THE FIRST-ROUND EVALUATION OF THE HEALTH DEMONSTRATION PROJECT

BY

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I. INTRODUCTION

The ROKG-USG Loan agreement (AID LOAN No. 489 -U-092) for the implementation of a low cost health care delivery demonstration project and the presidential decree establishing the Korea Health Development Institute(KHDI) call for the completion of a systematic evaluation of the health demonstration projects by the National Health Secretariat of the Korea Development Institute (NHS/KDI). This paper represents a first round analysis of the proposed evaluation of the KHDI demonstration projects by the NHS/KDI.

It is important to note that few specific guidelines for evaluation of health projects of this type are available due to the current "state-of-the-art". For this reason the evaluation project has drawn heavily from the prior experience and expertise of the NHS/KDI evaluation staff, adopting internationally accepted methods and measures when possible, and developing potentially replicable innovations for field -testing.

The planning process has been characterized by the concern that the evaluation system must generate reliable and relevant data in order (1) to guide project staff optimally in the health delivery system's development, management, and evaluation; (2) to provide the Korean government and decision-makers in the relevant ministries a rational and substantial basis for evaluating the key features of the project and for assessing the feasibility and desirability of replicating these features nationwide; and (3) to provide collaborating organizations with analysis, interpretations, experience and insights relevant for health planning and for the programming of comprehensive health delivery systems as one approach to meet the current problems in the delivery of effective health services for the rural populace in Korea.

This first round evaluation not only outlines the ways and means by which the project's progress, achievements and impact will be measured and documented, but also gives some interim results of performance and cost analysis.

It describes a comprehensive evaluation system that is practical, and provides insights into areas of mutual interest and benefit to Korea and to the collaborating organizations.

1. Project Objectives and Key Features

In June 1974, the Government of the Republic of Korea and the USAID jointly determined that it was necessary to develop a national health program which would extend health services to those citizens who were excluded from the existing health delivery system.

Korea has excellent medical specialists and hospital facilities in the major urban areas, but these are normally accessible only to a small minority of economically advantaged Koreans. In the rural areas it is estimated that only 15-20% of all sick persons have access to hospitals or clinics. Of the rest, 45% obtain their primary curative services from pharmacies or drug stores, and 10% from herb doctors, while 30% receive no treatment whatsoever. 1/

1/ "Maul-Geon-Gang-Saup" by Sung Woo, Lee, Korea Health Development Institute, 1978.

In order to carry out field demonstration projects and to test new ways of delivering primary health care to the lower-income groups, the Korea Health Development Institute was established in April 1976 under the Korean Health Demonstration Loan Project by the USAIL and the Government of the Republic of Korea. The Korea Health Development Institute(KHDI) subsequently has announced its objectives and implemented organizational plan and action plan.

The basic goal of the project is to develop a new system for providing better health care to low-income Koreans. However, this goal must be achieved without imposing excessive financial burdens on the individuals receiving services or the Korean government. Since the delivery of "low-cost" health services is a new area of concern in Korea, experimental or demonstration activities must be undertaken to develop and field test alternative delivery schemes appropriate for local conditions. At the initial stage, the KHDI's role was to develop the project while introducing such innovations as:

1) training and utilizing paramedics to actually provide selected preventive and curative services which are now available only from physicians;

2) introducing integrated public health care services and making these available at the Myon and Village level;

3) coordinating a community-wide effort to improve environmental and personal sanitation;

4) conducting extensive efforts to promote good health through public information and education.

In conducting its activities, the KHDI was asked to make every effort to increase the support of private and public organizations for meeting the needs of low-income communities in rural demonstration areas. In order to achieve the objectives of the project, three demonstration sites were selected in September 1976 from among sixteen possible Guns proposed by the Provincial Governments. These project sites are: Hongcheon Gun, Gangwon Province; Gunee Gun, Gyeongsang Buk Province; and Okgu Gun, Cholla Buk Province. 2/

2/ See appendix for their general characteristics.

II. OVERALL DELIVERY SYSTEM

This analysis recognizes the administrative structure of an organization as a logical construction to attain the ultimate goal that the organization is established to achieve. The KHDI Health Demonstration Project was developed as an attempt to improve the rural health delivery system. The basic goals of the program are to increase the accessibility and use of modern health facilities. Given limited health resources, a Comprehensive Health Care Delivery System (abbreviated CHCDS) is a bold innovation. The establishment of a demonstration model had two aims:

(1) to provide a high-quality comprehensive health service model that would be adaptable to other rural communities, and

(2) to achieve this goal without imposing excessive financial burdens either on the individuals who receive care or the Korean Government.

For demonstration purposes, the KHDI attempted to create a model that is readily acceptable, practical, and effective in delivering comprehensive health care to a community.

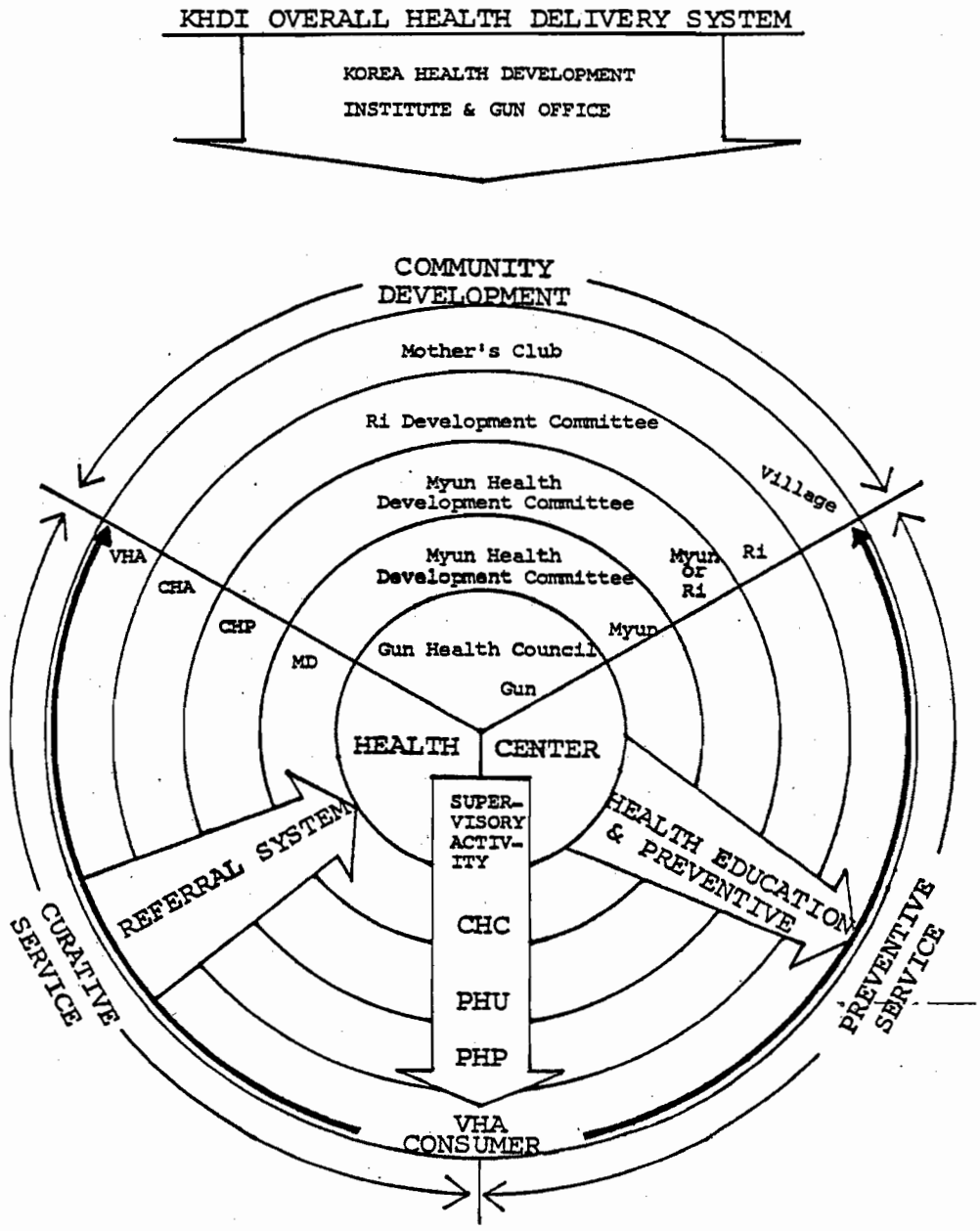
As figure 1 shows, the system is logically designed to function as a CHCDS by providing:

a) Primary health care advice and preventive and therapeutic health care, to two thirds of the population 3/ to be covered. Establishing more service units such as health centers, community health centers, primary health units, primary health posts and midwifery centers.

b) Introducing various new types of health personnel such as community health practitioners (CHPs), community health aides (CHA-multipurpose workers), health communicators, health educators and village health

3/ "Maul-Geon-Gang-Saup" by Sung Woo, Lee, Korea Health Development Institute, 1978, p.10.

Figure 1



Note: Abbreviations are:

MD : Medical Doctor,
CHP : Community Health Practitioner(nurse practitioner)
CHA : Community Health Aide (multipurpose worker)
VHA : Village Health Agent,
CHC : Community Health Center,
PHU : Primary Health Unit,
PHP : Primary Health Post,
Gun : County, Myun : Sub-county, Ri : Villages

agents (VHA) in order to articulate the service demand and serve along with other health personnel especially the midwives, health officers and medical doctors. By dividing health care responsibilities among different types of personnel, referral, as well as preventive services could be efficiently carried out.

It was assumed that the project could best achieve its long term objectives by making maximum use of the health personnel who were already located in the demonstration areas. However, it was also recognized that in order to improve health service both qualitatively and quantitatively, additional health personnel would have to be recruited. In either case, it was deemed necessary to provide orientation and training to primary health care delivery system workers, as well as to those who had undergone previous training in other health-related activities.

Initially, priority was given to the training of the following types of health workers so that they might play key roles in the improvement of the health delivery network in the demonstration areas:

	New Role/Title	Old Role/Title
1.	Community physician(CP)	Physician/Limited Practice physician
2.	Community Health Practitioner(CHP)	Did not exist
3.	Community Health Aide(CHA)	Nurse Aide
4.	Village Health Agent(VHA)	Did not exist

c) To facilitate community involvement, various health committees were established as forums for community participation in each local administrative level. In this way popular participation is institutionalized in the various health committees at the Gun, Eup, Myun and Ri levels which generate the health policy and coordinate health services.

How well this organizational arrangement has worked out is yet to be evaluated both from the performance and degree of institutionalization points of view. Since, this paper is mainly concerned with the intermediate stage of project implementation, the review of administrative operations from June 1977 to February 1980 will be included in a future evaluation.

As has been mentioned, efficiency is determined by the design of the system, the worker performance, and the informational structure.

With regard to the design, the system is intended to allow maximum accessibility despite limited resources. In this respect answering the question of whether to utilize resources to build as many three-tiered systems as financially possible would be a good approach. The answer will be influenced by cost analysis and the philosophical relationship between preventive and curative practices, as well as the level of intended quality.

Since an experimental system would undoubtedly provide the information needed to determine this matter, this paper will not present a complete analysis of the project, but rather will limit itself to recommendations for the further improvement of KHDI implementation, thus the report will primarily concentrate on task performance and cost aspects.

Several visits were made to field project sites at Gunee, Hongcheon, and Okgu Guns during the periods 1977 through 1979 for the purpose of gathering data. Interviews were held with health workers and also with randomly selected residents of the community in order to collect data for the NHS survey.

Presently, each county possesses a number of health care and referral centers established by the KHDI, which are staffed with well-trained personnel. This is an indication of the marked improvement in the availability of health service to the population. The CHP's and CHA's have been built up much community trust.

Overall, much progress has also been realized in project implementation. Nevertheless, the following comments and suggestions are presented for the sake of further improving the implementation of the KHDI demonstration project.

1. Supervisory and Follow-up Functions:

In general, the major problem in demonstration areas is weak supervision and follow-up inspection. The relative isolation of the demonstration projects from the KHDI tends to make health project information difficult to obtain. Also, not enough supervision is performed by the KHDI, probably due to the limited information available.

Since close supervision is needed to respond innovatively and quickly to field situations, the KHDI should play a stronger role in eliciting field information, in insuring the quality of the reporting, and in supervising and coordinating

future operations. In addition, KHDI should continuously evaluate the progress of projects and then act to improve the availability and quality of health services.

The KHDI has been utilizing a "control" type management information system (MIS), whereby a limited number of pre-determined key data elements are selected for continuous observation and statistical analysis. This is supplemented by a periodic (quarterly) statistical record survey to measure health system performance in the project area. The MIS design conceives of program management as including the function of program evaluation. Within this frame of reference, the MIS can aid both program management and evaluation even though these two functions are conceptually distinct.

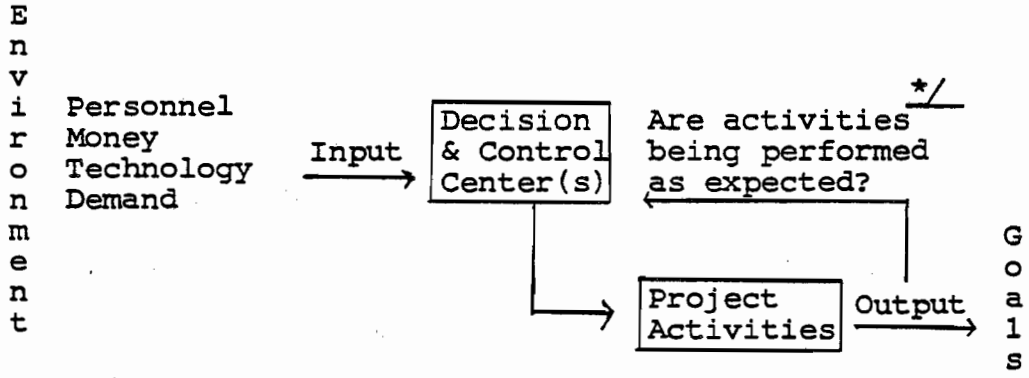
Developing an MIS system that provides data on elements of two functions does not need to be elaborate or expensive. KHDI should also develop simple ways of recording administrative and su-

pportive activities, such as the amount of time spent in supervision and teaching.

Aside from the responsibility of evaluation, administrative analysis should perform a monitoring function. This role of the KHDI in integrating various health data on a collective and heuristical basis perhaps could be expanded cooperavively thoughout the KHDI and its demonstration project infrastructure.

Figure 2 represents the KHDI's routine management control of program activities.

Figure 2. Recommended Management Control of Projects



*/ This function of the KHDI seems to be somewhat weak at this stage of implementation, should be strengthened

2. Coordination Between CHP's and CHA's:

There seems to be some discrepancy between the training the CHP's receive in reference to directing the activities of the CHA's and the actual practice in the field. There has also been generally little coordination between the two types of health workers.

This is of concern because the CHP's were given specialzed training to allow them to direct the services of the CHA's and thereby to make them more efficient and scientific. However, due to the weak cooperation between the CHA's and the CHP's, the guidelines set up by KHDI have been largely ignored. Therefore, it appears that the KHDI should reevaluate the current guidelines regarding the type of services to be provided by each health worker in the field, as well as clarify the administrative chain of command with a view toward improving the effectiveness of each link in the chain. Furthermore, once these new guidelines have been drawn up, the KHDI must actively see to

it that they are enforced.

We recommend that the KHDI health project division and manpower division make plans for improving this situation.

The following are the duties assigned to the CHP in the demonstration projects which were too difficult to perform effectively 4/:

1) The delivery of primary and ambulatory medical care including home visitation,
2) Identifying most common diseases,
3) Taking general medical histories,
4) Handling frequently required laboratory tests,
5) Providing treatment for a defined range of conditions,
6) Providing treatment prescribed by a physician including regular check-ups of chronically ill patients,
7) Making efficient referrals of complicated cases,
8) Administering immunizations,

4/ "Maul-Geon-Sang-Saup" (Community Health Project) by Sung Woo Lee, Korea Health Development Institute, 1978, p.21.

9) Providing pre and post-natal care,

10) Attending normal deliveries,

11) Providing nutritional guidance,

12) Undertaking public health education,

13) Carrying out family planning education,

14) Controlling communicable diseases such as tuberculosis, typoid fever, veneral disease, etc.,

15) Instructing the residents in sanitation,

16) Supervising community health aides and village health agents,

17) Recording and reporting data with accuracy,

18) Supporting and participating in the community agencies.

3. Problems with the Community Cooperative System:

The present community cooperative system (Dae Dong Hoe), while theoretically a good idea, has not functioned as originally planned. Initially, the intention was to increase community support and utilization of the PHU's. Unfortunately, the widespread community support of the program

which was hoped for has not materialized. This has produced a situation where the system, instead of being self-sufficient as planned, requires substantial government subsidies. Furthermore, the limited acceptance by the community of this system has also acted to produce some degree of alienation among the nonmembers. Therefore, it appears that the concept of the community cooperative system should be reevaluated by the KHDI and the local county administration and revised so that maximum utilization of the health facilities by the target population, as well as financial self-sufficiency, can be realized.

4. Demonstration Project Emphasis on Preventive Care and Community Services:

Okgu county residents possess a higher average income level than Hongcheon county residents. Furthermore, Okgu county consists largely of flat land in contrast to the mountainous character of Hongcheon county. This has acted to facilitate the

construction of an efficient transportation network in Okgu and greatly impeded the development of one in Hongcheon, In addition, a large number of private sector medical facilities are located near Okgu county, which tend to compete to some degree with the PHU's in offering curative services. These facts suggest that there should be a change in emphasis in the functions of the PHU's in Okgu toward more preventative care and community development services.

In contrast to their curative functions, the preventive role of the health centers appear to be somewhat weak. The fact that only about a third of the children under five years of age are covered by DPT supports this view. Preventive vaccinations against polio and measles were administered to an even lower percentages although BCG coverage for children under one year is around 61 per cent (still lower than the targetted coverage of 70-80%). 5/

5/ Lay Maung, "observations on the PHC Services in Hongcheon Gun" UNICEF Memorandum, May 1979

Added to this low number of immunizations is the fact that only about 10-15 per cent of the deliveries are conducted by the community health practitioners(CHPs). This is quite understandable if one remembers that the maximum percentage of CHP time is spent in the Health Center and very little in home visitation for pre-natal and post-natal care and home confinement.

From this one may also conclude that the CHP's supervisory functions over the CHA's and VHA's work are minimal. Under the present circumstances, the VHA cannot also expect much technical guidance from the CHP. If any assistance is expected, it should come from the CHA's since they perform more home visits than the CHP's.

Most of the pregnant women registered with the two primary Health Units(PHUs) appear to have been discovered through regular home visits carried out by the VHAs.

On the basis of this brief observational experience, we wish to make the following comments

on the KHDI project.

In the three county project systems, there is a trend toward placing more emphasis on curative services. This emphasis, especially in Hongcheon county, is not necessarily undesirable in view of the almost total lack of curative services which existed prior to the advent of the demonstration project. Neverthless, as the program expands, efforts ought to be made to arrive at an eventual balance of services in each area which can meet the overall primary health care needs of a large and diverse community.

Because primary health care is comprised of several elements in addition to curative services, the demonstration projects eventually should be expanded to include the following functions:

i) health education,

ii) communicable disease prevention and control,

iii) environmental health, and

iv) family planning and maternal and child health care.

5. Activities of Various Health Committees

In order to encourage participation of residents in the project areas, various health committees were organized in three demonstration Guns. At the county level, each Gun established a health service management committee to operate and support the KHDI project.

The committee is chaired by the Gun chief and consists of 14 representatives chosen from villagers, officials and professional or development-oriented bodies in the area. The committee is designed to coordinate and support project planning, implementation, supervision, budgetary and resource mobilization, and other aspects of the county's health care services.

At the Myun level, a Myun Health Development Committee was organized under the chairmanship of the Myun Chief with 14 members representing health services consumers and other professional/or development-oriented bodies in the area. The function

of the Myun level committee is to define the health problems and the needs of the community and resolve problems either independently or with outside support to, or refer them to higher levels for ultimate solution.

III. COVERAGE AND ACTIVITY PATTERN

In order to distinguish the change over time resulting from the project activities, 3 sample areas (CHC or PHU) have been chosen in each demonstration site. 6/ Bukbang, Naechon, and Mulgul(Ri) a myon of Hongcheon Gun about 24, 32. and 38 Kilometers, respectively, from the Hongcheon Gun Health Center. Sobo, Goro and Suksan(Ri), a Myon of Gunee Gun about 14.9, 32.9, and 38.9 Kilometers respectively from the Gunee Gun Health Center. Hwoehyun, Daegwang and Seosoo, a Myon of Okgu about 16, 1, and 8 Kilometers respectively from the Okgu Gun Health Center. 7/ The type and number of health personnel in each area at the beginning of the project appear in the following table 1. Usually, health personnel perform the various activities suggested by the KHDI.

6/ The reason for selecting these sample areas is that they were established before 1978, i, e., the earliest opening post in each demonstration area was established before 1978.

7/ Gun Statistical yearbooks, Gunee, Hongcheon, Okgu Guns, 1978.

Table 1 Number of Health Personnel by Type and Area

Dec. 1978

Area	Facilitys	Doctors	Nurses	CHPs	CHAs	Midwives	Others[2]	Total
Gunee	Health Center	1	5	1	3	1	18	29
Sobo	Sobo-CHC	-	1	-	1	-	-	2
Goro	Goro-PHU	-	-	1	1	-	-	2
Goro	Suksan-PHP	-	-	-	1	-	-	1
Hongcheon	Health Center	2(1)[1]	7	-	3	-	21	33
Naechon	Dogoan-PHU	-	-	1	2	-	-	3
Naechon	Moolgul-PHU	-	-	1	1	-	-	2
Bukbang	Yeukjunpyeong -PHU	-	-	1	1	-	-	2
Okgu	Health Center	1	5	-	-	-	16	22
Daeya	Daeya-CHC	1	-	-	3	-	3	7
Hwehyun	Hwehyun-CHC	1	-	1	3	-	3	7
Seosoo	Seosoo-PHU	-	-	1	1	-	-	2
Daeya	Daegwang-PHU	-	-	1	1	-	-	2

Note: 1/ Chief of Health Center who is working both in administration and clinical practice

2/ This category include sanitary workers, health educators, statisticians and all kinds of other administrative workers.

Source: Korea Health Development Institute, Report of Maul-Geon-Gang-Soup, 1979.

The project is interested in the performance of personnel with regards to the services rendered. It is hoped that their performance will be satisfactory given project limitations.

1. Purpose of the Analysis

The KHDI project is intended to measure the population's health needs, the ways these needs are being met, and the ultimate impact of the project on health. The Service Coverage Analysis, as a component of the evaluative study, is designed to provide information concerning the system's ability to serve the population's health needs. It aims at answering questions regarding personnel performance, effectiveness and efficiency. The study quantitatively measures activities carried out by various types of health personnel. Thus, it can be viewed as a quantitative micro-analysis which yields objective data on which to base the qualitative macro-analysis. The data obtained in this round(till December 1978) may be ragarded as the first to middle stage performance levels.

This data will be used continuously, i. e., changes in performance level, efficiency and effectiveness will continue to be observed (till February 1980) so that effects of project implementation may be ascertained. Personnel time distribution by service function will also be used as a basis for allocating personnel costs in the closely related cost analysis which is in next chapter. To be specific, the present analysis attempts to derive indicators relating to the performance of various services.

Some of these are:

1. the average monthly number of service contacts by type of facility and by service function,
2. the average service time spent per 1,000 target population by type of service function, health personnel and health facility,
3. the variations in time required to perform one service by type of service, health personnel and health facilities,
4. the proportion of time spent on various types of service function (curative, preventive, MCH, FP, other),

5. the annual number of referred cases by type of facility per 100 service contacts.

2. Method of Study

The first round (till December 1978) of data collection includes 3 to 4 sample areas in each demonstration site. Data concerning the performance of these health personnel were collected by means of actual direct interview, as well as by analysis of administrative documents. The actual direct survey of the tasks performed by each health worker may be termed a "time and motion study." A random working week was selected for each health facility and the tasks performed by each health worker at that unit were recorded. Furthermore all activities carried out by each health worker were recorded, as well as the length of time spent on each activity. In addition to the actual interview with the health worker, administrative documents were examined to gain insights into the performance of tasks.

Daily, monthly and other periodic records and reports were examined, and some information was extracted from these documents.

3. Results of the Study

In trying to achieve the objectives of the study as stated in chapter I, the processed data have been analyzed and categorized into 5 subjects as follows:

a) health coverage,
b) personnel activity pattern according to function,
c) facility activity pattern according to function,
d) average time taken to perform one direct service and the pattern of variation,
e) referral activity.

3-1. Health Coverage

The first result to be presented is the average monthly number of services per health center classified by type of service function and type of health facility. These numbers indicate the average amount of work in each category of service function performed by each type of facility.

Since a health center, community health center(CHC) and primary health unit(PHU) are usually located in a Eup, a Myon, and a Ri, respectively, these numbers can be used as a rough measure of the scope of health coverage provided by the government.

It can be seen from table 2-1 that the Gun health center rendered more direct services than any other facility. Both health centers in Okgu and Hongcheon seemed to have given services to roughly the same number of people. In general, it can be seen that the PHUs are delivering the curative services reasonably well-reaching an average of 15-20 patients per day. In view of the many other sources of medical care such as herbalists, drug vendors and private practitioners and that these are results from the beginning stage of implementation, this seems to be an acceptable utilization rate for a population of this size (average per capita annual consultation rate lying between 0.6 and 1.5.) However, the number of curative services offered by the PHU center in Okgu was significantly lower than that offered by the PHU in Hongcheon.

Table 2-1. Average and Coefficient of Variation of Monthly[1] Number of Services Per Facility by Type of Service Function (1978, 1-12)

Unit: number of contact

Facility	Type of Function					
	Curative	Preventive	MCH[3]	FP[4]	Other	Total
Health Center[2]						
Gunee	629	107	659	120	103	1,618
Hongcheon	599	699	758	267	68	2,391
Okgu	870	148	1,089	156	3	2,264
$\bar{X}$	699	318	835	181	58	2,091
SD	121	269	183	62	41	338
C.V.	0.17	0.84	0.22	0.34	0.70	0.16
Sub-Structure						
Gunee PHUS						
Sobo-CHC	375	54	375	70	13	886
Goro-PHU	350	36	215	28	-	630
Suksan-PHP	72	28	169	13	10	293
Hongcheon PHUS						
Dogoan-PHU	547	20	219	84	24	895
Moolgul-PHU	324	11	68	44	25	471
Yeukjunpyong-PHU	362	20	109	12	23	526
Okgu PHUS						
Hwehyun-CHC	422	32	332	80	-	865
Seosoo-PHU	239	71	134	70	16	529
Daegwang-PHU	77	-	17	-	35	129
$\bar{X}$	307	34	182	50	21	580
SD	146	18	110	27	8	253
C.V.	0.47	0.54	0.60	0.55	0.37	0.43

Note: 1/ 25 working days

2/ The figures for Gunee Health Center include the activities of Gunee Eup CHC, for Hongcheon Health Center include Hongcheon Eup CHC, and for Okgu health center include the activities of Daeya CHC.

3/ Maternal and Child Health 4/ Family Planning

Source: Korea Health Development

3/ Maternal and Child Health 4/ Family Planning

Source: Korea Health Development Institute, Report of Mual-Geon-Gang-Saup, 1979

Table 2-2. Average Daily Number of Curative Service Contacts by Type of Health Facility Per Population

Facility	Monthly Contact	Daily Contact	Target Population	Annual Contact Rate Per Person
Health Center				
Gunee	629	25	13,690	0.6
Hongcheon	599	24	31,280	0.5
Okgu	870	34	16,265	0.6
Sub-Structure				
Gunee Sobo-CHC	375	15	4,577	1.0
Goro-PHU	350	14	2,821	1.5
Suksan-PHP	72	3	2,528	0.3
Hongcheon Dogoan-PHU	547	22	5,592	1.2
Moolgul-PHU	324	13	3,058	1.3
Yeukjunpyong-PHU	362	15	2,725	1.6
Okgu Hwehyun-CHC	422	17	9,259	0.6
Seosoo-PHU	239	10	3,269	0.9
Daegwang-PHU	77	3	4,035	0.3

Source: Korea Health Development Institute, Report of Maul-Geon-Gang-Saup, 1979

This apparent discrepancy is probably due to the fact that in Hongcheon the PHU is the only government health facility at the myon level, therefore it actually serves in the capacity of a health center. Whereas in Okgu, the PHU is situated at the Myon level where many private clinics already exist, as well as health substitutes, i. e., Seg reve hospital, nearby hospitals in Gunsan city. As a result the PHU in Okgu serves only as a supporting facility, thus yielding a lower number of services.

The figures also indicate that, in terms of number of service contacts provided, the community health center at Daeya was clearly outstanding, although, on the average, the health facilities in Gunee and Hongcheon provided more service contacts than their counterpart in Okgu.

The coefficients of variation are almost invariably large indicating, perhaps, that the grouping by type of service function is too broad. We intend to give some more thought to the mean variations in service contacts in order that a more meaningful interpretation

can be attached to the number of service contacts. At the sub-structure level, one can readily see that from an absolute standpoint, the 146 service contacts of standard deviation for curative service has a larger range than the 110 service contacts of standard deviation for MCH service. But from a relative standpoint, it can be seen that the service contact dispersions (coefficient of variation) for curative services were much closer together among the different demonstration areas, i. e., C. V. of curative service is 0.47 and C. V. of MCH service is 0.60. To bring this idea out explicitly, a measure of relative service contact dispersion has been formulated as the coefficient of variation in each category of comparable direct services. We applied the coefficient of variation to check the experimental results and found the lowest service contact dispersions on curative services among all the other activities both in the health center and in the sub-structural levels. This means that the working patterns for curative services are similar, although the working patterns of other activities vary greatly between demonstration areas.

Another useful measure for indicating the relativ coverage provided by various health care facilities in these areas is the service time spent by the health personnel of each facility during a given week among the target population. Table 3 presents this measure for the three study areas with breakdowns by type of service function. It can be seen that, in contrast to the coverage result implied by table 2, the rates for Gunee, Hongcheon and Okgu are, respectively, 424, 205 and 357 at the health center level. These seemingly contradictory results stem from the fact that Okgu consists of Ban with the largest average size(population density 347 per square kilometer), whereas thcse in Gunee are some what smaller (averaging roughly 64.9). Furthermore there is the fact that average service time in Gunee was about twice that of Hongcheon and 19 percent larger than that of Okgu. In virtually all categories of service function, the rates for HC were consistently higher than that of CHC and PHU, and the rates for the sub-structures were similar in regard to their health services.

Table 3. Service Time(hours) Spent in One Month Per 1,000 Target Population by Service Function

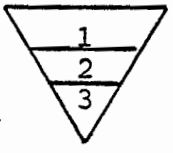
Unit: hour

Area	Facility	Type of Service Function								
		Curative	Preventive	MCH	FP	Office Work	Idle Time	Travel	Other	Total
Gunee										
	Health Center	14.2	32.7	14.8	14.4	136.4	48.9	32.4	130.1	423.7
	Sobo-CHC	38.6	6.3	13.3	12.0	14.6	18.6	8.5	18.6	131.1
	Goro-PHU	30.9	15.4	7.8	10.9	20.6	12.6	16.7	26.9	141.8
	Suksan-PHP	38.4	15.1	15.4	11.1	15.8	14.8	18.2	29.6	158.2
Hong Cheon	Health Center	22.1	13.7	2.6	4.8	72.1	22.8	15.9	50.5	204.6
	Dogoan-PHU	13.9	9.2	9.9	9.9	19.5	8.4	21.1	15.5	107.3
	Moolgul-PHU	16.9	12.5	10.9	9.3	19.2	14.6	27.9	19.5	130.8
	Yuckjun Pyong-PHU	22.7	11.9	10.4	11.3	23.6	15.4	29.1	22.3	146.8
Okgu										
	Health Center	28.4	17.7	6.7	13.6	109.9	38.2	33.5	108.5	356.6
	Hwehyun-CHC	33.4	3.8	4.9	9.5	24.3	20.6	14.6	18.3	129.6
	Seosoo-PHU	21.7	5.3	9.2	14.0	19.9	10.1	18.2	23.7	122.4
	Daegwang-PHU	17.3	5.1	9.1	12.6	16.1	8.2	13.2	17.4	99.1

Source: Korea Development Institute, Survey, 1979

3-2. Personnel Activity Pattern According to Function

The question concerning what health facility activity profiles, comparisons of direct service, supporting service, travel and idle time components, should look like, is a controversial one. Many people feel that the ideal profile should resemble that of an inverted triangle 8/ with direct service consuming the largest portion of time followed by supportive service, staff travel time and staff personal time. Alternatively the three portions: direct service, supporting service, and staff travel and personel time, could be of roughly the same size. Although it is unlikely an ideal national profile can be so generalized, it should be possible to develop a more appropriate program for specific socio-economic and geographical environments.

8/ This means that 

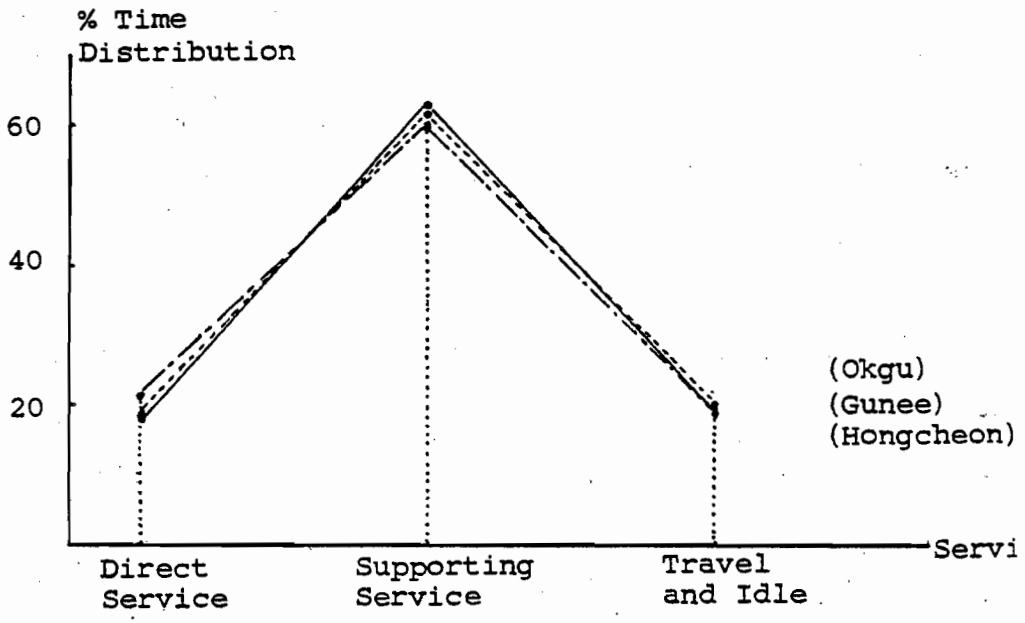
1. direct service
2. supporting service
3. travel and staff persona. time.

The results of field observations in the sample areas and the profiles of these areas are shown in figure 3. The ratio of direct service efforts to total health facility efforts ranges from about one-fifth on the Health Center level to almost two-thirds on the substructure level. Support service components are invariably large at the Health Center level, more than three times as large as the direct service component in Hongcheon Health Center and exactly 3.5 times the size of the direct service components in the two other areas. Travel and idle time components are relatively small in all areas.

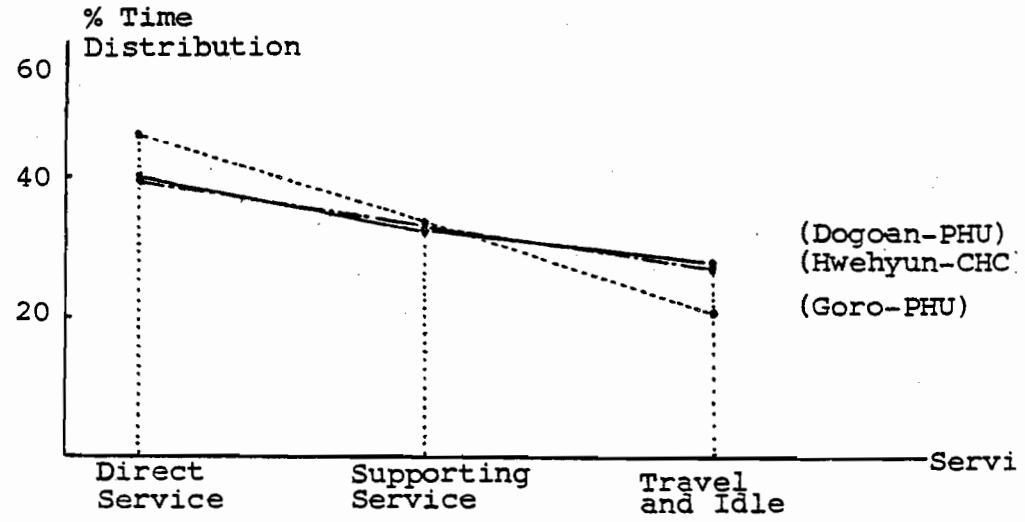
Due to the small number of doctors, nurses, family planning and MCH workers, CHPs, and CHAs present during the observation period, it probably is not wise to generalize on the inverted triangular-shaped pattern or work at the Health Center level, shown in figure 3. It suffices to note that the administrator of each Health Center seems to have spent over 70% of his time doing what he is supposed to do, i. e., office work and social administrative work.

Figure 3. Health Facility Activity Profile
(% Time Distribution)

A. Health Center



B. Substructure



Health-oriented personnel in the Health Center were the only persons who spent a significant amount of time performing direct services. The CHP's in Hongcheon devoted about 30% of their time to direct service, 10% to supportive service, 28% to personal matters and 4% to travel. The corresponding figures for doctors were 69%, 6%, 8% and 3%. CHA's in Hongcheon HC performed direct service during about 31% of their observed time. Hongcheon CHAs spent almost 19% of their time on supporting services, as did their counterparts in the other two areas.

Idle time ranged from 5% in Okgu to 12% in Gunee and travel time ranged from just over 28% in Hongcheon to about 8% in Gunee. The contents of tables 4-1, 4-2, and 4-3 were used in constructing the profiles presented in figure 3. These tables give detailed breakdowns by function and personnel type. Hongcheon leads in direct service efforts, although Gunee is the leader in other supporting services.

In contrast to results of field observations at the health center level, health facility activity profiles (see figure 3) at the substructure level show

the ideal inverted triangular shape. At the top dire service, consumes the largest portion of time, and is supported by the time components of supportive servic staff travel and staff personal affairs in that order

Dogoan PHU in Hongcheon devoted 39.9% of its t to direct service, 32.5% to supportive service and 27 to travel. Corresponding figures for Hwehyun-CHC wer 39.9%, 32.9% and 27.3% respectively; corresponding figures for Goro PHU were 45.9%, 33.4% and 20.7% respectively. The result is striking in that it shows clearly that, based on the proportion of time spent or direct service, supportive service, travel and idlenes a primary health unit staffed with one CHP and CHA is indisputably more efficient than a health center in generating direct service activities.

Substructures tended to concentrate their effor on direct services while health centers spent a very large portion of time on office work, resulting in a large portion of supporting time, as has been mentione previously.

In conclusion, sufficient evidence exists to suggest that although the ratio of direct service ti

Table 4-1. Time Spent on Each Service Function by Type of Personnel in Guinea as Percentages of Total Time Spent by Each Type of Personnel

Unit : %

Type of Personnel \ Function	Curative	Preventive	MCH	FP	Office Work	Idle Time	Travel	Other	Total
Health Center									
M. D.	3	0.5	-	-	17.5	11	12	56	100
CHP	42.4	0.9	3.5	3.2	12.5	10	4	9.7	100
Nurse(Ad.)	-	9.8	-	-	29.4	22.5	9.8	27.5	100
CHA	3.2	11.2	14.8	14.8	20	12	8	16	100
T. B Worker	-	37.5	-	-	20	10	6.5	26	100
F. P Worker	-	-	-	20	25	12.5	12.5	30	100
MCH Worker	-	-	25	-	25	20	12.5	17.5	100
Sanitary worker	-	18	-	-	20.5	14	22	25.5	100
Technician	-	37.4	-	-	20	10	6.5	26	100
Administrator	-	-	-	-	71.5	5.5	7.5	15.5	100
Other	-	-	-	-	-	14	-	86	100
Total	3.35	7.7	3.5	3.4	32.1	11.4	7.6	30.7	100
Sobo-CHC									
M. D.	53	-	-	-	-	26	5	15	100
CHP	35.5	4.5	9.5	4.5	17.5	12.5	4	12	100
CHA	-	10	21	23	16	4	10.5	15.5	100
Total	27.4	5.27	11.0	10	12.1	13.3	6.7	14.0	100
Goro-PHU									
CHP	40.7	7.2	-	-	13	9.7	10	19.4	100
CHA	3	14.5	11	15.5	16	8	13.5	18.5	100
Total	21.8	10.8	5.5	7.75	14.5	8.9	11.8	18.9	100
SukSan-PHP									
CHP	40.7	7.2	-	-	13	9.7	10	19.4	100
CHA	7.7	11.8	19.5	14	7	9	13	18	100
Total	24.2	9.5	9.8	7	10	9.4	11.5	18.7	100

Source: Korea Development Institute, survey, 1979

Table 4-2. Time Spent on Each Service Function by Type of Personnel in Hongcheon as Percentages of Total Time Spent by Each Type of Personnel

Unit : %

Type of Personnel \ Function	Curative	Preventive	MCH	FP	Office Work	Idle Time	Travel	Other	Total
Health Center									
M.D.	64.3	4.5	-	-	5.6	7.6	2.8	15.3	100
Pharmacist	64.2	-	-	-	18.3	6.9	2.3	8.3	100
Nurse(CHP)	38.5	-	-	-	9.6	28.8	3.9	19.2	100
F.P Worker	-	-	-	26.7	21.6	21.6	17.2	12.9	100
MCH Worker	-	-	27.6	-	21.3	21.3	17.0	12.8	100
T.B Worker	-	27.1	-	-	27.0	16.2	8.1	21.6	100
Administrator	-	-	-	-	77.3	2.6	7.7	12.4	100
Technician	-	37.5	-	-	20	10	6.5	26	100
CHA	-	14	6.5	10.8	18.7	9.4	28	12.6	100
Other	-	-	-	-	-	12.9	-	87.1	100
Total	10.8	6.7	1.3	2.3	35.2	11.1	7.8	24.7	100
Dogoan-PHU									
CHP	31	6.8	4.3	4.3	15.4	7.8	13.6	17.4	100
CHA	3.9	9.8	11.7	11.7	19.5	7.8	22.7	12.9	100
Total	12.9	8.6	9.2	9.2	18.1	7.8	19.7	14.4	100
Moolgul-PHU									
CHP	25.8	5.1	10.3	3.4	10.7	12.9	14.6	17.2	100
CHA	-	14.0	6.5	10.8	18.7	9.4	28.0	12.6	100
Total	12.9	9.55	8.4	7.1	14.7	11.1	21.3	14.9	100
Yuckjunpyong-PHU									
CHP	30.9	2.3	7.7	4.6	13.5	11.6	11.6	17.8	100
CHA	-	14.0	6.5	10.8	18.7	9.4	28.0	12.6	100
Total	15.5	8.1	7.1	7.7	16.1	10.5	19.8	15.2	100

Source: Korea Development Institute, Survey, 1979

Source: Korea Development Institute, Survey, 1979

Table [illegible]. Time Spent on Each Service Function by Type of Personnel in Okgu as Percentage of Total Time Spent by Each Type of Personnel

Unit: %

Type of Personnel \ Function	Curative	Preventive	MCH	FP	Office Work	Idle Time	Travel	Other	Total
Health Center									
M.C.	42.8	0.5	-	-	6.2	14	10.1	26.4	100
Nurse(Ad.)	-	9.8	-	-	29.4	23.5	9.8	27.5	100
Nurse	-	11.1	-	-	22.2	26.7	8.9	31.1	100
F.P. Worker	-	-	-	16.7	23.8	19	11.9	28.6	100
T.B. Worker	-	26.3	-	-	26.3	10.5	10.5	26.4	100
MCH Worker	-	-	22.2	-	22.2	17.8	11.1	26.7	100
Leprosy "	-	-	-	-	23.8	33.3	7.1	35.8	100
Technician	-	37.5	-	-	20	10	7.5	26	100
CHA_I	74.5	-	-	-	-	8	2.7	14.8	100
CHA_{II}	2.3	7.0	10.7	25.6	18.6	4.7	16.3	14.8	100
CHA_{III}	64.2	-	-	-	18.3	6.9	2.3	8.3	100
Administrator	-	-	-	-	53.7	5.0	10.4	35.7	100
Other	-	-	-	-	-	14.4	-	85.6	100
Total	8.0	5.0	1.8	3.8	30.8	10.7	9.4	30.4	100
Hwehyun-CHC									
M. C.	53.2	-	-	-	-	26.6	5.3	14.9	100
CHA_1	53.2	-	-	-	5.3	26.6	5.3	9.6	100
CHA_2	-	8.9	11.4	22	19.1	4.2	21.2	13.2	100
CHA_3	48.1	-	-	-	19.2	19.2	4.8	8.7	100
Administrator	-	-	-	-	50	15	10	25	100
Total	25.7	3.0	3.8	7.3	18.8	16.0	11.3	14.1	100
Seosoo-PHU									
CHP	33.9	0.4	2.5	2.5	16.9	12.7	10.2	20.8	100
CHA	1.6	8.2	12.5	20.4	15.7	3.9	19.6	18.0	100
Total	17.8	4.3	7.5	11.5	16.3	8.3	14.9	19.4	100
Daegoang-PHP									
CHP	33.5	2.1	5.9	5.0	16.7	12.6	7.1	17.1	100
CHA	1.6	8.2	12.5	20.4	15.7	3.9	19.6	18.0	100
Total	17.5	5.2	9.2	12.7	16.2	8.3	13.4	17.5	100

Source: Korea Development Institute, Survey, 1979

to total time is rather small at the level of health centers, it increases as the size of the facility decreases.

Tables 5-1, 5-2, and 5-3 have been constructed from the same set of data used for construction of tables 4-1, 4-2, and 4-3. The times spent on each service function by each type of personnel are displayed in tables 4-1, 4-2, and 4-3 as percentages of the total time spent by each type of personnel, on the other hand tables 5-1, 5-2, and 5-3 display percentages of the total time spent on each service function by all types of personnel. Such presentation enables us to identify the extent to which each type of personnel contributed to each of the health facility functions. The percentage contribution of each type of personnel may, however, be misleading since different total numbers of personnel of various types have been observed. The reader can get the proper perspective by observing the number in the column at the far right of each row, which is the total number of personnel of each type as a percentage of the total number of health personnel.

For example, in the curative service function (first column), the doctor in Hongcheon health center contributed approximately six times his quantitative share, because his percentage contribution for this function is 37.1%, which is almost six times his "perspective percentage" of 6.3%. Tables 5-1, 5-2, and 5-3 also imply that the CHPs in both Hongcheon and Gunee health centers, but this was not so in Okgu health center, gave more than their share of direct service. In all three demonstration areas, CHAs were very active in this service category.

The single-purpose workers in Gunee spent more time travelling than similar workers in the other areas. 9/ It is also important to note that both the doctors and CHPs of Hongcheon and Gunee contributed heavily to curative service, contributed only slightly to other services. The CHA and nurse rendered preventive service, MCH and FP services, as evidenced in their contribution figures in tables 5-1, 5-2, and 5-3.

9/ That is MCH, F. P., and T. B. workers.

Table 5-1. Time Spent on the Service Function by Type of Personnel for Gunee as the Percentage of Total Time Spent on Each Service Function by all Types of Personnel.

Type of Personnel	Type of Function							
	Curative	Preventive	MCH	FP	Office Work	Idle Time	Travel	C
Health Center								
M.D.	3.1	0.2			1.8	3.3	5.4	
CHP	87.0	0.8	6.9	14.6	2.6	6.0	3.6	
Nurse(Ad.)	-	8.7	-	-	6.3	14.1	8.8	
CHA	9.9	15.0	43.8	44.9	6.4	10.8	10.8	
T.B. Worker	-	16.8	-	-	2.1	3.0	2.9	
F.P. Worker	-	-	-	40.5	5.3	7.5	11.3	
MCH Worker	-	-	49.3	-	5.3	12.0	11.3	
Sanitary Worker	-	8.1	-	-	2.2	4.2	9.9	28
Technician	-	50.3	-	-	6.4	9.0	8.8	8
Administrator	-	-	-	-	61.2	13.2	27.0	13
Other	-	-	-	-	-	16.8	-	38
Sub Total	100	100	100	100	100	100	100	1
Sobo-CHC								
M.D.	52.9	-	-	-	-	54.8	21.6	28
CHP	47.1	31.0	31.1	16.4	52.2	34.2	21.6	31
CHA	-	68.9	68.9	83.6	47.8	10.9	56.8	40
Sub Total	100	100	100	100	100	100	100	1(
Goro-PHU								
CHP	93.1	66.7	-	-	44.8	54.8	42.6	51.
CHA	6.9	33.3	100	100	55.2	45.2	57.4	48.
Sub-Total	100	100	100	100	100	100	100	1(
Suksan-PHP								
CHP	84.1	37.9	-	-	65	51.9	43.4	51.
CHA	15.9	62.1	100	100	35	48.1	56.6	48.
Sub Total	100	100	100	100	100	100	100	10

Source: Korea Development Institute, Survey, 1979

Table 5-2. Time Spent on the Service Function by Type of Personnel for Hongcheon as the Percentage of Total Time Spent on Each Service Function by all Types of Personnel

Unit: %

Type of Personnel	Curative	Preventive	Type of Function: MCH	FP	Office Work	Idle Time	Travel	Other	Total
Health Center									
M.D.	37.1	4.2	-	-	0.9	4.2	2.3	38.7	6.3
Pharmacist	18.5	-	-	-	1.6	1.9	0.9	1.0	3.1
Nurse (CHP)	44.4	-	-	-	3.4	35.3	6.2	9.7	12.5
F.P. Worker	-	-	-	71.2	3.8	12.1	13.8	3.3	6.3
MCH Worker	-	-	68.0	-	1.9	6.0	6.8	1.6	13.1
T.B. Worker	-	12.7	-	-	2.4	4.5	3.2	2.7	3.1
Administrator	-	-	-	-	75.4	8.0	33.9	17.3	34.4
Technician	-	70.1	-	-	7.1	11.2	10.4	13.2	12.5
CHA	-	13.1	32.0	28.8	3.3	5.3	22.4	3.2	6.3
Other	-	-	-	-	-	14.3	-	44.1	12.5
Sub Total	100	100	100	100	100	100	100	100	100
Hogoan-PHU									
CHP	79.9	24.0	15.5	15.5	28.3	33.3	23.1	40.3	33.3
CHA	20.1	76.0	84.5	84.5	71.7	66.7	76.9	59.7	66.7
Sub Total	100	100	100	100	100	100	100	100	100
Moolgul-PHU									
CHP	100	26.7	61.3	23.9	36.4	57.8	34.3	57.7	50
CHA	-	73.3	38.7	76.1	63.3	42.2	65.7	42.3	50
Sub Total	100	100	100	100	100	100	100	100	100
Yuckjunpyong-PHU									
CHP	100	14.1	54.2	29.8	41.9	55.2	29.3	58.6	50
CHA	-	85.9	45.8	70.2	58.1	44.8	70.7	41.4	50
Sub Total	100	100	100	100	100	100	100	100	100

Source: Korea Development Institute, Survey, 1979

Table 5-3. Time Spent on the Service Function by Type of Personnel for Okgu as the Percentage of Total Time Spent on Each Servic Function by all Types of Personnel

Unit:

Type of Personnel	Type of Function							
	Curative	Preventive	MCH	FP	Office Work	Idle Time	Travel	Oth
Health Center								
M.D.	37.0	0.6	-	-	1.4	2.9	7.4	5.
Nurse(Ad.)	-	6.7	-	-	3.3	7.6	3.4	3.
Nurse	-	7.7	-	-	2.5	8.6	3.3	3.
F.P. Worker	-	-	-	-	53.2	12.2	8.7	6.
T.B. Worker	-	18.2	-	30.3	29.4	3.2	3.9	3.
MCH Worker	-	-	40.8	-	24.8	5.7	4.1	3.
Leprosy Worker	-	-	-	-	26.6	10.7	2.6	4.
Technician	-	52.0	-	-	44.7	6.4	4.8	5.
CHA_I	32.2	-	-	-	-	2.6	0.9	1.
CHA_{II}	3.0	14.6	59.2	69.7	62.4	4.5	17.9	5.
CHA_{III}	27.7	-	-	-	20.4	2.2	0.8	0.
Administrator	-	-	-	-	66.1	17.8	42.0	38.
Other	-	-	-	-	-	9.2	-	19.
Sub Total	100	100	100	100	100	100	100	10(
Hwehyun-CHC								
M.D.	34.4	-	-	-	-	27.8	7.8	17.6
CHA_I	34.4	-	-	-	4.7	27.8	7.8	11.3
CHA_{II}	-	100	100	100	33.9	8.8	62.5	31.2
CHA_{III}	31.2	-	-	-	17.0	20.0	7.1	10.3
Administrator	-	-	-	-	44.4	15.7	14.7	29.6
Sub Total	100	100	100	100	100	100	100	10C
Seosoo-PHU								
CHP	95.4	4.7	16.7	10.9	51.8	76.5	34.2	53.6
CHA	4.6	95.3	83.3	89.1	48.2	23.5	65.8	46.4
Sub Total	100	100	100	100	100	100	100	100
Daegwang-PHU								
CHP	95.4	20.4	32.1	19.7	51.5	76.4	26.6	48.7
CHA	4.6	79.6	67.9	80.3	48.5	23.6	73.4	51.3
Sub Total	100	100	100	100	100	100	100	100

Source: Korea Development Institute, Survey, 1979

ce
: %

her	Total
.9	6.9
.1	3.4
.5	3.4
.5	6.9
.0	3.4
.0	3.4
.1	3.4
.9	6.9
.7	3.4
.0	10.4
.9	3.4
.4	37.9
.4	6.9
.00	100
.6	16.7
..3	16.7
..2	33.3
.3	16.7
.6	16.7
.00	100
.6	50
.4	50
.00	100
.7	50
..3	50
.00	100

3-3. Field Work and Travelling Pattern

It is unfortunate that, with the data available, it is not possible to compute the ratio of service time spent in the field to service time spent in the office. Similarly, it is not feasible to determine the amount of travel time for service purposes as a percentage of the total travel time. Consequently, the amount of field work is not derivable. Although personnel in PHUs are supposed to spend a large portion of their time working in the field, the findings presented in table 6 indicate that they do not. Therefore, we have decided to classify the average monthly travel time by type of personnel and facility in the hope of gaining some insight into the travel behavior of the staff. Table 6 gives such figures for the three demonstration areas. The average of total travel time for CHAs in the Hongcheon demonstration area is much larger than that of CHAs in the other areas. Closer observation reveals that the Hongcheon PHU center personnel travel almost twice as much as the personnel of the other two demonstration areas.

Also on the health center level, the average time travel is longest in Hongcheon, three times longer than that of Gunee. Gunee in turn is about 12% longer than the corresponding average of the community health aides (CHA) in Okgu. Community health practitioners and community health aides consistently have longer travel time averages than their co-workers. This seems appropriate for community health aides. Since community health practitioners take fewer trips than community health aides, the relatively less travel time for community health practitioners can probably be explained by their greater office duties. We intent to give more thought to the mean variation in travelling time for various types of health personnel in order to present a more meaningful interpretation of the average travel time. One can readily see that, from a relative standpoint, the dispersions (coefficients of variation) of travel times for CHPs and CHAs were much closer together than those of the doctors and nurses among the different demonstration areas, i. e., C. V.'s of the CHPs, the CHAs and the doctors were 0.58, 0.38 and 0.36 respectively.

Table 6 Average Monthly[1/] Travel Time by Type of Personnel

Unit: hour

Facility \ Personnel	MD	CHP	Nurse	CHA	T.B. Worker	F.P. Worker	MCH Worker	Sanitarian	Technician	Administrator
Gunee										
Health Center	24.0	8.0	19.6	16.0	13.0	25.0	25.0	44.0	13.0	15.0
Sobo-CHC	10.0	8.0	-	31.0	-	-	-	-	-	-
Goro-PHU	-	20.0	-	27.0	-	-	-	-	-	-
Suksan-PHP	-	20.0	-	26.0	-	-	-	-	-	-
Hongcheon										
Health Center	5.7	-	7.8	56.0	16.2	34.4	34.0	-	13.0	15.4
Dogoan-PHU	-	27.2	-	45.4	-	-	-	-	-	-
Moolgul-PHU	-	29.2	-	56.0	-	-	-	-	-	-
Yuckjunpyong -PHU	-	23.2	-	56.0	-	-	-	-	-	-
Okgu										
Health Center	20.2	-	18.0	14.2	21.0	23.8	22.2	-	13.0	20.6
Hwehyun-CHC	10.6	-	-	20.6	-	-	-	-	-	20.0
Seosoo-CHU	-	20.4	-	39.2	-	-	-	-	-	-
Daegwang-PHP	-	14.2	-	39.2	-	-	-	-	-	-
$\bar{X}$	14.1	18.9	15.1	38.0	16.7	27.7	27.0	-	13.0	17.8
S.D.	6.9	7.2	5.2	13.7	3.3	4.7	5.0	-	0	2.6
C.V.	0.48	0.38	0.34	0.36	0.19	0.17	0.19	-	0	0.14

Note: 1/ means 25 working days and total monthly working hours per person is 200.

Source: From Tables 2-1,2,3.

3-4. Average Time Taken to Perform One Direct Service and The Variation Pattern

We have already discussed the total number of services rendered and the amount of service time spent by type of activity, by type of facility, and by type of personnel. We now turn our attention to the averag time taken to perform one direct service and its patte of variation, a measure closely linked to the other tw We have intentionally excluded the analysis of the aver age time taken to perform one supporting service and the average duration of idle time since such an analysi does not seem to be useful. The data collected has bee processed and summarized in Table 7. We have chosen the coefficient of variation to present the pattern of variation in service time. This statistic, the ratio of the standard deviation to the arithmetic mean, gives a good estimate of data dispersion in a normalized form allowing different coefficients of variation to be directly compared to one another.

Since Table 7 is, to some extent, formalized on the basis of crude data, it is not easily comprehensible on first reading.

However, it can be seen that the average time taken to perform one direct service is lower in the health center than in the substructure. Whether this fact indicates better and more thorough services in the substructure than in the health center, or more efficient operations in the former than in the latter, cannot be concluded with any degree of confidence because of their different service qualities. It might be desirable to include some means of measuring the quality of services performed in the observation method to be used in the future round although many drawbacks of this approach must be overcome. We are not now in a position to comment on the subject for want of a reliable qualitative measure.

The coefficients of variation are almost invariably large, indicating perhaps too broadly grouped service functions, and possibly a rural Korean cultural trait of exchanging friendly conversation of varying duration both before and after medical service.
We intend to give more thought to the mean variations in time to provide a more meaningful interpretation

of the average time. At the substructure level, one ca readily see that from an absolute standpoint the 9.5 minutes of standard deviation for family planning service is larger than 6.1 minutes of standard deviation for curative service. But from a relative standpoint, we can see that the dispersions (coefficients of variation) of time spent for family planning services were much closer together among the different demonstration areas: C. V. of family planning service is 0.42 and C. V. of curative service is 0.51. For better comparison, a measure of relative time dispersion has been formulated as a coefficient of variation in each category of direct services. We apply this coefficient of variation to check experimental results. Our findings show that the dispersion of time spent on curative services is higher than that of the time spent on mother and child health care and family planning services in each demonstration area.

Table 7. Average Service Time and Coefficient of Variation of Service Time by Type of Service and Facility

Unit: Minute

Facility	Type of Function		
	Curative	MCH	FP
Health Center			
Gunee Health Center	3.1	2.6	14.1
Hongcheon Health Center	9.9	2.2	8.4
Okgu Health Center	4.5	2.0	16.9
$\bar{X}$	5.8	2.3	13.1
SD	2.9	0.24	3.5
C.V.(SD/$\bar{X}$)	0.51	0.10	0.26
Substructure			
Gunee PHUS			
Sobo-CHC	9.4	4.9	23.6
Goro-PHU	7.5	6.1	33.2
Suksan-PHP	-	6.9	-
Hongcheon PHUS			
Dogoan-PHU	8.5	5.0	33.0
Moolgul-PHU	9.5	14.8	19.6
Yuckjunpyong-PHU	10.2	7.8	-
Okgu PHUS			
Hwehyun-CHC	14.6	4.1	5.1
Seosoo-PHU	8.9	6.7	19.3
Daegwang-PHU	27.3	-	-
$\bar{X}$	11.9	7.0	22.3
SD	6.1	3.1	9.5
C.V.(SD/$\bar{X}$)	0.51	0.44	0.42

Sources: from Tables 2 and 3-1,2,3.

Table 8. Quarterly (1/4 in 1979) Number of Referral Cases, Quarterly Number of Service Contacts and Rate of Referral Per 100 Service Contacts by Type of Facility

Area		No. of Contacts	No. of Referrals	Refer rate(%)
Health Center				
Gunee		2,349	92	3.9
Hongcheon		7,899	251	3,2
Okgu		4,428	21	0.5
Substructure				
Gunee	Sobo-PHU	1,952	21	1.1
	Goro-PHU	1,578	21	1.3
	Suksan-PHP	194	7	3.6
Hongcheon	Dogoan-PHU	1,211	126	10.4
	Moolgul-PHU	1,177	21	1.8
	Yeukjunpyong-PHU	1,443	39	2.7
Okgu	Hwehyun-CHC	1,674	66	3.9
	Seosoo-PHU	1,307	20	1.5
	Daegoang-PHU	1,001	20	2.0

Source: Korea Health Development Institute, Monthly Report, 1979

3-5. Referral Activity

It has been recognized that a good referral system can help a hierarchy of health facilities to achieve better case loads. The number of referred cases, both into and out of a health facility, was collected from quarterly and monthly reports which each facility is required to submit to the KHDI headquarters. These numbers, together with the collected quarterly number of service contacts for each type of facility and the rate of referrals per 100 service contacts, have been presented in table 8.

4. Summary

In conclusion, we wish to report the following summarized results and observations.

1. In relation to the size of population in each study area, Gunee has been endowed with the largest number of health facilities and personnel. This fact is reflected in table 3, which shows that

Gunee had the highest per capita rate of service time in practically every category of service function. Gunee, however, had the poorest ratio of direct service to total staff (See figure 3).

2. In general, this ratio is unsatisfactorly low for all Gun health centers. Using this ratio, Hongcheon Health Center was judged the best and Okgu Health Center was second. But substructures concentrated their efforts on direct services while health centers spent a very large portion of time on office work, resulting in a large portion of support time. Therefore, we conclude that sufficient evidence exists to suggest that the ratio of direct service time to the total time is rather small at the level of the health center, but that the ratio improves as the size of the facility decreases.

3. In general, it can be seen that the PHUs are delivering curative services reasonably well, reaching an average of 15-20 patients per day. This seems to be an acceptable utilization rate for a population of this size, having an average

per capita annual contact rate between 0.6 and 1.5, considering that other sources of medical care such as herbalists, drug vendors, and private practitioners are available. Also, this is the result of the beginning stage of implementation.

4. From the measure of relative service contact dispersion (analysis of the coefficient of variation), we found that the variation of service contact dispersions of curative services are lower than for other activities both at the health center and the substructure level. This means that the working patterns for curative services are similar, but that the working patterns of other activities differ greatly among demonstration areas.
Field observations in the sample areas yield the following profiles of health facility activity in these areas: The ratio of direct service effort to total health facility effort ranges from about one-fifth on the Health Center level to almost two-thirds on the sub-structure level.
Supporting service components are invariably large

at the health center level, more than three times as large as the direct service component in Hongcheon Health Center and 3.5 times as large as the direct service components in the two other areas. Travel and idle time components are relatively small in all study areas. The result is striking in that it shows clearly that, based on the proportion of time spent direct service, supportive service, travel and idleness, a primary health unit staffed with one CHP and one CHA is indisputably more efficient than a health center in generating direct service activities.

5. Doctors and CHP's did not contribute much service time in any category except curative services. This category, incidentally, received the most greatest portion of all direct service functions from the staff in every substructure, followed by maternal and child health, family planning, and preventive service, in that order.

6. Even though it is not possible, to compute the ratio of service time performed in the field to service time performed in the office, with the data available, it is clear that personnel in the PHU have spent a large portion of their time working in the field; community health practitioners and community health aides consistently have larger travel time averages than their co-workers on the health center level. However, because community health practitioners make fewer trips than community health aides, the relatively lower travel time for community health practitioners can probably be explained by their greater office duties.
7. Many results concerning average service time have been obtained but cannot be assigned much significance for want of a reliable measure of service quality.

IV. COST ANALYSIS

1. Introduction

The KHDI Health Demonstration Project has been established as a pilot project to improve the general level of health of the rural population through the innovative development and evaluation of a low-cost integrated health delivery system. It aims to cover at least two-thirds of the target population. 10/ If the project is successful, its key features will be considered for replication in other parts of the country in so far as the resources of the Korean government permit. The key features and innovations of the project include: 11/

(1) Development of cadres of clinically skilled para-physicians, called community health practitioners (CHP), to extend the clinical skills of the physician to every health facility;

10/ "Mual-Geon-Gang-Saup" (community health project) by Sung Woo, Lee, Korea Health Development Institute, 1978. p. 10

11/ See the "alternative approaches and rationale for meeting community health needs" by Sung-Kyu Ahn, Korea Health Development Institute, 1978.

(2) Development of new systems and procedures to provide better health care to low-income groups without significantly increasing the financial burden, to better utilize health professionals, and to provide more career opportunities in the field of primary health care;

(3) Integration of the health sub-center/health infrastructure under a single administration, with the Gun health center as the nucleus of the health care system;

(4) Development of a system for the management of health information to improve health data and, by rapid retrieval and feedback systems, to promote utilization of health information for program management; and

(5) Development of large cadres of community health personnel including health post volunteers (VHA), health communicators, and traditional midwives to extend health care and information to villages.

The key factors in determining replication potential, i. e., the possibility of using the information obtained, will be the project impact and the project cost to the government. Analysis of costs, then, is essential to measure the financial feasibility of replicating the key features of the demonstration project delivery system.

Cost analysis for Hongcheon (H_1), Okgu (O_1) and Gunee (G_1) covers the same sample facilities in these

areas as our performance analysis. The number and types of facilities appear as in the following table 1.

These facilities serve different communities in the respective areas. The size of the communities varies as does that of the facilities. A Gun office is an administrative unit in the Gun in which no health services are usually performed. A Gun health center or CHC is distinguished by the presence of a physician and is usually better equipped with personnel and materials than the substructures. Each PHU/or PHP usually serves a myun and normally has two workers, a CHP and a CHA. The midwifery centers, normally staffed with one midwife and one CHA are located in smaller communities (villages) and have limited services.

The first round of cost analysis covers expenditures for all these types of health facilities during fiscal year 1978, the second year of actual implementation. The data obtained are regarded as baseline and will be used for comparision purposes during the project's life.

Cost analysis in the first round covers the period

Table 1. Number of Health Facilities by Area

Dec. 1978

Area	Type of Facility					
	HC	CHC	PHU	PHP	MC	Total
Gunee	1	3	5	-	8	17
Hongcheon	1	1	11	-	-	13
Okgu	1	5	7	13	-	26

Source: Korea Health Development Institute, Report of Maul-Geong-Gang-Saup, 1979

Note: The abbreviations are: HC; Health Center; CHC; Community Health Center, PHU; Primary Health Unit, PHP; Primary Health Post; MC; Midwifery Center,

from January to December 1978. Most of the cost dat was drawn from the financial statements of the Gun office administrative records. Some information was obtained by direct observation of the health center surroundings and by interview. The results of the performance analysis described in chapter II were us to allocate salaries to specific functions of the health facilities. In general, however, the results may be used as baseline information for comparison with data for 1979.

2. Objectives of the Study

The cost analysis aims to compare the cost -effectiveness of the existing government health center with the innovative integrated health delive system over time. It is hoped that the comprehensiv health care delivery system in the three demonstrati areas will result in low costs, both per unit of ser contact and per capita population. Cost of operatio includes working capital costs, cost of expendable items, maintenance, and salaries.

The present round of cost analysis seeks information on:

(1) The operating cost to the CHCDS as the provider of services;

(2) The cost borne by the consumers.

The operating cost of the project will be studies separately. It is the aim of this study to follow the evaluation plan drawn by the KDI external evaluation team so that many indicators required can be derived.

To be more specific, the present round of cost analysis in Hongcheon, Okgu, and Gunee seeks to derive indicators concerning costs to providers and consumers of services. Some important indicators and items of information include:

(1) the total operating cost in a fiscal year with a breakdown by type of service function, and by type of facility;

(2) the average cost to the Korean government per service contact with breakdown by functional type of service and by health delivery units;

(3) the per capita health expenditures of the Korean government in each of the areas per year by service function;

(4) the average cost borne by the patients seeking services at the demonstration framework.

3. Method of Study

This round of cost analysis covered the same sample facilities in three demonstration areas as our performance analysis. Data concerning the cost to the Korean government of operating these facilities was collected for the whole fiscal year 1978.

The analysis of the demonstration project was carried out by studying offical documents available at the KHDI headquarters, health centers, and Gun offices. The offical documents used to find the cost to the provider of services were registration records, reports, finacial statements, and purchase records. Additional information obtained by direct interviews with personnel who had worked in the same position for more than half a year was used to calculate the proportion of time spent on various activities. This proportion, in turn, was used to allocate salaries to various functions.

The expenditures incurred by the patients seeking health services in the areas were derived from the records at the centers, from the community health survey, and from direct interviews with patients.

The cost estimates by service function were derived by allocating the total expenditure for such items as buildings, equipment, maintenance and repairs, salaries and allowance, medical supplies, etc. Capital depreciation was also included. The health personnel's service time distribution, derived from performance analysis in the same areas, was used to allocate salary expense to various service function categories.

a) Data Collection

Data on cost was collected mainly from documents available at the health centers in the study areas. Forms were prepared and pretested in similar health centers. Data was obtained from 3 PHU's and health centers in Hongcheon, the three PHU's at Dogoan,

Moolgul and Yuckjunpyong. In Okgu, data was obtained from the HC, one CHC and two PHU's, namely Hwehyun CHC, Seosoo and Daegwang. In Gunee data was obtained from the HC, one CHC and two PHU's, Sobo CHC, Goro and Suksan. Data on expendable items was also collected from each of the centers under study. Salaries of all health personnel in the area were recorded. Building, vehicle and equipment data was also collected from documents and actual observation. Some documentary information was confirmed by direct interview.

Cost incurred by patients for one visit, classified by type of illness, was derived from the community health survey results and documents of revenue in each facility. All forms completed by the CHP or Health Center's statistician were checked for completeness by field supervisors and the KDI staff. If additional information was needed, enumerators were required to go back for information as soon as possible. Data collection was carried out during April 1979 by KDI evaluation staffs. Three enumerators from KDI interviewed patients on sample days and observed the performance of various

personnel. On the days not in the sample, all enumerators worked on offical documents at the various health delivery units. Their work was checked by supervisors at the end of each day. The data collected was coded and some tables were constructed manually, but most tables were processed by computer. All the forms completed were edited for possible errors.

4. Results of The Study

4-1. Provider Cost

The actual results were obtained by applying the method of cost accounting. As seen from the data in Table 2, the total annual health center health expenditures are about 175,467 thousand won for Hongcheon, 63.032 thousand won for Okgu, and 38,135 thousand won for Gunee. Further, by using information on the amount of service obtained from the earlier performance analysis, we obtained an allotment of the total annual health expenditures classified by the type of facility according to five different types of service function; curative, preventive, mother and child health

Table 2. Total Annual Health Expenditure and Percentage Distribution by Facility , and Service Functions

Unit: 1,ooo won : %

Study Area	Type of Function					Total
	Curative	Perventive	MCH	FP	Other	
Health Center						
Gunee	3,425(8.9)	2,903(7.6)	3,528(9.3)	1,532(4.0)	26,747(70.1)	38,135(100)
Hongcheon	31,471(17.9)	31,440(17.8)	28,878(16.6)	11,823(6.8)	71,855(40.9)	175,467(100)
Okgu	12,892(20.4)	3,548(5.6)	13,039(20.7)	3,193(5.0)	30,389(48.2)	63,032(100)
Mean($\bar{X}$: %)	(15.9)	(10.3)	(15.5)	(5.2)	(53.1)	(100)
Substructure						
Gunee Sobo-CHC	2,778(30.5)	496(5.4)	1,595(17.5)	870(9.6)	3.362(36.9)	9,109(100)
Goro-PHU	1,741(35.2)	435(8.8)	829(16.7)	319(6.4)	1,627(32.9)	4,951(100)
Suksan-PHP	633(24.2)	249(9.5)	369(14.1)	176(6.7)	1,189(45.5)	2,616(100)
Hongcheon Dogoan-PHU	1,850(30.2)	387(6.3)	897(14.6)	568(9.3)	2,432(39.6)	6,134(100)
Moolgul-PHU	1,779(35.9)	325(6.6)	538(10.9)	396(8.0)	1,913(38.6)	4,951(100)
Yeukjun Pyong-PHU	1,471(33.5)	292(6.6)	514(11.7)	258(5.9)	2,038(40.4)	4,395(100)
Okgu Hwehyun-CHC	7,673(34.0)	730(3.2)	3,658(16.2)	1,802(8.0)	8,729(38.6)	22,591(100)
Seosoo-PHU	1,669(31.4)	469(8.8)	870(16.4)	656(12.4)	1,646(30.9)	5,310(100)
Daegwang-PHU	1,489(34.0)	138(3.2)	471(10.8)	338(7.7)	1,938(44.3)	4,374(100)
Mean($\bar{X}$: %)	(32.5)	(6.4)	(14.3)	(8.2)	(38.6)	(100)

Source: Gunee, Hongcheon, and Okgu Guns, Financial Statements, 1978

care (MCH), family planning (FP), and other activities.

Table 2 also gives the percentage distribution of the expenditures for each study area to different service types. In the substructure, there is a strong contrast between the 32.5% of total annual expenditure which went to curative services and the mere 6.4% which went to provide preventive health care service. In the health center, the major portion (53.1%) of the total expenditure was spent on providing other health -related services and on administration; only 15.9% was used for curative service. The same percentage of the total expenditure for Hongcheon Health Center went to the three major service functions MCH, curative and preventive. By and large, it can be concluded that all the substructures paid much less attention to prevention than to the other three functions.

In Table 3, the percentages of annual expenditures for each study area are tabulated by category of expenditure: capital, maintenance, expendable items and salaries. Both the health center and the substructure in Gunee spend the largest portion of their expenditures (about 84.5% and 78%) on salaries.

Table 3. Total Annual Health Expenditure and Percentage Distribution by Category of Expenditure

Unit: 1,000 won: %

Study Area	Category of Expenditure					
	Capital (%)	Maintenance(%)	Salary (%)	Expendable Items		Total (%)
				Medical	Administrative(%)	
Health Center						
Gunee	2,205(5.8)	475(1.3)	32,238(84.5)	2,181(5.7)	1.036(2.7)	38,135(100)
Hongcheon	54,821(31.3)	739(0.4)	88,079(50.2)	23,578(13.4)	8,250(4.7)	175,467(100)
Okgu	5,356(8.5)	156(0.2)	37,349(59.2)	9,130(14.5)	11,071(17.6)	63,062(100)
Mean($\bar{X}$: %)	(15.2)	(0.6)	(64.6)	(11.2)	(8.3)	(100)
Sub-Structure						
Gunee Sobo-CHC	646(7.1)	22(0.2)	7,205(79.2)	1,194(13.1)	34(0.4)	9,101(100)
Goro-PHU	583(11.8)	22(0.4)	3,004(60.7)	1,322(26.7)	20(0.4)	4,951(100)
Suksan-PHP	139(0.2)	5(0.2)	2,380(91.0)	80(3.0)	12(0.5)	2,616(100)
Hongcheon Dogoan-PHU	264(4.3)	28(0.5)	3,956(64.5)	1,486(24.2)	400(6.5)	6,134(100)
Moolgul-PHU	264(5.3)	22(0.5)	2,912(58.8)	1,367(27.6)	386(7.8)	4,951(100)
Yeukjunpyong -PHU	264(6.0)	23(2.5)	2,912(66.3)	810(18.4)	386(8.8)	4,395(100)
Okgu Hwehyun-CHC	452(2.0)	91(0.4)	14,501(64.2)	6,481(28.7)	1,066(4.7)	22,591(100)
Seosoo-PHU	276(5.1)	621(11.7)	2,659(50.5)	1,555(29.3)	199(3.7)	5,310(100)
Daegwang-PHU	276(6.3)	23(0.5)	2,659(60.8)	1,292(29.5)	124(2.8)	4,374(100)
Mean($\bar{X}$: %)	(5.3)	(1.9)	(66.2)	(22.3)	(4.0)	

Source: Gunee, Hongcheon, and Okgu Guns, Financial Statements, 1978

But the average expenditure on salaries in the health centers is 64.6% and 66.2% in the substructures. All study areas spend the least on maintenance.

Given such heavy expenditures on staff salary, it is questionable whether health personnel have been properly and appropriately utilized. Such a conclusion can be drawn in respect to their probable efficiency, as well as the effectiveness of their jobs.

The expenditure for a specific unit of service (called the "service contact") can provide useful information for an assessment of the "relative effectiveness" of health centers or health delivery infrastructures.

The total annual number of service contacts estimated from our analysis can then be allocated to the five service functions by health centers and types of facility. The average expenditure per service contact for each type of service function can then be obtained by dividing the total annual health expenditure by function of each facility by the total number of annual service contacts by each facility for that

particular service.

There are two different ways of looking at personnel salaries in total health expenditures:

Method 1: The total personnel salaries are alloted to the five service functions in proportion to the actual time used for each service function,

Method 2: The total personnel salaries are alloted to all activities, namely the five service function activities, as well as idle time, office work, social administration and travelling activities in proportion to the actual time spent on each of them.

Table 4-1 shows the average expenditure per service contact as calculated by methods 1 and 2. It can be seen that the average expenditure per service contact for the health center and the substructure are 3.47 thousand won, and 1.14 thousand won, respectively. Hongcheon Health Center has the highest average expenditure per service contact among the three health centers in providing mother and child health care, preventive and other types of medical care, while Gunee has the smallest average for all four service functions.

Table 4-1. Average Expenditure Per Service Contact by Service Function Using Methods 1 and 2.

Unit: 1,000 won

Study Area	Type of Function				
	Curative	Preventive	MCH	FP	Total 2/
Health Center 1/					
Gunee	0.60(0.45)	4.27(2.26)	0.60(0.45)	1.87(1.06)	1.96
Hongcheon	5.94(4.37)	4.58(3.74)	3.33(3.17)	4.43(3.69)	6.12
Okgu	1.53(1.23)	3.10(1.99)	1.05(0.99)	2.50(1.70)	2.32
Mean($\bar{X}$)	2.69(2.01)	3.98(2.66)	1.66(1.54)	2.93(2.15)	3.47
Substructure					
Gunee Sobo-CHC	0.83(0.62)	1.05(0.77)	0.44(0.35)	1.45(1.03)	0.86
Goro-PHU	0.50(0.41)	1.42(1.01)	0.36(0.32)	1.33(0.95)	0.65
Suksan-PHP	1.03(0.73)	1.04(0.74)	0.36(0.18)	1.60(1.12)	0.74
Hongcheon Dogoan-PHU	0.35(0.28)	2.82(1.61)	0.46(0.34)	0.87(0.56)	0.57
Moolgul-PHU	0.54(0.46)	4.34(2.44)	0.93(0.66)	1.10(0.75)	0.88
Yeukjunpyong-PHU	0.43(0.34)	2.07(1.21)	0.53(0.39)	3.15(1.76)	0.70
Okgu Hwehyun-CHC	2.15(1.52)	2.89(1.90)	1.03(0.92)	2.81(1.87)	2.18
Seosoo-PHU	0.69(0.58)	0.64(0.55)	0.62(0.54)	1.02(0.78)	0.84
Daegwang-PHU	1.92(1.61)	- -	3.03(2.30)	- -	2.83
Mean(X)	0.94(0.73)	2.03(1.28)	0.86(0.67)	1.67(1.10)	1.14

Note: 1) The figures in first column were calculated by method 1 and the figures in parentheses were calculated by method 2.

2) Total column was calculated by method 2.

Okgu, the health center which is the leader in preventive care expenditure, registered a very high expenditure of 3.98 thousand won per contact. Using method 2 gives results very similar to method 1. The main difference is in the total cost terms used. In the following table the total cost for each service function consists of capital cost, maintenance, and expendable items (which are the same as in method 1), but the personnel salaries are calculated by method 2.

Table 4-2 shows the relative effectiveness ratio of health personnel 12/ for the five service functions of each facility. The relative effectiveness ratios give some indication of how far the system is from being acceptable. The degree of acceptability depends on the management's point of view. However, if a health center devotes all of his working time to providing only direct services, the theoretical ratio of method 2/ method 1 is equal to 1. But this does not in any way indicate that the system is perfect since a fully effective system holds no guarantee that it will also

12/ Defined to be ratio of

$$E_F = \frac{\text{average expenditure per service contact by method}}{\text{average expenditure per service contact by methon}}$$

Table 4-2. Ratio of Average Expenditure per Service Contact by Service Function Between Methods 1 and 2.

Unit: %

Study Area	Ratio of Average Expenditure per Service Contact (method 2/method 1)				
	Curative	Preventive	MCH	FP	Total
Health Center					
Gunee	0.75	0.53	0.75	0.75	0.65
Hongcheon	0.74	0.82	0.95	0.83	0.84
Okgu	0.80	0.64	0.94	0.68	0.77
Substructure					
Gunee Sobo-CHC	0.75	0.73	0.80	0.71	0.75
Goro-PHU	0.82	0.71	0.89	0.71	0.78
Suksan-PHP	0.71	0.71	0.50	0.70	0.66
Hongcheon Dogoan-PHU	0.80	0.57	0.74	0.64	0.69
Moolgul-PHU	0.85	0.56	0.71	0.68	0.70
Yeukjunpyong-PHU	0.79	0.58	0.74	0.56	0.67
Okgu Hwehyun-CHC	0.70	0.66	0.89	0.67	0.73
Seosoo-PHU	0.84	0.86	0.87	0.76	0.83
Daegwang-PHU	0.84	-	0.76	-	0.80

Note: 1) Effectiveness ratio can be defined by:
E_F = average expenditure per service contact by method 2/average expenditure per service contact by method 1.

2) The total figure (last column) signifies the average mean for the four direct services.

be efficient. Since an idealistic ratio is equal to 1, it appears that there may be more opportunities to improve the effectiveness of the health workers in providing family planning and preventive services, but few in curative service.

The ratios of effectiveness by types of facilities, the HCs, CHCs, PHUs, and PHPs for each service function can be seen in Tables 4-1 and 4-2.

Table 5 shows the proportion of total expenditures used in providing three types of services for each gun: direct services, indirect services, and unproductive activities. Based on a performance analysis of a particular center in each gun, the direct service time is defined as the total time taken by each center to perform the four service function, 13/ the indirect service time comprises the total time consumed in office work, social and administrative work, and travel. Unproductive time is time spent idle.

13/ The curative, preventive, mother and child health care, and family planning services.

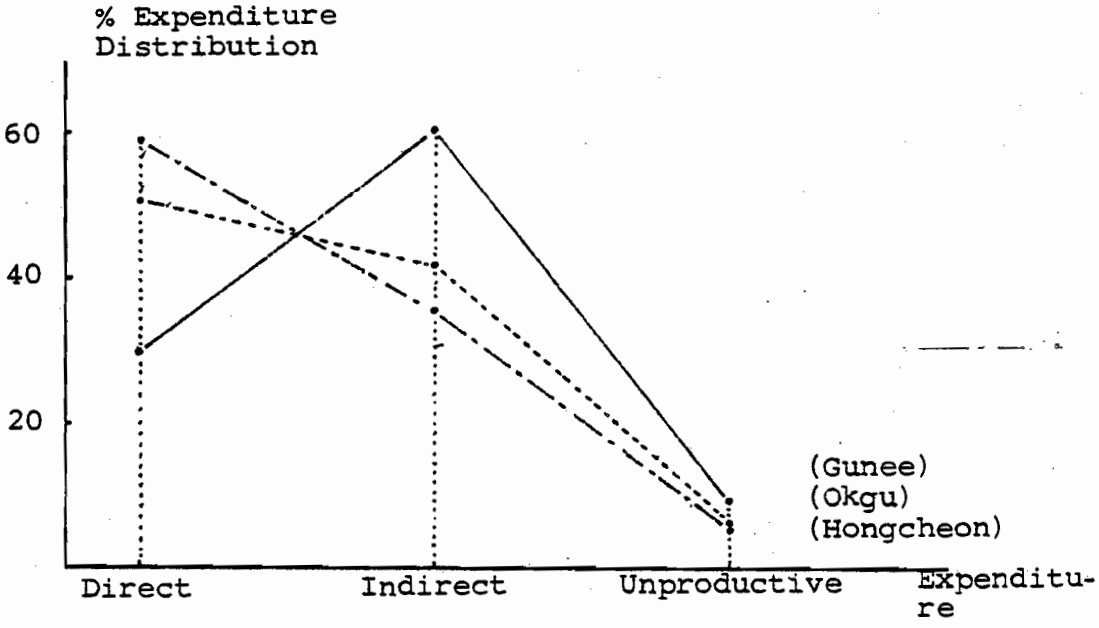
Table 5. Percentage Distribution of Expenditure by Service Activity and Study Area.

Unit: %

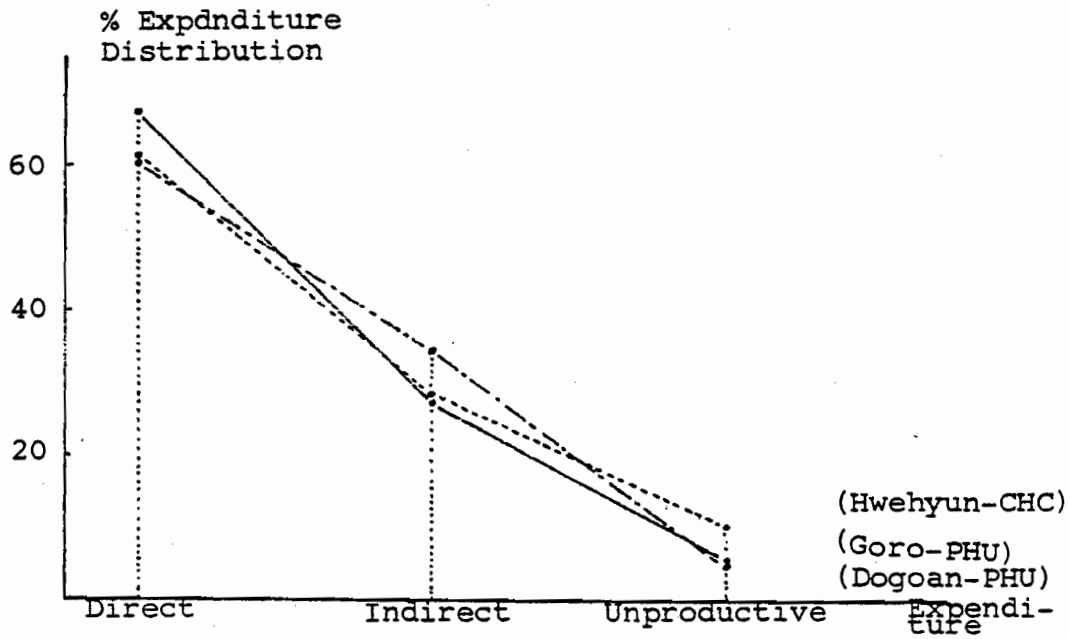
Study Area	Service Activity			
	Direct	Indirect	Unproductive	Total
Health Center				
Gunee	29.8	60.6	9.6	100
Hongcheon	59.1	35.4	5.5	100
Okgu	51.8	41.9	6.3	100
Substructure				
Gunee Sobo-CHC	61.3	26.4	10.5	100
Goro-PHU	67.2	27.4	5.4	100
Suksan-PHP	54.6	36.8	8.6	100
Hongcheon Dogoan-PHU	60.4	34.6	5.0	100
Moolgul-PHU	61.4	32.1	6.5	100
Yeukjunpyong-PHU	57.7	35.3	7.0	100
Okgu Hwehyun-CHC	61.4	28.4	10.2	100
Seosoo-PHU	69.0	26.8	4.2	100
Daegwang-PHU	55.7	39.3	5.0	100

Figure 4. Health Facility Expenditure Profile
(% Expenditure Distribution)

A. Health Center



B. Substructure



* Campare with Figure 3 in Chapter III.

The percentage of time spent on each of the three service groupings in each facility was applied to determine total expenditures for that center by category. The total expenditure for each of the service groupings tabulated in Table 5 for a particular area was then found by summing the statements of all centers in that area. The numerical results from table 5 indicate that the greatest portion of expenditure was on direct services and the smallest portion on unproductive activities. This agrees with the ideal model in which the largest expenditure is made for direct services, followed by indirect services and unproductive activity.

Table 6 gives the per capita annual average expenditure in each study area. The numbers were computed by dividing the total expenditure for each service function in a study area by the total population in that area. 14/

14/ The figures for per capita family planning health expenditure were computed by dividing the total expenditure for the family planning service function by the total number of eligible women (aged 15-44) in the specific area.

In all study areas, the preventive service function accounts for the least per capita average expenditure. There are significant variations in the average expenditure for the same type of service function in the three different health centers and also between health centers and the substructure. Assuming the population is homogeneous in all areas, one should expect the variations to be small. If the per unit cost for providing the same type of service for each gun is significantly different, it would suggest there is a need for administrative improvement.

Table 6 also summarizes the annual average per capita cost and the coefficient of variation of expenditure for each service in the different facilities of the study area. The average figures for health centers are much higher than those for community health centers (CHC) and primary health units(PHU). In Hongcheon the health center had three times as high an average as the substructure. Expenditures for the CHC centers in Okgu and Gunee were also much higher than for the PHUs. A more detailed breakdown of the annual average expenditure per health center is also given in table 6.

Table 6. Annual Average Per Capita Expenditure and Coefficient of Variation by Service Function and Study Area.

Unit: 1,000 won

Study Area	Type of Function					
	Curative	Preventive	MCH	FP[1/]	Other	Total
Health Center						
Gunee	0.25	0.21	0.26	0.54	1.95	2.78
Hongcheon	1.02	1.00	0.92	1.56	2.29	5.61
Okgu	0.79	0.24	0.80	0.90	1.86	3.88
Mean($\bar{X}$)	0.68	0.47	0.66	1.00	2.03	4.09
C. V.	0.45	0.78	0.42	0.42	0.09	0.28
Substructure						
Gunee Sobo-CHC	0.61	0.11	0.35	1.04	0.73	1.99
Goro-PHU	0.62	0.15	0.29	0.61	0.58	1.76
Suksan-PHP	0.25	0.09	0.15	0.37	0.48	1.04
Hongcheon Dogoan-PHU	0.33	0.07	0.16	0.54	0.43	1.09
Moolgul-PHU	0.58	0.11	0.18	0.64	0.62	1.62
Yeukjunpyong-PHU	0.54	0.11	0.19	0.49	0.68	1.61
Okgu Hwehyun-CHC	0.83	0.08	0.39	0.94	0.94	2.44
Seosoo-PHU	0.51	0.14	0.27	0.91	0.50	1.62
Daegwang-PHU	0.37	0.03	0.12	0.37	0.48	1.08
Mean($\bar{X}$)	0.51	0.10	0.23	0.66	0.60	1.58
C. V.	0.32	0.03	0.39	0.35	0.25	0.27

Note: 1/ These figures were computed by dividing the total expenditure for family planning service by the total number of eligible women(aged 15-44) in the area.

Table 7. Annual Health Expenditure Per Capita by Category of Expenditure

Unit: 1,000 won

Study Area	Category of Expenditure					
				Expendable		
	Capital	Maintenance	Salary	Medical	Administrative	Total
Health Center						
Gunee	0.161	0.035	2.354	0.155	0.076	2.786
Hongcheon	1.753	0.024	2.816	0.754	0.264	5.610
Okgu	0.329	0.009	2.296	0.561	0.681	3.877
Mean($\bar{X}$)	0.747	0.022	2.488	0.490	0.340	4.091
C. V.	0.951	0.48	0.09	0.50	0.743	0.28
Gunee Sobo-CHC	0.141	0.005	1.574	0.261	0.007	1.988
Goro-PHU	0.207	0.008	1.065	0.469	0.007	1.755
Suksan-PHP	0.055	0.002	0.941	0.032	0.005	1.035
Hongcheon Dogoan-PHU	0.047	0.005	0.707	0.266	0.072	1.097
Moolgul-PHU	0.086	0.007	0.952	0.447	0.126	1.619
Yeukjunpyong-PHU	0.097	0.008	1.069	0.297	0.142	1.613
Okgu Hwehyun-CHC	0.049	0.010	1.566	0.699	0.115	2.439
Seosoo-PHU	0.084	0.009	0.813	0.476	0.061	1.624
Daegwang-PHU	0.068	0.006	0.659	0.320	0.031	1.084
Mean($\bar{X}$)	0.092	0.005	1.038	0.363	0.062	1.583
C. V.	0.53	0.38	0.30	0.48	0.82	0.27

Table 7 shows the per capita annual health expenditure and the percentage distribution for each category of expenditure. The results (see last column) shown in this table are the same as those given in table 6, differing only in the manner of presentation. 15/

4-2. Patient Costs

Patient costs may be divided into travelling and medical expenses. Travelling expenses depend upon the distance the patient travels. Most of the patients came to the health care facilities by bus or on foot. The travel cost to the substructure health facilities in each gun is the lowest, since most of the patients can walk to the centers. The round-trip expense varied from an average 100 won for a patient

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15/ The average cost per capita at the substructure level of the KHDI Project is $3.25(1,583 won), or much higher than that of the Lampang Health Project ($0.56 to $1.50) directed in THAILAND. However, these projects can not be compared since the health delivery units in Lampang received much less financing than the KHDI Project.
See Lampang Project Evaluation Progress Report #1. Lampang Provincial Health Office, 1978

living nearby to nearly 200 won for one living in a mor remote district. The patients from nearby villages and myons are not required to travel to the health centers in a Eup unless some kind of special treatment is needed. Only 15% of the patients interviewed said that they paid for travel to the health delivery units. Consequently, it appears that medical expenses comprised a great portion of the total cost to the patient. Table 8 shows the degree of financial self-sufficiency and a comparision of medical care unit costs according to source of care. Although these results are based on the limited information available thus far, it is apparent that the costs in the demonstration area are lower, and that the degree of relative financial self-sufficiency in the substructure is somewhat higher than in the health centers; 25.4% for PHUs, 18.3% for CHCs and 17.6% for health centers.

Table 8. Financial Self-Sufficiency and the Comparision of Medical Care Unit Costs.

Unit: 1,000 won

Area	Total Provider Cost (A)	Total Patient Cost(B)	Self -Sufficiency B/A(%)	Patient Per Visit Cost [5]
Private Practitioner[1]				
Seoul Area	-	-	-	3,902
Middle Size City	-	-	-	3,409
Rural Area	-	-	-	1,800
Insurance	-	-	-	2,875-3111
Public Sector				
Demonstration Area Health Center[2]	63,032	11,090	17.6	1,062
Substructure				
CHC[3]	15,846	2,900	18,3	596
PHU[4]	5,130	1,305	25.4	391

Note: 1/ Results from survey carried out by KPC in 1978
2/ Represents the figures in Okgu Health Center including Daeya CHC
3/ Represents the average figure of Sobo in Gunee and Hwehyun in Okgu CHCS.
4/ Represents the average figure of Goro in Gunee and Seosoo in Okgu PHUS.
5/ Unit: Won

5. Tests of Equality Between Health Centers and Substructure.

5-1. Comparison of Costs

Since health delivery administration is very much the same in the various health delivery units, it is possible and meaningful to apply the previously discussed cost measures to compare the relative efficiency of the different health delivery units(scales).

First, let us assume the distribution of all cost measures for two different scales(units) 16/ is normal. Given this assumption, We then can test the equality of variances of each cost measure for the two different scales. Once the null hypothesis of equality of variances is accepted, the next step is to test the equality of means for the corresponding cost measure between the health center and the substructure. 17/

16/ They are health center and the substructure.

17/ See for examples, Hogg, R.V., and Craig, A.T., Introduction to mathematical Statistics, 2nd ed., John Wiley, 1965, pp.294-298; and Mood, A.M., and Graybil, F.A., Introduction to the Theory of Statistics, 2nd ed., McGraw-Hill, 1963, pp.301-308.

Table 9. Means and Variances of Costs Per Capita

Cost Measure	Health Center (Y)		Substructure	
	Mean	Variance	Mean	Variance
Capital	0.747	0.951	0.092	0.530
Expendable (medical)	0.490	0.500	0.363	0.480
Salary	2.488	0.090	1.038	0.300
Maintenance	0.022	0.480	0.005	0.380
Other	0.340	0.743	0.062	0.820
Total	4.091	0.280	1.583	0.270

Source: From table 7.

Note: The Substructure is comprised of both community health centers (CHC) and primary health units (PHU).

In the first part of this section, tests of equality of variances and means for the cost measures are presented. In the second part, some uncontrollable factors that have a significant impact on costs are identified, and tests of equality between two sets of regression coefficients in two linear models are made. Following this, the summary and conclusions are briefly presented. The means and variances for the five cost measures, and for the two delivery units(scales) are presented in Table 9. The test statistic for the equality of variances is

$$F = \frac{\sum_{i=1}^{n} (X_i - \bar{X})^2/(n - 1)}{\sum_{j=1}^{m} (Y_j - \bar{Y})^2/(m - 1)}$$

which has an F distribution with (n-1) and (m-1) degrees of freedom. In the present study n=27 and m=3. The calculated F is 0.557 for capital costs per capita, 3,333 for salary per capita, 0.960

for expendable costs per capita, 0.791 for maintenance costs per capita, and 1,103 for other costs per capita. None of these is statistically significant at the 5% level. The null hypothesis of the equality of variances between the substructure and health center order each of the five cost measures therefore cannot be rejected.

Once the hypothesis of equality of variances is accepted, one can proceed to test the equality of the means for each cost measure.

The appropriate test statistic is given by

$$t = \frac{(\bar{X} - \bar{Y})\sqrt{nm/(n+m)}}{\sqrt{\left[\sum_{i=1}^{n}(X_i - \bar{X})^2 + \sum_{j=1}^{m}(Y_j - \bar{Y})^2\right]/(n+m-2)}}$$

which has a t distribution with (n-m-2) degrees of freedom. The computed t for net capital costs per capita is 38.8, 13.5 for expendable costs per capita, 128.8 for salary per capita, 67.5 for maintenance costs per capita, and 44.8 for other costs per capita. All of these are significant at the 1% level.

From the foregoing tests it can be observed that CHCs and PHUs, on average, have significantly lower net capital costs per capita, expendable costs per capita, salary costs per capita, maintenance costs per capita, and other costs per capita.

There are several possible explanations for the lower administrative costs incurred by the CHCs and PHUs. One possible explanation could be the different practices that exist between CHCs or PHUs and HCs in delivering health care. In all probability, the substructures hire fewer experienced employees as health workers and administrators. The next step in examining comparative administrative costs between CHCs or PHUs and HCs is to classify all possible pertinent factors into two categories: those factors that good management can control and those it cannot. Even if the CHCs or PHUs had lower administrative costs than the HCs, as discussed previously, it remains unclear whether the former are relatively more efficient. In order to determine their relative efficiency, it is necessary to investigate whether the CHCs or PHUs and HCs faced an

identical environments in 1978.

5-2. Identification of Uncontrollable Factors and Tests of Equality Between Two Sets of Coefficients.

From available, comparable, and consistent data, 10 uncontrollable variables(factors) were collected. These include: the annual number of curative services performed per capita; the annual number of preventive services per capita; the annual number of MCH services per capita; the annual number of FP services per capita; the annual number of other services per capita; the total number of health personnel; the net productive hours per man-year; the total cost per patient; the total target population; and the annual number of referral cases.

Initially, each cost measure was regressed on all variables. One set of regression equations was in linear form and in logarithmic linear from. Then those variables which either were significant at the 10% level, or accounted for at least 1% of the total variations in the regression were selected and run in logarithmic linear form.

The dummy variable approach[18] was tried in order to test the difference between the health centers and the substructure, but the results were no different from those obtained from the Chow test. [19] In the latter test, two separate regression equations were run for each cost measure: one for the substructure alone and the other for both the health centers and the substructure. Only the results from the latter test are reported in this section.

18/ GUJARATI, D. "Use of Dummy Variables in Testing for Equality Between Sets of Coefficients in Two Linear Regressions" The American Statistician, Feb., 1970, pp.50-52

19/ See, for examples, Chow, G.C., "Tests of Equality Between Sets of Coefficients in Two Linear Regressions, "Econometrica, Vol.28, 1960, pp.591-605; Fisher, F.M., "Tests of Equality Between Sets of Coefficients in Two Linear Regressions: An Expository Note, "Econometrica, Vol.38, 1970, pp.361-366, and Johnston, J., Economic Methods, 2nd ed., McGraw-Hill, 1972, pp.206-207.

Definition of Variables

Variable	Definition
CCPC	Capital Costs Per Capita
EMCC	Expendable(medical) Costs Per Capita
SCPC	Salary Costs Per Capita
MOPC	Maintenance Costs and Other Costs Per Capita
TCPC	Total Costs Per Capita
ACSP	Annual Number of Curative Services Per Capita
APSP	Annual Number of Preventive Services Per Capita
AMSP	Annual Number of Mother and Child Health Care Services Per Capita
AFSP	Annual Number of Family Planning Health Care Services Per Capita
AOSP	Annual Number of Other Services Per Capita
TNPP	Total Number of Health Personnel
PHPY	Net Productive Hours Per Man-Year
TBPP	Total Patient Costs Per Patient
TTPN	Total Target Population
ANRC	Annual Number of Referral Cases

a) Net Capital Cost Per Capita

The regression results for the substructure alone are summarized in the second column of Table 10, while those for the substructure and the health center combined are in the first column. All factors in the final run are significant at the 5% level or better, and in both cases more than 70% of the total variations in the regressions are explained.
The required test statistic of equality between two sets of coefficients is given by

$$F = \frac{(SSE_2 - SSE_1)/m}{SSE_1/(n - k)}$$

Where SSE_1 is the residual sum of squares from the regression for the substructure alone, SSE_2 is the residual sum of squares for the substructure and health center combined, n is the number of observations for the substructure, m is the additional number of observations of the health center, and k is the number of parameters to be estimated.

Table 10. Net Capital Cost Per Capita

Independent Variables	Substructure Combined With HC(A)			Substructure (B)		
	Regression Coefficient	t	R^2	Regression Coefficient	t	R^2
C	3.168	2.149	0.85	2.373	1.476	0.69
ACSP	0.390	4.863		0.345	4.457	
APSP	0.731	4.594		0.643	4.081	
TNPP	1.688	7.413		1.409	5.212	
PHPY	-2.124	-4.486		-1.196	-1.661	
TBPP	-0.290	-1.881		-0.175	-0.992	
TTPN	-0.420	-2.356		-0.420	-2.392	
ANBE	-0.144	-1.581		-0.107	-1.070	

Note: sample size; A = 30, B = 27.

The calculated F is 2.088 which is not significant at the 5% level. 20/

The result indicates that the substructure and the health center face the same set of uncontrollable factors in regard to capital cost related activity; there was no shift in parameters.

All regression coefficients have expected signs, and from Table 10 two variables have particularly important economic implications. These are the net productive hours per man-year and the total target population. The health delivery unit in general and Medicare administration in particular are labor intensive. The scale of production can be measured in terms of either inputs or outputs. In the present case, the scale of production is measured by total target population and the net productive hours per man-year.

20/ At the 5 percent significance level, F=2.98 for 3,25 degrees of freedom. At this level of significance, the computed value of F (2,088) does not exceed 2.98. Therefore, We can accept the hypothesis that the regressions(A) and (B) are similar.

The regression coefficients of both variables for the substructure and for the substructure and the health center combined are both negative and statistically significant. This is a clear indication of the economies of scale experienced by both the substructure and the health center.

b) Expendable Cost Per Capita

The regression results for the expendable cost per capita are presented in Table 11. Except for the total target population in equation B, 21/ all other regression coefficients have expected signs. For the substructure alone, most of the variables are significant at the 5% level or better, except the total target population,while for both the substructure and the health center combined all variables are significant. However, the inclusion of the health center reduces the R^2 from 0.99 to 0.91.

21/ This variable in equation B is not statistically significant i. e., t=0.613.

Table 11. Expendable Item Cost Per Capita

Independent Variables	Substructure Combined With HC(A)			Substructure		
	b	t	R^2	b	t	R^2
C	-0.599	-0.334	0.91	-1.479	-2.882	0.99
ACSP	0.605	7.487		0.381	12.912	
APSP	0.650	4.420		0.0260	0.398	
AMSP	0.357	1.752		2.627	14.333	
AFSP	0.522	3.889		1.059	18.024	
AOSP	0.271	1.966		2.232	15.582	
TNPP	1.234	5.505		0.429	3.911	
PHPY	-1.991	-4.638		1.351	4.967	
TBPP	0.792	4.542		1.529	20.088	
TTPN	-0.339	-1.859		0.0345	0.613	
ANRC	-0.126	-1.395		0.0245	0.864	

Note: Sample Size: A = 30, B = 27.

With regard to the test of equality between two sets of regression coefficients, F=98.86 was calculated. 22/

This implies that both the CHCs or PHUs and HCs faced a different environment in 1978. This, coupled with the significant lower expendable item costs per capita for the substructure, clearly indicates that the substructure is more efficient than the health center in the expendable-item-cost-related activity. 23/

c) Salary Cost Per Capita

All of the eight factors included in the regression are significant at the 5% level. Since service-related costs are not directly related to the total number of bills processed, it is appropriate to measure the scale of production in terms of labor inputs, i. e. the net productive hours per man-year.

22/ That is $F > F_a$, for 5% significant level, reject the hypothesis that the parameters A's and B's are the same for the two sets of observations.

23/ See Table 7 for real expendable item cost per capita.

Table 12. Salary Cost Per Capita

Independent Variables	Substructure Combined With HC (A)			Substructure Only (B)		
	b	t	R^2	b	t	R^2
C	-1.124	-2.252	0.95	-0.708	-1.721	0.94
ACSP	-0.674	-2.962		-0.108	-4.734	
APSP	0.159	3.666		0.457	0.954++	
AMSP	0.300	5.356		0.648	5.139	
AOSP	0.999	2.626		0.321	3.492	
PHPY	-0.230	-5.657		-0.118	-2.619	
TNPP	0.399	9.321		0.160	1.955	
TBPP	0.262	5.678		0.358	7.981	
TTPN	-0.673	-1.224		-0.642	-1.409	

Note: ++ is not statistically significant at t = 10% level.

The regression coefficient of this variable is negative and significant. This, again, is a clear indication of the existence of the economies of scale for both the substructure and health center in salary-cost-related activities. In addition, the eight factors together account for 94% of the total variations in the equation for the substructure and 95% of the total variations when the health centers were included.

In the substructure equation, the amount of curative service is significant, while the amount of preventive service is not significant. But when the health centers were added, the results were reversed. This is mainly because the substructures, on average, offer fewer preventive services and more curative services than the health centers. In the tests of equality for the two sets of regression coefficients, the computed F is 7.2195. 24/

24/ That is $F > F_a$, for 5% significance level, reject the hypothesis that the parameters A's and B's are the same for the two sets of observations.

Therefore, in salary-cost-related activities, not only are the average costs are significantly different, but the substructure and health center were faced with two different sets of uncontrollable environment variables in 1978.

d) Maintenance Costs and Other Costs Per Capita

From Table 13 it is clear that the tightness of the fit in terms of R^2 for the equation for maintenance costs and other costs is as good as that of the three other cost measures discussed thus far. However, as expected, an increase in the number of curative and preventive services provided will increase maintenance costs and other costs per capita. This is because these are a proxy variable for the size of a health care delivery unit, and the greater the curative and preventive service provided, the larger the maintenance costs and other costs per capita. The significant and negative regression coefficient of net productive hours per man-year in-

Table 13. Maintenance Costs and Other Costs Per Capita

Independent Variables	Substructure Combined With HCs (A)			Substructure (B)		
	b	t	R^2	b	t	R^2
C	-11.125	-4.768	0.80	-9.051	-5.309	0.94
ACSP	0.625	3.584		0.315	2.629	
APSP	1.044	3.060		0.467	1.650	
AMSP	-1.106	-2.240		0.370	0.456	
AFSP	-0.310	-1.015		0.165	0.573	
AOSP	-0.668	-1.956		-0.312	-0.492	
TNPP	-0.690	-1.549		-2.620	-5.682	
PHPY	2.182	2.084		-1.844	-1.486	
TBPP	1.557	3.584		1.782	4.891	
ANRC	0.541	2.395		0.226	1.677	

dicates that only the substructure enjoyed economies of scale in maintenance costs and other costs. To test for equality between the sets of coefficients the F was computed to be 21.54, which is significant at the 5% level. This implies that the health centers were less efficient in holding down maintenance costs and other costs.

In this section, five administrative cost measures were used to compare the relative efficiency of the substructure and health centers and to examine whether economies of scale exist for both types of health care delivery units. Applying standard statistical test procedures, it was found that during fiscal year 1978 the CHCs and PHUs had significantly lower net total costs per capita, particulary in salary-related-cost per capita, maintenance costs, and other costs per capita than did the health centers.

Furthermore, factors affecting various cost measures, but lying beyond the control of management were identified and tested to determine whether additional observations of the health centers would shift

the set of regression coefficients. It was found that a shift had occurred in all regression equations except the regression for net capital cost per capita. This implies that the substructure and health centers faced somewhat different uncontrollable environments, as would be expected. The combination of both findings indicates that the substructures were more efficient, or had lower costs, than the health centers. Although the conclusion is tentative by virtue of the fact that only data from one year was utilized in the study, it seems likely that the efficiency of different types of facilities may vary. Finally, it was found that both the substructures and health centers experienced economies of scale in health delivery administration, and that the substructure had lower capital costs, expendable item costs, and salary-related costs.

6. Summary

The total annual average cost per center, and the percentage distribution of expenditures by type

of service functions, by type of facilities, and by category of expenditures have been presented. The average cost per service contact and per resident are also computed. Thereafter a method of comparing the effectiveness of the utilization of the health personnel was proposed.

The following are the summarized results and observations of the present round of cost analysis.

1. In the substructure, 32.5% of total annual expenditures were on curative care services and a mere 6.4% went to providing preventive health care service. The major portion(i. e., 53.1%) of the total expenditures of health centers, was spent on providing other health-related services and administration, and only 15.9% was used on curative services. Thus, it can be concluded that all the substructures paid much less attention to preventive services than to other activities.
2. Both the health centers and substructures in the demonstration areas made their largest expendi-

tures (about 60% to 65%) for salaries.

3. The average expenditure per service contact for health centers was 3.47 thousand won, but for the substructures only 1.14 thousand won.
4. An performance analysis of the substructures, indicates that the major portion of their expenditures was made for direct services and the least portion on unproductive activities. This agrees with the ideal model in which the largest part of all expenditures go for providing direct services, followed by indirect services and unproductive activity, respectively.
5. The annual average per capita cost of the health centers was observed to be much higher (4,090 won) than those of the community health centers (2,220 won) and primary health units (1,580 won).
6. The results of the analysis of financial self-sufficiency and the comparison of medical care unit costs indicate that the costs in the demonstration area are lower and also that the degree of financial self-sufficiency in the substructures is somewhat

higher than in the health centers: 25.4% for PHUs, 18.3% for CHCs and 17.6% for health centers, respectively.

7. Applying the standard statistical test procedures, it was found that during fiscal year 1978 the CHCs and PHUs had significantly lower net total costs per capita, particularly in salary-related cost per capita, maintenance costs, and other costs per capita than the health centers.

   Furthermore, factors affecting various cost variables but beyond the control of management were identified and tested to determine whether additional observations of the health centers would shift the set of regression coefficients.

   In this analysis, the substructures and the health centers appeared to face different uncontrollable environments, as might be expected from the viewpoint of health care delivery administration.

   Both findings, when combined, seem to indicate that the substructures were more efficient or had lower costs than the health centers.

Although these conclusions are tentative, since data from only one year was utilized in the study, the analysis indicates that the efficiency of different types of facilities varies from case to case.

8. Finally, it was found that both the substructures and the health centers did experienced economies of scale in health care delivery administration and that the substructures had lower capital costs, expendable item costs, and salary-related costs.

Table 14. F-Statistics from Testing the Hypothesis of No Difference in the Set of Coefficients in the Two Linear Regressions

Dependent Variable	Calculated F
CCPC	2.0800
EMPC	98.8610
SCPC	7.2195
MOPC	21.5408
TCPC	4.1880

Note: Calculated value for F is based on the equation:

$$F = \frac{(SSE_2 - SSE_1)/m}{SSE_1/(n - k)}$$

Here, SSE_1 is the residual sum of squares from the regression for the substructure alone, SSE_2 is the residual sum of squares for the substructure and health center combined. If the Calculated Value of $F > F_a$, for the significance level a, reject the hypothesis that the parameters a's and b's are the same for the two sets of observations.

V. COST-EFFECTIVENESS

The number of patients receiving medical treatment and the effectiveness of this treatment in improving health have different implications.

The cost per unit of activity is a useful measure where the target population and treatment activities are homogeneous, as in immunization or screening campaigns. However, most target populations and treatment activities are heterogeneous, and thus cost-effectiveness should be used as a criterion for allocating health resources. Efficiency is a ratio concept between cost and related either to the unit of service or to the effectiveness

$$\text{Efficiency} = \frac{\text{Effectiveness}}{\text{Cost}}$$

Since effectiveness, in the health sense, has not been defined with sufficient mathematical precision to be used in efficiency formulae, choosing an appropriate

expression of effectiveness is the key definitional and measurement problem. We have selected average productivity as a proxy for effectiveness. This will permit the comparison of project efficiency ratios of different types of health facilities. In the course of our review we will discuss a series of properties that an ideal productivity index should possess.

In the case of multi-product firms such as the health centers, community health centers (CHCs), and primary health units (PHUs), not only are products not clearly distinguishable, but separate accounting data on costs, inputs, and outputs by product line are not obtainable. The absence of analytical and estimating techniques for this concept of medical service presents a serious problem to the evaluation of the demonstration project. In this section, the specification and estimation of a multiproduct (health service) cost index and a productivity index, will be introduced. These two indexes will then be used in the cost-effectiveness model to evaluate the KHDI demonstration projects. Before considering the framework for dealing with the

multiproduct character of the CHCDS, two basic indexes of productivity and cost must be defined which will allow the comparision of the performance of the health demonstration project over time.

1. The Cost Index.

We shall use the case-mix cost index and define it as a Paasche index number 25/

25/ Although it is possible to estimate the corresponding Laspeyres cost index,

$$C_i^{**} = \frac{\sum_{i=1}^{n} n_J \, c_{ij}}{\sum_{i=1}^{n} n_J \, c_J}$$

where n_J is the average number of cases of service j treated by all health centers in a year, it is likely that $C_i^* \geq C_i^{**}$. If the unit cost of producing a given service decreases as a higher proportion of the health center's caseload is concentrated on that type of service, or if health centers tend to produce relatively more of those types of services in which they enjoy a comparative advantage. When weighting individual case costs (c_{ij}) by the number of such cases in that health center (n_{ij}) will give greater weight than in Laspeyres index to the health center's relatively lower-cost cases. The Paasche index therefore probably measures the health center's performance more favorably than would a Laspeyres index.

$$C_1^* = \frac{\sum_{i=1}^{n} n_{ij}\, c_{ij}}{\sum_{i=1}^{n} n_{ij}\, c_J}$$

where C_i^* : Paasche cost index of health center i.

n_{ij} : Number of cases of service j treated per year in health center i.

c_{ij} : Average cost per case of service j in health center i

c_J : Average cost per case of service j in all health centers.

Cost index is thus an index number comparing the health center's costs for specific case type with the corresponding average costs, weighted by the composition of the service casemix. C_i^* can also be interpreted in terms of an underlying linear model of health center cost; this interpretation provides the basis for the estimation procedure described below. Using a single value to represent the cost of each service type implies that their average cost is constant, i. e., that the total cost function is a linear combination of the individual cost types.

Total cost in health center, $TC_i = \sum_{i=1}^{n} n_{ij}\, c_{ij}$.

2. The Productivity Index

A productivity index provides an additional way of assessing a health center's performance. Instead of examining the costs incurred by the health center to produce a particular output, we now consider the output which the health center produces with a given set of inputs. To simplify the discussion, we will disregard the crucial problem of aggregating the health center's heterogeneous mix of service cases and assume that there is a single-valued measure of output,

$$Y_{ij} = \sum_{i=1}^{n} \lambda_j\, n_{ij}$$

The λ_j's indicate the marginal social value of the individual service cases; society's marginal rate of substitution of cases of type j for cases of type k is

the ratio of λ_k to λ_j (i. e., $MRS_{jk} = \lambda_k / \lambda_j$). 26/

26/ We have to face the problem of aggregating the individual cases to obtain a suitable measure of output. In effect, we ask: what are the relative shadow prices (λ_j's) with which society should value the various types of services produced by a HC/or PHU? Although we may not be able to establish a set of shadow prices reflecting the relative desirability of an additional treated case of each service type, an alternative approach is possible. The relative value to society of the different services produced at health center i may be measured approximately by the relative marginal costs of these services in the health center system. Unfortunately we do not have information about the relative marginal costs of different services. We must go one step further and replace relative marginal costs with relative average costs; thus $\lambda_k / \lambda_j = c_k / c_j$. This cannot be justified by arguing that equilibrium conditions assure that relative average costs are the same as relative social values. Rather we assert as a plausible and useful assumption that society might value different services produced in a particular health center in proportion to the average costs of producing those services elsewhere in the health center system. Therefore, we may take $\lambda_j = c_j$ and, therefore, define output as

$$Y_{ij} = \sum_{i=1}^{n} \lambda_j n_{ij} = \sum_{i=1}^{n} c_j n_{ij}$$

This solution to the problem of output measurement is far from satisfactory but seems the best available.

The health center's production function may be expressed as:

$$Y_{ij} = F(X_{1j}, X_{2j}, \ldots X_{5j}, \varepsilon_{ij})$$

where Y_{ij}: output of service j per year in health center i.

X_{1j}: capital expenditure alloted to j type of service per year in health center i.

X_{2j}: maintenance expenditure alloted to j type of service per year in health center i.

X_{3j}: salary expenditure alloted to j type of service per year in health center i.

X_{4j}: expendable item cost alloted to j type of service per year in health center i.

X_{5j}: administrative and other cost alloted to j type of service per year in health center i.

ε_{ij}: random term indicating the output that each health center would obtain from given inputs will not be the same.

More specifically, at this point we shall assume a Cobb-Douglas production function:

$$Y_{ij} = A\left(\prod_r X_{jr}^{\alpha_r}\right) \varepsilon_{ij}$$

With no restriction on the sum of the α_j's, the parameters of the equation can be estimated by ordinary least squares if Y_{ij} and the X_{jr} are first transformed into logs. We measured a health center's productivity as the ratio of its actual output, Y_{ij}, to the output expected from a health center of "average" productivity using that set of inputs $\hat{Y}_{ij}$. Because we assume that the production function of all health centers have the same values for the α_j's, the measured productivity is equal to ε_{ij}.

Thus $$P^*_{ij} = \frac{Y_{ij}}{\hat{Y}_{ij}} = \hat{\varepsilon}_{ij}$$

The proposed measure of productivity should fit into an efficiency framework that relates the effectiveness of an activity to its cost.

The term project efficiency identifies whether the demonstrated comprehensive health care delivery system meets the efficiency criterion $E_e = \frac{P^*}{c^*}$,

Table 1. Efficiency Ratio ($E_e = P^*/c^*$) by type of Facility

Study Area	Type of Functions					
	Curative	Preventive	MCH	FP	Other	Total
Health Center	1.7020	0.6370	0.5147	1.2404	1.2241	1.0123
Substructure						
CHC	1.1381	2.4793	1.2453	0.8428	1.1226	1.1984
PHU	1.6733	1.6517	2.0800	1.4741	1.4344	1.6953

Note: Both the productivity and cost indexes were calculated based on the results of the table 2 in chapter III and tables 6 and 7 in chapter IV using the multiple regression method and Paasche cost index which were already discussed.

where E_e, P^*, and c^* are the rate of efficiency, the productivity index, and the cost index of services, respectively.

3. Results of Cost-effectiveness

Table 1 shows the efficiency ratio by type of facilities. It can be seen that the total efficiency ratio of the substructure is higher than that of the Health Center, 1.6953 to 1.0123, respectively. When the ratios of efficiency by types of service functions namely, curative, preventive, mother and child health care, family planning and the other health activities, are compared with the above table 1, they support the previous findings concerning trends in performance, cost accounting and the variance of cost analyses.

VI. ACCESSIBILITY AND ACCEPTABILITY

The determination of the rate of utilization of health services by a population is a difficult research task, because it usually requires collecting data from a sample of households in an area. By surveying a sample of the population, however, data can be collected, not only on the number and source of the health services that people receive, but also on the occurrence of untreated sickness among the population. In this section we would like to introduce the methodology and concepts which will be used to make the evaluation of the accessibility and acceptability of the KHDI demonstration project. We will also conduct an empirical study based on the data of the post baseline survey which will be conducted by the KHDI at the end of the project in 1980. After analyzing the post baseline survey data, we will compare the rate of utilization of substructures to that of health centers.

Accessibility refers to the actual availabi-

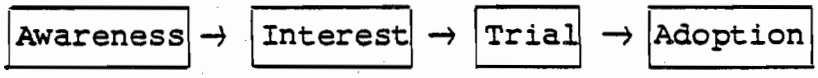
lity or presence of services in a given area, and the characteristics of those services which facilitate or obstruct utilization by consumers.

Accessibility comprises those factors which make it easy or difficult for consumers to secure the services they need.

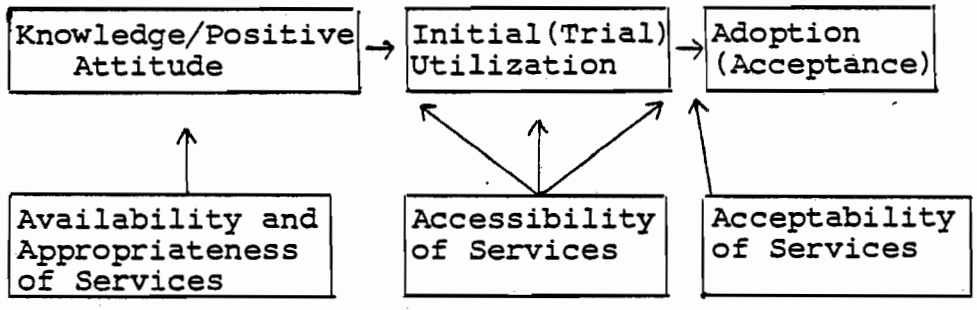
These factors include the presence (availability or non-availability) of at least one primary access point to health services within each village area, backed up by a referral system which sends patients to the appropriate level of service required. This will include all government and health post volunteer services. When all components of the health servies have been integrated in a given area, then services are considered "available".

Acceptance is a major behavioral end-point of the project effort which will largely be measured by the patterns of service utilization of consumers. However, acceptance could be viewed as the expected result of interaction between the members of the community and the health services system.

It is the final outcome in a chain of behavioral events which constitutes the community's response to the health service system. The consumer response follows the classical pattern of innovation diffusion:



This pattern of diffusion is modified slightly to encompass concepts of importance to the project. The modified diffusion sequence may be viewed as follows:



Given health services that are both available and appropriate, the potential consumer first becomes

aware of these services. Knowledge, then, is the stage when the potential consumer recognizes the availability of services, and positive attitude is the potential consumer's favorable subjective evaluation of the service alternatives.

The accessibility of services is a necessary element in the sequence of acceptance and is defined to be the presence or absence of factors which facilitate or deter utilization of the available health services.

The trial stage, or the period of initial utilization, is the point at which the first service interaction between the patient and the health care system occurs (a service interaction refers to the patient reception of any one of the integrated health services which are provided by government service personnel and community health volunteers). This,then, encompasses the initial utilization of services. It is also the strategic point in determining the probability of adoption, or continued utilization, of health services. If the effectiveness of the service

and the nature of personal interaction at the health service centers are viewed as satisfactory by the consumer during his trial contact, then the likelihood of further interactions is enhanced.

While accessibility is most directly measured by the initial utilization of services, acceptance is most directly measured by repeated utilization of services.

Acceptability of services will be explored through studies of (1) consumer satisfaction, (2) clinical services at sub-centers, (3) community coordinating committee activity, (4) medical and health centers with MDs/CHPs, and (5) volunteer services.

The objective of this analysis is to test the following major assumption of the model: "If the numbers, distribution and performance of health personnel are increased, then consumer accessibility to and acceptance of services will increase". This major assumption leads to two hypothesis:

Hypothesis A

Increasing the number and distribution of health care providers will increase consumer access to health services.

The project is expanding the reach of health services by training a large number of community health volunteers(VHAs) and deploying them in every village. These volunteers, together with retrained government health workers and newly trained community health practitioners(CHPs) are expected to strikingly increase consumer access to services. That is, by increasing the availability of health care providers, travel time and service costs should decrease resulting in the increased utilization of services.

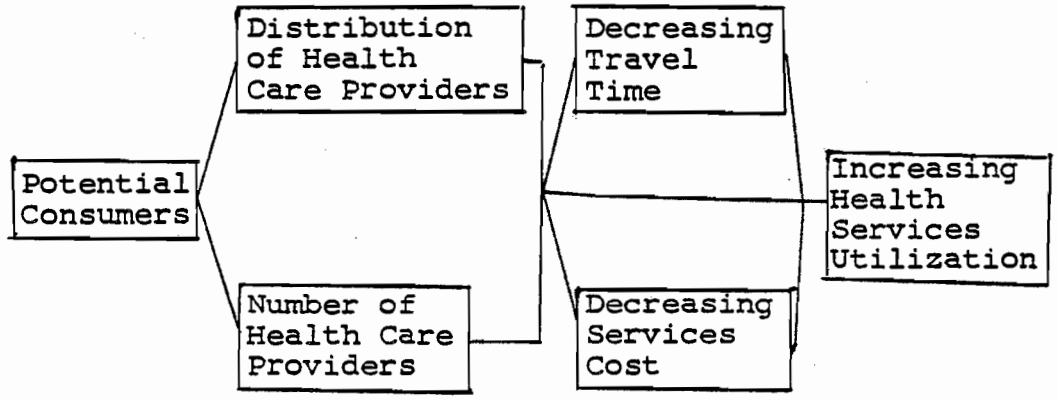
Hypothesis B

Increasing the acceptability of health services will increase consumer acceptance (of these services).

Increasing the number of health care providers to cover every Myun will make services more accessible

to rural consumers. But by recruiting and training villagers to become community health volunteers(VHAs), by retraining existing health workers, by offering new clinical service(through the CHPs and extended VHAs), and by seeking support from village leaders, the program hopes to better fill the needs of consumers than in the past. This increased satisfaction with services (acceptability) will lead to further and continued utilization of the available services (acceptance).

The analysis be carried out to test this hypothesis can be illustrated as follows:



These concepts are further defined as follows:

(1) Distribution of Health Care Providers = $\frac{\text{No. of Myuns with Government Health Care Provider}}{\text{Total No. of Myuns}}$

(2) Number of Health Care Providers = $\frac{\text{Target Population in an area}}{\text{No. of Health Care Providers in an Area (Volunteer + Health Personnel)}}$

(3) Accessibility Ratio = $\frac{\text{Target Population Receiving Service at Least once in a Given Year}}{\text{Total Target Population (in that area)}} \times 100$

(4) Acceptability Ratio = $\frac{\text{Target Population Receiving Service Repeatedly in a Given Year}}{\text{Total Target Population (in that area)}} \times 100$

or $\frac{\text{No. of Patients Expressing Satisfaction with Services Received}}{\text{No. of Patients Receiving Service}} \times 100$

Changes in these variables are compared between the demonstration and control areas and in the same area over time by cross tabulation of the significant variables:

Table 1. Accessibility and Acceptability Ratios

Variable \ Area/Time	Demonstration Area		Control Area	
	1977	1979	1977	1979
Distribution of Health Care Providers	0.5	0.9		0.7
Number of Health Care Providers	270	150		280
Accessibility Ratio	5	10		9
Acceptance Ratio	0.5	0.8		0.7

Note: The data on the table are hypothetical. The data for 1977 are based on the results of the baseline survey in 1977 which has been done by the KHDI and the data for 1979 will be based on the post KHDI baseline survey which will be done by KHDI in 1980.

All of the above tabulations of above analysis will be tested for significance to highlight the differences of achievement in the demonstration and control areas over time.

VII. FEASIBILITY OF REPLICATION

The recommended or demonstrated models should meet two tests for their feasibility of national replication. The first test of economic feasibility examines whether the total resource requirements for their replication are within the possible range of an extended effort for comprehensive health care by the government. The second test concerns the behavioral implications of the recommended and demonstrated models for a comprehensive health care delivery system. To be replicable, the services from these models should be acceptable to the community, and the responsible ministry should be willing to adopt the project recommendations into the national formal health sector plan. In assessing project replicability, economic feasibility is a necessary, but not sufficient condition, unless the socio-political requirements for feasibility are established and met.

a) Economic Feasibility

To estimate the resource requirements of replicating the recommended or demonstrated model on a national basis, the NHS/KDI evaluation team will first determine the number or sites where project replication would be possible. Following this, the time span required for gradual implementation of the demonstration models will be estimated using the guidelines presented in the Fifth Five-Year Economic Development Plan, 1982-1986.

The total resource requirement for the scheduled replication can easily be computed by multiplying the individual unit costs of relevant input elements by the numbers of units. Resource requirements should be estimated both in terms of fixed investment and recurring expenditures because of the difference in their financing mechanisms. Of recurring expenditures, those for training will only be allowed temporarily until the existing training and educational institutions plan the necessary curriculum changes, to institutionalize them, and train their graduates in the new curriculum.

In order to derive the net resource requirement which is the net investment requirement for national replication, the estimated value of existing under-utilized facilities within the public sector and the outstanding public and private expenditures on health care service should be deducted from total resource requirement. Thus, the difference between total resource requirement and deductions of the incurred expenditures and investment will determine the amount of additional government and private outlays for replication, subject to the condition of economic feasibility. In short, the net resource requirement for a given year over the period of national replication may be expressed as follows:

$$NRR_t = TRR_t - (GE_t + PE_t + VEF_t)$$

where NRR_t : Net resource requirement for year t,

TRR_t : Total resource requirement for year t,

VEF_t : Value of existing public investment facilities absorbed in year t,

GE_t : Government expenditures on health care in year t,

PE_t : Private expenditures on health care in year t.

To determine the economic feasibility of national replication, the annual net resource requirement will be compared with the increases in annual investment in the health sector over the period of the Fifth Five-Year Economic Development Plan. Should the net resource requirement prove to be less than the increases in planned investment, then national replication is undoubtably economically feasible. Otherwise, the magnitude of additional effort, which will be shouldered, primarily by the government sector and to a lesser degree by the private sector, should be assessed by examining the trade-off between the additional investment required and the extended availability and public use of health care services.

b) Socio-political Feasibility

Even when economically feasible, a comprehensive health care services program must be acce-

table to the community residents and be consistent with the public policy and development strategy of the government. To a certain extent, these considerations are implied in the preceeding analysis of economic feasibility. Without acceptance by the community residents and their active participation, the benefits of any program would be much reduced despite its economic feasibility. Consequently, given economic feasibility and community support, policy-makers would have little difficulty adopting the project recommendation at least in the short run. The important consideration in this context is the long-run ramifications of nationally replicating a lasting health care system.

In order to determine the project's socio-political feasibility, NHS/KDI will collaborate with KHDI in conducting regular surveys during the demonstration project period in order to obtain the data and information relevant to analyzing the following attitudinal changes:

(1) Whether or not the community residents accept the community health practitioner, community health aide, and village health agent as providers of health care services?

(2) Whether or not people are willing to utilize the facilities of the CHCDS and, if they are not, why?

Based on the survey findings, the level of acceptance by general public will be estimated as a measure of socio-political feasibility. At the same time, the progress and the findings of the KHDI project will continually be brought to the attention of high level governmemt officials during the remaining demonstration period to assist the formulation of follow-up policies, particularly in respect to national replication.

An analysis of replicability is a much more qualitative, subjective process. Nevertheless, it will derive supportive data from other parts of evaluation. One major assumption is: "If the project is highly effective then the feasibility of replication will be great". However, the importance of assessing the feasibility of replication is not necessarily to prove

a hypothesis. Rather, it is to clearly and persuasively demonstrate to government, professional, and political leaders that the features are compatible with government budget limitations (central or local) and bureaucratic methods. Similarly, it must be shown that the resulting achievements and benefits make replication in other areas of the country highly desirable.

Initially, the project will establish that the existing health care delivery system can indeed be modified to incorporate the key KHDI comprehensive features. This is accomplished by the completion of infrastructure reorganization, the training and deployment of various new categories of health care providers, and the stimulation of community participation.

Then, an analysis of the short-term system effects of CHCDS, discussed under analyses II and III, will demonstrate the unique achievements of the project. This analysis will also probe the cost-effectiveness of the project.

VIII. CONCLUSION

The KHDI project is now fully operational. Every effort is being made to assemble the information needed to modify and to strengthen the delivery system for replication throughout the nation. Since many of the questions surrounding the demonstration projects are ultimately empirical, a certain amount of experimentation is inevitable. The strategy of the first round evaluation, then, should stress flexibility, and should not prejudge the results. Therefore, the paper which we present here is not the final version of the external evaluation results, but simply an intermediate evaluation for discussion purposes only. The foregoing discussion outlined a procedure which will enable the NHS/KDI staff to systematically evaluate the demonstration project, leading ultimately to improved rural health care delivery. This is not an easy task: much of the hard data is not currently available, and it will take time to practically apply the theoretical framework. The objective warrants our earnest efforts. We contributing

to a national health policy, a policy that can be only as good as the data which it is based.

The important information obtained through the first round evaluation is:

1. the average monthly number of service contacts cagagorized by the health facility and by the service function,
2. the average service time spent per 1,000 target population catagorized by service function, by health personnel, and by health facility,
3. the variation pattern of time spent to perform one service catagorized by service, by health personnel and by health facility,
4. the proportion of time spent on various types of service functions (direct, indirect and unproductive),
5. the annual number of referred cases per 100 service cantracts catagorized by health facility,
6. the total operating cost in a given fiscal year catagorized by service function, and by health facility,
7. the average cost to the Korean government per service contact catagorized by service and by health facility,
8. the health expenditure of the Korean government per capita in each of the areas per year brokendown by service function,
9. the average cost borne by patients seeking services at the demonstration level.

The following are the summarized results and observations of the performance, cost, and cost -effectiveness studies.

a) Sufficient evidence exists to suggest that the ratio of direct service time to total personnel time is rather small at the health center level, but the ratio improves as the size of the facility decreases.

b) It can be seen that the PHUs are delivering curative services reasonably well, treating an average 15-20 patients per day. This seems to be an acceptable utilization rate for a population of this size. The average per capita annual contact rate between 0.6 and 1.5 is also acceptable, bearing in mind other sources of medical care such as herbalists, drug vendors and private parctitioners are available. Also, it must be noted that this is the result of the beginning stage of implementation.

c) Sufficient evidence also exists to suggest that the working pattern of various functions is quite different among demonstration areas. According to the results of field observations, the health facility activity profiles of the different areas are as follows: the ratio of direct service to the total health facility service ranges from about one-fifth in the health center level to almost two-thirds in the substructures.

d) Even though it is not possible to compute the ratio of service time performed in the field to the service time performed in the office with available data, personnel in the PHU spent a large portion of time working in the field, i. e., community health practitioners and community health aides consistently have larger average travel time

compared to their co-workers in the health center level.

e) In the substructures, there is a strong contrast between the 32.5% of total annual expenditures used to provide curative services and a mere 6.4% to provide preventive health care. The major portion (53.1%) of the total expenditures in the health centers was used to provide other health related activities and administration, and only 15.9% was used up in curative services. It can be concluded that the substructures paid much smaller attention to the preventive services than to other activities.

f) The largest portion of expenditures by both the health centers and the substructures (60% to 65%) is spent on salary.

g) It is seen that the average expenditure per service contact for the health centers is 3.47 thousand won, but a much lower, 1.14 thousand won for the substructures.

h) The annual average 4,090 won per capita cost of the health centers was observed to be much higher than the community health centers', 2,220 won average per capita cost, or the primary health units 1,580 won per capita cost. 26/

i) There is evidence that the degree of financial self-sufficiency in the substructures is higher than that of the health centers, i. e., 25.4% for PHU, 18.3% for CHC, and 17.6% for health centers,

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26/ Won (₩) is the unit of currency of the Republic of Korea (1978) US $ 1.00 = ₩485.

j) It is seen that the total efficiency ratio of the substructures is higher than that of health centers i. e., 1,6953 for the substructures and 1,0234 for health centers.

k) The combination of both performance and cost analysis indicates that the substructures are more efficient, or had lower cost per capita, than the health centers. Even if these conclusions are tentative, by virtue of the fact that only one year's data was utilized in this first round study, it indicates that the efficiency of different types of facilities (scales) may vary from one case to another. Finally, it was found that both the substructures and the health centers experienced economies of scale in health delivery administration.

To date, KHDI's progress in mobilizing community resources and developing community health practitioners for primary health care is very encouraging. However, there are three major tasks remaining: to inculcate in the general population the concepts of primary health care, to gain the support of national leaders for the organizational changes needed to bolster the primary health care effort, and to develop and to utilize the appropriate technology for primary health care. If these tasks are accomplished, rural people will be helped to help themselves. "If rural people are helped to help themselves.... a genuine development will be

insured."

An Effective national policy on primary health care for the underprivileged will involve a virtual revolution in the health service system. Fundamental changes in rural Korean health care will require similarly far-reaching changes in the organizational structure and the management practices of the health services. The entire health service must mobilized to strengthen and to assist the primary health workers, providing them with training, supervision, referral facilities, and logistic support including a simplified national health technology appropriate to their needs.

Assessing the feasibility of project replication will be based, in part, on analysis of coverage, performance, cost and other data gathered from all phases of the KHDI experience. The feasibility of replication will be determined by both financial and administrative factors based on both subjective and objective judgements. Part of the KHDI project external evaluation process is to gather both qualitative and quantitative data which can contribute to this decision-making process.

The evaluation will demonstrate the effectiveness, and will show the cost of modifying the health care system in other areas. Project evaluation results concerning salaries, system performance costs, and health behavior and health status impact have a direct bearing on further refinement of the ministry decisions. Much of the KHDI project experience will be incorporated into the ministry planning process to develope the ministry's expanded primary health care system. This cooperation together with the quantitative and qualitative results of the project, should have a significant influence on rural health care implementation.

From the beginning of project planning, we have emphasized the development of a low cost delivery system, since cost was assumed to be a major factor, influencing both the provision and the acceptance of services. It is assumed that improved cost effectiveness must be clearly demonstrated to convince government of the efficiency of comprehensive health delivery system. As a result, cost factors will be strongly emphasized, both in the project cost analysis study and in the other components.

However, a number of other factors importanct to the replication process have been indentified.

1. Efforts to remove legal restraints from new categories of community health practitioners (CHPs) and to provide salary incentive scales for them.

2. Ministry of Health and Social Affairs approval and adoption of the comprehensive health care system/health center infrastructure on a country-wide basis.

3. Establishment of health committees or forums for community participation in each local administrative level to facilitate community involvement.

4. Response to the KHDI project by both public and private providers. As yet no formal data collection concerning the response of public and private providers has been carried out.

5. Change in public and private expenditure on non-project health services overtime. Data on this item is not yet available.

6. Incorporation of the key features of the project in the next five year economic and social development plan.

Future Plan

In the period remaining to complete the evaluation, project staff must select only the data most relevant to the evaluation objectives, reduce the follow-up data to be collected, steamline data collection

methods, and reduce the follow-up sample size. Final data collection will begin in fiscal year 1980 and will be completed in the first half of that fiscal year. Coding and editing of the data by area will begin as the first sets of data become available, and will continue concurrently as data is collected in subsequent areas. Three to four months will be required to complete the data processing and the tabulations. This step is similar to that of the initial analysis but in an abbreviated form. Basic tabulations will available through the second quarter of fiscal year 1980, and should be completed for all studies by the third quarter of that year. Approximately one year would then remain for integrative analysis, interpretation, report writing and other documentation.

Activities related to the preparation of the analysis will be conducted concurrently with data collection, and will be completed in fiscal year 1980 when all data sets should be available for analysis. The interpretation of the results and the preparation of the final evaluation reports and other project

documentation will be completed during fiscal year 1980 to transfer the knowledge gained in the KHDI project experience.