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USE OF MICROCOMPUTER TO IMPROVE HEALTH INFORMATION SYSTEM AT DISTRICT LEVEL

PRADIT WINICHAKOON

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
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บัณฑิตวิทยาลัย ม. มหิดล

IN

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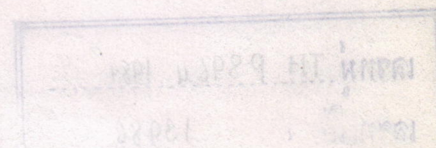

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Thesis

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Pradit Winichakoon
....
Pradit Winichakoon

Candidate

Oratai Rauyajin, M.A.,M.P.H.,Dr.P.H.

Major advisor

Kanchana Kanchanasinith, Dr.P.H.

Co - advisor

Suchin Norattejananda, S.R.N.,S.C.M.,M.T.D.

Co - advisor

Smarn Roongsrithong M.D.,M.P.H.

Co - advisor

Monthree Chulasamaya,M.D.,Ph.D.

Dean

Faculty of Graduate Studies

Krasae Chanawongse,M.D.,Dr.P.H.

Director of ASEAN Institute for Health Development

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was submitted to the Faculty of Graduate Studies, Mahidol University for the degree of Master of Primary Health care Management.

ON

30 MAY 1989

Pradit Winichakoon
....
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Candidate

Oratai Rauyajin

Oratai Rauyajin, M.A.,M.P.H.,Dr.P.H.
Major advisor

K. Kanchanasinith

Kanchana Kanchanasinith, Dr.P.H.
Co - advisor

S. Norattejananda

Suchin Norattejananda,S.R.N.,S.C.M.,M.T.D.
Co - advisor

Smarn Roongsrithong M.D.,M.P.H.
Co - advisor

M. Chulasamaya	Krasae Chanawongse
Monthree Chulasamaya,M.D.,Ph.D.	Krasae Chanawongse,M.D.,Dr.P.H.
Dean Faculty of Graduate Studies	Director of ASEAN Institute for Health Development

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BIOGRAPHY

NAME : PRADIT WINICHAKOON

DATE OF BIRTH : AUGUST 26 TH, 1952

PLACE OF BIRTH : BANGKOK.

INSTITUTION ATTEND : CHULALONGKORN UNIVERSITY

FACULTY OF MEDICINE

MARCH 1976 Bsc. , MD.

MARCH 1980 THAI BOARD IN GENERAL PRACTITIONER

POSITION HELD AND OFFICE : Director of PUA Crown Prince Hospital , Pua district Nan province , Thailand .

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PRADIT WINICHAKOON

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THESIS TITLE : Use of Microcomputer to Improve Health Information System at District Level.

NAME : PRADIT WINICHAKOON

DEGREE : Master of Primary Health care Management (M.P.H.M.)

THESIS SUPERVISORY COMMITTEES :

Oratai Rauyajin , M.A.,M.P.H.,Dr.P.H.

Kanchana Kanchanasinith , Dr.P.H.

Suchin Norattejananda , S.R.N.,S.C.M.,M.T.D.

Smarn Roongsrithong , M.D.,M.P.H.

DATE OF GRADUATION : 30 MAY , B.E. 2532 (1989)

ABSTRACT

In the light of limited health resources, efficient and effective management of health care system including Primary Health Care (PHC) is necessary. Information is identified as one of the key elements and much attention was given to improve information system management. With effective management of health information system, it is anticipated that PHC managers will be able to efficiently use information to support their operational management. This study is an intervention study using microcomputer as a tool to improve health information system at district level. The main objective is to find out whether the microcomputer can be used in health information system,especially for reduction of time spending in information tasks. Expanded Programme of Immunization (EPI) and Family Planning Programme (FP) were selected as the model of study.

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The study was conducted at Pua district, Nan province in the Northern Region of Thailand. Five out of ten health centers were used as the study site. The community hospital at PUA district was used as the center of district health information system. Baseline data related to EPI and Family Planning activities were collected from the study health centers. Database management systems, dBase III plus, was the application software implemented for data storage and feedback information from center of health information system (at the community hospital) to health centers. Time consuming for information tasks called " total information time " were observed before and after the use of microcomputer and these period of time were used as the indicator to show how effective the microcomputer could reduce working hours in information task.

The result showed that in EPI work, " total information time " was reduced from 494.9-697.9 minutes (596.4±101.5) to 324-452.8 minutes (388.4±64.4) with statistical significance ($p < 0.05$) and in Family Planning work," Total information time" was reduced from 41.7 - 57.5 minutes (49.6±7.9) to 22.3 - 31.3 minutes (26.8±4.5) with statistical significance ($p < 0.05$). The reduction of time was not as outstanding as expected. The unacquaintance of health personnel to this new technology possibly explained the results. This study, however, demonstrate the feasibility to set up a district health information system at community hospital.

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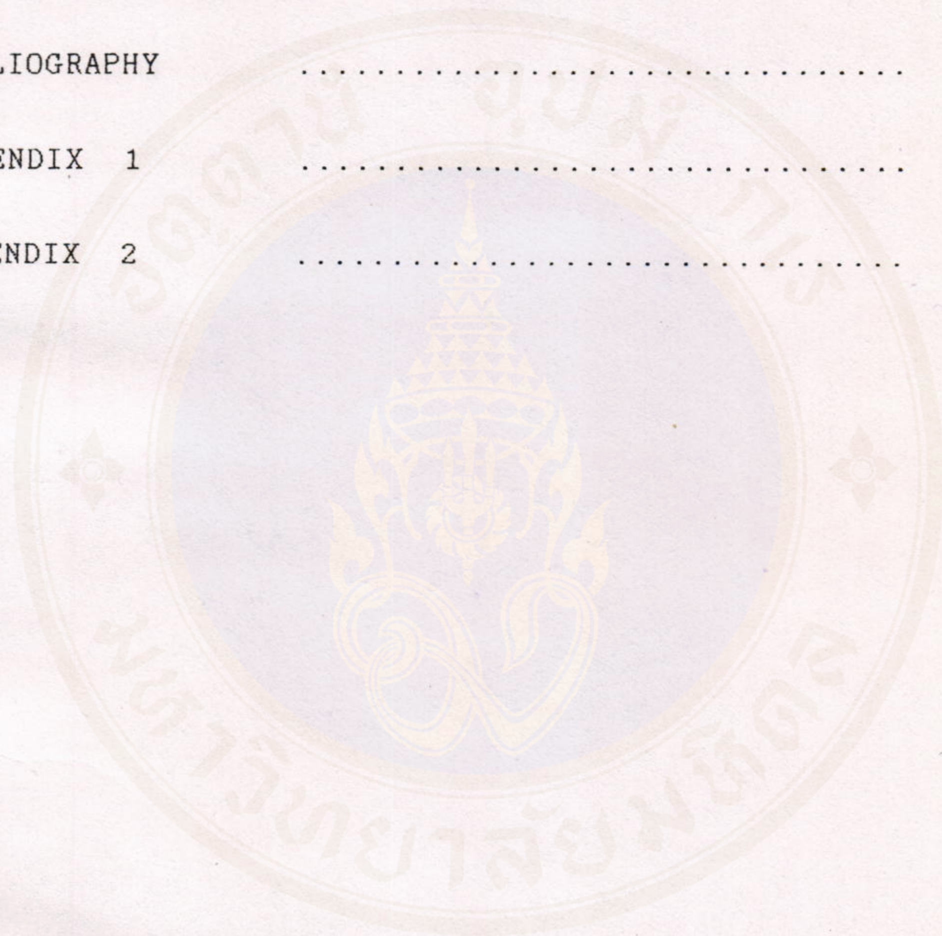

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CHAPTER I
INTRODUCTION

Rationale and Justification

After "Alma Ata Declaration" in 1978, governments around the world have endorsed the 'Health For All'(HFA) strategy and commitments in principle of Primary Health Care (PHC) approach. Although substantial progress has been made during the past decade, resources remain inadequate for equitable provision of basic health services to the population living far from health care services. As experience in PHC programmes increase,needs for prioritizing health problems and interventions become evident. Therefore, accurate and properly selected information deem important for efficient management and decision-making. Accurate and reliable information remains inadequate in most areas of health information system. Managers tend to use intuition and judgment rather than belief in faulty information or misleading data. The major constraint in most developing countries is insufficiency of information for managerial process. To provide systematic and analytical information for continuous assessment of situation and determination of priorities, improvement of health information system is crucial.

Adequate information does not necessarily mean collecting a large amount of data or information. WHO had reported that in developing countries, 40% of the working time of health workers was spent on filling up reports and collecting

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data instead of devoting to service delivery. (World Health Organization : Seventh Report on the World Health Situation, 1987). Thus, a well designed management information system will potentially reduce the time required for information tasks. Currently most information system is centralized at the national level, it is fragmented and produces redundant information with internally inconsistent data. The routine management data are seldom used effectively in planning and provision of policy direction for community health activities.

A movement is underway to decentralize health information system to the district level. District health information system is conceptually considered very important to improve PHC activities. The questions are: what would be a model of district health information system ? Could it replace the centrally designed information system, and thereby reduce the overall workload of health workers at the periphery of the system. Currently, most information systems are designed for data collection and reporting system. Little or no attention has been given to data analysis and utilization. Moreover,success of management information system lies in its ability to feedback the data collected to the workers for further actions. Lack of immediate feedback results in low motivation and thus predictably, the quality of information, such as accuracy and up-to-date data, will be rather poor. The common deficiencies in district health information system are inadequate skills and tools for information analysis.

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In Thailand, district health information system has not been established. Major problems in the current health information system are

(1) Health personnel are burdened with a large amount of records and reports.

(2) Health personnel's knowledge and skill for data analysis and use are lacking.

Therefore, most of the health workers ignore the importance of data and information which they had to collect. Their attitudes towards health information system are negative.

Microcomputer,which is now available at low price, is considered to be a promising appropriate equipment for developing effective and reliable information system. Some of its usefulness are

1. Its ability in data processing and analysis in a short period of time. Many statistical packages as well as other commercial softwares are now available.

2. Its storage capacity. A lot of database can be created, stored and retrieved in the form as needed.

Accordingly, use of microcomputer for this purpose should potentially provide more effective and efficient management.

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Research Objectives

The general objective is to improve PHC management by establishing an effective health information system.

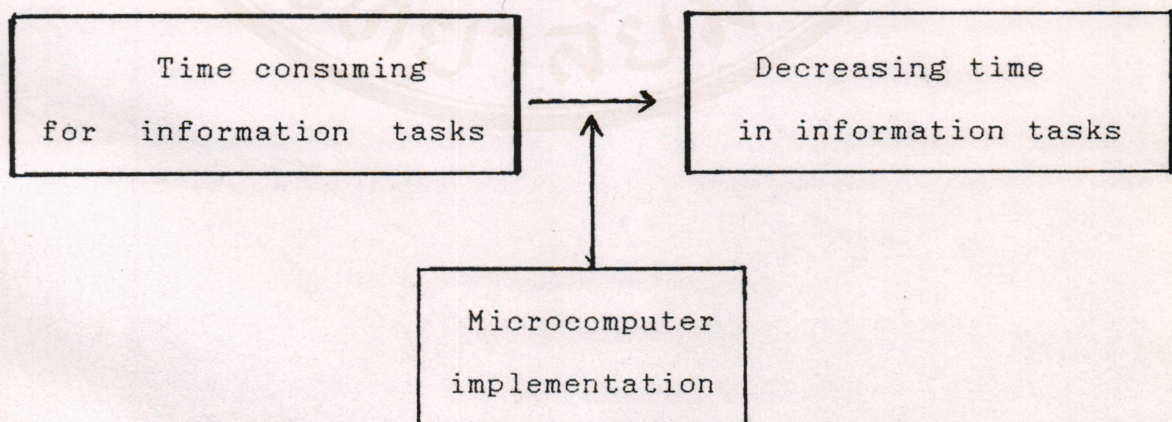
The specific objectives are

(1) To conduct a pilot study on the use of microcomputer in health information system at district level.

(2) To identify problems and other necessary requirements in implementing microcomputer for district health information system.

(3) To evaluate time reduction in information tasks after the use of microcomputer .

Figure 1. *Conceptual Framework*



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Hypothesis

Use of microcomputer in district health information system will decrease time consuming in health information tasks.

Scope of study

This study will confine to the data and information in relation to the Expanded Programme of Immunization (EPI) for children under 2 years and contraceptive services (for contraceptive pills and injections only) of Family Planning Programme.

Study Setting

Nan province is in the northern part of Thailand. It consists of eight districts and three semidistricts (Gink-am-phur) with the population of 440,000. There have been good coverage and distribution of health facilities. Every subdistrict has a health center and every district has one community hospital. Health infrastructure with hierarchy of command from provincial to subdistrict level is shown in Figure 2 .

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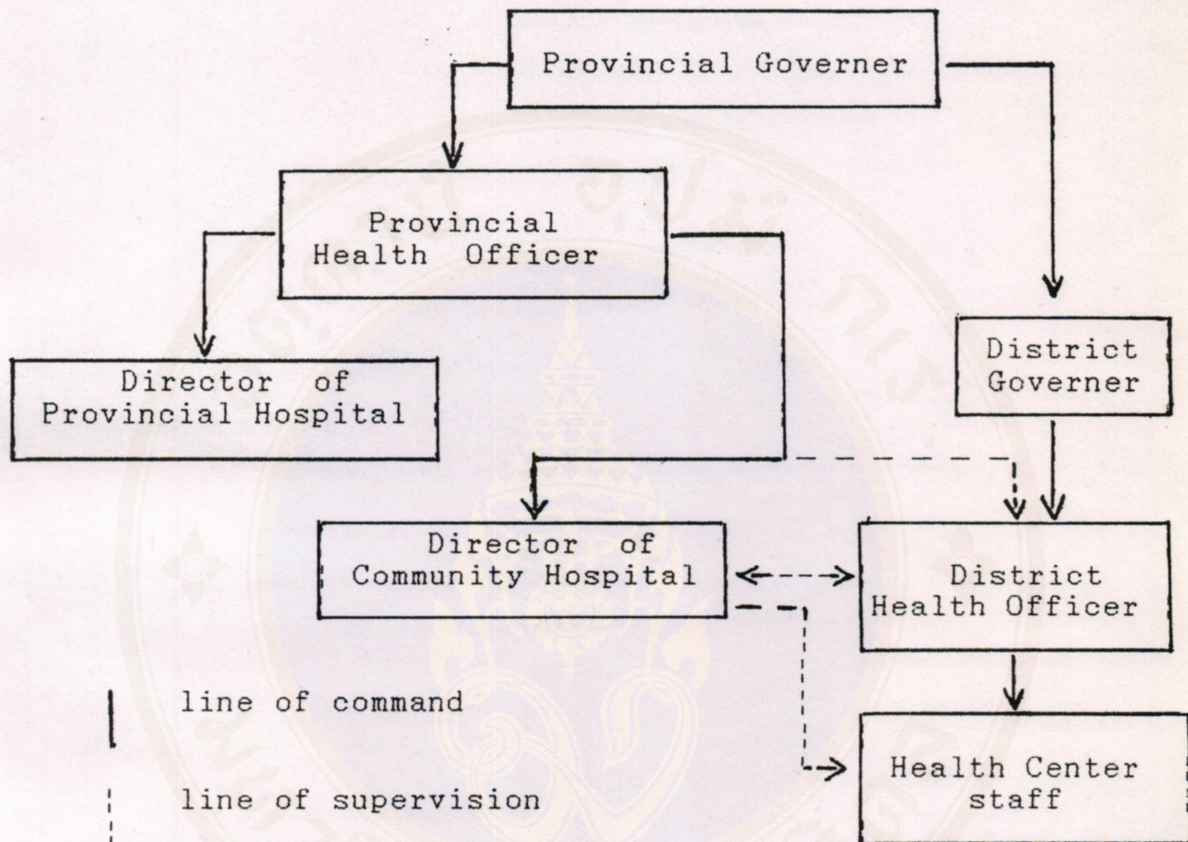
Figure 2 Hierarchy of command of the provincial health facilities



From the line of command in figure 2, the provincial hospital and the community hospital are directly controlled by the provincial health officer. District health officer and health center staff are, however, under control of the provincial governer through the district governer. The provincial health office serves as a technical supervisory unit. In fact, most of the work,command and policy from Ministry of Public Health are streamlined to provincial health officer passing through the district governer to district health officer and health center

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staff. Community hospital also provides technical supervision for health centers. Both district health office and the community hospital are health facilities at the same administrative level, in the district. They are linked via coordination, not by order or command.Under such a dual authority, the the success of health plan, projects or even Primary Health Care (PHC) highly depends on the quality of coordination between community hospital and district health office to support the health center personnel and health volunteers at the village level.

Currently there is no established MIS or center of health information system at district level. All data and information collected by volunteers and health personnel are sent through district health office to the information center at provincial health office. In this situation,district health information system is only used in data collection and reporting system. Volunteers and health personnel are providers of information for health records. Community hospital, has only minor role in district health information system.

At present, in Nan province, there is an attempt to improve health information system at every level. A pilot project for health information system has just been launched. Seven form of records for collecting baseline data from every village were developed, and they are :-

List no. 1 consists of name, address, age of all population.

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List no. 2 consists of housing condition and sanitation of every household.

List no. 3 consists of name, address, nutritional status, immunization history (type and number of vaccination which had been given) for all children under 1 year.

List no. 4 contains the same information as list no.3 but for children 1 - 5 years only.

List no. 5 consists of school health information, nutritional status and immunizational status of all pupils in every school.

List no. 6 consists of name, address, marital status, number of children and contraceptive method which was used for all women of reproductive age (15 - 44 years).

List no. 7 consists of name, address of all pregnant women including post partum women.

All baseline data according to the list were collected by health center personnel and sent through ' District Health Office ' to the center of health information system at provincial level. Update of these baseline data can be done in the same way from health center to health information center every 3 months.

Study Area

Pua is a district located in the north of Nan province and is about 60 kilometers from the main city. This district is divided into 10 subdistricts with the total population about 60,000. For health facilities,there is one sixty bed community hospital. In each subdistrict there is one health center operated

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by at least 2 health personnel. These health centers are under supervision and supported by the 'District Health Office ' staff.

Table 1 list of health centers in Pua district with the general data

Name of health center	Number of personnel	Number of villages	Number of population
1. Chaiwattana	3	8	3,791
2. Silalang	3	10	4,437
3. Silapet	3	7	4,458
4. Oun	3	9	4,400
5. Skard	2	3	2,618
6. Ngang	3	6	4,821
7. Starn	2	9	5,247
8. Pooka	2	8	2,414
9. Paklang	2	6	4,104
10. Jedeechai	2	8	6,243
AVERAGE	2.5	7.4	4,253.3

Table 1. showed the general data of all health centers in Pua district. From these data we can see that every health center had at least 2 health personnel, number of villages and target population covered, were not much different. On average each health center is responsible for 6 - 9 villages, with average target population 4,000 - 5,000. Maximum population are

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in Jedeechai (6,243) and the minimum are Skard and Pooka (2,618 and 2,414).

Although there is no line of command between the community hospital and the district health office, the coordination between them, in this district, is very good. There have been a monthly meeting whereby many health problems have been solved and information exchanged. However, the adequacy, the accuracy and relevance of health data or information are still one of the major problems of health management. Improvement of the district health information system with appropriate equipment and technology such as the microcomputer,is needed.In the prospect of improving effective MIS by using microcomputer,the community hospital appears to be promising judged by the manpower availability, training capability and even fiscal and technical support. A model of MIS for district health information system should be established.

Background of the study activities

The scope of this study is limited to only health information relating to the Expanded Programme of Immunization (EPI) in children under 2 years and the use of contraceptive service (only contraceptive pills and injections) on Family Planning Programme. These two activities will be elaborated as followed :

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Expanded Programme of Immunization (EPI)

The objective of this programme is to provide a complete vaccination to children under 2 years of age. Complete vaccination consists of :-

1. B.C.G at birth or at age of 2 months.
2. 1st DPT and OPV at age of 2 months.
3. 2nd DPT and OPV at age of 4 months.
4. 3rd DPT and OPV at age of 6 months.
5. Measles vaccine at the age of 9 months.
6. Booster dose of DPT and OPV at the age of 18 months.

Generally, a fix schedule of vaccination is set for every 2 months and is called " Immunization Round ". The first round begins in November and the last round ends by September every year. Newborn babies who are born during the 2 month interval or children who had missed vaccination, will be assigned to recieve vaccination on the next round or they may recieve vaccine at the community hospitals. Every child who has recieved vaccine is registered and obtains an " Immunization card ". This card is also used as an appointment card for vaccination. The card consists of two identical parts. The first part is kept at the health center and second part is given to the parents. Therefore, health staff at the health center can use these cards to prepare a list of the children who were supposed to recieve vaccine in each round. Newborn babies can be identified from birth registration and their names added to the list.

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Working steps of EPI activities to be done by health personnel are as follow:

(1) Estimation of total number of vaccine . By using data in lists no.3 and 4 or immunization card,the number of eligible children for each kind of vaccine can be estimated. From the number of eligible children, total number of vaccine to be used in each immunization round can be calculated by adding with standard loss during vaccination. This data are sent through district health office to the provincial health office about 14 days prior to the ′immunization round′ begins. This step is called "vaccine estimation".

(2) Prior to the appointment date of ′immunization round ′, every health center will prepare the list of name and address of eligible children by sorting the immunization cards. Then, location for vaccination and equipments are prepared. This step is called "data list preparation" and the step of preparing place and equipments is called "place preparation".

(3) On the appointment date, health center personnel were divided to take care of two kinds of vaccination job. The first group is assigned to be in charge of registration of all eligible children who came to recieve vaccination. The second group is assigned to give vaccination service to the children. This step is called " EPI service provision"

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(4) At the end, all the necessary records and reports in relation to EPI are prepared. Then all the immunization reports will be sent to the district health office. This step is called the step of "recording and reporting"

(5) All the children who had missed the appointment are identified in the list. Then all of them will be visited by the health personnel for vaccination. This step is called "checking and follow up".

Usually, all of these activities will be finished within 2 - 3 days, depending on number of respective villages and number of eligible children .

Family Planning Programme (FP)

The objective of the programme is to provide contraception for all married women in reproductive age (15 - 44 years). Contraceptive pills and injections are regularly and continuously provided at the health center. Women who come for the first time are registered and obtain an appointment card. In Pua district, every health center has a fix schedule,on Tuesday for for family planning clinic. The appointment is every 3 months for for contraceptive pills users and every 84 days for contraceptive injections users. Women who missed the appointment are supposed to be visited by health personnel as soon as possible. List no. 6 can be used as a reference to locate name and address of all users.

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Working steps of contraceptive service activities (only contraceptive pills and injections) to be done by health personnel are as follow :

(1) On every Monday, according to appointment date in registration card and list no.6, health personnel will check and prepare list of name and address of contraceptive users who are appointed for family planning clinics on the following Tuesday. This step is called "data list preparation". Place, equipment and contraceptive drugs (pills and injections) are prepared. This step is called "place preparation".

(2) On Tuesday, the service is given to all of the women who come to the clinic and the next appointment is made (on the following Tuesday). This step is called " Family Planning service ".

(3) All records and reports involving in this work are prepared and this step is called "recording".

(4) Names and addresses of women who missed the appointment were listed and this step is called "checking". All of these women will be visited by health personnel as soon as possible.

(5) Family planning reports are sent to district health office at the end of each month.

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CHAPTER II

LITERATURE REVIEWS

Many PHC programmes have difficulties in conceptualizing, planning, establishing and using information effectively. PHC management systems need to be simplified and streamlined to meet local health management needs. PHC programme managers need better information related to programme´s objectives and targets. They also need efficient method to collect, process and analyse as well as present data meaningfully. So management information system is necessary to support PHC programmes to make them more competently and efficiently.

What is Management Information System (MIS)

Chalermsook Boonthai, (Chief Medical Officer, Ministry of Public Health, Thailand) had given the meaning of MIS as the information used in planning, analysing and monitoring the progress of work and organizations both in resource administration and guideline for decision making. The beneficial information in increasing the efficiency of the organizational administration must be relevant, accurate, valid and up-to-date. MIS is practically aimed at assisting the decision makers in rationally selecting procedures which make balance between manpower, supplies ,equipment and budget allowance.

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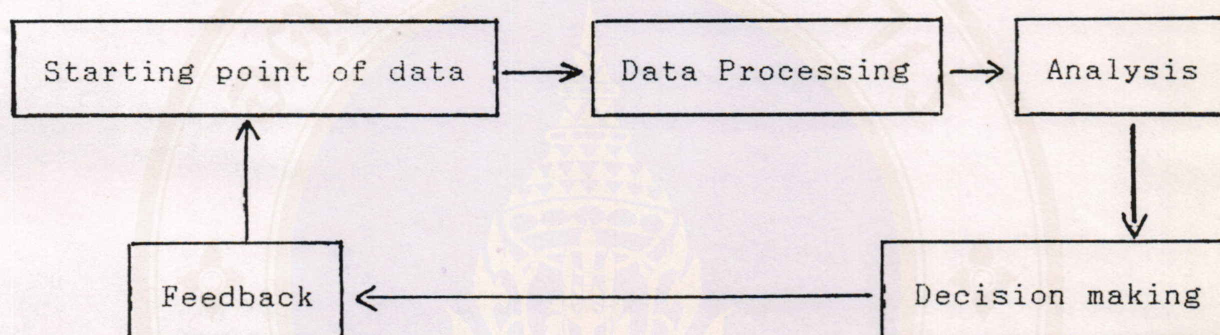
She also stated that MIS is a system which creates the network among organizations from the starting point of data through data processing and analysis then the outputs are sent to the decision makers and produce feedback to the working spots as shown in Fig. 3

Fig. 3 The network among organizations created by MIS



MIS of the Thailand Ministry of Public Health

(Source: Chalermsook Boonthai, 1987)

In public health administration, MIS is useful for programme planning, implementation as well as follow up and evaluation. The objectives of MIS for the Ministry of Public Health are as following

1. To obtain information which can be actually utilized in programme management and eliminate irrelevant information.

2. To offer information services at various levels of administration which will be beneficial to programme implementation and management.

3. To obtain model for the most effective information transfer according to nature of information.

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Theoretically, MIS is seen as a major tool for improvement PHC activities and health care delivery. Ideally, effective information system requires participation from every levels starting from community through subdistrict, district and provincial level to the center at Ministry of Public Health. (William E. Bertrand et. al, 1988) In reality however, there are many constraints and obstacles prohibiting the advancement of this system especially at district level.

Duane L. Smith (Duane L.Smith et.al, 1988) found that common deficiencies in district management information system are

(1) Important information is missing such as

- Information about target population.
- Information about outcome and impact.
- Information about social and environmental determinants of health.
- Information from all relevant institutions.

(2) Available data is inappropriate in quantity and quality , e.g.,

- Information is collected but not used.
- Available information is often late, incorrect, incomplete or missing.

(3) Health staff have limited skills in information processing and usage.

(4) Available information is not sufficiently used for local decision making.

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In order to solve these problems not only training which aims to provide the knowledge or experience to the health workers but the appropriate equipments and technology which are suitable to their working conditions should also be considered.

Microcomputer and MIS

From the study of microcomputer applications in health population surveys by Bertrand (W.E. Bertrand, 1985), he had mentioned that during the last decade ,the use of computer on statistical analysis of large surveys and on census has a great impact to many tasks. Faster data presentation, rapid manipulation and performing mathematical operations are obvious in all fields. Less obvious, but of increasing importance, has been the use of large mainframe computer as a database management system to enter,edit and clean data sets prior to statistical analysis. However, there were two major obstacles to their widespread application. Firstly, the cost of acquisition of large mainframe and computer time was high. Secondly, the machines are not portable and require expensive and complex supporting system.

The appearance of microcomputer on the market had changed the way computer were viewed. Microcomputer is relatively portable and inexpensive to acquire and maintain. They were quickly adopted in many places, resulting in a drastic increase in varieties of machines. Presently, commercial application programme such as Lotus 1-2-3 and dBase were available and microcomputer becomes an attractive investment for field-oriented statisticians or epidemiologists.

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Roles and potential of microcomputer support for district health system (Duane L. Smith et. al, 1988) are

- Management : monitoring, resource allocation, decision making support
- Administrative tasks : budget, accountancy, activity records, personnel, inventory, typing and reports.
- Research : special study , data analysis
- Planning : projections, modeling and decision aids.

Another study from Zambia (Paul J. Freund , 1986) suggested that"**community**" should be included as a part of health information system instead of being only as respondent to survey or providers of information for health records. If local health workers have been involved in the collection and use of the data, it will stimulate community interest in health. This also helps to form closer relations between health workers, schools and health centers and will generate data for immediate use in health planning and health education.

In light of Thailand experience, Bennett (Anthony Bennett, 1987) reported that at subdistrict level alone, there are 108 different forms currently being used. Inadequate attempts were made to consolidate the data requirements to the minimum. Therefore each department designs its own vertical flow of information and is centrally processed by individual departments. Introducing microcomputer in management information system were believed to be advantageous for the following reasons :

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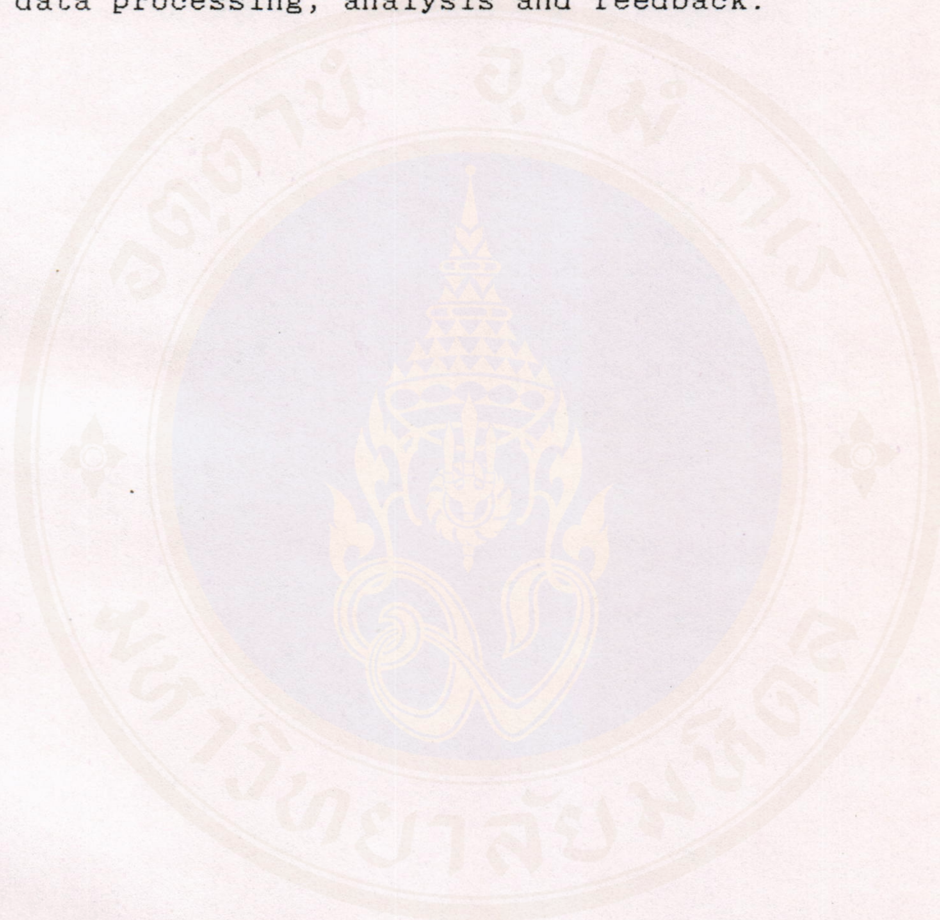
1. It improves accuracy by means of automatic correction of logical and arithmatic errors.

2. The local (Thai) language could be applied.

3. Speeding up the flow of information including the step of data processing, analysis and feedback.



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CHAPTER III

RESEARCH METHODOLOGY

RESEARCH DESIGN

This study is pre and post test design to compare the difference between the time consuming for information tasks before and after the use of microcomputer in the district health information system. Possibility in using community hospital as the center of district health information system and problems were to be identified.

SITE SELECTION

The study was conducted in Pua district, Nan province, during February to May 1989 . Health center was a sampling unit. Five health centers were selected by purposive sampling method under these criteria

(1)Personnel There were at least 2 health personnel. One is an auxiliary midwife and another is junior sanitarian.

(2) Location The distance between health center and district health office should not be more than 30 kilometers.

The study population were all health personnel in these sample health center.

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OPERATIONAL DEFINITION

(1) Health Information System refers to a system by which data are processed, analysed and stored. This system also provide necessary information in planning and monitoring the progress of works and organization. In this study, health information is confined to only information involved in EPI and Family Planning.

EPI information consists of name, address, date of birth, parents' name and types of vaccine recieved of the children under 2 years.

Family Planning information consists of name, address, type of contraception used and appointment date.

(2) Feedback information refers to the information which had been completely summarized and tabulated and sent back by the community hospital to health personnel at health center who provide and collect the information from the field. In this study, feedback information is specified as the following :-

-EPI feedback information refers to the lists of children under 2 years of age classified by names, addresses, dates of birth, parents' names for each types of vaccine to be given . (Appendix 2)

-Family Planning feedback information refers to the list of family planning acceptors (pills and injections) classified by names, addresses, types of contraceptive method and appointment dates. (Appendix 2)

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(3) Time for vaccine estimation refers to total time spent for calculating total amount of vaccine to be provided for the eligible children. It includes time spent for sorting the immunization cards, counting the number of children classified by types of relevant vaccine , and calculating standard loss for each type of vaccine. Time spending for all of these steps are " Time for vaccine estimation. " State another way :

Time for vaccine estimation = time for sorting immunization card + time for counting number of children + time for calculating total amount of vaccine.

Unit of time measurement is " minutes "

(4) Time for data list preparation refers to total time spent for preparing data lists for EPI and family planning work.

In EPI work, it includes time spent for copying information from list no.3 and no.4 or immunization cards and make the list with tabulation. State another way ;

Time for data list preparation (EPI) = time for checking eligeble children´s names, addresses, dates of birth, parents´names and types of vaccination to be given + time for copying and tabulating these data to make the list.

Unit of time measurement is " minutes "

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Similarly, in family planning data list preparation, it is the list of names, addresses, types of contraception and appointment date. Health personnel prepared it by tabulating these data from List no.6 and the registration cards . Time spending for the whole process is called " Time for family planning (FP.) data list preparation "

Time for (FP) data list preparation = time for checking names, addresses, types of contraceptive methods to be provided to the eligible women + time for tabulating these data to make a list.

Unit of time measurement is " minutes ".

(5) <u>Time for data recording</u> refers to the time spent for filling up all records and reports related to EPI and family planning.

Time for EPI data recording = Time spending for filling up records and reports in EPI.

Time for FP data recording = Time spending for filling up records and reports about contraceptive service.

Unit of time measurement is " minutes "

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(6) Time for checking refers to time spent for identifying eligible person and making a list of potential service recipients who had missed the appointment. Health personnel can identify those who had missed the service provided by comparing the name of eligible person in data list with those who came to register for the service. Then the list of those who missed the appointment could be made. Total time spending for this work is called " Time for checking ".

Time for checking (EPI) = time for identifying the missed children + Time for tabulating the list names, addresses of these children.

Time for checking (FP) = time for identifying missed contraceptive users + time for tabulating the list of their names and addresses.

(7) Total information time refers to time spent for all activities related to information tasks mentioned above such as " time for vaccine estimation ", " time for recording ", and so on.

Total information time (EPI) = time for vaccine estimation + time for data list preparation + time for recording + time for checking.

Total information time (FP) = time for data list preparation + time for recording + time for checking.

Unit of time measurement is " minutes ".

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RESEARCH INSTRUMENTS

Questionaire was used as a research instrument for data collection. These data were collected at two different periods. The first round of data collection was undertaken at the end of February 1989 to serve as the baseline data about EPI and family planning activities. Total time spent for information tasks was was also recorded. The second round of data collection was undertaken at the end of March . Similar data were collected from the two round of data collection. However,opinions or suggestions from the respondents were added in the second round.

The questionaire consists of three main parts ;

Part I : includeed general information about health center, work load and about the respondents.

Part II : included EPI activities, time spent in each step of working and feedback information.

Part III : included family planning activities, time spent in each step of working and feedback information.

The questionaire is shown in Appendix 1

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IMPLEMENTATION OF RESEARCH

Establishment of Health Information System at district level

Since the center of district health information system have never been established in Nan province. In this study, PUA hospital, a community hospital, was selected as the center of district health information system. Microcomputer was chosen as the tool for developing effective and reliable health information system.

Microcomputer and Software

Microcomputer used in this study was 16 bit personal computer (IBM PC/XT), CPU no.8088 (XT-like) with internal hard disk and available random access memory (ROM) = 640 kilobytes. This computer was placed at the community hospital. Software or application programme used in this study was " dBase III plus ", which was one type of database management programme. This software was selected since intervention for a trial in this study involved database management.

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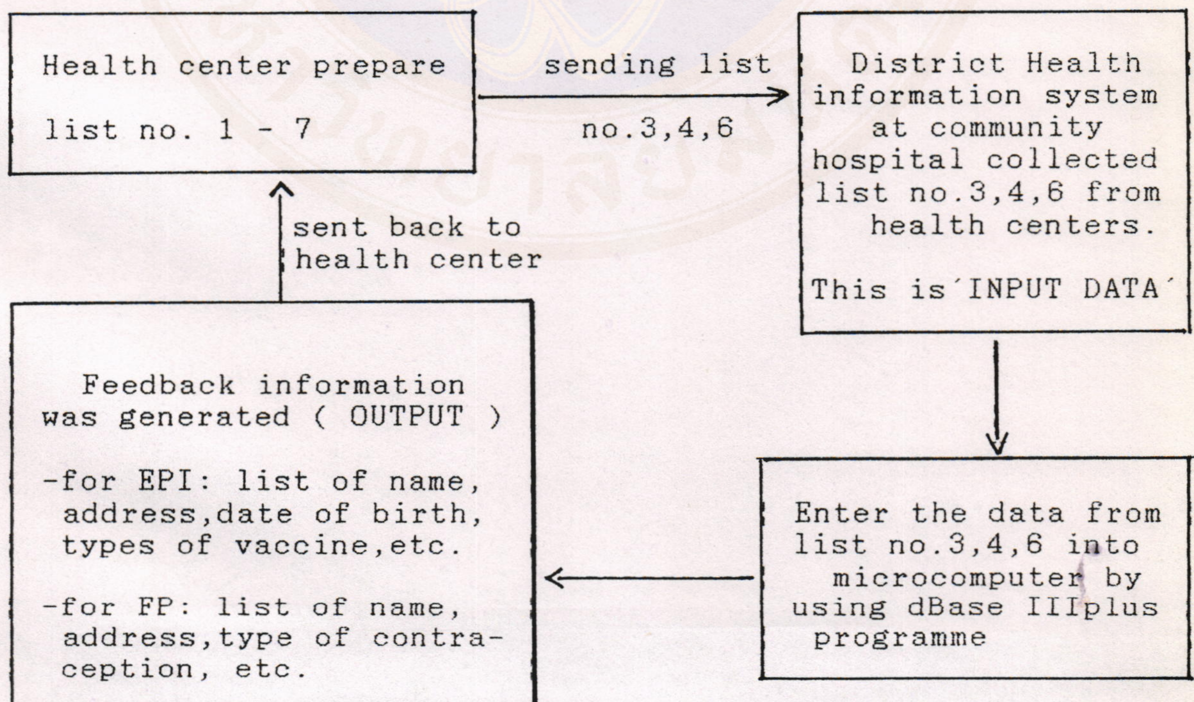
Operation of the health information system at district level

A hospital personnel, junior sanitarian, was assigned to operate the computer. Lists no. 3,4 and 6 from the sample health centers were collected and all the data related to the study were entered into the microcomputer. After that, names, addresses and other information were checked for correctness.Then the feedback information was generated by this computer, based on the list that had been collected, and sent back to the sample health centers. The flow of information can be diagrammatically shown in Figure 3 .

Figure 4 Flow of information in district health information system



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Application of health information system with microcomputer in EPI and FP programmes

Microcomputer were implemented in the following tasks:

A . Expanded Programme of Immunization (EPI) activities

(1) Firstly, microcomputer will be used to calculate the total amount of each kind of vaccine by using the baseline data from List no.3 and 4 .

(2) Secondly, microcomputer was used to tabulate the list of names, addresses, dates of birth, parents' names and types of vaccine to be given to the children according to schedules. The printouts of these lists will be sent to the sample health centers. These printouts of list of children can be used as the reports after completion of the work. And from the list, names, addresses of children who missed the " Immunization round " could be identified.

B . Family Planning (FP) activities

Microcomputer was used in the same way as in EPI activities. It is used to prepare lists of names, addresses, types of contraception of eligible women. These lists can be used as the reports on accomplishment of work and also for locating women who has missed the appointment.

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METHOD FOR DATA COLLECTION

The data collection was administered in 3 phases as the following

Phase I <u>Before microcomputer implementation</u>

1. In February 1989, a meeting was arranged to orientate health center personnel about the objectives and potential benefits of this study. Questionaire was tested and steps of working in EPI and family planning were reviewed. Criterian of time measurement in each activity was discussed and standardized. Time for uninvolved activities such as lunch time or resting time must not be included in this measurement.

2. Prior to the use of microcomputer, the baseline data was collected by sending questionaire to every health center on February. Data collected at this time were used as baseline information on EPI and FP activities. These data included the time consuming for information tasks in every steps and total information time.

3. Before the end of March, the questionaires were sent back from every health centers.

Phase II <u>Implementation of microcomputer</u>

1. At the end of March, second set of questionaires were sent out to the study health centers.

2. List no.3, no.4 and no.6 as mentioned in chapter I, were collected from the stydy health centers.

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3. From list no.3 and no.4, data on names, addresses, dates of birth, parents´names and types of vaccination recieved, of all children under 2 years were entered into microcomputer.

4. From list no.6, data on names, addresses, types of contraception (pills or injections) and appointment dates of all women who recieved family planning services were recorded into microcomputer.

5. Feedback information (as mentioned in operational definition) was generated by microcomputer based on list no.3,no.4 and no.6 .

6. In April, feedback information on Family Planning activities was sent out to those 5 health centers. This information included the list of eligible women for family planning services on that month.

7. Similarly in May, feedback information of EPI and family planning jobs were sent to those five health centers. (Immunization round is in May)

Phase III <u>After microcomputer implementation</u>

On the 12th of May, the second set of questionaires were collected from the sample health centers. The time consuming for information tasks after the implementation of microcomputer were measured.

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Data processing and Analysis

Since the time spent for information task was used as indicator to assess the usefulness and advantage of the microcomputer, therefore time consuming in each step of activities had been measured.

From the data collected by questionaires both before and after the use of microcomputer, the " total information time " of EPI and family planning activities can be calculated. Then the " total information time" of both activities were compared and tested the significant of time difference by F test and T test.

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CHAPTER IV

RESULT OF THE STUDY

From ten health centers in Pua district, five of them were selected as the samples according to the criteria of selection. These health centers were Chaiwattana, Silalang, Silapet, Oun and Skard.

Time for Information Tasks in EPI

After the microcomputer was used in health information system, time spent for information tasks in EPI activities were measured and compared with the time before the use of this equipment as shown in Table 2. Time consuming in information tasks were reduced significantly. Prior to the use of microcomputer (m.c.), total information time average was 265 minutes and was reduced to 115 minutes after the use of microcomputer or 56.6 % reduction. Time reduction in each activity was more than 50 % . About time for vaccine estimation, although it was reduced from 66 minutes to 33 minutes, this reduction is not statistical significant after testing by T test ($p > 0.05$). The time for vaccine estimation was expected to be eliminated after the use of microcomputer but the health center personnel still wanted to manually confirm the calculation again. The reason is that they did not believe in the capability of microcomputer in calculation because they are unfamiliar with this new technology.

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Table 2. Comparison of time spent for information tasks including " Total information time " in EPI activities, before and after the use of microcomputer (m.c.)

	Total cases		Total information time (minutes)		Time for vaccine estimate. (minutes)		Time for data list prepare. (minutes)		Time for recording (minute)		Time for checking (minute)	
	before m.c. use	after m.c. use	before m.c. use	after m.c. use	before m.c. use	after m.c. use	before m.c. use	after m.c. use	before m.c. use	after m.c. use	before m.c. use	after m.c. use
Chaiwattana	55	40	381	145	120	45	120	45	85	40	56	15
Silalang	50	42	265	130	60	40	100	40	60	35	45	15
Silapet	50	50	165	85	30	20	45	20	60	30	30	15
Oun	60	64	240	115	60	35	105	45	45	25	30	10
Skard	70	53	275	103	60	25	75	30	90	30	50	18
AVERAGE	57	49.8	265	115	66	33	89	36	68	32	42.2	14.6
STANDARD DEVIATION	7.48	8.59	69.5	20.8	29.3	9.27	26.3	9.7	16.9	5.1	10.5	2.6
% of reduction			56.6		50.0		59.5		52.9		65.4	
P value			< 0.05 *		>0.05		<0.05 *		<0.05 *		< 0.05 *	

* with statistical significant after testing with T test

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In Table 3. the result in Family Planning activities were shown in the same way. Time spent for information tasks at each step was reduced significantly. But the number of cases were too small compared to the cases in EPI activities.

Table 3. Comparison of time spent for information tasks in Family Planning activities, before and after the use of microcomputer (m.c.)

	Total cases		Total informa- tion time (minutes)		Time for data list prepare. (minutes)		Time for recording (minutes)		Time for checking (minutes)	
	be- fore m.c. use	af- ter m.c. use	be- fore m.c. use	af- ter m.c. use	be- fore m.c. use	af- ter m.c. use	be- fore m.c. use	af- ter m.c. use	be- fore m.c. use	af- ter m.c. use
Chaiwattana	8	6	50	26	10	6	25	15	15	5
Silalang	10	12	55	26	15	5	20	14	20	7
Silapet	10	11	50	28	10	5	30	18	10	5
Oun	12	11	58	34	11	8	25	16	22	10
Skard	10	6	35	20	10	5	15	10	10	5
AVERAGE	10	9	49.6	26.8	11.2	5.8	23	14.6	15.4	6.4
STANDARD DEVIATION	1.3	2.5	7.9	4.4	1.9	1.1	5	2.6	4.9	1.9
% of reduction			45.9		48.2		36.5		58.4	
P value			< 0.05*		< 0.05*		< 0.05*		< 0.05*	

* with statistical significant after testing with T test

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Average total information time was reduced from 49.6 minutes to 26.8 minutes or 45.9 % reduction and time spending in each step also reduced significantly. Since the time spent for each task was very short and it could not be measured any more accurately so there may be some errors in this part.

In sum, it was shown that time spent for information tasks in EPI and family planning activities were reduced significantly. Time reduction in most activities were more than 40 % so the use of microcomputer on these works seems to be advantageous.

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CHAPTER V

CONCLUSION AND RECOMMENDATION

The objectives of this study is to find out whether the use of microcomputer in district health information system could reduce working hours in information tasks or not. The study also attempted to identify problems and requirements for effective implementation of microcomputer to health information system at district level. Theoretically, the success of primary health care was shown to depend in large part on data and information system management. However, it was found that most health center personnel now,did not appreciate the benefits of collected data. Over reporting are usually occured with mistaken beliefs by health personnel that these are performance indicators, while in fact the importance of these data are their uses as indicators of community health status. Another problem is that process of data collection was not seen as being beneficial and related to the service delivery system. This problem could be solved by adequate and effective feedback information. Special attention of the study was also given to this problem. The use of microcomputer to process the raw data and generate relevant information to feedback to the health center was attempted.

The study was conducted at Pua district, Nan province, during February to May 1989. The community hospital was chosen to be the center of district health information system. EPI and Family Planning were selected as the model for microcomputer use because of their simple procedures and most of health center

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personnel already understood the concepts and usefulness of both programmes.

Five out of ten health centers were chosen as the samples. Time spent for information tasks in both EPI and Family Planning activities, or " total information time ", were used as the indicators for assessing the advantages of this study intervention. Database on EPI and Family Planning from these five health centers including the total information time of both activities were collected. Microcomputer was used to tabulate the feedback information for both activities and sent back to health centers. Thereafter the total information time were measured again. Total information time before and after microcomputer implementation was compared.

Although the reduction of time consuming in some activities were not clear due to limitation of study, the advantage of microcomputer was substantial. Mostly, the total information time decreased with statistical significant. For EPI activities,it was expected that time for vaccine estimation could be eliminated by the use of microcomputer but it was not. The health personnel still spent their time for manual rechecking the information tabulated by the microcomputer. This problem might be due to unfamiliarity of health personnel to the new equipment and technology, or the orientation about efficacy of microcomputer were too short and not clear. As the consequence, the microcomputer capability was not appreciated.

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For family planning activities, the number of acceptors were so small and could not adequately confirm the hypothesis. Due to the responsibility on contraceptive pills distribution for old acceptors had been given to village health volunteers, only the new cases of pills acceptors who go to the health centers were included in this study.

Limitation of the study

(1) This study is 'Pretest-Posttest Experimental Design' which has no control group, it only allows the investigator to examine changes over time. Some threats of validity should be aware such as the attitude and knowledge of health personnel to this new technology, accuracy of time measurement and also the research instrument which was used.

(2) Because of time limitation, this study can be only a crossectional study .

(3) Time factor is only the single parameter for assessing the usefulness of microcomputer. Other important factors such as convenience, satisfaction of health personnel or the cost/benefit were not included and evaluated.

(4) Since the investigator can not measure the time consumed in each activities by himself therefore the figures of time spending in this study were measured by health center personnel.

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Due to many limitations, the weak point of this study are

1. Time measurement for this research objective needs better standardization. There was no monitoring of time measurement by the investigator. The results might vary depend on the attitude, intelligence and perception of the respondents.

2. About study design, it was pre and post test design without control so comparison to other group without intervention could not be made.

3. This study was only crossectional study because of time limitation. Thus, the study should be confirmed by operating at a longer period and possibly include more activities.

However, in the aspect of district health information system model, community hospital showed the potential for being the center of district health information system. In this study, microcomputer could be used to store the data and also generate the feedback information to health center. But the scope of study was confined to only EPI and contraceptive service. For confirmation, a more established model with expansion to other PHC activities should be done.

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RECOMMENDATION

It is realized from this study that microcomputer is a useful tool in improving the health information system and facilitating the health personnel in many activities. There are, however, a number of requirements which are necessary to optimise the use of this tool such as :

1. Jobs and tasks involved in each area of work which the microcomputer is to applied, must be carefully analysed and modified to suit with this equipment.

2. Requirements for personnel involved

2.1 The personnel who operate microcomputer must be well-trained.

2.2 Orientation of all personnel involved is necessary as a motivation and allow these people to adapt themselves to this new equipment.

3. Facilities and organization of health information system must be established for the effective operation of the whole systems. The study showed that " Community hospital" is a promising center for the district health information system.

Further study should be continued with more broader aspect and to cover all necessary activities. By this way the appropriate and effective way of using this new technology will be established.

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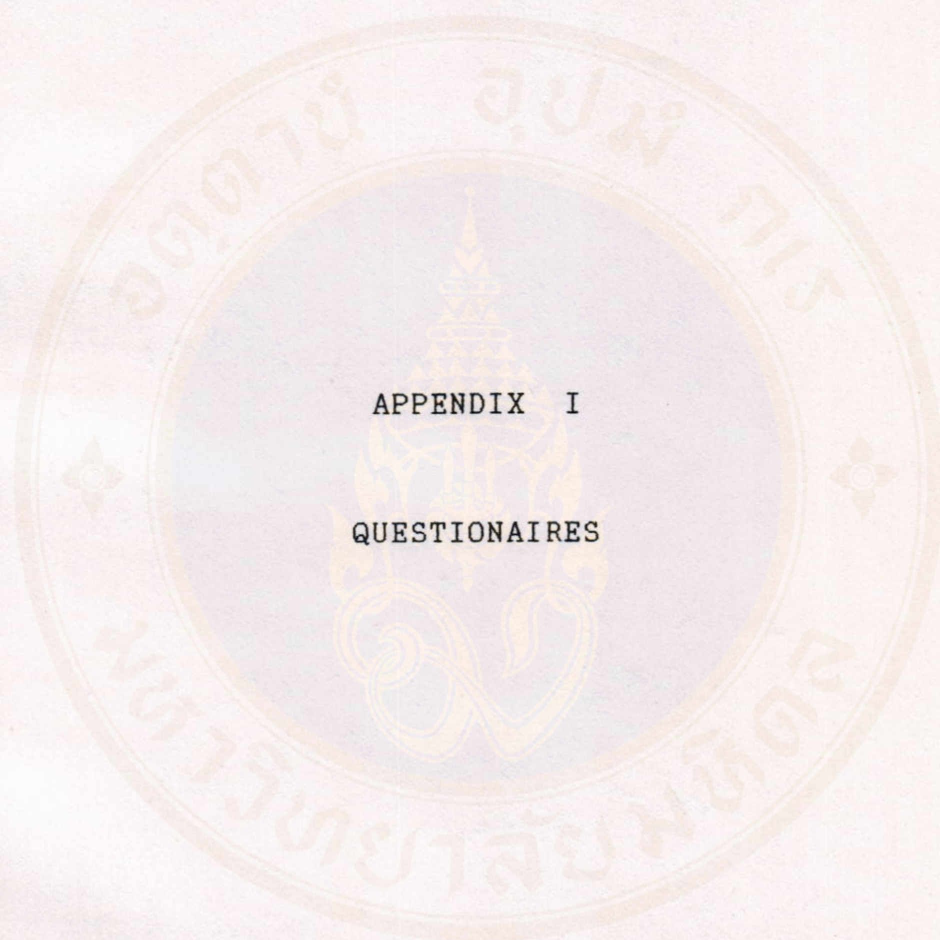

APPENDIX I

QUESTIONAIRES

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PART I GENERAL DATA

(1) Name of the place ....(health center)..............
Subdistrict...........District..........Province .....

(2) Number of health personnels ....

(3) Number of village which have to take responsibility ...
Number of target population ....

(4) Distance from health center to district health office...
.........Km.
Distance from health center to community hospital....Km.

(5) Number of out patient cases average /day ....
average/month ....

(6) How many hours/week you have spent for services working..
.... hours.

(7) How many hours/week you have spent for data collection, filling records and reports (Information time).........hours.

(8) Have you ever recieved feedback information about the data, information or reports that you had sent ?

A. Yes. B. No (never) C. Don´t know.

(9) If yes, it is information involving to which work. (The answer can be more than one)

A. .... B. ....
C. .... D. ....

(10) Have you ever recieved any reports which were sent back for correction ? (During 1 year from now)

A. Yes. B. No. (never) C. Don´t know.

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(11) If yes, which work it was involved and how many times ?

A. .... number of times ....

B. .... number of times ....

C. .... number of times ....

About the respondants

(12) What is your position, now ? ....rank .....

(13) Are you the head of the health center ?

A. Yes. B. No.

(15) How long have you been working in this position ? .....

(16) In which work you have to take responsibility ? (The answer can be more than 1)

A. ....

B. ....

C. ....

PART II EPI. WORK

(16) Average number of children under 2 years that had come to recieve vaccine at each immunization round. ....

(17) For EPI. work which type of data or information do you need ? (The answer can be more than 1)

A. Name, address of children under 2 years.

B. Name of the parents.

C. Type of vaccine which had recieved before.

D. Type of vaccine which should be given each time

E. All of the above.

F. Others (Please specify) ....

G. Don't know, have not done this work.

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(18) Had you already have these data ,as mentioned in (17), completely ?

A. Yes, complete. B. Yes, but not complete.

C. No, not have. D. Don´t know.

(19) Where could you get these data or informations ? (The answer can be more than 1)

A. From health personnels´survey.

B. From village health volunteers and communicators.

C. From list no. 3 and 4 and from previous records.

D. From population census.

E. Others. (Please specify)............ F. Don´t know.

(20) Did you have to calculate for the estimated amount of each kind of vaccines which were required and sent them to district health office before the EPI. work appointment ?

A. Yes . B. No . C. Don´t know .

(21) If yes, which method did you have used ? (The answer can be more than 1)

A.Estimated from the amount which had recieved last time.

B. By using all of the existing data and information, e.g.records, list no.3,4 + Standard loss of each kind of vaccine.

C. By counting from immunization cards + Standard loss of each kind of vaccine.

D. Had not done this step, the district health office had done it.

E. Others . (Please specify)

(22) How much time had you spent for this step ? ......(min.)

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(23) Before the appointment of EPI. work or 'Immunization round', what did you have to prepare ? (The answer can be more than 1)

A. Sorting 'Immunization cards' of every children under 2 years.

B. Prepare the list of names,address of every children who have to come to recieve vaccine.

C. Prepare the places and the equipments which should be used for working.

D. All of the above.

E. Others. (Please specify) ....

F. Don't know, have not done this work.

(24) How much time had you spent for sorting those 'Immunization cards' and listing the names, address of children who would come to recieve the vaccine ? ....(mins).

(25) How much time had you spent for preparing the places and equipments in these work each time ? ....(mins).

(26) What activities you have to do during the appointment date for immunization?

A. Registration for children who had come and filling the 'Immunization card'.

B. Giving vaccine to the children.

C. All of the above.

D. Others. (Please specify) ....

E. Don't know, have not done this work.

(27) How much time had you spent for registration and filling the 'Immunization card' per one child ? ....(mins).

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(28) How much time had you spent for only giving vaccine per one child ? ....(mins).

(29) After finishing this work, what records and reports you had to do or fill up ?

A. .... B. ....

C. .... D. ....

(30) How much time had you spent for finishing these records and reports ? ....(mins).

(31) Had you have to check up for those children who had not come or missed the appointment ? (List the names, address)

A. Yes. B. No. C. Don´t know .

(32) If yes, how much time had you spent for this step ?

(33) Total working time ,from the begining (vaccine estimation) till the last step (sending reports),are

(34) Total information time, the time using for data collection,preparation, recording and reporting, are equal to

(35) When you had to send these reports to district health office ? ....(date, month).

(36) Could you send these reports on time ?

A. Yes(100%) B. Yes(>70%) C. No (<70%)

D. Don´t know , have not done this work.

(37) Only EPI. work, during this year , had you ever recieved those reports which were sent back for correcting mistakes ?

A. Yes. B. NO. C. Don´t know.

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(38) In your opinion, what kinds and types of data or information that could help to improve your work or working conditions ?

A. .... B. ....

C. .... D. ....

(39) Had you ever recieved these data or information ?

A. Yes. B. No. C. Don't know.

(40) If you had recieved the list of names, address and types of vaccine which should be given for every children under 2 years, do you think these would be very useful for your works ?

Why ? ....

PART III FAMILY PLANNING (FP.) WORK

(41) How frequent do you set your family planning clinic ?

A. Every day. B. Every week. C. Every 2 weeks

D. Every month. E. Others .(Please specify)........

(42) Average number of women who came to use this type of service each time. ....

(43) In contraceptive service, only for pills and injections, what types of information did you need ? (The answer can be more than 1)

A.Names,address of those women who had used this service.

B.Types of contraception. (Pills or Injections).

C.Names of their husbands.

D.Appointment date for coming to recieve this service.

E.All of the above.

F.Don't know, have not done this work.

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(44) Did you have these data or informations completely ?

A. Yes. B. No. C. Don't know.

(45) Where could you get these data or informations ? (The answer can be more than 1)

A. From health personnels' survey.

B. From village health volunteers and communicators.

C. From previous records and list no. 6

D. From population census.

E. Others. (Please specify)..................

F. Don't know.

(46) Before the appointment date (FP. clinic),what did you have to prepare ? (The answer can be more than 1)

A. List of names, address of women who would come to the clinic on the appointment date.

B. Places for service.

C. Drugs and other equipments.

D. All of the above.

E. Others. (Please specify).....................

F. Don't know.

(47) How much time had you spent for preparing those information in (46) ? ....(mins)

(48) On preparing the places, drugs and equipments, how much time had you spent ? ....(mins)

(49) On appointment date, what activities you have to do ? (The answer can be more than 1)

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A. Registration and making the next appointment.

B. Physical examinations.

C. Giving the service, instruct those women what should they be aware of.

D. All of the above.

E. Others. (Specify) ....

F. Don´t know.

(50) For registration and making appointment, how much time had you spent ? ....(mins)

(51) For giving service and instructing those women, how much time had you spent ? ....(mins)

(52) After finishing this work, what records and reports you have to do or fill up ?

A. .... B. ....

C. .... D. ....

(53) How much time had you spent for finishing these records and reports ? ....(mins)

(54) Did you have to check up for those who had not come and missed the appointment ?

A. Yes. B. No. C. Don´t know.

(55) How much time had you spent for this step ? .....(mins)

(56) Total working time, from begining(prepare the list) till the last step (sending reports),are equal to ....(mins)

(57) Total information time, the time uses for data collection ,preparing the list until sending reports, are equal to ....(mins)

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(58) When you have to send these family planning reports to the district health office ? ....(date,month)

(59) Could you send these reports on time (during this year)?

A. Yes (100%)   B.Yes (>70%)   C. No (<70%)

D. Don't know, have not done this work.

(60) Had you ever recieved those reports which were sent back for correcting mistakes ?

A. Yes.   B. No.   C. Don't know.

(61) In your opinion, what kinds and types of data or information that would be useful to this work (Family Planning) ?

A. ....   B. ....

C. ....   D. ....

(62) Had you ever recieved these data or informations ?

A. Yes.   B. No.   C. Don't know.

(63) If you had recieved the list of names, address, type of contraception and appointment date of those women who would come to use these service, do you think these would be very useful to your work ? Why ?..

(64) Have you any comments to the district health information system ? ....

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APPENDIX II

EXAMPLES OF FEEDBACK INFORMATION TO HEALTH CENTER

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EXAMPLES OF FEEDBACK INFORMATION IN EPI WORK

List of name, address, born, parents'name
in according to the type of vaccine given

สถานีอนามัยตำบล ศิลาแลง

ดี.พี.ที.,รอ.พี.วี.เข็ม1
(DPT1,OPV1)

ชื่อ นามสกุล (NAME)	ที่อยู่ (address)	ว.ด.ป.เกิด (born)	ชื่อ บิดา,มารดา (parents'name)
1.ดช.ศรัทาวุธ จันขัน	83 หมู่ 1	02/01/32	นาง พา
2.ดญ. นิลวรรณ อุดนัน	100 หมู่ 1	02/24/32	นาง ถนอม
3.ดญ.นาริน สายแบง	54 หมู่4	10/02/31	นาง วิลัย
4.ดช.สนธยา กุกไชย	105 หมู่ 5	02/18/32	นาง ประนอม
5.ดช.เกรียง ไชยหาญ	11 หมู่ 6	12/04/31	นาง ก้อม
6.ดช.จตุรงค์ สุริยา	115 หมู่ 6	01/09/32	นาง จวน
7.ดช.ปฐมพงษ์ สายแบง	145 หมู่ 9	03/10/32	นาง คำมูล
8.ดช.นิวัฒน์ หม่อนแก้ว	38 หมู่ 9	03/13/32	นาง ศรีทอง

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ดี.พี.ที.,รอ.พี.วี.เข็ม2

(DPT2 ,OPV2)

ชื่อ นามสกุล (name)	ที่อยู่ (address)	ว.ด.ป.เกิด (born)	ชื่อ บิดา,มารดา (parents´name)
1.ดช.วุฒิวัฒน์ ต๊ะแก้ว	109 หมู่ 3	12/28/31	นาง แสงเพ็ญ
2.ดช.นพคุณ ทีฆาวงค์	87 หมู่ 4	12/06/31	นาง ค่าย
3.ดญ.นงนุช แซ่ลี้	122 หมู่ 2	09/30/31	นาง อินปา
4.ดญ.พิมพา เตชะพิมพ์	17 หมู่ 5	01/20/32	นาง สุพิน
5.ดญ.วิไล พนะสันต์	16 หมู่ 1 ภูคา	12/01/31	นาง ม่วน
6.ดญ.สุนทรี พนะสันต์	26 หมู่ 1 ภูคา	10/21/31	นาง ลำพี
7.ดช.ฉลาด พนะสันต์	8 หมู่ 1 ภูคา	10/01/31	นาง ยอด
8.ดช.เพยาว์ อินปา	17 หมู่ 11 ภูคา	11/03/31	นาง ศรีนาน
9.ดญ.สมพร อินปา	43 หมู่ 11 ภูคา	10/31/31	นาง พองจันทร์
10.ดช.สมศักดิ์ อินปา	5 หมู่ 11 ภูคา	12/11/31	นาง สาย

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EXAMPLES OF FEEDBACK INFORMATION IN FP.WORK

List of name, address,type of contraception and appointment date for those women who would come to use these services during May 1989

สถานีอนามัยตำบล ศิลาแลง

ชื่อ นามสกุล (name)	ที่อยู่ (address)	วิธีคุมกำเนิด (Type of contraception)	วันนัดมารับบริการ (Appointment date)
1.นาง ไสว ช่างเหล็ก	10 หมู่ 1	ยาเม็ด	05/02/32
2.นาง พร หาญยุทธ	94 หมู่ 1	ยาเม็ด	05/16/32
3.นาง ทองใบ มูลคำ	24 หมู่ 1	ยาเม็ด	05/16/32
4.นาง ลำใย บริคุต	88 หมู่ 2	ยาเม็ด	05/16/32
5.นาง อารี หาญยุทธ	27 หมู่ 3	ยาฉีด	05/16/32
6.นาง สมสาย พันชน	67 หมู่ 3	ยาฉีด	05/23/32
7. นาง คำใบ ยานันท์	71 หมู่ 3	ยาฉีด	05/23/32
8.นาง ปรานี ใหม่น้อย	18 หมู่ 5	ยาฉีด	05/23/32
9.นาง มอน เนตรทิพย์	67 หมู่ 6	ยาเม็ด	05/23/32
10.นาง สุพิน กันศรี	27 หมู่ 7	ยาเม็ด	05/23/32
11.นาง ประไพ ยานันท	22 หมู่ 7	ยาเม็ด	05/23/32
12.นาง ลำพึ ต๊ะแก้ว	17 หมู่ 7	ยาฉีด	05/30/32
13.นาง คำมี ทีฆาวงค์	33 หมู่ 7	ยาฉีด	05/30/32
14.นาง พอ เจริญวงค์	8 หมู่ 7	ยาฉีด	5/30/32
15.นาง เพชร ทีฆาวงค	60 หมู่ 7	ยาฉีด	05/30/32

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