TRIP REPORT

PAPUA NEW GUINEA DEPARTMENT OF HEALTH
MEDICAL SUPPLY INVENTORY CONTROL
SOFTWARE AND UPDATES OF THE REACH STOCKS
AND LOGISTICS MODULE

Papua New Guinea

June 16 - July 21, 1991
TRIP REPORT

Papua New Guinea Department of Health
Medical Supply Inventory Control Software
and
Updates of the REACH Stocks and Logistics Module

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Special thanks go to Allan and Caroline Bass for their kind assistance and friendship.
I. EXECUTIVE SUMMARY

This consultancy was initiated on the request of the Resources for Child Health (REACH) Project of John Snow, Inc. and the Child Survival Support Project (CSSP) of Papua New Guinea (PNG), with two major objectives: 1) to field test the Stocks and Logistics Module (SLM) and incorporate changes based on input from the PNG Department of Health, Pharmaceutical Services Division, and 2) to advise and give technical assistance to the Child Survival Support Project in its support of the Papua New Guinea Department of Health, Pharmaceutical Services Division.

The focus of the technical assistance was to develop reports for the SLM and the Medical Supply Software that better displayed stock information, to facilitate minimum/maximum forecasting and to enable the development of realistic computer outputs for decision-making. The consultant visited nearby and remote Area Medical Stores and observed their stock management practices first-hand.

The Stocks and Logistics Module program was modified by the experience gained in the above work. The data from the Medical Supply Software System was loaded (where appropriate) in the Stocks and Logistics Module to test the program. Reports and data entry procedure were changed to make them more intelligible to inexperienced users and new variables and routines were added.

It is recommended:

A. Stocks and Logistics Module

1) that improvements be made to the stocks and logistics module, based on the results on the field test.

B. Training

2) that further technical assistance be provided to the Child Survival Support Project in the form of basic computer and Medical Supply System training for data entry personnel at the six Area Medical Stores.

3) that the Area Medical Stores managers be trained to understand the Medical Supply Software program and to use the management reports that the system generates.

4) that safety and basic stock management training be provided to all Area Medical Stores.

5) that the medical supply officers' biannual conference be made a permanent event.

C. Stock Management Procedures

6) that Pharmaceutical Services Division fully implement a 'minimum/maximum' reordering system.

7) that the Area Medical Stores start using bin cards to record all expiry dates and lot numbers of all vaccines and drugs.

8) that a bar code system be developed and required for all vaccine and drug shipments.
D. Medical Supplies Inventory Software

9) that modems be installed at the Pharmaceutical Services Division main office and at the six Area Medical Stores to speed the flow of information between the stores and headquarters.

10) that improvements be made in the Medical Supply Inventory Software System to make it easier to use and more responsive to managers' needs, particularly through the addition of graphic reports.

E. Physical Condition of Area Warehouses

11) that the Rabaul Area Medical Store have its office upgraded so that a secure computer room with an air conditioner is available. An inspection of Wewak and Medang should be undertaken to assess their computer environment.

12) that steel racks be supplied to the Area Medical Stores at Rabaul and Mt. Hagen to improve their storage of supplies. An assessment should be made at Wewak and Medang to see if they would benefit from additional space.

13) that temperature monitoring equipment be installed and maintained at all Area Medical Stores.

14) that the Area Medical Stores start using area or location designations within the warehouse to store and easily locate stock items by expiration date and that this information be added to the computer program.

II. PURPOSE OF VISIT

To field test the REACH-developed Stocks and Logistics Module in PNG, incorporating useful elements of the Stocks and Logistics Module into the Pharmaceutical Services Division Medical Supply Inventory Software System and incorporating into the SLM useful features of the Medical Supply Inventory system.

To assist in developing guidelines and documentation for modifications to the Medical Supply Inventory Software System in PNG.

To assist in planning a field trial of the modified Medical Supply Inventory Software System in PNG.

To attend the biannual Medical Supply Officers' meeting on Inventory Control.
III. BACKGROUND

A. Stocks and Logistics Module

The Stocks and Logistics Module program grew out of a proposal from WHO/Geneva Technet members in early 1990 to find or write a computer program that would facilitate the management of immunization supplies and vaccines. The program was to be 'user friendly', and detailed enough to meet fairly sophisticated needs.

The Stocks and Logistics Module was developed by this consultant, funded by REACH, in 1990. After completion of the module, the REACH Project located appropriate sites in which the program could be field tested prior to its widespread distribution.

It was decided in the spring of 1991 that PNG would be the ideal place to get additional input for the Stocks and Logistics Module as Allan Bass (in PNG as a JSI advisor to Department of Health, Pharmaceutical Services Division) had assisted in developing initial specifications for the SLM with REACH staff and this consultant in July, 1990.

It was seen as most desirable to install the SLM, train some local personnel in its use, and obtain feedback on the reports produced by the system, but operational constraints argued against this course. After evaluating the Medical Supply Inventory Software system in operation and seeing the various problems with 'real' data, it was agreed that the best course of action would be to use the existing system as a platform for testing existing SLM reports, trying out new reports and forecasting ideas that could then be incorporated into the SLM.

B. Medical Supply Inventory Software System

Pharmaceutical Services Division operates six Area Medical Stores throughout the country. These stores supply various health centers, sub-health centers and hospitals, who in turn supply aid posts. The stores are staffed by a manager, a pharmacist and various office and warehouse support staff. The Offices are equipped with two computers, one printer and software.

Pharmaceutical Services Division is facing a serious shortage of many critical drugs, vaccines and supplies. It is estimated that all of the medical stores have zero stock for 30 to 40 percent of the items listed in the Medical Stores Catalogue. A large part of this shortage is due to reduced budgets in each of the last three years, with this year holding steady at last year’s level. The Pharmaceutical Services’ budget is only 9.3% of the entire Department of Health budget, and even a year with no cuts in the Pharmaceutical Services’ budget represents a real decrease of 15 to 20% because of inflation.

The present Medical Supply Inventory Software System was developed over the past three years from a paper-based inventory control system. Through its evolution, the Medical Supply Inventory System has been changed consistently and, at times, six different versions of the system have been installed at the six different Area Medical Stores. This is mostly resolved now, and outside of the overall limitations imposed by the paper-based system, the Medical Supply System is internally consistent in all regions and gives reports to management on which to base decisions. The reliability and quality of the data in these reports remains an issue.
A critical problem within the Pharmaceutical Services Division is the overall low level of training among Area Medical Store staff and a lack of standardized procedures governing computer operation, overall warehouse management and the ordering and distribution of supplies to the area medical stores. While each of the four Area Medical Store locations that the consultant visited had a manager who was dedicated to making the store function as well as possible, the lack of skill-specific training and standardized procedures limited their ability to accomplish the task of warehouse management.

In most of the stores visited, the staff responsible for the entry of supply data into the Medical Supply Inventory System possessed few computer skills beyond the specific tasks for which they were minimally trained. All staff seemed genuinely interested in learning more, and were frustrated by their basic lack of skills. Some wanted to learn word processing or spreadsheet applications. None of them knew more than how to turn the machine on and get into the Medical Supplies program. The managers similarly demonstrated little advanced computer knowledge.

IV. TRIP ACTIVITIES

The first seven days of this consultancy were spent meeting and interviewing the key people at the Child Survival Support Project, Pharmaceutical Services Division, Department of Health and World Health Organization. Time was spent with the Medical Stores programmer, and programming and report strategies were discussed. The consultant visited the Port Moresby Area Medical Store and talked at length with the manager about warehouse operations, in general, and his own warehouse, in particular.

On June 26th the consultant visited Mt. Hagen to interview the regional store manager and his staff. A tour was given of the facilities and the consultant worked with the data entry person and the store manager for two hours on their computer.

On June 27th the consultant visited Lae and talked at length with that region's medical store manager about his warehouse operations. Since his store was in very good order, the concentration was on finding out what made it work as well as it did.

On June 28th the consultant visited Rabaul and talked with the store manager about his problems. The Rabaul store is having more trouble than the other stores visited. The current manager recently took over the operations.

A summary of the observations made at these three regional stores can be found in Attachment 1.

From July 1 to July 12 the consultant spent about an equal amount of time working with the Medical Supplies programmer on the Medical Supply Inventory Software System and working on the Stocks and Logistics Module. Most of the time with the Medical Supplies system was spent in developing a new report format that includes a graphic display of stock positions.

The last week (July 15 to 19) was spent in preparation and attendance at the Area Stores Managers bi-annual conference. Much time was also spent in rewriting the Stocks and Logistics Module routines.

A list of people contacted appears as Attachment 13.
V. CONCLUSIONS

A. Stocks and Logistics Module Updates

The Stocks and Logistics Module was originally developed as a tool EPI staff could use to manage stocks of vaccines and needles. The specifications were developed by REACH staff, Allan Bass, and the consultant. An implicit assumption made was that the module would be used by managers of a central warehouse to track the shipment of supplies through the warehouse, and to monitor stock balances and facilitate stock ordering at the central warehouse.

The Papua New Guinea medical supply system was not of this type, having six Area Medical Stores that were fairly autonomous with a centralized headquarters that did the actual ordering and tendering for them. The differences between the supply system in PNG and the inventory system assumed by the SLM model prompted certain useful revisions to the design of the Stocks and Logistics Module. These included loosening control on entering new stock and adding facilities to permit tracking of any type of consumable commodity, not just vaccines and needles. Details of the changes made to the "Item" and "Itemdet" data files and the impact on the functioning of the SLM are listed in Attachments 5, 6, 7, and 8. These capabilities make the SLM a general tool for stock management, one that could be used to facilitate the management of essential drugs or of a pharmaceutical warehouse for example.

Furthermore, the SLM reports as originally designed were not easily understood by some medical supply staff not trained to read tables. The reports were improved in part by adding bar graphs to facilitate the interpretation of stock positions. Other reports were either reformatted or had their content changed based on input from staff in PNG. Details of the new report format for the stock balance report are found in Attachment 2 and the program specification and code in Attachments 3 and 4. Details of the specifications for the new expiration date report are found in Attachment 11 and the code for generating the graph line on the report in Attachment 12.

Lastly, changes made to the history functions in the SLM (attachment 9) will permit the module to generate reports showing the average stock issued in a given month.

B. Medical Supply Computer System

The Medical Supply computer program is a product of its environment. It was not so much designed as 're-written' from an existing paper system, retaining the strengths and weakness of that system. Because of the nature of the scope of work, a complete analysis of the code was not appropriate.

The operation of the program is fairly straightforward, with all major sections listed on the main menu. The sub-menus were somewhat obscure, but with a bit of explanation or a look at the (outdated) manual, the functions became reasonably apparent. The various sections calculated their totals accurately and the outputs are also fairly clear. Often two reports are required to get the desired information.

All of the printed reports are in table format, and are clear enough to be interpreted by someone trained in reading and understanding tables. Those with little experience in interpreting tabular data would have difficulty, however, understanding the reports. There is also a tendency on some of the reports to have too much unnecessary data displayed, which detracts from the actual function of the particular report.
The main problem that the consultant has identified in the Medical Supply system is not the computer program, but rather the lack of training and procedures at all levels of the supply system. There would have to be considerable improvement in the overall operations of the Pharmaceutical Services Division before the Medical Supply computer system shortcomings would become a limitation. The changes instituted and proposed for the Medical Supply computer system are those that will help Pharmaceutical Services deal with the information that they now possess and to use this information to make necessary changes.

VI. RECOMMENDATIONS

A. Stocks and Logistics Module

This consultant should complete the following modifications to the Stocks and Logistics Module:

a) Change the item input routines so that items may be entered without a purchase order number being associated with it. This will allow the entry of commodities that were donated or otherwise got to the warehouse door without being ordered in the usual manner.

b) Modify the ITEMDET, HISTORY and ITEM database files to increase the ability of the SLM to track more information about additional types of commodities.

c) Make the reports clearer and easier to understand by including bar graphs, and by changing the content or format of the reports where appropriate.

d) Update and improve the readability of the user's manual.

e) Change the installation procedures to make the SLM more generic. This will include allowing the user to define the administrative structure of the installation site and the stock items that will be tracked at that site.

B. Training

Staff of the Department of Health Pharmaceutical Services Division and Child Survival Project should:

1. Provide computer training and technical assistance to staff at the six Area Medical Stores. This training should coincide with the introduction of the Medical Supply Inventory Software System updates for the year. It was recently decided by Pharmaceutical Services that updates to the computer program would no longer be made in an ad hoc manner, but routinely on an annual basis. The training should be conducted on site at each medical store and include some basic computer skills. The training should center on the Medical Supply Inventory System updates and include a review of the software system in general. This training should include the Area Medical Store managers as well, so that they may see the operation of the system and understand better what the reports are telling them. Training should take two to four days at each site.
2. Provide information management training for the six Area Stores Managers. Besides being able to understand what their staff are doing with the computers, the managers need to be able to interpret the reports that the Medical Supply computer system generates. At present, information on the reports is often disregarded because managers do not understand or trust the data being presented.

3. Provide safety training and training in stock management procedures. Training (of all types) within the medical supply system is not standard and is incomplete. New employees are trained by the person who s/he is in closest contact with, not the one best qualified. General pre-service and in-service training in stock management procedures should be standardized.

4. Make the semi-annual Medical Supply Officers' conference a permanent event. This meeting was extremely useful for all involved and gave the normally isolated managers a chance to share their concerns with each other and directly with Pharmaceutical Services. This would be an excellent venue to discuss new stock management procedures and provide in-service training.

C. Stock Management Procedures

Department of Health Pharmaceutical Services Division should:

1. Standardize the recording of expiry dates and lot or batch numbers throughout the Area Medical Stores immediately. The specifications for the expiry date report (see Attachment 11) should be turned into a Medical Supply system routine and used by the managers to determine the status of the vaccines and medicines with critical expiry dates. At present, very few store managers pay any attention to this critical bit of information.

2. Consider specifying that all future orders for the Area Medical Stores be sent with the critical information (name, expiry date, lot number, etc) encoded in bar code format. With this system in place it would be possible to enter the most important information about the new stock without the usual data entry errors and without the expenditure of time. The bar code system could be expanded within the Stores themselves to track physical inventory and paperwork. The equipment is relatively inexpensive and reliable. Further study should be undertaken to define exactly the specifications of variables required and how they are to be coded.

D. Medical Supplies Inventory Software

Pharmaceutical Services Division staff should:

1. Start using the new stock balance report with the 'MIN/MAX' graph line. This will require that a minimum and a maximum level be coded for each of the items in the supply catalogue. The use of this report with the present method of ordering (from set lists at set times of the year) will provide area store managers with a more readable assessment of their stock positions. Furthermore, when medical stores switch to the more responsive 'Min/Max' system, the major work will already be done.
2. **Purchase and install modems at the Pharmaceutical Services Division main office and computer room and at the six Area Medical Stores.** Use of modems between Area Medical Stores and the main office would enhance the movement of information through the system and help ease one of the most persistent problems in the system - that of zero stock in one Area Store with over supply in other stores. The Medical Supply computer programmer could easily take care of many problems and extract data from the Stores without requiring staff to go to the remote locations or wait for correspondence by mail. Phone lines in Papua New Guinea are excellent and data errors should be minimal.

3. **The Medical Supply Inventory Software System should be modified by the Department of Health Systems analyst as follows:**

   a) The reports need to be made clearer and have only the information that is required. More bar graphs should be used to help the managers identify critical information on the report. Since tables of numbers are not very helpful to many of the managers, all reports should be reviewed with an eye towards improving the report style.

   b) The software system's menus are sometimes confusing. They should be made more user friendly by clearly stating the menus' purpose. This is done well on the opening menu, but becomes less clear in the sub-menus.

   c) More range checking needs to done on input data. Except for catching numeric data input in text fields and the converse, there are no routines to check the 'reasonableness' of an input. This can be a serious problem because of the near universal confusion of the catalogues use of 'units'.

   d) Limit the user's ability to make mistakes by limiting his/her choice of inputs to only correct ones that appear in a menu. If the user needs to select a health center or item code, s/he should be able to do so from a list which pops up in a window on the computer screen and forces the selection of one from it.

   e) Update the user's manual. The last major update of this document was in 1988.

**E. Physical Condition of Area Warehouse**

1. The physical location of the computer at Rabaul (and possibly Wewak and Madang) should be improved. The computers and printer are sitting in the middle of an office where there is much foot traffic from the warehouse. During the summer, it is hot and dusty. There is no air conditioner. A section of the office should be walled off, air conditioned and made secure.

2. The Rabaul and Mt. Hagen (and possibly Wewak and Medang) area stores should be fitted with steel racks to increase the amount of space available for supply storage. Small fork lifts would also be required to maximize efficiency.

3. Temperature recording equipment and an alarm system to notify someone in the event of a refrigerator failure should be purchased and installed as soon as possible in the area medical stores. The vaccines that are stored in these refrigerators represent a large effort from many
people. Failure to monitor and ensure their potency represents a basic gap in stock management procedures. Complete training in the use and simple maintenance of cold chain equipment should also be undertaken.

4. The Area Medical Stores should start using area designations within their warehouses. Presently, there is nothing written down as to where a particular item is in the store. The present system works because the employees have been there for sometime and because the number of items is limited. Either one of these present realities could change in the near future. Warehouses should rationalize their spaces by creating a grid on the floor and numbering or lettering the squares created. These designations should be entered into the computer when the item is put into stock and printed on the picking slip so that a warehouse person can locate the item by knowing only the grid system.
ATTACHMENTS
Attachment 1

Summary of Observations from Visits to Area Medical Stores

Trip report for
26 June 1991

Mt. Hagen- Arrived at Mt. Hagen by plane and was taken to the Area Medical store. A tour of the store was given and the manager (Mr. Simeon Abo) and the consultant discussed issues relating to the Medical Supply Inventory Software System and his store in particular. The following observations were made:

1) Because there are no heavy steel racks to put any boxes on, the stock is piled on pallets on the floor. Many of the lower boxes are broken or distorted.

2) The cold storage system at Hagen is in serious trouble. There are presently three refrigerators: a walk-in and two cabinet style. The walk-in is overcrowded and somewhat in disarray. There is no thermometer that is trustworthy and no temperature monitoring equipment. One of the cabinet style coolers has been broken since 1989. The other failed two weeks before while full of vaccines and those vaccines were still present. There is no contract to keep any of this equipment running and the manager is unaware of anyone to contact.

3) There was a wide divergence between what the Medical Supply Software reported stock balances to be and the physical count of stock. Everyone who worked with the system knew this to be the case, but as of this time there was no attempt to reconcile the differences.

27 June 1991

Lae- Arrived by plane from Mt. Hagen and was picked up by Mr. David Guillam, manager of the Lae Area Medical Store. The Lae store is the largest and newest of the six stores and has the best trained staff. Mr. Guillam has been the manager of several of the other stores and has quite a lot of experience in the country with medical supplies. He also was one of the moving forces behind the introduction of the Medical Supply computer system and did quite a lot of the initial analysis work for it. His problems were mostly of 'structural' nature and not operational, in fact most of the time spent there was trying to define what worked, why it worked and how it could be made to work at the other stores.

28 June 1991

Rabaul- Arrived by plane from Lae and was met by Mr Kouh Sosohe, manager of the Rabaul Area Medical Store. A tour was given of the facilities and problems were discussed. Mr. Sosohe recently took over the operations of the Rabaul store. The problems in this store are somewhat similar to those at Mt. Hagen. The following was observed:

1) The same refrigerator problems exist at Rabaul as in Mt. Hagen with both cabinet style fridges inoperative and the walk in crowded with those items that should have been in the cabinet fridges. Again, no company has been found to maintain these.
2) Seven pallets of commodities were present that had recently been discovered in a remote store room. They were mostly drugs in critically short supply in all the Area Stores but were unusable due to the fact that their expiry dates had all passed at least six years ago.

3) The availability of floor space in this store is better than at Mt. Hagen. However, the use of steel racks and a fork lift would improve the situation.

4) Staff at Rabaul had limited computer experience. The manager must rely on his staff for all information about stock positions.
Attachment 2


The new report format developed is a modification of the stock balance report. The addition of the graph line after the item description enables one to quickly 'size up' the stock position without reference to tables of numbers. The graph provides a clear indication of the current stock on hand. The length of the bar for each stock item indicates how long the stock will last, based on the average monthly consumption in the past. The minimum level reflects the lag time in ordering and receiving new stock. Levels over the maximum line indicate an excess of stock.

The report was introduced at the bi-annual Medical Supply Officer's conference on 17/7/91 and was favorably received after a short introduction and explanation. Specifications were also written for a similar type of report to display the expiry date status of stock (attachment 11). Because expiry date is not presently used in allocating stock for shipment (though it is input by most of the stores), the production of the report was determined to be a low priority.
Programming specifications for graphing Minimum/Maximum graph and report.

Report Purpose: to quickly highlight the status of individual stock items graphically, with supporting figures beside it.

Discussion: The problem is to display stock levels in a coherent and rational manner so that one can tell at a glance the status of that item in relation with its predefined minimum and maximum stock level. This would be simple if all the minimum and maximum levels were the same (i.e. min=9 months and max=12 months), but in fact, they might all be different. The key is to establish a ratio of the item's 'stock on hand' (SOH) and its 'average monthly issue' (AMI) with the 'minimum and maximum' (MIN/MAX) points established. This first step is to establish how much stock is on hand now, based on the AMI. This is a straightforward calculation of the number of months of stock that is on hand, given an average usage (pre-calculated AMI). The months of stock on hand (SOHM) can be directly compared to the MIN/MAX levels. This can be done by dividing the problem into three parts: 1) SOH over MAX, 2) SOH over MIN and 3) SOH over 0. In a series of IF statements, the quantity is compared with MIN and MAX. The following example with serve as a guide to the entire operation of this module.

GIVEN: SOH = 1200 units
AMI = 100 units
MAX = 16 months
MIN = 10 months

1) Calculate SOHM (stock on hand/months)
   \[
   \text{SOHM} = \frac{\text{SOH}}{\text{AMI}} \\
   \text{SOHM} = \frac{1200}{100} \\
   \text{SOHM} = 12 \text{ months}
   \]

2) Compare with the MAX stock level
   if SOHM > MAX ... it's not

3) Compare with MIN stock level
   if SOHM > MIN ... it is (12 > 10)

4) Find how many months it is over the minimum
   \[
   \text{OMIN} = \text{SOHM} - \text{MAX} \quad (\text{OMIN} = 12 - 10; \text{OMIN} = 2)
   \]

5) Get the ratio of that to the MIN level
   \[
   \text{ratio} = \frac{\text{OMIN}}{\text{MIN}} \times 10 \quad (*10 \text{ to give it INT value})
   \]

This ratio is then used to determine the graph line length. Since we found out before we started this calculation that SOHM is above MIN level, we don't need to calculate the line length from '0' to 'MIN', but can simply add the additional length to the full size of the 0 to MIN line (same as if it had been over MAX- then it would be added to the full size of the 0 to MAX line). Each area on the bar (0 to MIN, MIN to MAX and MAX and over) is divided into units of 10 and the ratio calculated by OMIN / MIN is rounded to the integer value between 0 and 9.
Required Variables

(global)
AMI- average monthly issue
SOH- stock on hand
MIN- minimum stock level
MAX- maximum stock level

(local)
LINVAL- line counter
OMAX- quantity over MAX
OMIN- quantity over MIN
OZERO- quantity over 0
Attachment 4

Code for calculating min/max ratio for minimum/maximum graph and report

```java
public soh, sohm, ami, omax, omin, linval, linvalue, max, min, ozero, linenum
public star
linenum = 1
soh = 1045
max = 12
min = 8
ami = 108
sohm = soh / ami

do while soh > 0
    if sohm > max
        omax = sohm - max
        linval = (omax / max) * 10
        do starcalc
            linvalue = "***************" + star
        exit
    else
        if sohm > min
            omin = sohm - min
            linval = (omin / min) * 10
            do starcalc
                linvalue = "**********" + star
            exit
        else
            if sohm > 0
                ozero = sohm
                linval = (ozero / min) * 10
                do starcalc
                    linvalue = star
                exit
            else
                linvalue = "NIL STOCK"
            endif
        endif
    endif
@linenum, 10 say linvalue
linenum = linenum + 1
enddo
linenum = linenum + 1
?linvalue
?linenum
```
New variables within the ITEMDET file are:

- CAT- catalogue designation
- TRADENAME- common name of vaccine or drug
- COST- cost per unit
- SUPCODE2- second supplier code
- EXPIREYN- yes/no for determining if item has an expiration date
- ORDRUNIT- the required unit this item is ordered in
- COMMENT1- short comment line
- LASTISSUE- total quantity issued last month
- YRGO3MONAV- 3 month average monthly issue from one calendar year ago
- AMIYTD- Average Monthly Issue (AMI) from Jan 1 to present
- AMIONEYR- AMI from one calendar year ago to present
- LASTCALC- date of last calculation (for averages above)

CAT defines a group within the list and can be used in conjunction with the variable ITEM (by coding a number or letter at the beginning or end of the item code to define a specific group) to define a 'two dimensional' classification for the items. If the category (presently 'x') is designated as 'vaccines', a secondary data entry screen for vaccine monitor card information is displayed at the ITEM data entry routine.

A 'Y' coded in EXPIREYN (at setup) indicates to the system that a secondary input screen should be displayed to gather expiry date and lot number information.

The last five variables (LASTISSUE, YRGO3MONAV, AMIYTD, AMIONEYR and LASTCALC) are included in ITEMDET as well as HISTORY. In HISTORY they record the values at the end of the month and keep them so that they may be used for graphing trends. In ITEMDET they are included for the Stock Balance Report.
The main item (ITEMDET) database file was expanded and the items contained were divided into groups and sections for displaying in the pop-up windows of the program during data entry and editing. Originally the Stocks and Logistics Module was created to take care of vaccines and needles only. Because of this short list of commodities, not much thought was given to the problem of having a great many items in the file and how to display them in some rational manner. One of the first things done with the Stocks and Logistics Module in Papua New Guinea was to load the 1600 records of the Medical Supply system ITEM1 file into the Stocks and Logistics Module ITEMDET file. It soon became clear that scrolling through a window with that many items was not feasible. The solution was to divide the items into their 'natural' classifications. The catalog (from where the items come) has two major divisions; sections and categories which divide the list into subgroups. For example category 'A' is a subset of each section and section '1' has all categories represented. This puts a reasonable number and rational list of items into each window.
New and changed variables within the ITEM file

CONTRIBUTR- coded entry from pop-up display of contributors
UNIT- description of commonly used item unit, example- 'bottle of 100' or 'vial of 10'.

UNIT replace two other variables- 'DOSE_VIAL' and 'ITEMPACK' as these variables were somewhat confusing when used with medical supplies, and useless when other commodities were entered. These variables have been replace by the UNIT variable in all database files.

CONTRIBUTR was added to the file to take into account the fact that some items may arrive through other channels besides the usual Purchase Order route. A Contributor file is built in the 'SETUP' section of the Utilities menu.
By the inclusion of new variables in the ITEM and ITEMDET database files, data entry and tracking of commodities has been generalized for the entry of non-vaccine and non-medical items.

Item Entry routines have been changed in several ways to accommodate the possibility of contributed stock and to simplify the entry process for non-vaccine and non-expiring stock. If the item was ordered by Purchase Order, the same tight controls are in place as before.

Upon entering the item data entry screen from the Stock Control menu, you are asked (from a pop-up menu) if the item was ordered with a Purchase Order or contributed. After that, both screens act in pretty much the same way with the old screen still asking for, and confirming, the Purchase Order number, while the new screen presents a pop-up of contributors (built in 'Setup') and inserts its code into the 'Contributed by' space.

For both types of entry, if the variable 'EXPIREYN' is coded with a 'Y' (in the ITEMDET file) then a secondary screen is presented asking for the expiry date and lot number of the item. If the item Category is vaccine (determined in setup) then vaccine monitor card information is sought.
New and changed variables within the history database file:

- YEARBACKOR - accumulated backorders within 1 year
- LASTISSUE - total quantity issued last month (period)
- YRGO3MONAV - 3 month average from one calendar year ago
- AMIYTD - average monthly issue (ami) from Jan 1 to present
- AMIONEYR - ami from 1 calendar year ago to present
- LASTCALC - date of last calculation (for averages above)

These new variables add detail and depth to the item's HISTORY record. The calculations are saved for each month by item and a useful graph could be constructed showing moving average trends over time.
Attachment 10

Changes to the Set-up and Utilities Routines

Additions and refinements to the SETUP section of the UTILITIES menu. Two new sections have been added: 'CONTRIBUTOR' and 'UNIT DESCRIPTION'. The ITEMDET routines have been updated to take into account the new variables and a new pop-up window gets the category information.

CONTRIBUTOR- new menu selection to enter and edit the contributors of commodities. A unique code is generated whenever a new contributor is entered and that code is what is passed to the ITEM dbf file (as it is much shorter than the contributor name).

UNIT DESCRIPTION- This new variable replaces the old variables DOSE_VIAL and ITEMPACK. The routine is for the simplified entry of possible unit designations to be displayed in a pop-up selection window whenever the variable is required for input or editing of a record.

ITEM CATEGORY- pop-up menu that allows the input of a category into the ITEMDET dbf file. Presently there are six categories: vaccines, needles and syringes, medicines, medical supplies, medical equipment and non-medical supplies. These are somewhat arbitrary at this point and could easily be expanded or reduced. The code associated with the categories are lettered 'A' through 'F'.
Attachment 11

Specifications for Expiry Date Graph and Report

This report will be similar in appearance to the MIN/MAX graph and report in that the primary way in which it conveys its information is through the display of a line graph in which there are vertical lines down the page corresponding to: 'Expired', '3', '6', '9' and '12' months from the expiration date. If the vaccine or drug is expired, the notation 'EXPIRED- REMOVE FROM STOCK' is printed instead of a line. If the item is not expired then a line is printed whose relative length indicates how long it is before the item expires. Beside the line is printed supporting documentation: expiry date, lot number, stock on hand, ami, minimum stock level (in months) and warehouse location.

The following is the minimum information to be included in the report. It might also include the 'expiry date', 'minimum stock', 'Minimum & Maximum' (value in months), 'warehouse location' and 'list'.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Time to Expiry (months)</th>
<th>Lot</th>
<th>SOH</th>
<th>AMI</th>
<th>Unit of Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 3 6 9 12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pseudo-code:

Read in record
get expiry date
get system date
diff = expiry date - system date
if diff negative
    print 'EXPIRED STOCK'
else
    if diff < 30 (within 30 of expiry)
        print 'STOCK EXPIRING'
    else
        convert diff to chr() units by dividing diff by 30
        print (units * chr(?)) & other variables
    endif
endif
Code for calculating graph line in expiration report

Calculate line length for linecalc (in '*')

```java
public star, linval
star = space(10)
?linval
do case
    case round(linval, 0) = 1
        star = "**"
    case round(linval, 0) = 2
        star = "***"
    case round(linval, 0) = 3
        star = "****"
    case round(linval, 0) = 4
        star = "*****"
    case round(linval, 0) = 5
        star = "******"
    case round(linval, 0) = 6
        star = "*******"
    case round(linval, 0) = 7
        star = "********"
    case round(linval, 0) = 8
        star = "*********"
    case round(linval, 0) = 9
        star = "**********"
endcase
return
^Z
```
Attachment 13

List of persons contacted

**Child Survival Support Project**
Dr. Jerry Russell - Chief of Party  
Mr. Allan Bass - Logistics and Cold Chain Advisor  
Dr. Keith Edwards - MCH doctor

**Department of Health**
Mr. Steve Cline - Chief of Pharmaceutical Services  
Mr. Igo Baru - Superintendent of Pharmaceutical Services  
Ms. Pakawan O'Leary  
Ms. Jojie Urbitzondo - Systems Analyst/Programmer, Medical Supply Inventory Software System

**WHO**
Mr. Steve Karel  
Dr. Barry Carlin  
Dr. John Mills

**Area Medical Stores**
Mr. John Martin - manager (and staff) - Port Moresby  
Mr. Simeon Abo - manager (and staff) - Mt. Hagen  
Mr. David Guilliam - manager (and staff) - Lae  
Mr. Kouh Sosohe - manager (and staff) - Rabaul