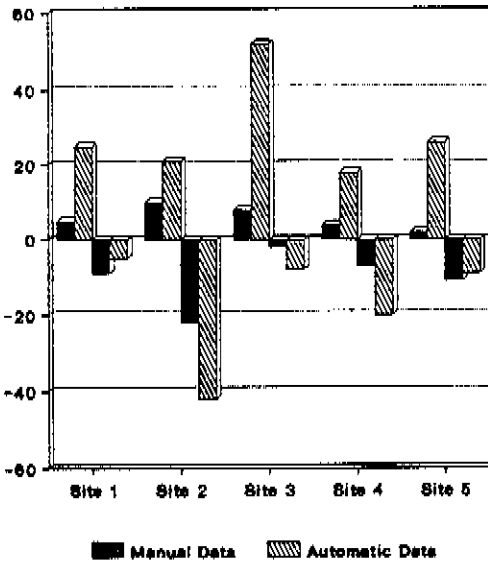


Figure 8: Temperatures in kerosene refrigerators in Mali: Comparison between manual and automatic data records.



Kerosene refrigerators are being phased out progressively in favour of solar or gas models in many African countries, including Gambia, Kenya, Sudan and Uganda. To assist the countries which continue to rely on kerosene, a major revision of user manuals for kerosene refrigerators is indicated. Clear and simple instructions are needed on fault finding, energy management and ice-pack management.

Recommendations *Manuals for kerosene refrigerators should be revised.*

The use of STOPwatch should be extended to all peripheral level vaccine storage to supplement the information provided by twice daily recordings of the thermometer by the health worker.

Plan of action *See Annex 1, para. 6: Refrigerators for the cold chain, 6.5, 6.6.*

Modification of domestic refrigerators for vaccine storage

Work on the development of upgrade kits to modify domestic refrigerators was described for the Americas and South East Asia. Testing has continued in the Univalle laboratory in Colombia over the past year and a new design has emerged. It was found that the drawer size was critical to reliable temperature distribution and dependent on the refrigerator model. The new design therefore has no drawers. It uses a large water store to obtain the same performance as the previous design. Test results with the modification installed show a major improvement over nor-

mal domestic refrigerators. It is not clear, however, whether a similar improvement could also be obtained simply by adding water bottles to a standard refrigerator.

Technet members agreed that it is necessary to convince senior ministry and procurement personnel that the use of domestic refrigerators is a problem for vaccine storage, particularly where power supplies are poor. Only then can they be expected to demand modifications or to purchase purpose-made vaccine refrigerators on the international market. An Indian manufacturer is reportedly ready to offer an upgrade kit for domestic refrigerators.

Countries which use domestic refrigerators for the storage of vaccines should be warned of the risk to the potency of the vaccines. Unmodified domestic refrigerators should be monitored, in comparison to models of the same refrigerator, appropriately modified.

Recommendations

Modified equipment should meet the appropriate WHO/UNICEF equipment specifications if it is to be used internationally. If equipment is only to be used locally, it should meet national specifications where local specifications exist.

See Annex 1, para 6: Refrigerators for the cold chain, 6.7.

Plan of action

INJECTION TECHNOLOGIES

Auto-Destruct Syringes

During 1992 Unicef will supply auto-destruct syringes to countries which have chosen to use only disposable syringes. The new syringes cost nearly three times as much as conventional disposable syringes. They are indistinguishable in use from conventional disposable syringes but provide a guaranteed protection against cross infection.

The countries which do not get their syringes through donations from Unicef can be classified into distinct groups according to their injection practices and budget restrictions:

Policy:	sterilizable or disposable
Techniques:	good or poor
Budget :	problematic or not

Efforts to introduce auto-destruct syringes should concentrate on those programmes which have no budget problems, a disposable syringe policy and poor injection practices.

Although WHO and Unicef have been mute on the question of risks of injection, 500,000,000 injections are administered each year in the EPI. With so many injections being given, poor practices increase the risk of transmitting HIV through EPI operations. The consequence of HIV transmission being associated with the EPI would be so serious for the future of immunization services that there is no alternative but to ensure that EPI injections are safe.

Recommendations

Injection Practice Surveys should be conducted in each country to assess the degree of risk in their programmes. The surveys will help to identify priority countries which already use disposable syringes and should either receive auto-destruct syringes or be targetted for promotion of other methods to ensure safe injection practices.

Plan of action

See Annex 1, para. 7: Injection technologies, 7.1-7.2.

Sterilization and injection technology

Over 200 sterilization cycles have always been achieved in trials conducted on the life of sterilizable syringes. However, some members of the Group doubt that the life of a sterilizable syringe is greater than 50 sterilizations. In areas where syringe life has been observed to be short, members requested that the degree of the problem be examined. A number of devices have been designed to solve water problems and are waiting to be tested as soon as difficult areas can be identified.

The safety of sterilizable syringes has been improved with the introduction of the new design of TST indicators. This will give operators and supervisors conclusive evidence that sterilization has been conducted correctly.

There is concern about the differing standards for sterility within primary health care. While EPI is conducting sterilization correctly, other parts of health care are still re-using unsterile equipment due to shortages and other reasons.

Recommendations

Global policy on the selection of injection equipment should be updated in a new document.

Technet should take an active role in promoting the use of sterilization for all invasive primary health care instruments.

Low workload jet injectors

Two low workload jet injectors were presented at the meeting. A disposable cartridge jet injector was introduced by APMP. The strengths of the design include the level of protection against cross infection, the simplicity of the fixed volume injection, the way in which the system remains sterile and the low pain level of the injection. The jet nozzle is built into the vaccine cartridge and is therefore discarded after each dose. The cost of the injector was not clear, but the cost per injection will increase significantly.

A second injector was introduced by PATH. The benefits claimed were the same as for the APMP injector, except that the jet nozzle is sterilizable. The cost of this injector is US\$ 250.00.

The Group considered that the distinct benefits in the quality and safety of the injections using the jet injectors as opposed to syringes and needles are more important than cost considerations.

A field trial of low work load jet injectors should be conducted as soon as possible.

Recommendations

See Annex 1, para. 7: Injection technologies, 7.3.

Plan of action

NEW DEVELOPMENTS

Reverse Cold Chain

The procedures and materials for the polio specimen reverse cold chain were presented. This system is necessary, not only for polio eradication, but also for any specimens collected from the field, such as blood or sera for measles control or HIV testing. The regional epidemiologist has a key responsibility for the system and should keep a stock of specimen collection materials to take to the field whenever there is a case investigation.

For polio, the objective is to collect the specimen preferably seven days, and not later than 14 days, following flaccid paralysis. Once the specimen is collected, it should travel to the laboratory with as few re-

icing and storage stages during the journey as possible. Any intermediate storage stage, which cannot be avoided, should be equipped with a refrigerator or freezer specifically for storing specimens. This will avoid the potential for contamination of refrigerators being used to store vaccines at regional level.

A reusable specimen carrier with a cold life of over 88 hours at +43°C and a disposable kit for specimen collection have been developed. Both items are available free of charge from WHO/EPI, Geneva, until stocks are exhausted. After that time UNICEF may be approached to supply the kits.

Recommendations *Country studies in the planning and evaluation of the Polio reverse cold chain should continue so that experience is gained in this field. Opportunities should be sought for Technet participants to take part in these studies.*

Plan of action *See Annex 1, para. 8: Polio reverse cold chain.*

Telecommunications for surveillance and reporting

The "telephone chain" was the subject of a brief presentation and discussion.

A feature of disease eradication initiatives is frequent routine reporting of surveillance and other data by telephone, fax, telex or radio from district level through to provincial and national level surveillance centres. A technology exists to achieve automatic transfer of such data by direct telephone line via modem with automatic, timed repeat calls. It has already been used for this purpose in several developed and undeveloped countries.

Where there is no telephone, as in parts of Burkina Faso for example, WHO has had experience of using high frequency (HF) radio timed transmission via Automatic Repeat Request (ARQ) modem.

Alternatively, Sattelite, USA and VITA, USA are offering low orbit satellite time "at-cost" for surveillance purposes. The cost of equipment (ground stations) for both types of data transmission range from US\$ 3,000 to US\$ 4,500 per station and donors are being sought to cover the costs of field studies.

Several Technet members volunteered to assist in the further development of the proposals which will have an important potential impact for the improvement of surveillance and reporting systems.

The feasibility, cost and impact of automatic data transfer by telecommunications should be evaluated through country studies.

Recommendations

See Annex 1, para. 9: Telecommunications.

Plan of action

New technologies

The Group felt that an important new area for their attention should be to study the impact of new technologies on the cold chain and logistic systems. An example given at the meeting was the Thermopac vacuum insulation system which provides storage for vaccine without the need for cold chain protection over six months.

CLOSING OF THE MEETING

Just before the conclusion, His Excellency the Minister of Health of Morocco addressed the participants and met them individually.

In closing, the acting Technet Chairman summarized the key issues which had emerged during the meeting. Firstly, he recalled the Group's urgent role in the further development and streamlining of logistic systems to facilitate the rapid expansion of the EPI to meet new targets and include new vaccines. In a climate of diminishing resources, Technet has a special responsibility to contribute to the process of priority setting and resource allocation. In this regard, he referred to the preparation of the senior level cold chain and health logistics planning workshop now underway and stressed the need for the active participation of the members of Technet.

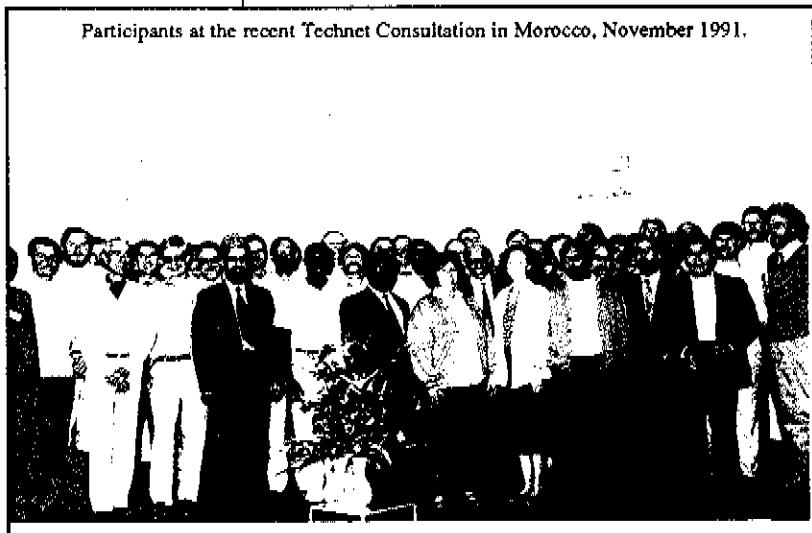
The second key to achieving more efficient cold chain and logistic systems is the development of managerial indicators to measure progress. New chemical indicators on the vaccine vial open the way to take vaccines "beyond the cold chain". This will be a central focus in the work of Taskforce 5 of the Childrens Vaccine Initiative (CVI).

Third is Technet's work in the development of transport training for EPI mid-level managers and driver and rider instructors. These activities, and others in the field of sterilization, are concrete examples of the integration of EPI logistics within the whole of primary health care.

Finally, in reaping the full benefits of solar energy in the cold chain, EPI will play an integral role in the development process by meeting the energy requirements of other health and community projects and thereby sharing the burden of cost and maintenance.

An ambitious programme of activities has been set for Technet during the coming eighteen months and a secure foundation laid for its work in the remainder of the decade. The next meeting of Technet will take place in March 1993.

Participants at the recent Technet Consultation in Morocco, November 1991.



ANNEX 1

TECHNET WORKING PROGRAMME 1992/93

1. STREAMLINE TECHNET COMMUNICATIONS

- 1.1. Investigate and take action for each member whose freedom to communicate is constrained.
- 1.2. Contact members without patron-organisation to discuss support for Technet communications.
- 1.3. Arrange for copies of relevant Secretariat correspondence to be routinely sent to each member.

2. MONITOR EPI LOGISTICS

- 2.1. Propose key indicators of performance of cold chain and logistic systems for three purposes:
 - outline monitoring;
 - quality surveys;
 - special equipment performance studies.
- 2.2. Set criteria for each indicator.
- 2.3. Prepare recommendations to the 1992 EPI Global Advisory Group on key indicators which should be incorporated into routine reporting systems worldwide.
- 2.4. Prepare Cold Chain Monitor survey manual and test/develop EPIC-Mate analysis utility.
- 2.5. Prepare guide protocol for evaluation of EPI logistics and data collection and analysis.

3. DEVELOP AND TEST LOGISTICS MANAGEMENT TOOLS

- 3.1. Evaluate the potential for EPI-Info software to be used to collect and analyse logistic quality survey data.
- 3.2. Develop and test IMPACT software.
- 3.3. Seek/develop and evaluate transport management software.
- 3.4. Seek/develop and evaluate stocks & equipment inventory control software.
- 3.5. Reach to distribute copies of the field test version of SLM software together with 'runtime' Foxbase (the manuals and a questionnaire) to interested Technet members by 15 April 1992.

- 3.6. Continue to collect, review and disseminate samples of stock and inventory control software to interested members. On the basis of these reviews, develop a detailed specification during 1992 so that software can be professionally developed within the CEIS.
- 3.7. Find or prepare guide on non-computer based inventory and stock control procedures suitable for central and regional stores.

4. DEVELOP AND TEST TRANSPORT TRAINING

- 4.1. Test and finalise transport training for mid-level health managers.
- 4.2. Develop and test protocol and software for vehicle lifetime surveys.
- 4.3. Test and finalise advanced driver training materials in AFR.

5. VACCINE MANAGEMENT

- 5.1. If vaccine manufacturers report that the Browne HEATmark indicator is feasible, test it in the field.
- 5.2. Formulate, discuss and test changes in policy as vial indicators are introduced. Write discussion paper proposing policies for using vaccine beyond the cold chain.
- 5.3. Prepare guidelines that will allow countries to confirm which vial size to choose for each vaccine.
- 5.4. Conduct studies on the use of tetanus toxoid beyond the cold chain: one in Kenya (Path) and one in Bolivia (PAHO); (other studies using Hepatitis-B vaccine are anticipated). The protocols for such studies should stipulate that:
 - every vaccine vial which is used in the study must bear a temperature threshold indicator;
 - the proportion of vaccine which can be given without loss of potency under ambient temperature conditions will be monitored;
 - the managerial acceptability of relaxing the cold chain under field conditions will be examined.
- 5.5. Study methods and technology to enable vaccine vials to be opened and used on more than a single day.

6. REFRIGERATORS FOR THE COLD CHAIN

- 6.1. Technet member to visit Indonesia in May to report on the impact of modifications of the RCW42EK and to advise on global recommendations for the use of this refrigerator.

- 6.2. Prepare a guideline on the choice of solar energy for the cold chain. The guide should include criteria for the choice of location, installation, planning and evaluation of solar energy for primary health care.
- 6.3. Continue development work, including that on PV (photovoltaic) batteries, with the objective of increasing the mean time between failures from 3.5 to 7.0 years.
- 6.4. Evaluate the potential for revenue generation through solar energy applications in health centres in more countries.
- 6.5. Revise manuals for the use of kerosene refrigerators in the light of the accidents which have occurred.
- 6.6. Make efforts to reduce the cost and increase the utilization of the STOP!Watch indicator for refrigerators by:
 - seeking alternative, less expensive indicators;
 - reviewing the layout of the card and offering it in multiple languages;
 - changing to a less confusing name for it.
- 6.7. Conduct country studies in which local refrigeration equipment is modified and then tested in parallel with unmodified equipment. The objective of such studies is to convince governments of the necessity to modify domestic refrigerators before they are used in the cold chain.

7. INJECTION TECHNOLOGIES

- 7.1. Conduct injection practice surveys to assess the current degree of risk in the EPI and to enable priorities to be set for:
 - the distribution of auto-destruct syringes; or
 - the promotion of other methods to ensure safe injection practices.
- 7.2. Update global policy and issue a new document on the selection of injection equipment.
- 7.3. Conduct a field trial of low workload jet injectors.

8. POLIO REVERSE COLD CHAIN

- 8.1. Develop a more satisfactory disposable container for shipping specimens to international laboratories.
- 8.2. Include polio kits in the 1993 *Product Information Sheets*.
- 8.3. Complete country study of the specimen reverse cold chain in Egypt in 1992 and plan other studies.

8.4. Prepare a training module on the specimen reverse cold chain for regional epidemiologists responsible for polio eradication

9. TELECOMMUNICATIONS FOR SURVEILLANCE AND REPORTING

9.1 Plan field studies to assess different available systems for sending surveillance data by telephone and radio transmission.

ANNEX 2

AGENDA OF 1991 TECHNET CONSULTATION

MONDAY, 18 NOVEMBER

- 8:30 Registration
- 9:00 Opening (Ministry of Health/Morocco); Adopt agenda (Chairman)
- 10:45 Overview
- 11:00 Unicef priorities for the 1990's
- 11:15 Discussion
- 11:30 1990-91 contribution of members to Technet
- 11:45 Bulletin board
- 12:00 Discussion on Priorities for the 1990's and the role of Technet
Logistics and cold chain planning workshop for central managers:
- 14:00 Methodology and content of draft training materials
- 16:00 Group Work: equipment, vaccines/supplies distribution, transport and facilities
- 17:00 Plenary discussion

TUESDAY, 19 NOVEMBER

Cold chain evaluation and evaluation tools:

- 9:00 Egypt
- 9:20 Kenya
- 9:40 The case of Niger
- 10:00 Discussion
- 11:00 AMRO surveys
- 11:30 Cold chain and EPI operations in PNG
- 12:00 Discussion
- 14:00 Evaluation software: Epi-Impact, Epic-Mate
- 14:30 Discussion
- Explosions of RCW 42 EK*
- 15:00 Discussion on RCW 42 EK refrigerator and new generation of Health centre refrigerator
- 16:00 Update and Plan of Action
- 18:00 Evening planning session for active participants of Technet topics:
 - T6: Cost and inventory studies
 - T12: Protocol for cold chain quality surveys
 - T14: Development of impact assessment software

WEDNESDAY, 20 NOVEMBER

- 9:00 Plenary presentation and discussion of action plan for Technet topics:
T6, T12, T14 (discussed in planning session, previous evening)
Transport:
- 9:15 Rider training in Ethiopia
9:30 Vehicle lifetime surveys
9:45 Strategy for transport training and evaluation
10:00 Repair and maintenance of Bicycle by cold chain technician in Malawi
10:15 Discussion
Inventory control software:
- 11:00 Vaccine stock Control software
11:30 Equipment inventory software
11:45 Equipment inventory control Software
12:00 Discussion
13:30 Planning Session for active participants of topics:
T4: Development of driver and rider training materials
T8: Development of inventory control software
T9: Vehicle whole life contracts

THURSDAY, 21 NOVEMBER

- 9:00 Plenary presentation and discussion of action plan for Technet topics:
T4, T8, T9 (discussed in planning session, previous day)
Injection technologies:
- 9:15 Introduction of auto-destruct syringes
9:30 Status of jet injection
9:45 Discussion
Domestic refrigerator upgrade:
- 10:15 Experience in Sri Lanka and India
11:00 Experience in the Americas
11:45 Development work at MUERI, Australia
12:00 Discussion
Solar refrigeration surveys and studies:
- 14:00 Solar programmes in the SEAR
14:15 Solar programme surveys in Uganda, Gambia and Kenya
14:45 Solar energy for Primary Health Care
15:00 Discussion
Performance of kerosene refrigerators:
- 16:15 Monitoring of Kerosene refrigerators in Mali
16:30 Performance of Kerosene refrigerators in Ethiopia
16:45 Discussion
18:00 Evening planning session for active participants of Technet topics:
T1: Domestic refrigerator upgrading
T3: Solar refrigerator surveys
T11: Sterilization and injection practice surveys
T13: Performance of kerosene refrigerators

FRIDAY, 22 NOVEMBER

- 9:00 Plenary presentation and discussion of action plan for Technet topics:
T1, T3, T11, T13 (discussed in planning session, previous evening)
Vaccines and monitoring:
- 9:15 Impact of 10 dose presentation of polio vaccine in Malawi (N. Ahmed)
- 9:30 Status of vial indicators: Lifeline indicator; Brown indicator
- 10:00 Discussion
Multi-speed cold chain:
- 11:00 Stability of Tetanus toxoid and Hepatitis-B Vaccines (A. Galazka)
- 11:30 Discussion on study protocols
New developments and new priorities for TECHNETH:
- 12:00 Impact of EPI R&D on logistics (R. Scott)
- 12:15 Immunization Life card (J. Lloyd)
- 12:20 Discussion
- 13:30 Planning session for active participants of Technet topics:
T2: Impact of 10 dose vaccine vials
T10: Introduction of vaccine vial indicators
- 14:00 Discussion on new priorities for Technet
- 14:30 Timetable of activities for TECHNETH 1991
- 15:00 Discussion
- 16:00 Summing up and closing

ANNEX 3

LIST OF PAPERS / OVERHEADS PRESENTED AT 1991 TECHNET CONSULTATION

1. GENERAL

Bulletin board (Evans)
1990/91 contribution of members to Technet (Zaffran)
Unicef priorities for 1990 (Gulaid)
Universal thermometer (Zaffran)

2. EVALUATION

AMRO surveys
Cold chain and EPI operations in PNG (Bass)
Egypt EPI (Pott)
Kenya EPI (Spanner)
Measles review (Bass)
Solar programme surveys in Uganda, Gambia and Kenya:
 Major conclusions and recommendations (Hart)
Using available data on coverage and cost to reformulate programme strategy:
 The case of Niger (Davis)

3. REFRIGERATION

Domestic refrig. upgrade, Sri Lanka and India (Srivastava)
Kerosene refrigerators: Field testing programme, Mali (Hart)
Photothermal refrigerators (Schlumberger)
Solar energy for PHC (Zaffran)
Status of solar refrigerators for vaccine in SEAR (Srivastava)
Update/action plan for RCW42EK (Zaffran)

4. INJECTIONS

Introduction of auto-destruct syringes (Carrasco)
Low workload jet injectors (Free)
Safe injections (Evans)
Vial indicators - Brown indicator (Evans)
Vial indicators - lifeline indicator (Free)

5. VACCINES

Can we use vaccines outside the cold chain? (Stability of tetanus toxoid and Hepatitis-B vaccines) (Galazka)

Study on impact of replacing 10 dose with 20 dose polio vaccine vial, Malawi (Ahmed)

6. TRANSPORT

Bicycle repair and maintenance, Malawi (Ahmed)

Motorcycle rider training in Ethiopia (Broms)

Vehicle lifetime survey (Poulsen)

7. SOFTWARE

Equipment and transport inventory programme - "Presage" (Rommelzwaal)

Equipment inventory, Ethiopia (Broms)

Equipment inventory control software (Belgharbi)

Evaluation software - EPI-impact, Epic-Mate (Lloyd)

Software for stocks and logistics management (Fields)

ANNEX 4

DIRECTORY OF TECHNET MEMBERS

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