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QUANTITATIVE TECHNIQUES FOR A HEALTH CARE DEVELOPMENT MODEL:

THE CASE OF REGENCY OF BOGOR
WEST JAVA, INDONESIA

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For Those Who Care

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PREFACE

Indonesia is a country of diversity. The country consist of thousands of islands separated by sea lanes. The land is comprised of many plains, hills, mountains, coast lines, forests, isolated rural areas, and metropolitan centers. The people of Indonesia have achieved various levels of development, ranging from the primitive life of the Papuans to the westernized elites in the national capital. Rich and poor live next to one other, each with their own set of problems. There is variation in type of employment or sources of livelihood as well. Most people are farmers, but there are those who earn their living from fishing, manufacturing, mining, forestry, petroleum, service, transportation, and also from the informal sector of the urban slums. Culturally, Indonesia ranges from the barren culture at the sites of the new development project in Central Kalimantan to the highly cultured Bali or Jogyakarta. They are all Indonesia, but they are not the same.

National health policy had considered the health problems of Indonesia as one aggregate for a long time. Statistics, estimations, assumptions, and all parameters of health used for planning are in aggregate for the entire country. Efforts to diversify health planning activities have been made, but are limited to the establishment of a

planning division in each provincial health office. These health planning divisions usually employ only one or two health professionals trained in statistics, epidemiology, economics, or survey research as the core of their planning team.

Decision makers have been aware of health planning problems and some have suggested that these problems may lead to the inappropriate implementation of infrastructure development projects in many regencies. The problems are piling up, since the country cannot refrain from building and expanding the health sector. Such expansion is assumed useful and necessary to keep up with population growth and the rising demand for health services.

Organization of the planning activities at the lowest level of government -- that of the regency -- is expected to reduce some of these "development mis-matches." In practice it will be difficult. Almost all elements of good planning are lacking. There is a lack of awareness about local health needs, limited availability of trained personnel, insufficient budget to experiment with innovative planning exercises, lack of easily accessible organized data, and the uncertainties of local political climates to contend with.

Research findings from other countries do not really give examples of how regency health planning should be performed. The gap between the research findings themselves and the use of the findings to compare relative effectiveness of different health sector policy alternatives

is enormous.

This research effort is aimed at developing a standardized technique in Indonesian regency health planning that could be used to plan the health services and to avoid some of the potential problems that may arise from the inevitable growth of the health sector. The approach used in this research is one of several possible methods for local health planning, and is far from perfect. This research utilizes information gathered from population based sample surveys of the household on health condition, health behavior, and health practice of the individual. It is backed by a study of performance and cost of government-owned health care facilities, and study of the health sector budget at the regency level. This effort stands somewhere in the middle of a long process, attempting to bridge the gap between research findings and rational implementation of those findings for regency health planning exercise. This study has tried to propose a planning solution to the development of health care infrastructure in the Regency of Bogor.

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ABBREVIATIONS

Adj. AIR	Adjusted Annual Illness Rate
ADL	Activity of Daily Living
AID	Automatic Interaction Detector
ANOVA	One-way Analysis of Variance
ASCFR	Age-Specific Case Fatality Rate
ASDIR	Age-Specific Days of Incapacitation Rate
ASIR	Age-Specific Incidence Rate
ASPR	Age-Specific Prevalence Rate
BAPPEMKA	Badan Perancang Pembangunan Kabupaten (Regency Development Planning Board)
BKIA	Balai Kesehatan Ibu dan Anak (Maternal and Child Health Care)
BKKBN	Badan Koordinasi Keluarga Berencana Nasional (National Family Planning Coordinating Board)
BP	Balai Pengobatan (Health Clinic or Polyclinic)
CBC	Complete Blood Count
CDC	Communicable Disease Control
CHAS	Center for Health Administration Study
DII	Days of Incapacitation Due to Illness
DVMR	Dummy Variable Multiple Regression
ECG	Electro Cardio Gram
ENT	Ear Nose and Throat (a medical specialty)
FY	Fiscal Year
GNP	Gross National Product
HC	Health Center
HEW	Health, Education and Welfare (in U.S.)

HFPA	Health Facility Performance Analysis
HHS	Health Household Survey
HIP	Health Insurance Plan
HIS	Health Information Survey
INH	Iso Nicotinic Acid Hydrazide (Anti tubercular drug)
MCA	Multiple Classification Analysis
MOH	Ministry of Health
NCHS	National Center for Health Statistics (in U.S.)
NHS	National Health Survey
OLS	Ordinary Least Square
OPD	Outpatient Department
PDP	Product Disease Profile
PE	Physical Examination
PHC	Primary Health Care
PKD	Promotor Kesehatan Desa (Village Health Promotor)
PKK	Pembinaan Kesejahteraan Keluarga (Family Welfare Guidance Program)
PKMD	Pembangunan Kesehatan Masyarakat Desa (Village Community Health Development)
RT	Rukun Tetangga (Neighborhood Administration)
RW	Rukun Warga (Hamlet Administration)
SE	Standard Error
SHC	Subhealth Center
SIAP	Sisa Anggaran Proyek (Unspend budget from earlier fiscal year carried forward to the present fiscal year).
SMR	Stepwise Multiple Regression

UDKP	Unit Daerah Kerja Pembangunan (Local Development Working Unit)
WHO	World Health Organization

CHAPTER I

INTRODUCTION

Since 1974 the government of Indonesia has tried to remedy social inequality by establishing a more redistributive policy through the extension of social services. The health sector has gained significant increases, in physical plants, personnel, and equipment availability in rural areas.

The government pursues this policy despite a lack of backing from relevant data and appropriate analysis. The central government must make decisions which, in turn, bind and commit provincial and local governments. In many instances national level decisions are unable to accommodate local variation and needs.

There have been some successful pilot projects in implementing non-conventional health care delivery to meet local needs. These localized success stories have been taken at face value by some in the "inner circle" of the Ministry of Health who have pressed hard to implement them nation wide.[1] For instance, a combination of health insurance, health education, and a community development program at the village level has been able to improve family income and

resource availability for primary health care in the subdistricts of Sumberlawang and Begajah in the Regency of Solo. The programs in Solo guaranteed access to health care and improved the people's awareness of the importance of health practice. The infant mortality rate dropped from 100 per 1,000 live births in 1966 to 44 per 1,000 live births in 1972 in Begajah. It dropped from 153 per 1,000 live births in 1970 to 43 per 1,000 live births in 1972 in Sumberlawang.[2] These changes are larger than the drop in infant mortality in West Java during the 1960s and 1970s, which was 138 per 1,000 live births in the sixties and 122 per 1,000 live births in the seventies.[3]

In 1978, the Alma Ata Declaration was signed by member countries of the World Health Organization. The Alma Ata Declaration accepted the principle of primary health care as the means to overcome shortages of health care services for all people throughout the world.[4] The Ministry of Health of Indonesia has been trying to capitalize on this declaration to use and expand the primary health care model following the example of Sumberlawang and Begajah.

Primary health care includes activities such as basic medical care, sanitation, nutrition, health education, and maternal and child health care, integrated with community development. Such comprehensive programs are good if they could be implemented. Knowledge and understanding about their implementation is insufficient. After several years, replication of the Begajah and Sumberlawang examples has not

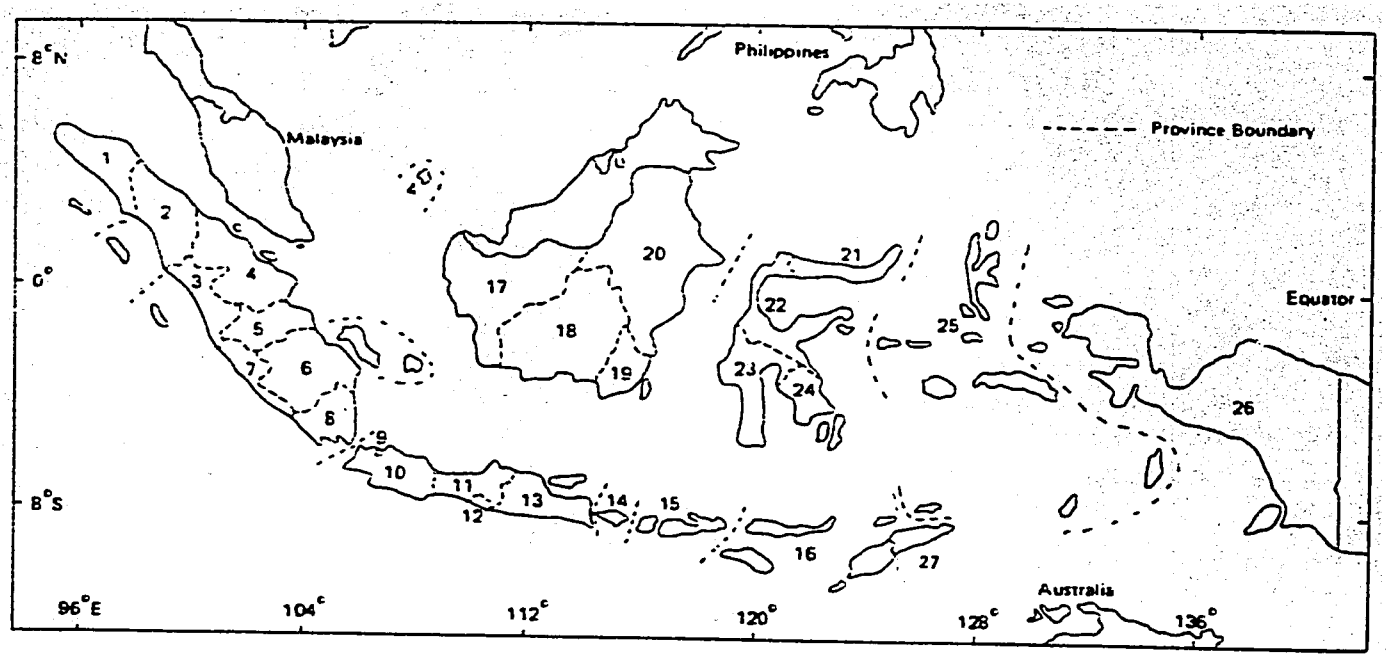
reached a meaningful quantity.

Meanwhile, Bogor, just like many regencies of Indonesia, still depends on the regency hospital/health center/subhealth center infrastructure, with an additional private sector operating separately. Government facilities operate on a nominal service charge, supplemented by government subsidy, while the private sector operates primarily on a fee-for-service basis.

A. Relevance of Regional Health Care Development Studies

Despite all of the government efforts to adopt and implement innovative health programs, similar to the program in Sumberlawang and Begajah, in other areas, it seems that the government has not came close to its objectives. Indonesia is too large and too diverse to have only one health plan (see map 1). Replication of the primary health care package of the subdistricts of Sumberlawang and Begajah, Surakarta, has been observed only in the subdistrict of Klampok in the Regency of Karang Anyar. The person who runs the program in Klampok had learned from his earlier field training in Sumberlawang and Begajah. He later designed the program in Klampok to meet the specific needs of the people of Klampok.

Adoption of all these examples "in-toto" to the national level ignores the specific needs of a particular locality. This is indicated by their slow



Provinces, 1980

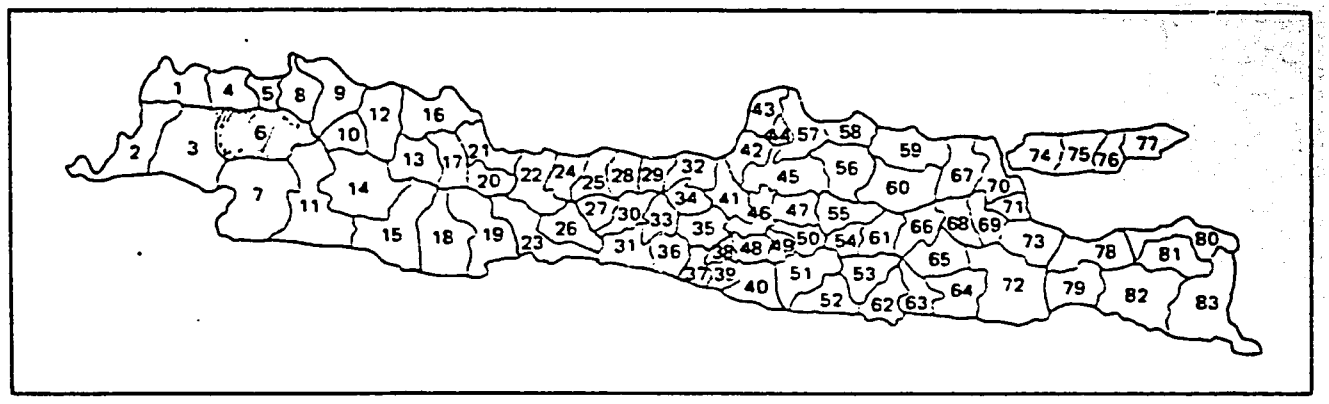
1 Aceh
2 Sumatera Utara
3 Sumatera Barat
4 Riau
5 Jambi
6 Sumatera Selatan
7 Bengkulu
8 Lampung
9 D.K.I. Jakarta
10 West Java
11 Central Java
12 D.I. Yogyakarta
13 East Java
14 Bali
15 Nusatenggara Barat
16 Nusatenggara Timur
17 Kalimantan Barat
18 Kalimantan Tengah
19 Kalimantan Selatan
20 Kalimantan Timur
21 Sulawesi Utara
22 Sulawesi Tengah
23 Sulawesi Selatan
24 Sulawesi Tenggara
25 Maluku
26 Irian Jaya
27 Timor Timur

MAP 1. MAP OF INDONESIA SHOWING PROVINCES

multiplication. Instead, the Ministry of Health should encourage regencies to develop their own plans, taking into account regional variation in disease types and incidence, population density, topography, epidemiology, and resource availability. Smaller service area has more homogenous health problems. Therefore more "specifically tailored" regency health planning should be developed and implemented.

The Regency of Bogor (see Map 2) is taken in this study as an example of regional health planning which could be used as an alternative to national health planning. We expect regional health planning will be more appropriate and will allow Regency Health Offices to develop their own programs to meet the specific needs of their regency, taking into consideration the regency's specific characteristics. Location-specific analysis, with the potential for rapid re-iteration, will gradually increase the speed and thoroughness of the planning process at various levels of government. The same principle can be repeated over and over again in other regencies, and finally, in all regencies of Indonesia.

In Bogor the types of health care facilities that should be maintained or expanded need to be selected. Should the present system be expanded using the same ratio of hospitals to health centers to subhealth centers? Or, should more weight be placed on hospitals with an effective referral system, or the other way around -- placing more weight on the subhealth centers, leaving the hospitals and



1 Serang
2 Pandeglang
3 Lebak
4 Tanggerang
5 Jakarta
* 6 Bogor
7 Sukabumi
8 Bekasi
9 Krawang
10 Purwakarta
11 Cianjur
12 Subang
13 Sumedang
14 Bandung
15 Garut
16 Indramayu
17 Majalengka
18 Tasikmalaya
19 Ciamis
20 Kuningan
21 Cirebon
22 Brebes
23 Cilacap
24 Tegal
25 Pemalang
26 Banyumas
27 Purbolinggo
28 Pekalongan
29 Batang
30 Banjarnegara
31 Kabumen
32 Kendal
33 Wonosobo
34 Temanggung
35 Magelang
36 Purworejo
37 Kulon Progo
38 Sleman
39 Bantul
40 Gunung Kidul
41 Semarang
42 Demak
43 Jepara
44 Kudus
45 Grobogan
46 Boyolali
47 Sragen
48 Klaten
49 Sukoharjo
50 Karanganyar
51 Wonogiri
52 Pacitan
53 Ponorogo
54 Magetan
55 Ngawi
56 Blora
57 Pati
58 Rembang
59 Tuban
60 Bojonegoro
61 Madiun
62 Trenggalek
63 Tulungagung
64 Blitar
65 Kediri
66 Nganjuk
67 Lamongan
68 Jombang
69 Mojokerto
70 Surabaya
71 Sidoarjo
72 Malang
73 Pasuruan
74 Bangkalan
75 Sampang
76 Pamekasan
77 Sumenep
78 Probolinggo
79 Lumajang
80 Panarukan
81 Bondowoso
82 Jember
83 Banyuwangi

MAP 2. MAP OF JAVA SHOWING REGENCIES

health centers as they are now? Or, should further expansion of the health center be proposed leaving the subhealth center and the hospital as they are now?

It has been established that family income, food availability, environmental sanitation, water supply, refuse management, communicable disease control, vector monitoring and control, climate, population density and overcrowding, and availability of health care facilities all influence the level of health in a society. Many of these factors are beyond the jurisdiction of the regency health office. Even if the regency health office is able to mobilize support from other government agencies, and gear them toward one particular goal in improving health, achievement of this goal remains difficult to predict.

Health problems in the Regency of Bogor are related to high mortality and morbidity, a high level of unperceived illness, and a low level of care for perceived illness. Infectious diseases-- those related to under-nourishment and overcrowding--dominate morbidity statistics.

In rural West Java, the infant mortality rate was 138 per 1,000 live births during the 1960s. The mortality rate was 28 per 1,000 between the ages of one and two years. Only 786 out of 1,000 babies born during that decade reached their fifth birthday.[5] Perinatal mortality and morbidity are suspected to be higher than that recorded. Children who survive the perinatal period are at high risk of death in early childhood.

Since many deaths and disabilities are still caused by preventable and curable diseases, more equitable access to good quality preventive and curative health care may lead to substantial reductions in death and incapacitation.

B. Research Objective

The main concern of this study is to (1) develop a method to explore the causality of incapacitation and utilization of health services; and (2) use this information to identify and analyze alternative options, within the jurisdiction of a regency health office in Indonesia, through the exploration of possible improvements in the quality of care, increased coverage, adjustment of cost of services and improvement of the referral system.

It is not yet clear whether increasing hospital care in a regency will produce better or worse effects on health than increasing health center or subhealth center care. Experience in the United States has shown that the neighborhood health centers did as well as hospital outpatient department (OPD) in reducing hospital days, and two thirds of the neighborhood health centers scored higher in quality than the average OPD. The centers, on the average, scored equal to the OPD of the university hospital, while they were 10% to 20% lower in cost.[4] In Bogor, analogous alternatives still need to be tested.

There has been pressure from the international

community through the World Health Organization; from the national government through the national health authority in the Ministry of Health in Jakarta; and from the provincial government through the Provincial Health Office in Bandung, on the Regency Health Office in Bogor to implement a primary health care approach in its area, using layman cadres recruited from the villages. Field experience in Bogor reveals that after several years such layman-cadre village health workers have not come into existence in any meaningful quantity. Is this an indication of a low level of acceptance of the primary health care concept in Bogor, or does it point to something else, such as weakness in the method of implementation, or resistance to adopting any new concept, be it from ordinary health workers or from the society?

In facing the rising costs of medical care, Bogor also needs her own primary health care system. Its definition, form, and limitations may be different from the definition of primary health care in other places, but the principle is the same--to get the most out of meager resources. Given the political and administrative constraints, there are three alternative course of actions for government-sponsored health care in Bogor:

1) Development and extension of the subhealth center system staffed by paramedics, and/or;

2) Development and extension of the health center system staffed by one or two physicians and para-medical personnel, and/or;

3) Development of hospital-based health care for taking care of difficult referral cases, especially those which are inappropriately treated by the health center and subhealth center because of lack of expertise and/or lack of equipment.

The growth oriented policy in health care delivery in the Regency of Bogor needs careful consideration. What particular type of facilities should be maintained or expanded among the existing chain of hospital/health center/ subhealth center? Should we propose across the board expansion using the same ratio of hospital/health center/ subhealth center, or should we put more emphasis on the expansion of a particular type of facility?

C. Plan of Analysis and Presentation

This introduction has suggested that regency health offices in Indonesia need regency health planning. In this proposal for regency health planning, rational analysis is used to pinpoint regency problems based on data collection utilizing special surveys designed for planning purposes. In light of the data, selection of the type of health care expansion that fits the specific conditions of Bogor will be

made. As has been mentioned earlier, not all potentially good programs in other regencies are bound to be good in Bogor.

Chapter II notes research literature on the linkage between health services, health programs and health status. Further, the review explores a variety of health status measurements and their influence on the development of resource allocation techniques in the health sector.

It is also argued that population based health data is more useful than service based health data. This analysis relies heavily on the use of population based health data, while service-based health data is used as a complementary element.

Exploration of several health service utilization models and health status models disclose their potential strengths and weaknesses.

Chapter III contains a description of the conceptual framework and methodology used in this research. Two models are proposed, an incapacitation model and a utilization model. These two models are used to obtain inputs for cost effectiveness analysis. The statistical techniques and several quantification approaches are highlighted.

Chapter IV contains a description of the data, the sample, the survey, the field work, and various ways to maintain the adequacy, the reliability, the consistency, and the validity of the data. It is noted that the comparison among program alternatives is made on the basis of

information obtained about the most prevalent incapacitating diseases in Bogor.

Chapter V describes findings of several key variables in the study, such as: response to illness, seeking care behavior, factors influencing seeking care behavior, age specific illness rates, basic mortality statistics, cost of health care, and outcomes of treatment.

In this chapter, bivariate analyses of several key variables is made. The analysis provides important insights into the nature of illnesses in the area, the illness behavior, and the pattern of health services utilization. Description of the costs of care and identification of factors influencing outcomes of treatment are also included.

Chapter VI describes the intensity of use of services, determinants of the use of services, and the development of an additive model of utilization. Further, it shows the computations of coefficients of utilization. These coefficients become components of the Product Disease Profile (PDP).[7] In this chapter, the relationship between the dependent variable utilization, and its independent variables is explained in quantitative terms.

Chapter VII describes incapacitation across different age groups, determinants of incapacitation, and the development of the additive model of incapacitation. Further, it describes the computation of the coefficients of incapacitation. These coefficients also

become another component of PDP. Also in this chapter, the relationship between incapacitation and the dependent variables is explained in quantitative terms.

Chapter VIII describes the computation of all the inputs obtained from the Annual Illness Rate (AIR), utilization, incapacitation, and costs, to produce the anticipated incapacitation under the present system of health care services. Selection of alternatives will be made based on sub-optimization in the health sector under certain levels of budgetary, administrative, and political constraints. Sensitivity analyses are made to test the consistency of the predicted outcome from different alternatives.

Chapter IX summarizes the study, and offers suggestions for implementing the methodology in other regencies.

Footnotes to Introduction:

[1]Ministry of Health Republic of Indonesia, Primary Health Care (Village Community Health Development) in Indonesia. Prepared for the International Conference on Primary Health Care, Alma Ata, U.S.S.R., September 1-12, 1978, Appendix I, (mimeograph).

[2]Nugroho,G., "A Community Development Approach to Raising Health in Central Java, Indonesia," in Health by the People, Geneva: World Health Organization, 1975, pp. 91-111.

[3]Computed from table 3 in Geoffrey McNicoll and Si Gde Made Mamas, The Demographic Situation in Indonesia, Paper of the East-West Population Institute, Number 28, December 1973, p.13, as quoted from the 1971 Census Advance Tabulation, Biro Pusat Statistik, Jakarta.

[4]International Conference on Primary Health Care, Primary Health Care: a joint report by the Director-General of the World Health Organization and the Executive Director of the United Nations Children's Fund, Geneva - New York, 1978, pp. 8-13.

[5]Computed from table 3 in Geoffrey McNicoll and Si Gde Made Mamas, The Demographic Situation in Indonesia, Paper of the East-West Population Institute, Number 28, December 1973, p.13, as quoted from the 1971 Census Advance Tabulation, Biro Pusat Statistik, Jakarta.

[6]Sparer, G. and Johnson, J. "Evaluation of OEO Neighborhood Health Centers," American Journal of Public Health No. 61, 1971, pp. 931-942.

[7]For explanation of Product Disease Profile, see Chapter III, part B, section on Multivariate Analysis Statistic.

CHAPTER II

REVIEW OF RESEARCH LITERATURE

A. Definition of Health

The World Health Organization defines health as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.[1] This definition is deficient when used for planning purposes. It does not describe quantitative measurement of health correlates to enable priority setting and selection among alternatives in the health sector. Due to the scarcity of quantitative measurement tools, researchers have developed a variety of qualitative estimates of health serving a specific purpose.

In the past, the earlier measurements of health were based on several parameters of illness, such as infant mortality rate, maternal mortality rate, crude death rate, and many others. Even so, none of these parameters fully reflect the illness status of a population from which we can thereby infer the health status of that population.

In general, mortality information is a good indicator

of the outcome of health care and other social interventions in a country. At the regional level, however, mortality information has some weaknesses. In order to obtain sufficient variation in mortality data, the size of the sample must be very large, far beyond the usual size of regional household surveys. Data collection then, becomes very expensive. Moderately sized regional household survey is able to provide sufficient cases of ill health, such as incapacitation, and complication of treatment, and permanent impairment, but will not have enough variation in mortality cases.

B. Determinants of Health

The health status of a population is influenced by various factors, at varying levels of intensity. It is the result of socioeconomic conditions in general, including factors at the community level, intrafamilial characteristics, and individual traits.

Economic Development Factors

A healthy population is an essential prerequisite for development. This rationale was the basis for the expansion of the health care system in Indonesia in the 1970s,[2] even though the causality relationship between health and development is not yet clear. It is difficult to tell which

comes first; will good health lead to high productivity or will high productivity lead to good health?[3]

Economic development in Western European countries during the nineteenth century changed the living conditions of the people and led to a higher standard of health. The relation between economic factors and health has been demonstrated by many writers. In his analysis of economic impact on health, Brenner has demonstrated (based on U.S. data from 1940 to 1967) the impact of the cyclical downturn of the economy on death, due to cirrhosis of the liver. Economic downturn causes a higher mortality rate, a higher suicide rate, and a higher death rate among persons over the age of forty-five due to cirrhosis hepatitis.[4] On the other hand, health improvement may have a significant impact on the earning power of the individual.[5] [6]

The GNP is not the most important factor in determining health status. Both Sri Lanka[7] and the People's Republic of China[8] have been able to improve the health status of their population without substantial increases in their GNP. It seems that the role of education and community development programs, involving community participation and efficient utilization of community resources, are the dominating factors in determining health status.

Environmental and Social Determinant

The U.S. Center for Disease Control quantified the proportional allocation of the contributing factors of mortality, from ten leading causes of death, among the U.S. 1975 population age one year and older. According to this report, the most important contributing factor is life style, followed by human biology, the environment, and finally, the health care system. Life style is the most dominant factor leading to death in all age categories. The influence of life style increases with age, while the role of the least important factor, the health care system, decreases with age. In a scale from 1-101.4, life style scores 48.5, human biology scores 26.3, environment scores 15.8, and the least important of all, the health-care system, scores 10.8.[9] If the purpose of the heath-care system is to reduce death, investment in health care facilities is the least effective option. Another U.S. Department of H.E.W. report mentions that residents of heavily-polluted cities have greater incidence of emphysema, respiratory infection, and lung cancer, than rural residents.[10]

According to Belloc, good health can also be obtained by a well balanced diet, maintenance of a proportional body weight, sufficient sleep, and regular exercise,[11] all of which are part of an individual's life style.

Changing Determinants of Health

Over time, as general socioeconomic conditions improve, the quality of life, the determinants of health, are also changing. Factors that were dominant in the past now become less so because they are "superimposed" by more dominant variables.

In the earlier stages of development, income and environmental sanitation play a dominant role, especially in reducing health problems related to infection, malnutrition, and parasitic infestation.[12] [13] [14] As the level of economic development and prosperity rises, and income is more equitably distributed, sociocultural factors and educational attainment will have more and more pronounced effects on health status.[15] [16] In the upper class there is an increase in psychosomatic diseases,[17] while in more industrialized regions the prevalence of diseases related to industrial pollution is also higher.[18]

Role of Health and Medical Sciences

The eighteenth and nineteenth centuries' overall health development in Western European countries took place prior to the revolution in health and medical sciences. The improvement in methods of production, and the improvement in living standards and sanitation facilities took place before

the rapid development of medical and health technology. It was these improvements, not the development of medical and health technology, which changed the health profile of Western European countries.[19]

In the developing countries of today, however, substantial reduction in mortality and disability is contributed by the application of an imported technology,[20] without significant change in living standard. The efforts have shown good result in the control of malaria. The eradication of smallpox is also benefit from an imported technology. Similarly the control of poliomyelitis and tuberculosis, and many others have reduced mortality and morbidity before socioeconomic changes, similar to those in Western European countries in the eighteenth and nineteenth centuries, had occurred. The classical example is Sri Lanka during the period between 1945 to 1960, and more recent examples are found in many African countries.[21]

C. Measurement of Indices of Health

Health is a product of complex social and biological processes. These complexities make the measurement of health difficult.[22] The multidimensional and qualitative aspects of health and illness, and variation in the expression of good health, makes the use of simple techniques in the measurement of health impossible without sacrificing the quality of measurement. Most parameters of health are

measurements of ill health or the measurement of diseases, such as, mortality, morbidity, disability, chronicity, and disease progression. Chiang tried to measure the average duration of health, by which he meant the average duration of absence of illness. He formulated health as (1 - average duration of ill health).[23]

In their effort to develop a health status index, Fanshel and Bush came up with eleven levels of health:

1. S_A - Well-being
2. S_B - Dissatisfaction
3. S_C - Discomfort
4. S_D - Disability, minor
5. S_E - Disability, major
6. S_F - Disabled
7. S_G - Confined
8. S_H - Confined, bedridden
9. S_I - Isolated
10. S_J - Coma
11. S_K - Death.

Fanshel and Bush proposed a Health Status Index (HSI) as a function of years of healthy life per person, which is equal to ninety years (U.S. standard) less time losses due to morbidity and mortality .[24]

The ideal parameter oftentimes cannot be constructed due to the complexities of health and the limitations of the data. Most health statistics provide two broad categories of indices:[25]

1) Indices of resources, such as man, manpower, facilities, and organization, and
2) Indices of health and disease, such as mortality, morbidity, disability rates and ratio, and level of health.

In the development of a health policy model for rural Java, Grosse and de Vries used:[26]

1) Attack rate of various diseases,
2) Age-specific mortality rate with or without treatment, and
3) Age-specific days of incapacitation with and without treatment during illness.

Those variables are combined with information on percentage seeking care when ill, and resource availability are considered in the computation of the overall mortality and morbidity rates.

The preparation of all the parameters required for the computation in a health policy model is elaborate, but the usefulness in analyzing alternatives for health service development lies in the ability to obtain more comprehensive alternatives. The difficulty in using mortality data from a survey is its need for a very large sample, in order to obtain enough variation in the death pattern. Also, in a society where there is a trend of rapidly declining mortality,[27] low mortality figures may mislead the measurement of health, if it is accompanied by a high morbidity rate due to chronic diseases.[28]

An index of health for regional health planning should include:

1. Epidemiological information, which covers mortality and morbidity rates; and
2. An indication of a set of diseases that could be used as a surrogate for all diseases in the region;

In addition to those two variables, there is a need for information on:

1. Statistics of resource availability, which may consist of enumeration of health facilities, health personnel, and a budget for health;
2. Quality of care, which may include structural quality of care, quality of the process of care, or perception of users about the quality of care in different health facilities;
3. Outcome of treatments; and
4. Cost of providing the services.

D. Health Policy and Health Care

A country may place emphasis on curative care or preventive care in its efforts to improve the health status of its population. The health services of a country depend very much on the value systems, bureaucratic preference and political vested interest in that country. Preventive health care may contribute more to the improvement of the health status of a particular country,[21] but the presence of

curative care is more visible, in terms of physical plants, treatment activities, etc.

Influential public figures may favor curative care over preventive care. The government may over-emphasize curative care in their concern for visible accessibility. Through the budgetary allocations and financing, curative health programs are disproportionately favored. The Government Budget Office may find it is easier to deal with the formally-structured health agency for accountability reasons, and hesitate to support the community health development approach. Improvement of accessibility to health services, especially to curative care, then, is considered to be the manifestation of the country's commitment to human development and social justice.

The dilemma is that the health system in one country often drifts between the goal of improving health and the goal of improving health services. In his "Epidemiological Model for Health Policy Analysis," Dever demonstrates that, between 1974 to 1976, the U. S. federal expenditure for system health care organization was 96.6% of the federal health expenditure. The percentage of allocation of mortality due to diseases preventable by health care services was 11.0%. Life style, which accounts for 43% of the mortality, was allocated 1.2% of the federal health expenditure. Environment, which accounts for 19% of the mortality was allocated 1.5% of the budget (see table 1).[30]

Even if the political establishment realizes the

TABLE 1

COMPARISON BETWEEN FEDERAL HEALTH EXPENDITURE AND THE ALLOCATION OF MORTALITY IN THE UNITED STATES IN 1974-1976.

COMPONENT OF EPIDEMIOLOGICAL VARIABLE	PERCENTAGE OF FEDERAL HEALTH EXPENDITURE (1974-1976)	PERCENTAGE ALLOCATION OF MORTALITY
System of Health Care Organization	96.6	11
Life Style	1.2	43
Environment	1.5	19
Human Biology	6.9	27
Total	100.2+	100

+rounding error

importance of good health for the country's development, the Ministry of Health in most developing countries will not receive a substantially higher share of the budget, even in the long term.[31]

Foreign aid may be available for capital investment, but funds for recurrent expenditures must normally be raised from domestic sources.[32] Furthermore, foreign aid often serves a certain interest group with a specific goal, such as population control, malaria control, Vitamin A program, iodination, chlorination of the drinking water, and many others. These specific programs are favored because of their clear objectives and outcomes which are easier to measure and evaluate.

Previous Indonesian experience shows that a

combination of primary health care and a community development approach worked well in the subdistricts of Begajah and Sumberlawang near Solo. The principal approach to the community health program in Solo consists of:

1) Improvement of community resource availability,
2) Increasing community awareness regarding the benefits of good health, and
3) Improvement of the existing social organization for cooperation between the health organization and the people, based on mutual trust.[33]

In Begajah, the work was started with the construction of a mini-dam, an agricultural demonstration plot for a new strain of rice, and the use of fertilizer. At the same time, food staple aid from overseas was used as an incentive in the "food for work" program. The result were immediate. The infant mortality rate dropped from 100 per 1,000 live births in 1966 to 44 per 1,000 live births in 1972. In Sumberlawang, the approach included animal husbandry beginning with fifty superior breed goats, some fish ponds, a "food for work" program to build the main village road, prepaid medical services, Maternal and Child Health (MCH) services, health and nutrition education, and the creation of a village community development board. Take at face value, the results in Sumberlawang were amazing. The infant Mortality Rate dropped from 153 per 1,000 live births in 1970 to as low as 43 per 1,000 live births in 1972. This tremendous improvement was probably caused by the increased

accessibility of health services, or it may have been due to the impact of the community development work carried out.

Duplication of the Solo experience was done in the Regency of Karang Anyar by Dr. Jahya. The program there was carried out among the palm sugar farmers and laborers in the village of Sirkandi, subdistrict of Klampok. Later, it was extended to the village of Karang Salam.[34]

The Karang Anyar case has won the support and the commitment of the local sociopolitical force, as well as that of the national health authority. It has received high doses of publicity.[35] The program more or less enjoys the pilot project status. It is still questionable whether identical programs will produce a similar outcome in the absence of strong leadership, pilot project status, and national exposure. Without publicity, the regent will probably spend a great deal of his time on population control programs, agricultural development, or industrialization. Cooperation from the most prominent local political figure is an essential prerequisite of success in a paternalistic society. It will lead to cooperation of lesser officials from the regency down to the village.

E. Overview of Indonesian Health Planning

The formalized health planning process in Indonesia began to obtain recognition among the "inner circle" of the Ministry of Health in 1969.[36] The actual implementation of

real health planning is limited, though in effect nationwide since 1975.[37] The Bureau of Planning in the Ministry of Health has not performed its full planning responsibility yet, as expected. The Bureau of Planning is still assigned to a lot of program control work for the Ministry of Health budgetary allocation, with insufficient resources to monitor and evaluate the outcome of each program within the ministry. The Bureau of Planning has not developed the capability to evaluate which programs work best, under what circumstances they work best, or what part of the ministry can carry them out successfully.

Nor does the Bureau of Finance have this capability. What the Bureau of Finance can do is to audit the expenditure at the end of the fiscal year. The use of the audit result for policy making and daily management of the program has not been developed to its fullest potential.

The Office of the Inspector General of Health also does not have the capacity to monitor and evaluate policy, nor to determine which trend in policy making should be followed, or which policies should be discontinued.

The skeleton of good organization, however, has been established. The problem is how to make the various units work in synchronized fashion. The regencies demonstrate a similar analogy, but on a smaller scale. Their more effective members are often assigned to numerous temporary task forces or ad hoc committees within the health systems, as well as in other government agencies.

The uncertain prospect of economic development forces the government to plan health services within the limits of its available resources. The plan can also be materialized through a form of commitment, ranging from the most desirable advances in clinical medicine, to the simplest form of implementation of modern medicine. Whatever their situation is, developing countries should stretch their resources as far as possible.[38]

The planning process is oftentimes hampered by the scarcity of knowledgeable and skillful personnel. Another acute problem is the inaccessibility of information needed to guarantee good planning. In the past, the health sector paid too much attention to the idea of catching up with the development of curative care, following the western stereotype. Not until the late 1970s was there a rush to adopt technology appropriate to the needs, and within the ability of the country to bear.

Meanwhile, time goes on. With or without sound information, a plan should be prepared, and health services should be provided. While waiting for a more developed capability to plan comprehensively, Waterston urges developing countries to use a step-by-step and project-by-project approach.[39]

Most health planning activities in Indonesia are centered on the budgetary process. The current year's budget is derived from modifications of the previous year's budget, with small budget increments across the board. As a result,

urgent and unplanned programs as well as new and innovative ones, often face funding difficulties. On the other hand, out-dated programs are receiving continuous budgetary and staff support. A classic example is the underfunded and understaffed community-based health programs, while budgetary and staff support for smallpox and yaws control programs have not been eliminated (in 1980), even though smallpox was eradicated in 1973 and yaws reduced to an insignificant number of cases since the late 1960s. This practice has produced a crisis of its own. In a land of scarcity, there has been a continuing substantial surplus in the annual budget, known as "SIAP" (SIsa Anggaran Proyek [left over from project budget]). In the Directorate General of Communicable Disease Control, the surplus has built up over the years.[40] If this trend is not immediately checked, the SIAP will continue to grow and, in the not so distant future, the SIAP will be enough to support all programs for one fiscal year.

Despite the efforts that have been made to develop a plan, decision makers rarely put the proposed plan into practice. The decision makers are not the only ones to blame in such a case, however. The reluctance of the decision makers to adopt a plan is partly due to the uncertainties incorporated into the plan, and the inability of the planners to explain the nature of these uncertainties.[41] The only remedy for this problem is to increase the flow of information regarding the planning

process from planners to decision makers. The establishment of a liaison between the planners and the decision makers is one possibility.[42]

In the last five years, there has been a serious effort by the government of Indonesia, through the Ministry of Health, the Ministry of Internal Affairs and the National Development Planning Board (BAPPENAS) to improve the health status of the population as a whole. Their major programs are known as Presidential Instruction (INPRES) for Health, PKMD, UDKP, and PKK. Health improvement has been recognized as a part of the ultimate goal of all government programs--that of a higher quality of life for all.

In retrospect, the main concern of the Ministry of Health in the early 1970s was the low utilization rate and low quality of care in government facilities.[43] It seems, nowadays, that reported utilization has increased. Despite increasing utilization of government health facilities, an important question remains unanswered. Does increasing utilization improve health status and, if so, by how much?

The ideal sequence of the health planning process has not been followed. Health planning activities should consist of at least:[44]

1) An accurate assessment (diagnosis) of the existing situation,
2) Formulation of alternative means to improve efficiency in operation,
3) An estimate of physical resource needs,

4) A pricing of various activities,
5) Computation of the expected outcome, as concrete as possible, using a cost effectiveness approach,
6) Estimate of the expected economic effect, and
7) Recommendation for activities other sectors that may support the health sector.

It is important to remember these this planning activities do not merely assess the existing situation, but also likely trends for the future. Selection of suitable indices, for use in the plan during the planning period are also necessary.[45] Again, the statement of the objective should be made clear after the assessment of the situation has been made, with respect to what it will be and what it should be.[46] A clear statement of the objective will prevent or minimize displacement of the organizational goal.[47] Thus, the objective--to improve health status--should not be displaced by a by-product of the health program, such as an increase in attendance.

F. Data Base for Health Planning

Development of data bases for health planning could start from census data, compilations of local statistics and general indicators, and compilations of health statistics.

The Regency Health Office in Bogor has its own routine data collection system. So far, the most common purposes for data collection are for service utilization statistics and

bookkeeping records.

One good way to diagnose the health situation in a country is through a population-based survey. The most elaborate method is the longitudinal survey. The problem with longitudinal study is that the time interval between the beginning of the study and the end may be too long. It may also be too expensive. Cross-sectional population-based Health Information Surveys (HIS) reduce the required time to complete the study even though it is less precise in measuring the characteristics of chronic diseases. Despite this deficiency, cross sectional population or household study is a lot better than service based statistics. Service-based statistics are biased due to the selective process of seeking care, non-random coverage of the population in the service area, as well as non-random use of treatment facilities by the people in need. People who reside closer to the health facilities will have a higher chance of using the facilities. There may be several natural and artificial barriers to the use of services. Thus, people in the catchment area of a facility do not have an equal chance to use the facilities. In Indonesia, most of the health problems are due to acute diseases. Therefore, the combination of HIS with physical examinations will provide reliable population-based information. The nature and extent of unmet demands, health-related social problems, sources of care in the community, appropriateness and adequacy of care, barriers to care, and problems related with the untreated or

inappropriately treated cases could be obtained from HIS.[48] HIS enables need assessment and a better information base for a rational approach in priority setting and allocation of resources, ranging from the local to the national level.[49] If the socioeconomic status of the household can be identified, the HIS has the potential to measure economic barriers to health care and the elasticity of demand for health care.

Despite its rationality, the HIS has additional limitations. Perception of morbidity is affected by cultural biases. In some cultures culture a particular disease may be perceived as normal. An interviewer with no biomedical training may fail to identify this unperceived illness.[50] [51] Combination of HIS with physical examinations will allow the measurement of the professionally defined need, perceived need, and the overlap, as well as the difference between them.

Underreporting may also occur due to recall errors. Prolonged recall errors will reduce the accuracy of reports. The HIP study of Kaiser Permanente demonstrated rapid decline in recalling events in the first forty days followed by a steady deterioration thereafter.[52] Sociopsychological threats posed by some diseases, such as venereal disease, disease of the female genital organ, cancer of the breast, and psychoneurotic disorders, may actually inhibit reporting.[53]

Chronicity of the disease will induce measurement

errors too, such as in measurement of the sequence of events, care, and treatment results.[54] However, the seriousness of the condition will increase the validity of the respondents' responses.[55]

The significant limitations of National Health Survey, according to Donabedian,[56] are due to the fact that the NHS in the United States is:

1) Confined to the civilian population,
2) Excludes persons in institutions, and
3) Excludes persons who have died since the survey period.

Exclusion of the non-civilian population in Bogor may be "justified" on the grounds that medical care services for the non-civilian population are provided by an autonomous and closed system. Further estimates of need are very difficult to make from household interview surveys, unless the interviews are combined with a more reliable physical examination of the population.[57] Therefore, in order to reduce the problem of the unmet demand, and to increase the precision and relevance of the data,[58] in the Indonesian case, combination of the HIS and a Physical Examination (PE) is used and will be called the Health Household Survey (HHS).

In addition to the problem of underreporting, respondents may report health needs which cannot be substantiated by the existing scientific tools of the professional.[59] The physician may classify them as

hypochondriacs and provide no drugs, giving psychotherapy instead. It is not uncommon for hypochondria to lead to inappropriate use and abuse of the health services, with patients wasting drugs and taking unnecessary laboratory tests.

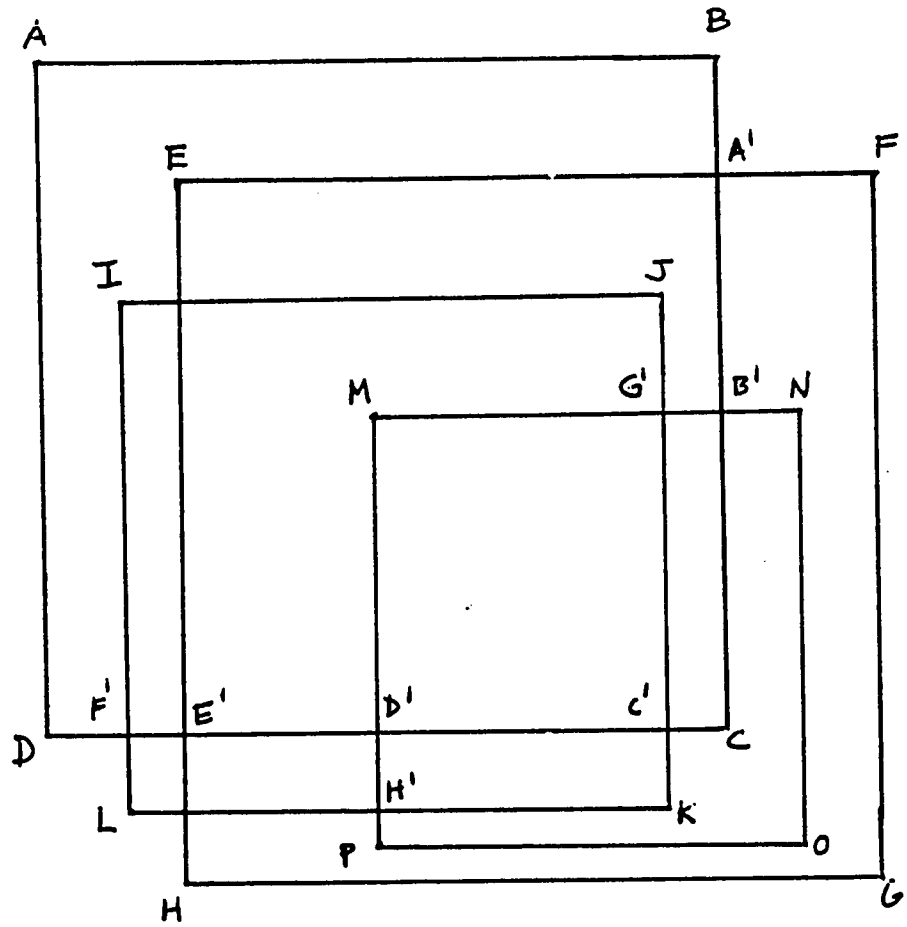


Fig. 1. HEALTH NEED AND HEALTH DEMAND

Finally, HHS will provide a clearer picture of the

demand and need analysis as demonstrated in figure 1. Area ABCD represents the appropriate need as determined by the professional. Area EFGH represents the perceived health problem as determined by the respondent. Area IJKL represents quantity of health care services provided by the public sector. Area MNOP represents effective economic demand in the area.

The overlap and the gap between these four quadrangles could be explained as follows: Area ABA'EE'D represents the unperceived health need by the people of the area. Area MB'CD' represents the appropriate allocation of the effective economic demand, by the people of the area, to improve their health, while area KH'D'C' represents the waste in the allocation of the effective economic demand, by the government health services, due to unnecessary consumption of health care services. The unnecessary services, such as the prescription of vitamins to healthy individuals, are provided by the health services.

Area KLF'C' represents the proportion of the public health services provided beyond technically defined need. The public health service should be made aware that such services do not produce any health benefit. Area IJG'MH'L represents the idle capacity of the public health services. Area ABB'G'JIF'D represents an area which needs to be served but has not yet been served because of a lack of resources. Area B'NOPH'KC'C represents effective economic demand used to purchase unnecessary health services outside

of the public heath sector, while area C'KH'D' represents effective economic demand used to purchase unnecessary services from the public health sector. Area A'FGHE'C represents the ill conception of health problems by the people of the area. Area B'CD'M represents the quantity of the effective economic demand that has been used to purchase beneficial health service from the public health service and elsewhere, where the share of the public health sector is represented by area G'C'D'M, and the share of the non-public health sector is represented by area B'CC'G'.

G. Models of Health Services Utilization

The new way of model building involves quantitative model building, based on empirical analysis and the application of more powerful statistical tools. High speed computers, now commonly used, make the exploration of causality relationships in model building, using large-size survey data a reality.

In more recent years, there have been several familiar models available to explain the utilization of health services. Some of these models will be highlighted here.

1. Empirical Model of Utilization of Health Services

This model was formulated by Veeder(1980)[60] as an effort to test the Rosenstock Model which was based on

earlier works searching for the determinants of health service utilization. According to this model, utilization of health services depends on several variables:

1. Potential severity;[61]
2. Actual Susceptibility;[62] [63] [64] [65] [66]
3. Availability of resources;[67]
4. Accessibility; convenience to reach (the case of poliomyelitis vaccination);[68] [69]
5. Demographic characteristics,[70] [71] [72] [73] which will cover variables of education, social status, income, and group influence.

There is a sound logical explanation as to why all the above variables may influence the utilization of health services. The problem with this model is the fact that each supporting point above was investigated independently. Some conclusions were based on outpatient visits to the clinic, others from visits to the hospital or to the physician's office. Some conclusion were drawn from responses to an episode of acute illness and others from responses to a polio vaccination campaign. The model, therefore, is susceptible to analyst subjectivity and can be developed in many directions. It requires a realistic analyst who has the capacity to identify potential variables associated with the utilization of health services, and can generalize the phenomena into a simplified, comprehensive model.

2. Causal Model

This model was based on a World Health Organization study on International Collaborative Study on Medical Care Utilization.[74] The causal model was introduced using a multiple regression approach. In this model, the utilization of health services (U) is a function of enabling factors, predisposing factors, perceived level of health, and individual exogenous variables (see figure 2). Therefore;

$U = f (E; P; A; H; X; \varepsilon)$ where:

U = Utilization of various health services reported by the individual interviewee;

E = Enabling factors (income, Y; health insurance status, I; family size, S; occupation of the head of the household, O; education of the head of the household, T);

P = Predisposing factors (attitude of individual toward health care, health care services, and physicians; health behavior when symptoms of health disorder are recognized; use of regular sources of care; knowledge of existence of various services);

A = Accessibility factors (distance and/or time away from facility; appointment delay time; waiting time; availability of hospitals, physicians, and dental

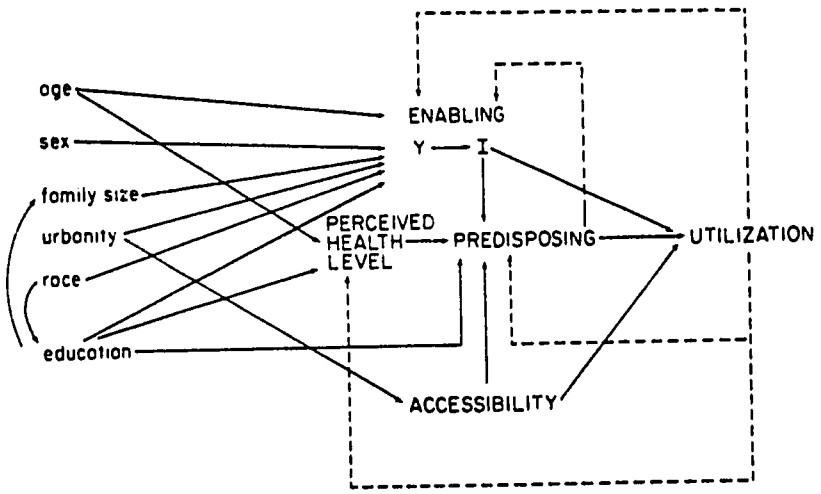
services at varying distances from the household; availability of regular sources of care);

H = Perceived health level of individual and his/her family as assessed from health interview survey (disability, restricted days, sick days);

X = Individual and area-wide exogenous variables (age, sex, family size, race, education, location); and

ε = residual error term.

Fig. 2. THE CAUSAL MODEL



Y = Income
I = Health Insurance Status

The concept of this model uses a good rationale. All variables in the model are supposed to be collected from one source. Therefore, it eliminates the problem of irrelevant generalization from an unrepresentative sample or data set. However, in using the causality model based on multiple

regression, care should be taken to control the problem of multicollinearity and possible reverse causality.

3. The Health Behavioral Model of Individual Determinants of Medical Care Use

This model was developed in 1968 and has been constantly revised since then. It is sometimes published under different titles/names. It is called the "Behavioral Model of Health Service Use,"[75] or "Family Life Cycles Model." Its further development can be seen in the works of other colleagues of Andersen.

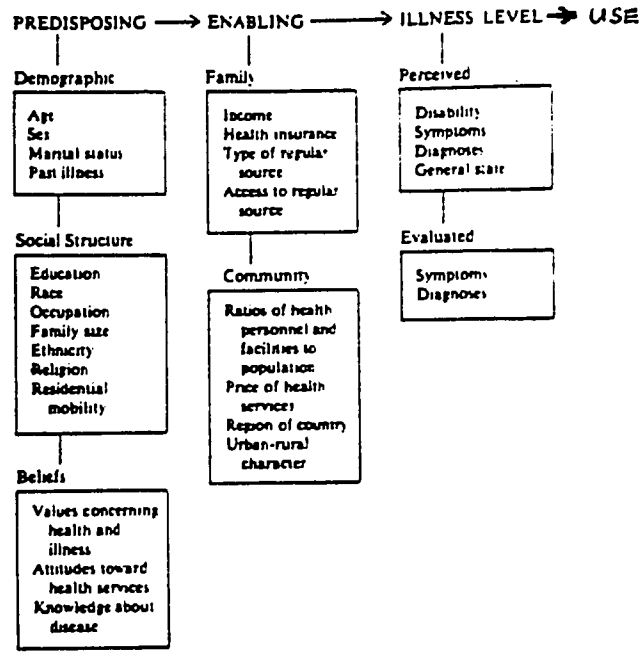


Fig. 3. THE HEALTH BEHAVIORAL MODEL OF INDIVIDUAL DETERMINANTS OF MEDICAL CARE USE

Some conclusions from the Health Behavioral Model of

Individual Determinants of Medical Care Use are summarized as follows:

Illness-level, which was earlier called **need variable**, was the most important variable in explaining use of health services. Disability days and worrying about health were the best predictors of hospital use. The severity of diagnosis is the best predictor of the number of physician visits, and dental symptoms are the best predictors of dentist contact.

The enabling variables, are a group of variables which represent factors enabling use of service. Availability of a regular source of care influences the number of visits to a physician. Income, controlling for education, explains some of the variation in dental care received. Presence of health insurance coverage explains only a little of the variance in types of health care used. Hospital bed to population ratio explains some variance of length of stay, and M.D. to population ratio explains some of the variance in dental visits.

In general, **predisposing variables**, including history of past hospitalization, did not have any predictive value regarding who would be admitted to a hospital. Age is the second best predictor of length of stay, after controlling for the severity of clinical symptoms. Older people are also more likely to see a physician and have more visits than any other age group. Education level of the head of the household and dental symptoms make modest contributions to explaining the variance in dental care use. Sex has

virtually no impact on physician visits, hospitalization, or use of dental services.

4. Health Belief Model

This model was developed by Rosenstock in 1960.[76] According to this model, the use of health services by the individual is influenced by the following factors:

1. He believes himself to be susceptible to the disease in question;
2. He believes that the disease in question would have serious effect upon him if contracted;
3. He is aware that certain actions may reduce his likelihood of contracting the disease should he have had contact with it; and
4. He believes that the threat of taking action is not as great as the threat of the disease itself.

The Health Belief Model has not been based on one empirical data set, but rather is a synthesis of many. Therefore, it is subject to bias because of the non-randomness in the selection of the data.

The utilization models do not really explain change in health status due to increasing utilization, measured in mortality or morbidity rates. The importance of such models, however, is in estimating the future work load, or providing information on utilization levels. The weakness of some of the models lies in the fact that they were based on

generalizations from several different activities or events, such as the analysis of poliomyelitis vaccination;[77] [78] [79] [80] the utilization of health services among the people when they have rheumatic fever;[81] the utilization of preventive dental care;[82] the utilization of dental care;[83] or the utilization of medical screening programs.[84] These various generalization were all combined to establish one general conclusion. Only the theoretical approach to the Causal Model of Health Services Utilization by Gross (1972)[85] analyzes a comprehensive data set (from International Collaborative Study on Medical Care Utilization). The Health Behavior Model of Individual Determinants of Medical Care Use, was tested by several workers using the data from the Center for Health Administration Study (CHAS), indicates that some variables mentioned in the model produce strong explanatory power, but others do not.[86]

In the analysis of CHAS data testing the Health Behavioral Model of Individual Determinants of Medical Care Use, Newman found that there was a relationship between utilization of health services and health status, with predisposing and enabling variables influencing through health status. Covariates had little effect on utilization, as shown by the increase in Multiple R between analysis with health variables only (Multiple R = .145) and the analysis with health variables and covariates (Multiple R = .164).[87]

Another study on the collection of data from the record of one physician in the British National Health

Services, dated from 1949 to 1958, and found that there is no difference in the health status of the population who attend a physician regularly and the health status of the non-attenders. Also, the social class of the attenders and the non-attenders is not different.[88] Therefore, an increase in utilization alone, without an improvement in health status, is meaningless, except that it costs more.

Despite their limitations, the present utilization models have inspired the development of a model for utilization, using the AID and MCA techniques to develop a utilization model for a variety of types of health care providers, by age and type of disease suffered. The product will become an input for cost-effectiveness analysis, for the purpose of comparing different types of health care providers.

H. Models of Incapacitation

Reasons for Using Incapacitation

The expected impact of health service expansion in a developing region is not merely that of increased health service use. Of course, with health service expansion an increasing number of points of contact will result in an increase in area of total coverage. Then, increased health service utilization can be expected. The purpose of health

services, however, is not to increase attendance to physicians, dentists, and midwives, or to improve bed occupancy rates in the regency hospital, but to produce health.

The measurement of health status using mortality rates has been around for a long time. The changing pattern of mortality, from communicable diseases to chronic diseases, and diseases of old age, requires changes in the use of indices of sickness and health from mortality to morbidity. Otherwise, the small death rate makes measurement of level of health using mortality as proxy, over time, become less sensitive.[8]

Based on 1971 census data, the crude mortality rate in Indonesia is 20 per 1000 population.[9] In order to obtain sufficient mortality data, access to a very large number of medically certified data in the regency is necessary. In fact, the issuance of death certificate is not strictly enforced in Bogor. The cause of death is often determined by untrained lay personnel called **modin**. A very large sample requirement in order to obtain sufficient variation in mortality statistics is beyond the financial capacity of many regencies. Therefore, planning methodology suited to the resources of the typical Indonesian regency should be developed.

Twenty of the most incapacitating diseases from the survey data comprised 6,657 cases. This was more than the number of perceived illness and represented 79.1% of all

episodes in the study. There were 4,543 cases among these twenty diseases with evidence of incapacitation. This number is sufficiently large to compare relative advantages of different types of health care providers, using "incapacitation days due to illness" as a parameter.

Incapacitation Model

Since the beginning of organized public health services, health professionals have been accustomed to measuring health in term of bad health-- by measuring illness and death. The definition of health by the World Health Organization, however, includes physical, mental, and social well-being, not merely the absence of disease. The ideal measurement of health should have the capability of quantifying any improvement in physical, mental, and social well-being. This definition has stimulated the evolutionary development of the measurement of health status. Several examples of health status measurement and evaluations using incapacitation are summarized below.

1. Kisch Health Status Scale[11]

The purpose of the Kisch scale is to measure the health status of the population at the moment of measurement, based on a self-administered questionnaire with weighted penalty scores of 2, 4 or 5 for each recognition of

past episodes of illness in one's lifetime from a standard list of past illnesses, provided by the evaluator. The (penalty) score of general health status for good health is 0 - 20; for medium health is 21 - 60; for poor health is 61+. Then, the same respondents are examined by a panel of physicians. All respondents are classified into one of three categories, good, medium, or poor health. Comparisons between the scores on the self-administered questionnaire and the physical examination is made. Chi-square tests demonstrate significant agreement between the two approaches, with $\chi^2 = 74.3335$ d.f. = 4, and contingency coefficient = 0.54. The problem with this scale is the age bias. There is a tendency to give too great a penalty to older people who have a history of many diseases in the past, and not enough penalty for those who have very few past illnesses but are currently suffering from prolonged debilitating or emaciating diseases. Also, younger people tend to have lower scores, even if they are suffering from measles at the time of measurement. In comparing the relative advantages of different health care providers, the Kisch scale is inappropriate. It is similarly inappropriate for the measurement of single episode acute cases. The Kisch scale has high association with finding of the physical examination because it tests the population in relatively stable conditions. In places where there is a rapid change in mortality and morbidity, the Kisch Health Status Scale reflects only conditions in the past.

2. OARS Multidimensional Functional Assessment''[2]

Duke University researchers have used multidimensional functional assessment questionnaires for the study of the aging. A standard questionnaire has been used as a tool to measure the outcome of the aging program. The model assesses:

1. Functional ability and capacity for self care,
2. Personal mobility,
3. Psychological status,
4. Physical environment, and
5. Social environment.

This scale would not be practical for developed countries because of the predominantly young population. The concern of health care services in developing countries is to take care of their younger population. The maintenance of the health of the older population is not yet the concern of the public sector. Moreover, strong family ties provide an important social role for old people. Therefore, nursing homes for the older population are not necessary.

3. Measurement of Health Status among Adult Population

Using a long questionnaire and Verimax Rotation in Factor Analysis among the participants of a health insurance study, Ware et al. (1980)''[3] identified six factors which can be

used to measure health:

Factor I. General health,

Factor II. Physical health,

Factor III. Mental health,

Factor IV. Personal rating of general and physical health,

Factor V. Social support, and

Factor VI. Life event scale.

If these six factors prove to be too many, then they proposed an alternate measurement with three factors:

Factor I. General Health,

Factor II. Mental health, and

Factor III. Social health.

These three factors are essentially what is included in the definition of health by the World Health Organization. Again, due to the length of the questionnaire, the requirement of a minimum level of education for the respondent in order to be able to answer the questionnaire properly, and the impracticality of factor analysis for use in the field, data collection utilizing this method in less developed countries has not yet been practical.

There are many other program-specific measurement of health. The measurement of Activity of Daily Living (ADL), for example, measures the functional activity of the aging or adult population with chronic illness.''

The complexities of health and illness make perfect multipurpose scale measurements of health

impossible. Different health problems require different measurement tools. Even though physical, mental, and social health are not separate entities, and, in fact, are strongly correlated,[5] they nevertheless require different methods of measurement.

If the purpose of measurement is to develop data for the selection of alternative priorities in health care, health indices capable of being used for establishing priorities should be selected. Pole (1973) indicates that such a scale should be developed using a combination of mortality, morbidity, pain, etc.[6] Starfield (1974) proposed that the scale should include **resilience** (resilient - vulnerable), **achievement** (achieving - not achieving), **disease** (not detectable - detectable - temporary - permanent), **satisfaction** (satisfied - dissatisfied), **comfort** (comfortable - uncomfortable), **activity** (functional - disabled), and **longevity** (normal life expectancy - dead).[7]

Apparently, there are many scales around, but only a few of them are designed to compare the relative advantages of different health programs, by which priorities for policy making, planning, and evaluation can be established. These are illustrated below.

4. Resource Allocation Models in Public Health[8]

Feldstein, Piot, and Sundaresan (1973) used a linear programming approach to research allocation in a

tuberculosis control program in South Korea. They tried to maximize the benefits of the tuberculosis control program by using the following objective function.

$$\text{Maximize} \sum_{k=1}^{k} W_k \sum_{k=1}^{k} \sum_{j=1}^{j} B_{kj} \cdot X_j$$

Subject to the constraints:

$$\sum_{i=1}^{i} \sum_{j=1}^{j} A_{ij} X_j \leq m_i \text{ , and}$$

$$X_j \geq 0$$

where:

X_j = the number of units of health activity j
A_{ij} = the quantity of input i that is required for one unit of health activity j
B_{kj} = the benefit k result from one unit of activity j
m_i = the maximum value of each constraint (resources)
W_k = the weight, relative value scale used to combine the benefit.

In his calculations, Feldstein used a sequence of actions in single period, but to achieve more precision he suggested the use of sequences of actions in many periods.''

It seems that most analysts limit themselves to specific issues. In the analysis of health problems, there are many interactive factors that may influence health status. Isolation of individual factors ignores the potential interaction. Tuberculosis control, carried out through one hospital/health center cannot be launched without affecting the hospital's performance in tackling diarrhea.

Grosse and de Vries (1978) have initiated the use of

computer aided (exhaustive) calculation of the number of deaths and days of incapacitation in a particular service area.[100] The mathematical formula used in the calculation is as follows:

Number of deaths =

$$\sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{k=1}^{p} R_{ij} \cdot P_j \cdot [N_{ijk} \cdot F_{ijk} + \{(1 - \bar{N}_{ij}) \cdot \bar{F}_{ij}\}]$$

Number of days of incapacitation =

$$\sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{k=1}^{p} R_{ij} \cdot P_j \cdot [N_{ijk} \cdot D_{ijk} + \{(1 - \bar{N}_{ij}) \cdot \bar{D}_{ij}\}]$$

Where:

R_{ij} = attack rate per person in age cohort j of disease i
P_j = number of population in age cohort j
N_{ijk} = proportion of people in age cohort j with disease i who seek care and receive care from medical care source k
$\bar{N}_{ij}$ = proportion of people in age cohort j with disease i and do not receive care
F_{ijk} = case fatality rate of disease i in age cohort j when utilizing medical care source k
$\bar{F}_{ij}$ = case fatality rate of disease i in age cohort j for those who do not use medical care
D_{ijk} = days of disability of disease i in age cohort j of those who seek care and receive care from medical care source k
$\bar{D}_{ij}$ = days of disability of disease i in age cohort j of those who do not use medical care.

Selection of alternatives proposed in the model was based on the effectiveness of alternative programs in reducing both mortality and days of incapacitation. Later, Grosse

improves the concept of the model by building a stratification of ordinal ranking of disability.[101] The calculation for disability is then changed into:

Number of days of incapacitation at each level of disability =

$$\sum_{i=1}^{n} \sum_{j=1}^{m} \sum_{k=1}^{p} \sum_{l=1}^{s} R_{ij} \cdot P_j \cdot [(N_{ijk} \cdot D_{ijks}) + \{(1 - \bar{N}_{ij}) \cdot \bar{D}_{ijs}\}]$$

where:

D_{ijks} = days of disability of level s associated with disease i in age cohort j of those who seek care from medical care source k

$\bar{D}_{ijs}$ = days of disability of level s associated with disease i in age cohort j of those who do not use medical care

$\bar{N}_{ij}$ = proportion of people in age cohort j associated with disease i and do not receive care.

The resource allocation models in public health discussed above have used mortality and morbidity simultaneously as indices of health.

5. Model for Health Sector Policy Cost and Effectiveness in Developing Area[102]

This model is the latest version in a series of model development works by Grosse et al., on the estimation of cost effectiveness of health sector policy alternatives, giving consideration to budget constraints. Its application could be easily modified to locality-specific cost effectiveness comparison using specified variables, such as:

1. Program specification,
2. Structural/environmental factors,

3. Health status of the population,
4. Effectiveness calculation of various types of care,
5. Stock of current resources,
6. Physical requirements of program, and
7. Cost calculation.

The result of cost effectiveness comparison could be seen in "Indicator of Effect on Health" variables, which contains quantitative information on morbidity and mortality, by age, by type of diagnosis, or as an aggregate.

Incapacitation as Measure of Outcome

The effort to reduce days of incapacitation is one way to improve the quality of life. In the health sector, reduction of incapacitation is one goal of the health services. Health programs capable of reducing incapacitation are undoubtedly able to reduce mortality and produce longevity, comfort, resilience, and satisfaction. Of course their degree of success is not merely the product of health services. Satisfaction about life is explained by many variables, in which satisfaction regarding health constitutes only one of them.

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CHAPTER III

CONCEPTUAL FRAMEWORK AND METHODOLOGY

In this chapter the general conceptual framework that will guide the analysis in later chapters of this study will be developed. Identification of specific variables to be included will be made. The hypotheses, or central themes of this analysis will be described, and the statistical techniques will be introduced.

A. Conceptual Framework

The mobilization of information in the health sector is not meant to merely serve the scientific curiosity of health professionals, but, more importantly, to support the decision-making processes. The multidimensional aspects of health must be dealt with to meet this purpose. Some of these dimensions are measurable while others are not.

This analysis employs objective measurements of health phenomena as much as possible. Unavoidably, the variables collected from the field survey contain documentation of measurable phenomena, measured at four levels of measurement:

1. Nominal scale variable,
2. Ordinal scale variable,
3. Interval scale variable, and
4. Ratio scale variable.

Nominal and ordinal scales are crude measurements, while interval and ratio scales are more exact measurements.

The parameter of outcome in this study is incapacitation days due to illness. The effectiveness of health services is measured by their ability to reduce incapacitation days. Variables in the study are selected and divided into several clusters. These include:

1. Incapacitation days due to illness (D.I.I.);
2. **USE** of health services variable cluster, measured in number of outpatient visits for ambulatory care and number of hospital days for inpatient care. If the respondent has both inpatient and ambulatory care, then utilization is equal to the total number of both outpatient visits and duration of inpatient stay. This can be justified since the total number of inpatient cases is only 0.87% of the total sample;
3. **NEED** variable cluster, which consists of variables of severity of illness, diagnosis of illness duration of illness, and clinical onset of disease;
4. **ENABLING** variable cluster divided into two clusters, the family variable cluster and the community variable cluster. The family variable cluster consists of variables of income and sources of regular

treatment. As a surrogate for income, which is very difficult to measure in a non-wage economy, the following information is gathered: estimated value of family assets, availability and quality of drinking water at home, availability and type of latrine at home, quality of sewer and garbage disposal, and distance from latrine to source of drinking water. The community variable cluster consist of variables of availability/monopoly of health care providers, cost of service in the community, and urban/rural character of residence;

5. **PREDISPOSING** factor variable cluster, divided into three groups--demographic characteristics , social structure, and belief/knowledge variable clusters. Demographic characteristics variable cluster consists of variables of age, sex, marital status and status of the sick in the household. The social structure variable cluster consists of the variables of education of the sick, education of head of the household, occupation of the sick, occupation of head of the household, family size, and religion. The belief/knowledge about the health variable is simply the perception of an individual about his/her illness. Do they perceive their illness or not? This variable includes knowledge about disease, type of health care provider sought, motivation to seek care, and impression about the quality of care received.

The structural relationships among variables, or clusters of variables, to use of service variable (USE) and days of incapacitation variable (D.I.I.) are described in figure 4, which is an extension of Andersen's Behavioral Model.[1]

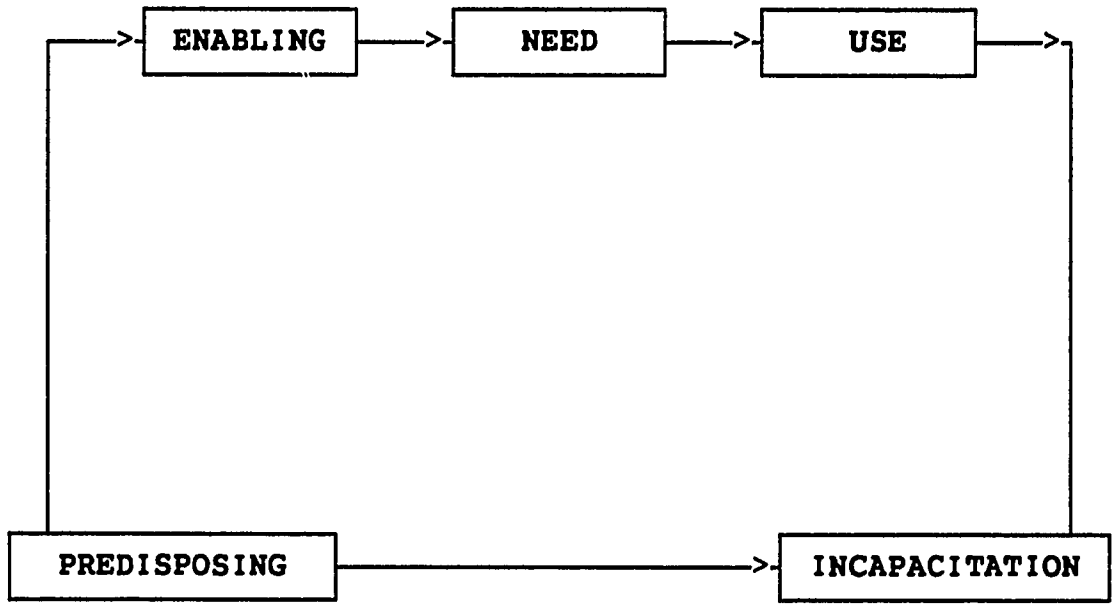

Fig. 4. RELATIONSHIP OF D.I.I. AND UTILIZATION WITH THEIR PREDICTORS

It is clear from figure 4 that D.I.I., as an end product of health services, is influenced directly by predisposing variable clusters, by length of illness prior to receiving treatment, and by use of services. D.I.I. is also indirectly influenced by enabling variable clusters. Also, there is a cyclical relationship between perception of need, use of services and D.I.I.

B. Application of Statistical Techniques

Univariate Analysis

Univariate analysis is the simplest way to calculate basic statistics of a variable, such as mean, median, mode, standard deviation, skewness, and kurtosis. All variables in this study will be analyzed with univariate descriptive statistics to check their normality. Normality is important since most statistical inferences require the assumption of normality of the probability distribution function of a variable in order to yield a more reliable interpretation.[2] Simple, descriptive, univariate statistics of all interval scaled variables in this study demonstrate the degree of normality and some demonstrate departure from normality. Logarithmic, square root, or recode transformation--whichever is best suited for a particular variable--could be applied to improve the normality of the probability distribution function of the variables.

Calculation of rates, duration of illness, and unit cost of services are also obtained from univariate statistics. In rates estimation, a special procedure will be employed to control the conceptual difference between prevalence and incidence of disease, and between acute and chronic disease. Prevalence and incidence have different definitions in epidemiology. Most acute diseases are

recorded in incidence rates, while most chronic diseases are recorded in prevalence rates. The relationship between incidence and prevalence is strong,[3] and could be formulated as:

$$I = c\frac{P}{D}$$

where I = Incidence,

P = Prevalence,

D = Duration of illness, and

c = correction factor approximately equals 1.

Most health household surveys have a recall period of two weeks. There is a difference in information retention between the two-week recall period and the one-month recall period. The one-month recall period however, almost double the number of observations without increasing the sample size. Therefore, the sample size required to obtain a sufficient number of observed illnesses for complex statistical analysis is smaller in the one-month recall period than in the two-week recall period.

All new episodes of acute illness, with a duration of illness of one month or less, are accounted for. Sub-chronic and chronic diseases, however, have a duration of more than one month. Since the duration of illness for sub-chronic and chronic diseases is longer than the recall period, there is a chance of finding episodes of illness starting before the recall period and ending during the recall period. Another possibility is that of finding

diseases which started during the recall period and continue beyond it. It is also possible of finding episode of illness starting before the recall period and continue beyond it. In the survey, a duration of illness of 997 days or more is coded 997 days. The primary concern of the local health officer in providing services for the sick is the patient load per year. Therefore, in the calculation of the adjusted annual illness rates (adj. A.I.R.) for all diseases, the denominator of duration of illness is less than or equal to 360 days, even though the actual duration of illness is less than or equal to 997 days. On the other hand, if the duration of illness is less than or equal to 30 days, in the calculation formula below, the duration of illness (D) is equal to 30 days.

$$\text{Adj. A.I.R.} = \frac{\text{Rates} \times 365}{D}$$

where Adj. A.I.R. = Adjusted annual illness rates,

Rates = Rates of cases found in the study population, and

D = Duration of illness per episode, but always less than 365 days.

This adjusted A.I.R. will be used in the calculation of the effectiveness of different types of health care facilities in replacement of incidence and prevalence.

Bivariate Analysis

There are several bivariate statistics employed in this study. They are:

1. Product moment correlation r^2,
2. Rank correlation coefficient ρ, and
3. Two-way contingency table analysis.

The purpose of the product moment correlation is to identify the degree and direction of association between two analytic variables and to test the significance of their relationship. Similarly, a rank correlation coefficient is used to identify the degree and direction of association between two variables where one or both of them are categorical variables.

Correlation analysis will help the development of theoretical constructs, and selection of potential predictors or clusters of predictors from an array of variables under investigation. Correlation analysis is also used to select potential predictors for various techniques in multivariate statistics.

Two-way contingency table analysis is used with the purpose of detecting association between two categorical variables in tabular form. Two-way contingency table analysis is a powerful tool which should be accompanied, among other things, by significance tests using chi-square test, maximum likelihood ratios and contingency

coefficients. This type of analysis is used to reveal the simplest relationship between two variables without controlling for other independent variables, and it usually yields good results.

The purpose of bivariate analysis is to detect the existence of variation in **D.I.I.** and **USE** of services by: (1) symptom severity, (2) duration of illness, (3) onset of illness, (4) value of family assets, (5) availability of regular sources of care, (6) presence of monopoly of health care provider, (7) urban/rural character of place of residence, (8) age, (9) sex, (10) marital status, (11) education, (12) occupation, (13) family size, (14) religion, (15) perception of illness, (16) cost of services, (17) distance of health facility to place of residence, (18) type of facility used, (19) quality of care received (20) latrine availability and its type. The findings will provide us with a better understanding regarding why people use health services, what type of facility they do use, and what is the influence of consumption of health service on D.I.I.

Multivariate Analysis

Multivariate analysis is a statistical term given to a group of techniques, using more than two variables at one time.

In this analysis, Automatic Interaction Detection (*AID*), Multiple Classification Analysis (*MCA*), and Stepwise

Multiple Regression (SMR) will be used. The foundation of these three techniques is the Analysis of Variance. Their use will simplify the development of the additive model in explaining variation in use of services and D.I.I., as well as helping with the hypothesis testing.

The product of the confirmed additive model, together with the product of descriptive statistics in estimating Adj. A.I.R., becomes the "product disease profile" (PDP) of the Regency of Bogor. This PDP has advantages over the "conventional disease profile" obtained from descriptive statistics and estimation, since the coefficient in PDP has better or closer to normality, distribution. Therefore, PDP yields better control over variables with skewed distribution.

1. *AID-Search* Technique

The *AID-Search* algorithm utilizes what is essentially a repeated one-way analysis of variance technique to explain the variance of a dependent variable as much as possible.[4] It divides the sample into a series of mutually exclusive subgroups and allows for the evaluation of values of dependent variables against the best binary splits of the predictor variables. These binary splits can continue until the specified minimum number of cases, minimum partitions, or minimum percentage of increase, in explanatory power for a split, is exceeded. The product, a hierarchical data

structure, will guide the formulation of a new hypothesis and a new model. Unlike the Ordinary Least Square (OLS), the *AID-Search* technique does not require the assumption of linearity and additivity.

However, the *AID-Search* technique requires a large size observation, at least ten times the total number of all categories in the predictor variable list combined,[5] [6] in order to obtain reliable and meaningful results. The common rule of thumb is to have at least 1,000 cases in the analysis. The dependent variable should not be too skewed or severely bimodal. Given the large sample size (over 8,400 cases) and a sizable number of variables in the study, the *AID-Search* technique could be used effectively and efficiently to detect important interaction effects. In fact, because of the large sample size is available for this research, the *AID-Search* technique can be performed by age groups or by type of health care facilities used.

2. Multiple Classification Analysis

Multiple Classification Analysis (*MCA*) is a technique for determining the interrelationship between a dependent variable and several explanatory variables within the context of an additive model.[7] Essentially it is a variant of the multiple regression technique, using dummy variables. Its chief advantage over the usual dummy variable multiple regression technique (DVMR) is its more convenient

and more elegant output which provides coefficients expressed as deviation from the grand mean, instead of deviation from a constant term based on a composite sum of means of the excluded subclasses. Another advantage of *MCA* is its ability to handle any level of measurement of the predictor variables. It also provides useful summary measures such as Beta (β) for each predictor to indicate the relative importance of that predictor after adjusting for effects of other predictors, and R^2 which is the proportion of the total variance in the dependent variable accounted for by all predictor in the model.

The dependent variables in *MCA* should not suffer from extreme skewness. Though suited for additive data, *MCA* cannot produce correct function representation or estimation for an interactive model. Thus, *AID-Search*, which renders a precise representation of interactive models, can complement *MCA* and provide a basis for judging whether the assumption of additivity is questionable and, if so, identifying those variables that should be recoded into pattern variables because of their interaction. In order to utilize the best features of both techniques, Sonquist (1975)[8] suggests an optimal procedure involving the joint use of *AID-Search* and *MCA* as follows:

1. Using *AID-Search* to extract information from the data about potentially troublesome characteristics,
2. Locating interaction terms,
3. Using *MCA* as a check on the existence of severe

multicollinearity problems; and

4. Estimating a final model using *MCA*.

3. Multiple Regression

Multiple regression is a general statistical tool which helps to analyze the relationship between a dependent variable and a set of independent variables. As a descriptive tool, multiple regression can be used as:

1. a predictor equation;
2. a control for other confounding variables;
3. a description of structural linkages between independent and dependent variables so as to determine the strength of direct and indirect impact of one variable on the other in the causal model;
4. an inferential tool, which involves estimating population parameters from the sample observation; and
5. as a tool in hypothesis testing.[9] [10] [11]

The basis of multiple regression is the ordinary least square (*OLS*) which has a robust property and produces the best linear unbiased estimator. Small and minor violation of the underlying assumptions do not invalidate the inferences derived from OLS analysis.[12] [13]

The general linear regression equation is

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots\ldots + \beta_p X_{ip} + \varepsilon_i$$

where : β_p = parameter or regression coefficient for each

of the predictors,

X_{ip} = predictor variable,

ε_i = random error term,

p = number of predictors, and

i = 1, ..., n.

Several assumptions are required in multiple regression. Those assumptions are:

1. the relationship between Y_i and X_i's is **linear** and **additive**, where there is no interactive effect among the X_i's , and an absence of multicollinearity;[14]
2. the random error term ε_i has zero mean and constant variance (homoscedasticity);
3. error terms ε_i and ε_j are not correlated, so that their covariance is zero for all pairs of different observations i, j,; and
4. assumption of normal distribution of the dependent variable, or assumption that the dependent variable is not too skewed; however, since the sample in this study is large, further assumption of normal distribution of the dependent variables, for a given combination of predictors, may be relaxed.

A test of assumption of linearity and constant variance of error terms will be made using simple graphical analysis of residual.[15] [16] In general, however, with a large number of observations, lack of independence of error terms may be ignored. Most importantly, there is no reason to believe that error terms are not independent.

Multiple regression can be used with dependent and independent variables at any level of measurement--interval, ordinal, or nominal. It is important to check the skewness of the dependent variable, especially for dichotomous variables. Their error terms are likely to be heteroscedastic, contributing to the imprecise and inefficient *OLS* estimators, unless the value of the dependent variables are within the range of .2 to .8. Outside of the latter range, the predicted values from the OLS equations may fall below zero or above one. Inside the range ($.2 \leq p_i \leq .8$) the loss of efficiency in estimation, due to heteroscedasticity, is minimal, and the estimator is unbiased as the value of $p_i q_i$ remains relatively constant.''

In case there is multicollinearity among potential predictors, the problem can be minimized by paring the list of predictors down to those not highly correlated, and by using stepwise multiple regression. Further, a computerized program, *AID-Search*, will be employed to systematically look for interaction effects. The finding will be used as a basis for judgement as to whether new variables should be created in undertaking any subsequent analysis using additive models of statistical techniques.

C. Working Hypotheses

The central theme of this section is to explore the

interrelationship among variables impacting on user's behavior in seeking care. The impact on utilization of increasing distance from place of residence to health care facilities vs. increasing quality of care on D.I.I., and the relationship between increasing distance vs. increasing quality of care, will be investigated.

Hypothesis I:

> Utilization of health services is influenced by cost of services, distance, severity of illness, estimated value of family assets, and quality of care. Improvement of utilization of health care facilities through reducing cost of services and adding more facilities to reduce distance, is better than improving quality of care.

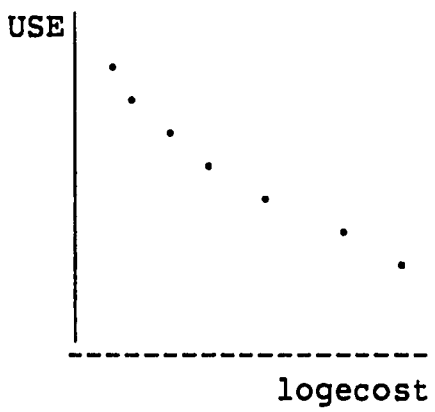

Fig. 5.1

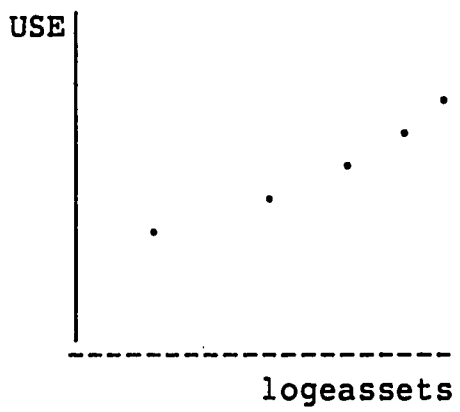

Fig. 5.2

Holding other variables constant, then, the bivariate

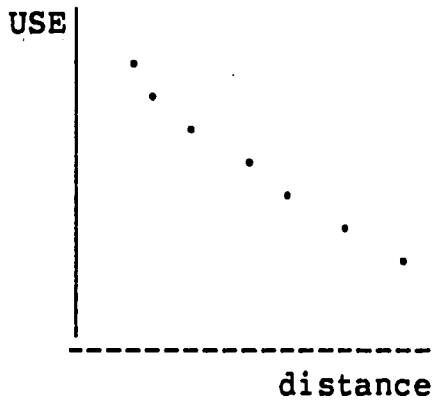

Fig. 5.3

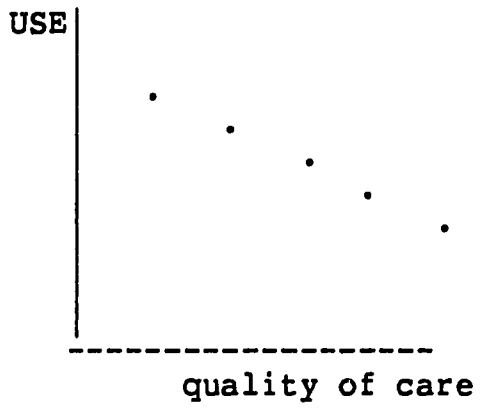

Fig. 5.4

relationship between the utilization variable and predictor variables is explained by figures 5.1 through 5.4 The slope of the quality of care variable is smaller than the slope of distance or cost. If this is true, then the expansion of health services in the area, by adding more facilities, even though these facilities provide lower quality care, is better than improving the quality of care of the existing facilities. The difficulty lies in determining the numerical advantage of the facilities is super-seeded by the need for better quality of care, at which point, quality of care would become more effective in stimulating utilization. Combination of the *AID-Search* and *MCA* techniques will be used to test this hypothesis.

Hypothesis II:

Measured in term of days of incapacitation, in a

marginally served area, improvement in accessibility through shorter distance and lower cost of services will have better impact than improvement of quality of care in the existing facilities.

Holding other variables constant, the bivariate relationship between D.I.I. and the predictor variables is explained by figures 6.1 through 6.4.

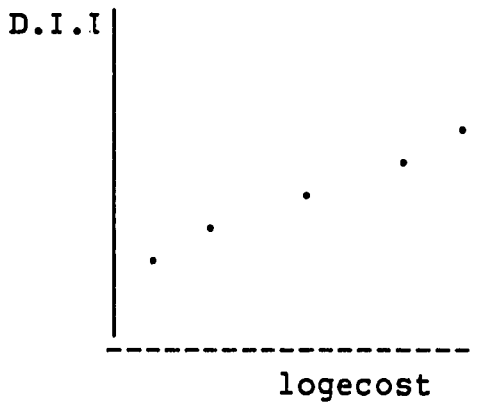

Fig. 6.1

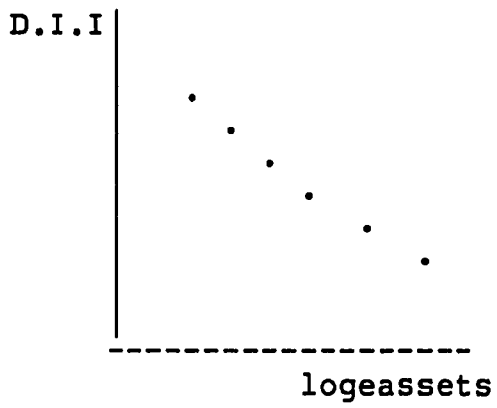

Fig. 6.2

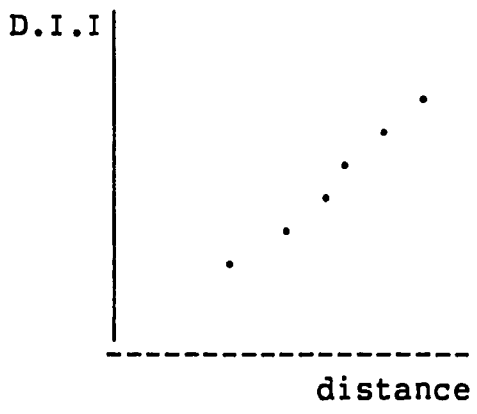

Fig. 6.3

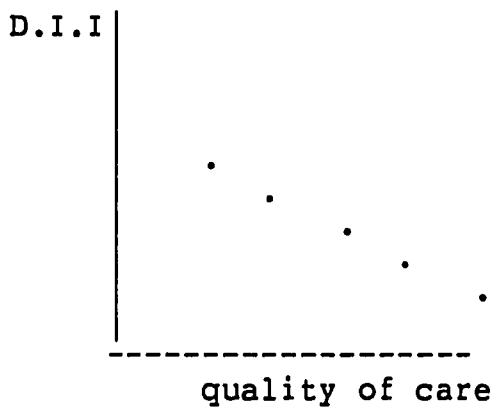

Fig. 6.4

The slope of the quality of care variable is smaller than the slope of distance or cost. If that is true, then the expansion of health services in the area, by adding more lower quality facilities to reduce distance, will produce better results than improving quality of care in the existing facilities. Combination of the *AID-Search* and *MCA* techniques will be used to test this hypothesis.

Hypothesis III:

> The individual decision to seek care or not to seek care is not a randomly occurring phenomenon. Rather, it is triggered by the family perception of disease severity and threat to well being, more than by the cost of care, distance, or length of incapacitation.

If this is true, then, we may conclude that the family places more value on survival and less on material well-being. However, when the cost of treatment and the difficulty of seeking care become a burden, a family will trade the "convenience" of their freedom for incapacitation, and at this point fewer follow-up visits and referral are in evidence.

D. Model Implementation for Health Care Development

The conclusion from the tested model for the regency of Bogor may or may not be applicable to other regencies,

but the model's method of data collection and analysis might be generally useful. The tested model, however, has greater reliability for generalization for regencies with characteristics similar to those of Bogor. The implementation of the utilization and incapacitation model for decision making in health care development and planning using D.I.I. as a parameter, is an objective way to provide information for judging among alternatives.

The calculation of D.I.I. will be done using the formula developed by Grosse et al (1979):''

Number of days of incapacitation =

$$\sum_{i=1}^{n} \sum_{j=1}^{m} \sum_{k=1}^{p} R_{ij} \cdot P_j \cdot \{N_{ijk} \cdot D_{ijk} + (1 - \bar{N}_{ij}) \cdot \bar{D}_{ij}\}$$

where R_{ij} = attack rate per person in age cohort j of disease i
P_j = number of population in age cohort j
N_{ijk} = proportion of people in age cohort j with disease i who seek care and receive care from medical care source k
$\bar{N}_{ij}$ = proportion of people in age cohort j with disease i and do not receive care
D_{ijk} = days of disability of disease i in age cohort j of those who seek care and receive care from medical care source k
$\bar{D}_{ij}$ = days of disability of disease i in age cohort j of those who do not use medical care.

The calculation of *USE* will be done with the formula:

$$\sum_{i=1}^{n} \sum_{j=1}^{m} \sum_{k=1}^{p} USE_{ijk} = P_j \cdot R_{ij} \cdot N_{ijk} \cdot V_{ijk}, \text{ where:}$$

V_{ijk} = number of visits per episode of illness in age

cohort j with disease i, who seek care and receive care from medical care source k.

Other notations are similar in meaning to the notations of D.I.I. above.

Revenue from patient care is equal to:

$$\sum_{i=1}^{n} \sum_{j=1}^{m} \sum_{k=1}^{p} REV_{ijk} = USE_{ijk} \cdot UCOST_{ijk},$$

where: $UCOST_{ijk}$ = unit charge for treatment of disease i in age cohort j, at source of medical care k.

Total cost is equal to:

$$TC = OPCOST + KCOST + MCOST - REV$$

where TC = total cost

OPCOST = total operating cost

KCOST = capital cost

MCOST = maintenance cost

REV = revenue from patient care.

Each health care development alternative in this area will change the composition of type of medical care k. Each type of medical care provider has different coverage or size of catchment area, and different effectiveness and unit cost. Therefore, changes in composition of type of medical care facilities in the area will also bring about changes in the effectiveness of the health services in reducing D.I.I.,

changes in total utilization, and changes in the total cost of running the system.

The Regency of Bogor runs its health services within budgetary limits. Differential projections of future budgets undoubtedly will produce different estimates of D.I.I. for specified levels of the budget. Rational decision making will opt for the best result. Unfortunately, rational decision making should include consideration of the external constraints limiting the adaptation of outcome based rationality. Furthermore, the selection of alternatives is not solely governed by estimates of D.I.I., but more importantly, by the stability of the estimated D.I.I.

Sensitivity analysis will be employed to test the stability of each alternative against possible variation in incidence rates, cost of services, estimated future budget, effectiveness of health care personnel, average length of age specific disability rates, and variations in the use of services. The stable alternative will not experience significant changes in order of relative preference among alternatives. Thus it will be more reliable for long-term planning.

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CHAPTER IV

THE SAMPLE AND THE DATA

A. Source of Data

In an effort to answer the hypothetical question and to develop the decision making and planning model for health care expansion in the Regency of Bogor, two types of field surveys were organized and funded through the National Institute of Health Research and Development, a Research and Development unit of the Ministry of Health, Republic of Indonesia. The first survey is the Health Household Survey of Bogor (HHS-Bogor), which is a subset of a larger survey, the National Health Household Survey of Indonesia 1980 (HHS-'80). I was appointed to the HHS-'80, with the responsibility of developing the sampling procedure for the survey, the questionnaire for the morbidity survey, and the design and lay-out of the whole questionnaire, as well as organizing data entry, and analyzing preliminary data. I was also partially responsible for the recruitment and training of the interviewer/examiners and field supervision.

The second survey is complementary to the HHS-Bogor. It is the survey of a sample of health service facilities in

the Regency of Bogor. This second survey was later called Health Facilities Performance Analysis (HFPA). I was the principal investigator of the HFPA and responsible for all aspect of the survey.

HHS'80 was carried out as a means of measuring health status and evaluating the results of health service expansion in the last decade. In 1972, 55.0% of the demand demand for health services was not met.[1] How much is met now? What are the determining variables that may explain variation in the utilization of health services? Is the service offered at the health center really effective? How much does it actually cost? What type of facilities look more promising for further development?

HFPA has been carried out on the assumption that the more spread out the coverage of less sophisticated health care facilities, the more benefits accrued to the public.[2] More sophisticated health care facilities probably would treat complicated cases better, but would also cost a great deal more. The gains from increased availability and increased accessibility may be greater than the loss from lower quality of care for complicated cases.

B. Sampling Procedures

The Health Household Survey of Bogor (HHS-Bogor) is a subset of the National Health Household Survey of Indonesia (HHS '80). The HHS-Bogor is one out of nine regencies of the

HHS-'80.

Comparison of the effectiveness of different types of health care facilities, across different age groups for each diagnosis of illness, requires at least thirty cases in each age group for each illness. If the twenty most important diseases are going to be used, then the number of observations will equal, at least, 3,000 cases (30 x 5 x 20). The distribution of the incidence of diseases is known to be not equal across age group, and also not equal across diagnosis of illness. By doubling the number of observations to 6,000 cases, the effect of unequal distribution is compensated for somewhat.

The point prevalence of illness in HHS-'72 was 50 episodes of illness per 1,000 population, with a recall period of two weeks. Therefore, the required number of samples for HHS-Bogor, with a one-month recall period, is 60,000 individuals (1,000/50 x 2/4 x 6,000). The average size of a household, according to the 1971 census, is 5 persons. The required number of households, then, is 12,000 households (60,000/5), or 1,000 households per subdistrict.

A stratified random sampling technique has been used in this cross-sectional survey. Stratification was based on the division of government, from regency to subdistrict, with the smallest sampling unit consisting of the neighborhood (RT).

In each district, all neighborhoods (RTs) are listed. All RTs in each subdistrict are ordered, using a random

number table or random number generator (TI 59 version). The order, from top to bottom, is the order of priority of the RT being selected. The number of all households from RT_1 to RT_t are cumulatively added. The cut off point for limiting the size of the sample is whenever the cumulative number of households in each subdistrict is greater than or equal to 1,000 households. Then, additional, next-lower-priority RTs are included with approximately 10% of the sample size in each subdistrict and used as a back-up sample. The sample obtained is consist of 427 RTs in 12 subdistricts with the the following detail:

Regency (Kabupaten)
(is 1 out of 1)

|

Subdistricts (Kecamatan)
(are 12 out of 29)

|

Villages (Desa)
(172)

|

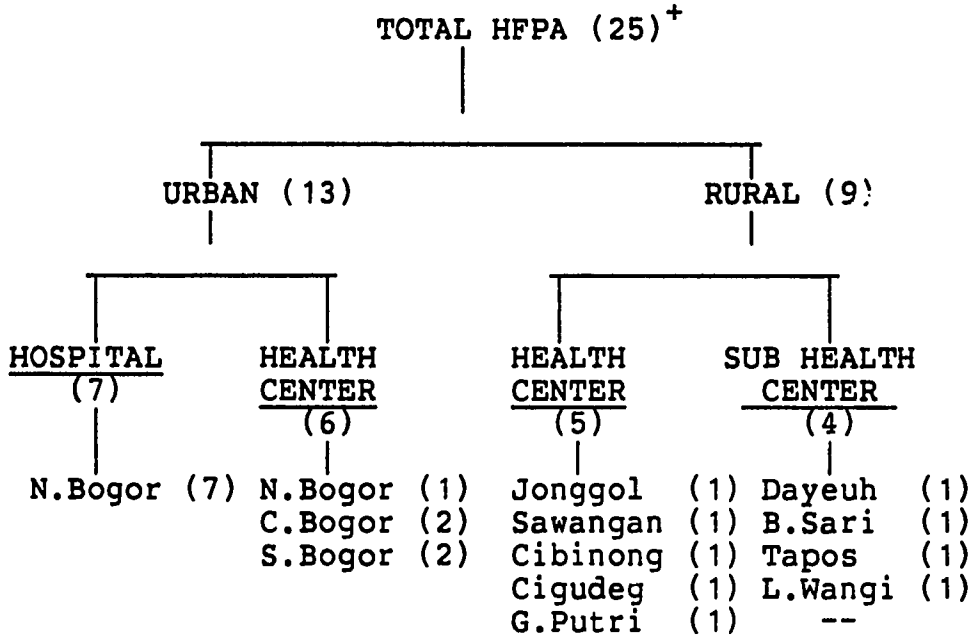
Hamlets (Rukun Warga or RW)
(304)

|

Neighborhood (Rukun Tetangga or RT)
(427)

A stratified random sample, cross-sectional survey of the government-owned health care facilities in the Regency of Bogor has been made in subdistricts where the health household survey took place.

The Regency of Bogor is divided into two strata: **URBAN** and **RURAL**. Since there is only one general hospital in Bogor, which is located in the city of Bogor, there is no further selection of hospitals to be made. Because of limitations of personnel and budget, the initial plan to survey one health center and two subhealth centers in each subdistrict was modified. Some of the subdistrict health centers and subhealth centers were dropped because they could not participate fully in the study. Facilities are summarized in figure 7.



+Numbers between parenthesis are the number of paramedical personnel that participate on a part-time basis for the HFPA survey in each facility as enumerators.

Fig. 7. SAMPLING FOR BOGOR HFPA

C. Data Collection

The design and the content of HHS-'80 is a modification of the HHS-'72[3] where several variables which did not have a good response in 1972 were eliminated or modified. The variables of duration of illness before treatment, duration of incapacitation days due to illness, outcome of treatment, and severity of clinical manifestation, were added. The format of the questionnaires was improved to enable edge coding. This format reduces punching errors during data entry.

There were 84 newly graduated physicians who applied for positions as field interviewers and physical examiners. Proficiency in local dialect gave qualified candidates a greater chance of being selected. There was an in-class instruction about the purpose of the study, the technique of using the survey instrument in the field, the responsibility of the interviewer, and the method of supervision. After several in-class sessions, a field exercise in the rural area of West Java was conducted. Following the field exercise, the wording and the format of the questionnaire were improved, and the definition of each variable was clarified. Then, the 40 best candidates were selected. After the selection, another in class workshop and field exercise were carried out. Before the interviewers were sent to the field, each of them had interviewed at least twenty

households.

The interviewers were divided into three groups. Each group was supervised by one field supervisor (M.D.'s with training in survey research). Equipped with elaborate survey tools, and a manual for field workers and supervisor, the interviewers and their supervisors began to interview and examine members of the households in the designated RTs.

Interviews took place in the respondents' homes. Characteristics of the home and demographic characteristics of all residents were recorded. All findings of morbidity and history of morbidity during a period of one month prior to the interview, and subsequent action, treatment, outcome of treatment, and diagnosis of illness were recorded and coded onto the morbidity form. All pregnancies with uterine fundus above the pubic symphysis, together with action taken during that pregnancy were recorded and coded onto the pregnancy form. All childbirths and action taken during pregnancy and delivery, within the period of one year prior to the interview were recorded and coded onto the childbirth forms. All cases of mortality and symptoms and signs prior to mortality, within the period of one year prior to the interview, were recorded. Possible cause of death was determined by the physician who interviewed the family, and all information related to the mortality was coded onto the mortality form. The forms were checked by the field supervisor. At random, the field supervisor made confirmatory physical examinations and

interviews to check the reliability of the responses. In the event of inconsistency with the recorded response, the supervisor asked the responsible interviewer to repeat the entire interview and physical examination once again. At regular intervals the field workers were checked by me or other members of the research staff. Our unannounced arrivals were meant to check irregularities in the process of data collection in the field. Any difficulties were immediately solved. Open-ended questions were later coded in the office. All completed questionnaires were directly punched onto several files, then each file was verified. After verification shows no punching errors, the files were copied onto magnetic tape.

The HFPA questionnaire is an-edge coded, abridged version of "status internus" of internal medicine cases. The questionnaire can accommodate information from the polyclinic visitor card as well as inpatient internal status. After the final draft had been written, a group of investigators and assistant investigators tried the form in a health center and subhealth center of Utan Kayu, Jakarta. Based on that trial, a training session was arranged and held at the Regency Health Office of Bogor. Twenty five paramedics, familiar with medical records, participated in the training and became members of the field investigating team.

After three sessions of class instructions, a one-day trial was conducted in the Department of Obstetrics and

Gynecology at the General Hospital in Bogor and in the health center of the subdistrict of Semplak, Bogor. Based on their experience, participants gave their comments and suggestions for the improvement of the survey tools. Those changes were made to make the forms easier to administer, and the manual easier to use.

The paramedics were instructed to sort out all consultation records/cards in the sampled health care facilities during the months of November and December of 1979, except in the health center of the subdistrict of Cibinong. In the subdistrict of Cibinong, the average daily census is between 150 and 160 patients. Therefore, only 30% of all consultations during November and December, 1979 were included. All consultations, diagnoses, number of days before seeking care, number of days of incapacitation, number of visits for each illness, outcome of treatment, and occurrence of referral are copied onto the survey form. Difficulties in obtaining responses regarding the outcome of treatment in terms of healing, complications and incapacitation, forced the data enumerators to wait until the same family made their next visit and interview them again.

The paramedics began to compile data in February, 1980. All work in the field was completed by May, 1980.

Every day during the first month of the field work/ data collection, an investigator or assistant investigator came to supervise the work. It was convenient to do so,

since the travel time between our office in Jakarta and the facilities only ranges from 30 minutes to two-and-a-half hours. Some of the facilities also can be reached by phone. In later stages of the data collection, supervision visits were made twice weekly, through the end of data collection period.

All diagnoses were coded in the office by assistant investigators for data processing. The code was based on whatever diagnosis and treatment had been copied from the patient status sheet to the form. After the form had been completely coded, the codes were rechecked by other assistant investigators.

Preliminary analysis took place before all questionnaires were received. This preliminary analysis gave insight into the common pattern of diseases found in the regency. Based on this information, three investigators and myself as principal investigator of HFPA made 21 confirmatory interviews of physicians/medical officers about Age Specific Incidence Rate/Age Specific Prevalence Rate (ASIR/ASPR), Age Specific Case Fatality Rate (ASCFR), Age Specific Days of Incapacitation Rate (ASDIR) of twenty of the most prevalent diseases in Bogor.

D. Quality and Reliability of the Data

Quality and Reliability of HHS-Bogor

The preparation, training , selection of personnel, and supervision, followed by a series of quality control techniques, was the most rigorous ever made in a survey conducted by National Institute of Health Research and Development (NIHRD). The language of the questionnaire was arranged in an informal "Bahasa Indonesia" (Indonesian language). In Bogor, where many respondents have Sundanesse as their mother tongue, Sundanesse-speaking interviewers were primarily used. They were either Sundanesse or non-Sundanesse trained in the medical school in Bandung, where Sundanesse is the common language. Non-Sundanesse speakers used an interpreter, in case the respondent did not feel comfortable speaking in "Bahasa Indonesia."

The quality of history taking and diagnosis is about the best we can do in this circumstances. It is understandable that the diagnosis is not confirmed by laboratory tests. But, since our concern is about major diseases which can be diagnosed without laboratory tests, our conclusion is not very far off. Even in the hospital, laboratory diagnostics are not compulsory. An accurate diagnosis can be made through the use of common sense.

Interviewing and coding error is minimal, since most

of the answers are printed on the form. Data transformation from the edge-coded questionnaire to machine-readable form was done with code and verification techniques to minimize punching errors.

Quality and Reliability of HFPA

The task of transferring the records from patient status cards to forms is not very difficult to do. In this survey, we had the opportunity to use paramedics who were familiar with patient care and patient records. Thus the transformation process was not a big concern; Rather, the reliability of what was in the patient status cards to begin with was in question. Was all of the important information written in the patient status cards?

All of the health centers in our study have one permanent full time physician among their staff. They all have a standard filing and recording system, since it is compulsory. Limited equipment may prevent them from making a precise diagnosis of all cases. But it is customary in medical practice to write down differential diagnoses on the status card if the physician or examinator is in doubt about the correct diagnosis.[4] Even then, the differential diagnoses are usually not very different and often recommend similar treatments.

In the study, the final diagnosis only was recorded.

In cases with complications of treatment or death after

receiving treatment, the diagnoses are more accurate than those in the regular outpatient clinics. Also, the inpatients have more precise diagnoses of their illnesses than the outpatients.

Subhealth centers may make more mistakes in the diagnosis. Eczema could be diagnosed as vesiculitis, or pyodermia, but as a whole, they are all skin diseases with minor variation in their method of treatment for the majority of cases.

As has been mentioned earlier, information important for this survey was not always recorded in the records. In these cases the observer would make a note on the card telling the future examiner to ask the person or her/his family, on their next visit, about this past illness that had occurred during the month of November and December of 1979. This data was then recorded on the patient's cards and copied onto the questionnaires.

E. Definition and Measurement of Selected Study Variables

Many of the variables collected during the two field surveys using household guided interview techniques, physical examinations, and compilation of medical records, are relevant for the purpose of comparing the effectiveness of the three types of facilities. Some of these facilities have potential for further expansion in the Regency of Bogor.

TABLE 2

COMPARISON BETWEEN HHS'80 AND HFPA

CATEGORIES	HHS'80	HFPA
SAMPLING	Cross Sectional	Cross Sectional
RECALL PERIOD OR PERIOD OF OBSERVATION	One Month[1]	Two Months[2]
METHODS OF DATA COLLECTION	Interview and Physical Examination	Medical Records Compilation
VARIABLES CATEGORIES OBSERVED	Household Characteristics Morbidity Morbidity Behavior Gravidity[1] Child Birth[1] Mortality[1] Area Profile	Demographic Characteristics Type of Consultation Number of Visits Number of Hospital Days Treatment Result
COST VARIABLES	As Paid by Respondent	Nominal Charge Capital Cost of Facilities

[1]In HHS'80 the recall period is one year for gravidity, one year for childbirth, and one year for mortality.
[2]In HFPA the recall period is three weeks in the subdistrict of Cibinong.

To enable the construction of the measurement of impact of each alternative on health status, selected tracer diseases were used. These tracer diseases should have at least two of the following characteristics:[5]

1. Have significant impact on the health of the people in

the community,

2. Easy to diagnose in the field,
3. Have high prevalence,
4. Provision of health care has substantial impact on the consequences of disease,
5. There is a high degree of consensus in the management criteria of the disease, and
6. The epidemiology of the tracer disease has been understood.

Based on preliminary analysis of HHS'80, potential candidates for tracer diseases in Bogor are selected based on a master table of selection, as presented in table 3. Twenty of the most appropriate diagnoses for tracer diseases are:

1. **Typhoid Fever**
2. **Dysentery**
3. **Enteritis and Gastroenteritis**
4. **Respiratory Tuberculosis**
5. **Malaria**
6. **Avitaminosis, Hypovitaminosis, or Malnourishment**
7. **Anemia**
8. **Infection of the Eye**
9. **Cataract**
10. **Infection of the Ear and Mastoid**
11. **Diseases of the Heart and Vascular System**
12. **Blood Hypertension**
13. **Infection of the Upper Respiratory Tract**

TABLE 3

SELECTION PROCESS OF TRACER DISEASES FOR REGENCY HEALTH PLANNING IN BOGOR

DIAGNOSIS OF ILLNESS	Number of Episodes per Month	Number of Death per Year	D.I.I.	Technique of Field Diagnosis	Treatment Make a Difference	Consensus on Case Management	Remarks
1. Typhoid Fever	60	9	++	difficult	always	yes	included
2. Dysentery	113	19	+	easy	always	yes	included
3. Enteritis	222	39	+	easy	always	yes	included
4. Respiratory Tuberculosis	389	36	+++	moderate	always	yes	included
5. Other Tuberculosis	17	1	+++	difficult	most of the time	yes	excluded
6. Malaria	145	4	++	easy	always	yes	included
7. Avitaminosis-malnourish.	152	1	+++	easy	sometimes	yes	included
8. Anemia	230	1	++	easy	sometimes	yes	included
9. Eye Infection	363	0	++	easy	always	yes	included
10. Cataract	112	0	+++	easy	sometimes	yes	included
11. Ear & Mastoid Diseases	106	0	++	easy	often	yes	included
12. Heart & Vascular Diseases	155	33	+++	difficult	often	yes	included
13. Hypertension	273	4	++	easy	sometimes	yes	included
14. Upper Respiratory Inf.	638	0	+	easy	sometimes	yes	included
15. Flu/Common Cold	2,007	0	+	easy	sometimes	yes	included
16. Pneumonia	52	60	+	moderate	always	yes	included
17. Bronchitis-Asthma-Emphys.	494	11	++	easy	sometimes	no	included

TABLE 3 (continued)

DIAGNOSIS OF ILLNESS	Number of Episodes per Month	Number of Death per Year	D.I.I.	Technique of Field Diagnosis	Treatment Make a Difference	Consensus on Case Management	Remarks
18. Peptic Ulcer & Gastritis	158	1	++	moderate	sometimes	no	included
19. Dermatitis	486	0	++	easy	most of the time	yes	included
20. Dermatosis	388	0	+	easy	most of the time	yes	included
21. Accident & Trauma	114	17	++	easy	most of the time	yes	included
22. Measle	40	3	+	easy	most of the time	yes	excluded
23. Tetanus	7	25	++	easy	always	yes	excluded
24. Birth Trauma	41	23	++	easy	seldom	yes	excluded
25. Cholera	7	20	++	difficult	always	yes	excluded
26. Dengue	6	4	+	difficult	sometimes	yes	excluded
27. Worms	130	0	+	easy	sometimes	yes	excluded
28. Scabies	134	0	+	easy	most of the time	yes	excluded
29. Maternity Illness	9	3	++	easy	sometimes	yes	excluded
30. Nephritis	33	4	++	difficult	most of the time	no	excluded
31. Malignancy	17	17	++	difficult	seldom	no	excluded
32. Tonsil & Adenoid Diseases	49	0	+	easy	sometimes	no	excluded
33. Dental Illness	90	0	+	easy	most of the time	yes	excluded

14. **Flu or Common Cold**
15. **Pneumonia**
16. **Bronchitis, Bronchial Asthma, or Emphysema**
17. **Peptic Ulcer & Gastritis**
18. **Dermatitis**
19. **Dermatoses**
20. **Accident and Trauma**

1. Disability due to illness

Disability due to illness is measured in the number of days the sick person is unable to perform his normal functions if he/she is totally disabled or bedridden. In cases of partial disability, days of disability is reduced in proportion to the level of their disability. Disability days greater than or equal to 997 days are coded 997 days.

2. Utilization of health services

Utilization of health services is measured in terms of the number of consultations made at health facilities in the event of perceived illness. For outpatient visits, the measurement of utilization is equal to the number of outpatient consultations made. For inpatients, the measurement of utilization is equal to the number of hospital days, and assumes that there is one consultation made for each hospitalization day. For persons with both

inpatient and outpatient consultation experience, the measurement of **utilization** is equal to the sum of inpatient days and outpatient visits.

3. Severity of illness

The severity of illness is based on the respondents' perception. In case the respondent is hesitant to state the severity of his illness, several criteria are offered. Severe = bed ridden; moderate = limitation in work; and mild = no limitation in work; but the conclusion is entirely dependent on the perceptions the respondent or his family.

4. Diagnosis of illness

Diagnosis of illness is based on the professional judgement of the examining physician in the field. The physician-interviewer establishes his diagnosis based on the history and progression of the illness, subjective symptoms and signs reported by the respondent or his/her family, and findings from a physical examination performed during a visit to the respondent's home.

5. Duration of illness

Duration of illness is the number of days the

respondent suffers for any illness, per episode of illness.

6. Clinical onset

Classification of clinical onset of illness is based on the natural history of the disease, its progression, and its duration. There are three types of onset of illness: acute onset, subacute onset, and chronic onset.

7. Estimated value of household assets

Income has been mentioned as an important determinant of health status and use of health service as well. In a non-wage earning society, however, estimation of income is difficult. Much of the consumption of goods and services is not-countable. Assessment of income based on income tax is impossible as only a small fraction of the population pays taxes. Most employees in the modern sector have had their income taxes paid by their employers through direct deduction from their salary, and do not know the actual amount of their income tax. They are free from the obligation of filing annual income tax returns. People also may have two or more sources of income. It is possible to calculate the respondent's income, but it is beyond the capability of the average physician-interviewer. As surrogates of income, ownership and consumption of several notable household assets were recorded. Included in the

count were: radio/receiver, furniture, refrigerator, television, bicycles, horse-driven coach, motorcycle, car, and domesticated animals such as horses, cattle/cow, goats, pigs, and poultry. Later on, the standardized market value of these assets was assigned, and the value of the total assets was calculated. The value of the home was excluded from the estimation.

8. Source of regular treatment

The source of regular treatment is based on the response of the head of the household or spouse. Several choices were offered. The interviewer corrected the response after consulting a list containing the type, number, and address of health facilities in the village or its surrounding area. This information was obtained from local public health personnel before the visits to the respondents' homes. For instance, a respondent may indicate that the source of regular treatment is a hospital three blocks from home. In the check list the facility is recorded as subhealth center. The interviewer, then, will code the response as subhealth center, instead of hospital.

9. Availability/monopoly variable

As done for the source of regular treatment, the interviewer will correct respondent terminology regarding

the type of health care facilities used. The head of the household or spouse was asked to identify the variety of health care facilities in their village or nearby. The "desa" (village) may have one or more facilities or health care providers. If the family was able to identify only one facility or one health care provider, then the family was classified as under the monopoly of that facility or that particular health care provider for their regular source of care. Thus, it does not necessarily imply that the family lived in a village with a monopolistic health care system if they are classified as such.

10. Average cost of service in the community

What we mean by cost of service in the community is the total out-of-pocket cost of health care which includes consultation fee, hospitalization costs, laboratory tests, and drugs for one episode of illness. The average cost of services is the mean cost per consultation, which is obtained by dividing cost of service by number of USE.

11. Urban/rural character of place of residence

The household has urban character if it is located within the boundary of the municipality of Bogor and rural character if it is located in a rural subdistrict.

12. Age

Age is recorded in days and months for infant, in months and years for children under five, and in years for all others. Later, the age of the sample population is also coded into five age groups and this age grouping is used as the standard grouping whenever analysis based on age group is needed. The age groups are:

1. less than or equal to one year,
2. one to four years,
3. five to fourteen years,
4. fifteen to forty four years, and
5. forty five years and older.

13. Sex

Each respondent was designated as being either male or female.

14. Marital status

The marital status of each individual is recorded as described by individual adult respondents and their family. There are three categories:

1. "Married" means presently married and not living separately,

2. "Not yet married" indicate that the adult respondent has not ever been married nor has ever lived with another adult of the opposite sex, and
3. "Divorced" includes those who have married but live separately and those who live as single person, with or without children, because of separation or death.

15. Education

In the education variable, two observations were recorded. First the education of the individual and secondly, the education of the head of the household which is indirectly derived from the data. Some people can read even though they have never received formal schooling. They learn how to read and write through the illiteracy eradication program. Those who said they go to school, but could not read the questionnaire, were considered "can not read". The ordinal scale of the education variable is divided into seven levels:

1. Pre-school age, grouped separately,
2. Cannot read,
3. No schooling but able to read,
4. Did not finish elementary school,
5. Finished elementary school and probably have some secondary school,
6. Finished secondary school and probably have some high school,

7. Finished high school and probably have some college education, and
8. Have the equivalent of a bachelor's degree or higher.

16. Occupation

In the occupation variables, two observations were recorded: occupation of self and occupation of the head of the household. Occupation of the head of the household is indirectly derived from the data on individual characteristics. Occupation of the individual twelve years old or older is classified into six nominal categories:

1. Not yet working and not working--includes housewife without employment outside the home;
2. Clerical--white collar job, professional, managerial, clerical, or military service;
3. Trading--retail business or commerce;
4. Daily laborer--people with daily wages or people who hold blue collar jobs;
5. Agriculture worker or those who make a living from small agricultural activities, including farming, fishery, and horticulture; and
6. Others not specified in categories 1 through 5.

17. Family size

A household is a person or group of persons occupying

a part or the whole of a dwelling unit, and generally eating together from the same kitchen.

Family size is measured by counting the number of individual directly under the responsibility of the head of the household. This will include financially independent adult sons and daughters who still live in the house and pay for their board and lodging, since they are not registered separately in the local government's "daftar keluarga" (family register) as single. Included as family members are the servants, house boys, and night watchers who board in the house, and other boarders who may or may not pay for their board and lodging, and who have lived in the house for at least one month prior to the interview, since they are also registered in one family register and considered to be part of the nuclear family of the head of the household.

18. Religion

The religion variable was based on individual responses to the question: "What is your religion?" There are five pre-coded responses:

1. Moslem,
2. Christian,
3. Hindu,
4. Buddhism, and
5. Other religions.

19. Knowledge and awareness about illness

TABLE 4

ASSIGNMENT OF SCORES OF KNOWLEDGE AND AWARENESS ABOUT DISEASE

Variables	Categories	Score
Perception of illness	Perceived	1
"	Unperceived	0
Treatment of illness	Treated	1
"	Untreated	0
Place/Provider of treatment	Hospital	3
"	Health center	3
"	Subhealth center	2
"	A.M.P.	2
"	Self	0
Self treatment using	Modern medicine	1
"	"jamu"	1
Other methods of treatment	Massage	1
"	Decortication	1
"	Depressurized	1
"	Acupuncture	1
"	Soothsaying	0
"	Others	0

This variables is rescaled from six variables of the survey. They are: 1) individual perception regarding illness; 2) treatment of illness; 3) place or provider of treatment; 4) use of modern medicine in self treatment; 5) use of "jamu" in self treatment; and 6) use of other methods of treatment excluding modern medicine and "jamu". Children under twelve years old are represented by their parent or other adult in the family (see table 4).

As a result of the scoring system, the variable of knowledge and awareness shows an acceptable normality with a slightly flat probability density curve, as shown below:

Minimum	0.
Maximum	5.
Mean	1.7716
Standard Deviation	1.3861
Skewness	0.353
Kurtosis	-1.157

20. Quality of care

The variable of quality of care is developed from three variables which are highly correlated using the principal component analysis approach in factor analysis. The three variables are: 1) respondent impression about the quality of care they have received for treatment of illness during the period one month prior to the interview, 2) respondent motivation to seek care, and 3) outcome of treatment of the illness suffered during the period one month prior to the interview (see tables 5, 6, 7, and 8).

Only one factor produced by the factor analysis, which

TABLE 5

RESPONDENT IMPRESSION ABOUT THE QUALITY OF CARE RECEIVED FOR TREATMENT OF ILLNESS DURING THE PERIOD ONE MONTH PRIOR TO THE INTERVIEW (*IMPRQLTY*), MEASURED IN THESE ORDINAL SCALES

CATEGORY OF RESPONSES	PERCENT OF RESPONSES
1. Not Satisfactory	10.3
2. Rather Satisfactory	18.5
3. Satisfactory	70.2
4. Very Satisfactory	0.9

TABLE 6

RESPONDENT MOTIVATION TO SEEK CARE (*MOTICARE*), MEASURED IN THESE ORDINAL SCALES

CATEGORY OF RESPONSES	PERCENT OF RESPONSES
1. Forced by others	0.2
2. No other choice	0.6
3. Suggested by others	2.7
4. Referred by professionals	4.3
5. Self motivated	92.2

represents measurement of quality of care (*QLTY*), where

$$QLTY = .6977\ IMPQLTY + .11246\ MOTICARE + .022923\ TRESULT$$

The factor loading assessment of the quality of care variable indicates that the measurement of quality of care is dominated almost equally by respondent impression and outcome of treatment.

The distribution of the variable of measurement of

TABLE 7

OUTCOME OF TREATMENT RECEIVED FOR ILLNESS SUFFERED DURING THE PERIOD ONE MONTH PRIOR TO THE INTERVIEW (*TRESULT*), MEASURED IN THESE ORDINAL SCALES

CATEGORY OF RESPONSES[1]	PERCENT OF RESPONSES
0. Death	0.1
10. Debilitating or Crippling sequela	0.4
25. Worse	1.1
50. More or less the same	23.7
75. Improved or better	45.7
100. Complete cure	28.8

[1]The scale has been developed somewhat to make the distribution closer to normal.

TABLE 8

FACTOR ANALYSIS OF *IMPRQLTY*, *MOTICARE*, AND *TRESULT* IN ESTIMATING QUALITY OF CARE

Variables	Initial Values	Communalities After 10 Iterations	Rescaled Factor Loading (1)
IMPRQLTY	0.16437	0.40727	0.63817
MOTICARE	0.0084997	0.014775	0.12155
TRESULT	0.16357	0.39685	0.62992

Eigen value = 0.81889
Variance Explained = 0.273

quality of care also shows an acceptable normality with a slightly flat probability density curve:

Minimum	0.
Maximum	6.2306
Mean	2.1038
Standard Deviation	2.4805
Skewness	0.574
Kurtosis	-1.458

21. Distance to place of treatment

There is variation in the way respondents assess the distance from their place of residence to place of treatment. Each family has a different level of mobility because of differential access to good roads and good transportation systems, and differential variation in ownership of transportation vehicles. Respondents with motorcycles can easily cover a considerable distance and may say that the place of treatment is near, while his next-door neighbor, who must travel on foot, will say the distance is quite far (see table 9).

TABLE 9

RESPONDENT PERCEPTION ABOUT DISTANCE, FROM HOME TO PLACE OF TREATMENT, MEASURED IN ORDINAL SCALE

RESPONDENT PERCEPTION ABOUT DISTANCE, FROM HOME TO PLACE

CATEGORY OF RESPONSES	PERCENT OF RESPONSES
1. Treated at own home	7.8
2. Near from home	50.2
3. Rather far from home	20.1
4. Far enough from home	14.8
5. Very far from home	7.1

F. Population and Health Sector Activities in Bogor

The Population of Bogor

The projected population of Bogor is 2.9 million people in 1980, with over 200,000 people living in the city of Bogor.[6] The birth rate is 44 per thousand.
The population distribution, by age, in Bogor in 1980 is presented in table 10.

TABLE 10

AGE DISTRIBUTION OF BOGOR POPULATION IN 1980[1]

AGE GROUP	NUMBER OF PEOPLE	PERCENTAGE OF TOTAL
< 1 Year	96,701	3.3%
1- 4 Years	325,634	11.1%
5-14 Years	811,986	27.6%
15-44 Years	1,272,952	43.2%
≥45 Years	437,927	14.9%
TOTAL	2,945,200	100.1%[2]

[1] Computed from population table of Bogor Bappemka and Bogor Office of Census and Statistics.
[2] The total number does not add up to 100.0% due to rounding errors.

In the Regency of Bogor, but outside of the city, only 6.8% of the work force is in modern sector. Employees of the modern sector usually have their medical care provided

partially or wholly by their employers. In the city of Bogor, 10% of the population has white collar jobs or is in the military service, where partially paid, modern medical care is available (see table 11).

TABLE 11

WORK FORCE OF BOGOR BY TYPE OF EMPLOYMENT IN 1974+

TYPE OF EMPLOYMENT	NUMBER OF PERSONS	PERCENTAGE
Agriculture	469,626.	70.9
Trade/Retailing	147,824.	22.3
Industry/Handicraft	37,798.	5.7
Service	7,219.	5.7

+Source: Government of Bogor, General Outline of Long Range Development in Bogor (Pola Umum Pembangunan Jangka Panjang Kabupaten Bogor), 1975., p. II-15.

There is no readily available data on income per capita in Bogor. The national average per capita income is estimated to equal (U.S.)$378.00 per year in 1978, with a 6.8% annual increase in Real Gross Domestic Product.[7] We believe that per capita income in Bogor is somewhat higher than that.

The majority of the population are Moslem. Moslems who observe their religion pray up to five times a day and clean their body (wudhu) before praying. This has a good effect on personal hygiene. However, the physical environment is not particularly supportive. There is a lack of latrines and protected sources of water. Small children

defecate wherever they want, without creating stigmas for their parents. Many villagers seem to consider that contamination by children's fecal material is not dangerous.

The population density is 803 people per square kilometers and it is increasing rapidly at 2.35% per year.

Health Services

The health services in Bogor are offered by four major groups. They are:

1) Government hospital-health center-subhealth center system,
2) Private modern practitioners,
3) Private hospitals or clinics, and
4) Private traditional practitioners.

There is one general hospital in Bogor in 1980 with 275 beds and 40 baby cribs, staffed by 23 physicians. In addition to providing primary care, the hospital also has specialized care for Internal Medicine, Surgery, Pediatrics, Obstetrics/ Gynecology, ENT, Opthalmology, Radiology, Pathology, Dentistry, Orthopedics, and Anesthesiology. The hospital also serves as the blood transfusion center for the regency and nearby regencies, such as those of Sukabumi, and Cianjur.[8]

There is one health center in each subdistrict's town, staffed by at least:

1 Physician/General Practitioner
1/5 Dentist

1 Nurse
1 Midwife
1 Dental Nurse
1 Health Inspector
1 Sanitarian
1 Nurse Assistant
1 Immunizator/Vaccinator.

Even so, the variation above the minimum among the subdistrict health centers is great. In Cibinong, the health center employs 26 persons with an average daily attendance of over 150 visits. In Sawangan, the average daily attendance was 35 to 40 visits per day in 1980s when the health center employed 13 persons, including one physician, one professional midwife, and one professional nurse.

There are one to two subhealth centers in each subdistrict. The subhealth centers are located separately from the health center. The purpose of the subhealth center is to increase the catchment size of the health center - subhealth center system. Currently, there are variations in the physical form and service emphasis of these subhealth centers. The newly built subhealth center is the extension arm of the health center. It performs a role similar to the health center but on smaller scale. The old subhealth center may be one of two types: first, the former MCH clinic (BKIA), which has formally been converted into a subhealth center; second, the former Polyclinic (BP), which has also been converted into a subhealth center. Since the staffs and the emphasis of the programs in the former BP and BKIA are not altered, their old functions are carried over to their new responsibilities.

Private modern practitioners are those who currently practice medicine separately from government services. They may still work in government service or may have retired. The private practice serves two objectives: first as a means of supplementing their low government salaries or pension benefits; and second, to provide services for those who cannot make time to visit government clinics during government working hours. Also, there are some patients who prefer a private practitioner. Private modern practitioners may have diverse technical qualifications. Their qualifications can be as simple as nurse assistant or as sophisticated as clinical specialist physician. Government physicians, nurses, and midwives are allowed to operate their own private practices and are protected legally, but require a license and must pay extra taxes.

Traditional private practitioners are generally called **dukun**. In West Java, many of them also have their own specialty and, in general, they know the limitations of their proficiency.' The variety of specialized expertise includes birth attendant, bone setter, anti venom-specialist, herbalist, massager, soothsayer circumcision specialist, and other medical duties. This medical expertise is called **ilmu putih** (white magic). Some roles and area of expertise or specialty are sex related. The dukun who performs black magic is not included in this group.

Private hospitals or clinics, in practice, are an extension of the government clinics, run mostly by

government health personnel from their own private offices. They indeed have a selected group of patients. They perform primarily curative care and usually charge higher fees. However, some of them work on a purely altruistic basis.

The church-operated hospital does not play an important role in this regency, since the area is populated by predominantly devout (conservative) Moslems. The church-operated clinics/subhealth centers, however, play an important role in the subdistrict of Depok, where a substantial proportion of the population is of Eurasian descent and practice the Christian faith.

Another important source of care is the **jamu** vendors and **tukang obat**. The jamu vendors carry a basket containing bottles of a variety of prepared potions, made out of herbs, tree bark, plants, or spices. Jamu is a popular folk medicine in Java. The jamu vendors are not dukuns. Their different potions have a variety of uses. The most commonly used are those which have efficacy against cold, muscle pain, headache, menstrual dysfunction, and low back pain. There is also a jamu which has a **cholagogum** (appetite stimulating) effect. There are well above 150 categories of jamu that have been identified and registered in the Directorate of Traditional Medicine in The Ministry of Health in Jakarta.

Tukang obat are those who sell drugs at the bazaar. In the past, there were many of them who sold

"magic" herbs or drugs, but nowadays, there are an increasing number of them who sell factory-made drugs, ranging from vitamins and antipyretics to antibiotics. They may have a stationary post or wander from place to place. In Bogor, a formal licence to sell drugs is required. However, the enforcement of the **tukang obat** license remains ineffective since the local health authorities are unable to control them.

The **Warung** (small grocery store) and the **toko** (drugstore) also play an important role in providing drugs to the community. **Bayer's Aspirin** and **Ciba's Enterovioform** are among the hottest selling items on the market, and are consumed at a tremendous rate.

The **PKMD**, which has been developed within the context of the Primary Health Care (PHC) concept, has not yet had observable impact on the rural areas of Bogor. Therefore, its potential should not be considered comparable to the **PKD** of Karang Anyar, Central Java.

In urban areas, the development of community participation in the provision of health care has not gone very far. Only in rare cases do health center personnel sponsor health education or nutritional education activities, conducted during arisan.[10]

Family planning is one program mentioned as a component of basic health needs.[11] The clinical aspect of family planning services is jointly provided with maternal and child health care services. In Bogor, as well as in

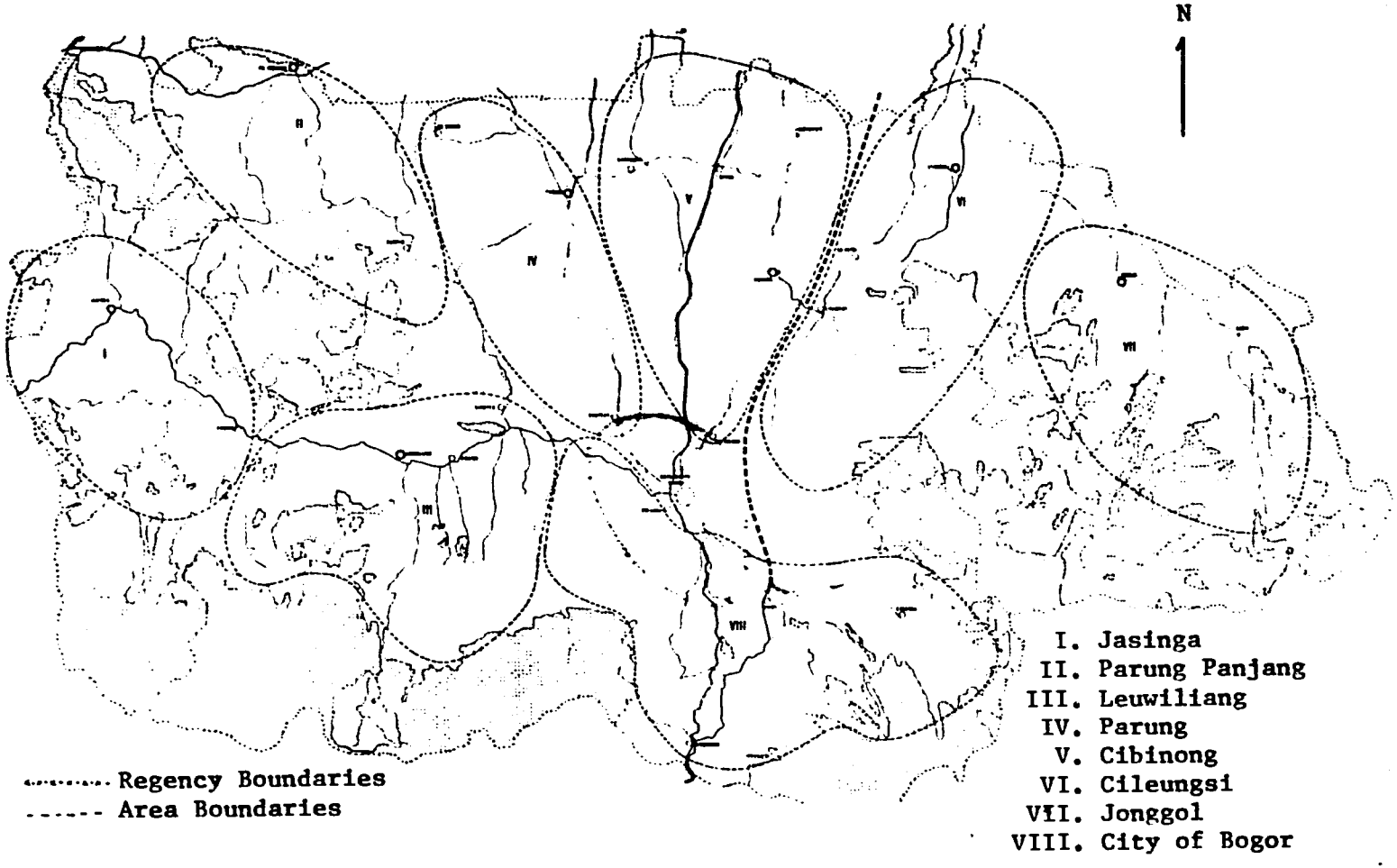
Indonesia, the family planning programs are coordinated by the **BKKBN**, a different organization with sub-ministerial status, responsible directly to the Office of the President. **BKKBN** has a separate budget from the Ministry of Health. **BKKBN** has a field office in each regency, and all of their clinical works are supported by government health services as well as by private health care providers. At the moment **BKKBN** maintains its symbiotic relationship with the government as well as with private health services.

G. Regional Development of Bogor

In planning the health sector for the regency of Bogor, we must not forget the master plan for Bogor as a whole. The Regency of Bogor has been divided into eight development areas, each of them having different characteristics, potentials, and trends for development.[12]

Development area I: 244.09 km^2, which covers the subdistricts of Jasinga, and Cigudeg, with its center at the town of Jasinga. This area will become the development area for agriculture, plantation, forestry, and agriculture-based industry. The projected population density in the year 2001 is 1,014 people per square kilometer.

Development area II: 193.03 km^2, which covers the subdistricts of Parung Panjang, and Rumpin, with its center in the town of Parung Panjang. This area will become the development area for animal husbandry and mining. The



MAP 3. REGENCY OF BOGOR SHOWING DEVELOPMENT AREAS

projected population density in the year 2001 is 1,206 people per square kilometer.

Development area III: 333.65 km^2, which covers the subdistricts of Leuwiliang, Cibulang, and Ciampea, with its center in the town of Leuwiliang. This area will become the development area for fresh-water fishery and wet rice agriculture. The projected population density in the year 2001 is 1,863 per square kilometer.

Development area IV: 137.37 km^2, which covers the subdistricts of Semplak, Parung, and Gunung Sindur, with its center in the town of Parung. This area will become the center for horticulture and the buffer zone for reversed urbanization from Jakarta. The projected population density in the year 2001 is 3,445 people per square kilometer.

Development area V: 310.95 km^2, which covers the subdistricts of Sawangan, Depok, Cimanggis, Cibinong, and Kedung Halang, with its center in the town of Cibinong. This area is an industrial area and it will also serve as a residential area for reversed urbanization from Jakarta. The projected population density in the year 2001 is 3,067 people per square kilometer.

Development area VI: 248.47 km^2, which covers the subdistricts of Citeureup, Gunung Putri, and Cileungsi, with its center in the town of Cileungsi. This area is residential area and will also accommodate the development of fruit agriculture. The projected population density in the year 2001 is 1,644 people per square kilometer.

Development area VII: 365.99 km^2, which covers the subdistricts of Jonggol, and Cariu, with its center in the town of Jonggol. This area is expected to become the area for **sawah** (wet-rice agriculture), agriculture-based industry, and other by-products of agriculture. The projected population density in the year 2001 is 825 people per square kilometer.

Development area VIII: 398.74 km^2, which will cover the subdistricts of Ciomas, Cijeruk, Ciawi, and Cisarua, with its center in the city of Bogor. This area is designated for agriculture and tourism. In addition the Bogor Institute of Agriculture, the leading agricultural university in the nation, is located in this area. The projected population density in the year 2001 is 2,474 people per square kilometer.

Whenever health service facilities need to be expanded in this regency, consideration should be given to the size and density of the population in each subdistrict, rather than simply making an across the board addition of facilities.

There are, of course, growing population pressures threatening the survivability of the Regency of Bogor, as well as all of the Island of Java. The population density in some of the subdistricts may reach over 3,000 people per square kilometer by the year 2000. This will have bad health effects, such as increasing the speed of transmission of communicable diseases, the very grave risk of mental

illness, nearly impossible management of solid waste and liquid waste disposal, and contamination of underground water reserves. The health agency is further handicapped by the distribution of power and authority among various government bureaucracies, when dealing with these problems. The management of the environment is shared by the Ministry of Public Works & Energy, the Ministry of Natural Protection and Human Ecology, and the Junior Minister of Urban Development and Housing. The Ministry of Health for instance, will have difficulty in coordinating programs for environmental protection to their own best interests, because none of these above three ministries could be subjected to the interests of the Ministry of Health.

Footnotes to Chapter IV:

[1]Pundarika, Ratna L. and Sulianti-Saroso, J., "Household Survey in Indonesia," Bulletin Penelitian Kesehatan Vol. 2, No. 2, 1974, pp. 70-72.

[2]Soetopo, M.H.W., Soemana, P., "An Analysis of the Utilization of Two General Hospitals in Pasuruan Regency," Bulletin Penelitian Kesehatan Vol. 1, No. 1, 1973, pp. 24-31.

[3]Pundarika, Ratna L. and Sulianti-Saroso, J., op. cit., pp. 70-72.

[4]Scheff, T.J., "Preferred Errors in Diagnosis," Medical Care Vol. 2, July-Sept. 1964, pp. 166-172.

[5]Kessner, David M. and Kalk, Carolyn E., A Strategy for Evaluating Health Services, Institute of Medicine, Panel on Health Service Research, Washington, D.C.: National Academy of Science, 1973, pp. 15-17.

[6] As projected by Bogor BAPEMKA and Bogor Office of Census and Statistics.

[7]Business Week, December 17, 1979, p. 48.

[8]General Hospital Bogor, Annual Report for Fiscal Year 1979/1980, Bogor, May 1980, unpaginated.

[9]Muzaham, Fauzi, Laporan Penelitian Dukun di Jawa Barat, (Report on the Study of "Dukun" in West Java), Jakarta: Badan Penelitian dan Pengembangan Kesehatan, 1979.

[10]Arisan is a club, usually among women, where they put together a sum of money, then a lottery is drawn to determine who will receive the money that month. All previous month winners are not included in the lottery, however they must pay their dues.

[11]Alternative Approaches to Meeting Basic Health Needs in Developing Countries: A joint UNICEF/WHO study, V. Djukanovic and E.P. Mach (eds.), Geneva: World Health Organization, 1975, p. 9.

[12]Pemerintah Kabupaten Daerah Tingkat II Bogor, Pola

Umum Pembangunan Jangka Panjang Kabupaten Bogor (The General Outline of Long Term Development of The Regency of Bogor), 1975, pp. I-5 - I-6.

CHAPTER V

HEALTH INFORMATION AND HEALTH BEHAVIOR

A. Response to Illness

Illness is a disruption of the harmonic balance of individual health which is perceived as a threat. Upbringing, social status, socioeconomic level, culture, and education all influence individual and societal concepts of health and illness. Response to illness varies across individuals as well as societies.[1 2]

Referring to figure 1 in chapter II, the examining physician and the respondent do not always agree on their perception of a particular health problem. As a whole, in a cross section of the population, examining physicians find that people who have been diagnosed as diseased (area ABCD) are not always identical to the group that believe they have suffered some diseases (area EFGH). Of course, there are some overlaps as well as disagreement between the two groups. There is one group with illnesses that could be diagnosed, but the individuals themselves are unaware of the problem (area ABMEPD). On the other hand, there is a group with complaints that could not be diagnosed as any

particular illness (area MFGHPOLKJN). This latter condition is called hypochondria. Both the diseased and the hypochondriacs are represented in the consumption of health services (area IJKL). The consumption of the diseased (area INCO) competes directly with the consumption of the hypochondriacs (area NJKLOC). The consumption of health services by hypochondriacs is a waste of resources. In places where resources are scarce, the consumption of health services by the hypochondriacs should be discouraged, and the unmet demand as represented by area EMNIOP, should be encouraged to consume more health services.

Table 12 demonstrates that episodes of illness perceived by the population are only 69.5% of the total episodes. If hypochondriacs are excluded, then the number of episodes of illness perceived by the population are 69.2% of the total episodes. These hypochondriacs consume health services at a relatively greater proportion than the population in general. Hypochondriacs comprises 1.2% of the total episodes, but they are 1.7% of those who perceived their illness and 1.4% of those who actually seek treatment for their illness. Considered from the extent of care, 2.2% of the hypochondriacs have said that hospitalization was advised for their illness. Decisions for admission to inpatient care, however, are still in the hands of health personnel, and are not dominated by the unreasonable demands of the hypochondriacs. The proportion of hypochondriacs among the hospitalized cases then drops to 1.0%.

TABLE 12

SUBJECTIVE AND OBJECTIVE PERCEPTION OF ILLNESS AMONG THE POPULATION OF BOGOR AND THEIR SUBSEQUENT ACTION

STATUS OR CONDITION CATEGORIES	DIAGNOSTIC CATEGORIES		Total Episodes of Illness and Complaints
	Number of Illnesses Diagnosed by the Examining Physician	Number of Hypochondria	
Episode of illness	8,316 (98.8%) (100.0%)	98 (1.2%) (100.0%)	8,414 (100.0%) (100.0%)
Perceived episode of illness	5,752 (98.31%) (69.2%)	98 (1.7%) (100.0%)	5,850 (100.0%) (69.5%)
Illness with treatment	4,041 (98.6%) (48.6%)	57 (1.4%) (58.2%)	4,098 (100.0%) (48.7%)
Episode of illness suggested for hospitalization	176 (97.8%) (2.1%)	4 (2.2%) (4.1%)	180 (100.0%) (2.1%)
Episode of illness actually hospitalized	100 (99.0%) (1.2%)	1 (1.0%) (1.0%)	101 (100.0%) (1.2%)

Status or condition categories "suggested for hospitalization" and "actually hospitalized" entirely depend on the respondent's opinion. The examining physician was unable to confirm the response at their source of care.
The middle percentage figures in each box are the row percentage. The bottom percentage figures are the column percentages relative to total episodes in each diagnostic category.

Assessment of the degree of preference and compliance o treatment also shows that hypochondriacs seek care and

comply to treatment procedure in greater proportion than the diseased. Among the sick, 48.6% seek treatment versus 58.2% among hypochondriacs. This figure, however, is lower than the 70.3% among the sick who perceive their illness. The diseased will use the service in greater proportion once they perceive their illness. The hypochondriacs tend to exaggerate the extent of their treatment. Among the hypochondriacs, the proportion who claimed that their illness was referred for hospitalization is 4.1% of the total perceived and 7.0% of the total treated, versus 2.1% and 4.4%, respectively, among the diseased. Actual hospitalization reported, as has been mentioned earlier, is higher among the sick than the hypochondriacs--1.2% among the sick and 1.5% among the hypochondriacs. Relative to the episodes of illness suggested for hospitalization, the sick were hospitalized in 56.9% of the cases versus 25.0% among the hypochondriacs who, to some extent, manage to obtain unnecessary hospitalization.

Among the sick, reasons for not seeking care are cost, distance, quality of care, and attitude (see table 13). Cost of service is a problem for 50.0% of the non-users. Distance is a problem for 6.8% of the non-users. An attitude of waiting for further development of the illness is the reason for not seeking care in 10.7% of the non-users, and an attitude of refraining from earlier consultation but going later (after the interview) accounts for 11.0% of the non-users. Thus, the problem of attitude constitutes 21.7% of

TABLE 13

REASONS FOR NOT SEEKING CARE AMONG THE NON-USERS

REASON	NUMBER	PERCENT
Cost of service	833	50.0%
Distance from home to clinic	114	6.8%
Waiting for further development	178	10.7%
Will go soon	184	11.0%
Low quality of care	29	1.7%
Inaccessible facility	5	0.3%
Others	323	19.4%
Total	1,666	99.9%+

+Percent total does not add up to 100.0% due to rounding errors

the reasons for non-use. Perception of lack of quality of care, from experiences with similar diseases in the past, accounts for 1.7% of the non-users. The reason for not seeking care due to inaccessible facility accounts for only 0.3% of the non-users.

The reason for not following recommendations for hospitalization include the problem of cost in 44.7% of the cases; the problem of attitude, such as family disagreement with the suggestion of hospitalization, in 32.9% of the cases, and lack of inpatient facilities, such as no available beds, in 3.9% of the cases (see table 14).

In aggregate, we may conclude that respondents react

TABLE 14

REASONS FOR NOT FOLLOWING ADVICE FOR HOSPITALIZATION AMONG THE SICK AND THE HYPOCHONDRIACS

Reason for not going for Hospitalization	Diagnostic Categories		Total
	Sick	Hypo-chondriacs	
Place/bed has not been available yet	3 100.0% 4.1	0	3 100.0% 3.9%
Do not have enough money	32 94.1% 43.2%	2 5.9% 100.0%	34 100.0% 44.7%
Family disagreement for Hospitalization	25 100.0% 33.8%	0	25 100.0% 32.9%
Other reasons	14 100.0% 18.9%	0	14 100.0% 18.4%
Total	74 97.4% 100.0%	2 2.6% 100.0%	76 100.0% 100.0%

There are 79 cases who disobey advice for hospitalization, but only 76 cases give their reason. The Chi-square test is inappropriate in this table since there are too many empty cells.

to episodes of illness, their method of treatment depending on their perceptions regarding the disease, their personality, and the degree to which they feel of insecure. The importance of socioeconomic factors in their responses can be measured by the number of cases who disobey suggestions for hospitalization due to financial reasons and due to disagreement from other members of the family.

The importance of accessibility to health services can

be demonstrated dramatically by the analysis of mortality data and causes of death. The survey data shows that the number of deaths in one month is 82 cases, which means, that the crude death rate is 16.7 per 1,000 population (82 x 12/58,934). However, annual deaths reported total 433 cases, which means 7.3 deaths per 1,000 population--an under reporting of 56.3%. If the recall error decreases in linear fashion, then the actual death rate is 17.48 per 1,000 {(16.7 - 7.3)/(12 + 16.7)}. Out of 67 cases of death due to illness and accident, only 5.77% had contacted health care providers. There were 5,490 people who perceived their illness during the period one month prior to the interview. Among them, 3,918 persons (71.37%) had sought treatment.

TABLE 15

DISTRIBUTION OF MORBIDITY AND MORTALITY OF NON OBSTETRIC CASES BY EVIDENCE OF CONTACT WITH HEALTH CARE PROVIDERS, IN 1980, IN BOGOR

CATEGORY	NUMBER OF CASES (PER MONTH)	NUMBER OF DEATHS (PER MONTH)	CASE FATALITY RATE PER 1,000 POP.
With Treatment	3,918	4	1.02
Without Treatment	1,572	63	40.08
Total	5,490	67	11.99

Ratio of case fatality rate "without treatment" to "with treatment" is 39.25

The difference in case fatality rates between the

groups with treatment and the groups without treatment is enormous. It demonstrates the benefits of increasing health care coverage to a population where only marginal health services are available. The magnitude of these benefits should be discounted somewhat, since some of these deaths probably occur after the relatives of the dead person decide that the situation of the patient is hopeless and no further medical intervention will be beneficial; or they simply accept the incipient death as a natural phenomenon.

B. Disease Pattern of Bogor

Survey-based data collection presents more accurate information about disease patterns of a region as compared to service-based data. The selection process prior to the utilization of health service facilities creates a bias. Most service-based data provides statistics of visits to outpatient clinics, hospital admissions, and hospital discharges.

The availability of information about age-specific duration of illness from the health household survey data enables the estimation of incidence rates, prevalence rates, and "Annual Illness Rates."[3] In the next presentation, the classification of diseases, which is originally in the modified "C-List" of the International Classification of Diseases[4] has been reduced due to the variations of illness in Bogor. The calculation of the Estimated Annual Illness

Rate of disease i in age group j, Estimated Annual Number of Episodes of disease i in age group j, Estimated Annual Death Rate per 1,000 population of disease i in age group j, Estimated Number of Deaths due to disease i in age group j, and Case Fatality rate due to disease i in age group j, use the following formulas:

$$\text{Est. A.I.R.}_{ij} = \frac{\#\text{Cases}_{ij} \times 1{,}000}{\text{Sample}_j} \times \frac{365}{\text{Duration}_{ij}}$$

$$\text{Ann. }\#\text{Episode}_{ij} = \frac{\#\text{Cases}_{ij} \times \text{Pop}_{ij}}{\text{Sample}_j} \times \frac{365}{\text{Duration}_{ij}}$$

$$\text{Est. Ann. Death Rate}_{ij} = \frac{\#\text{Death}_{ij} \times 1{,}000}{\text{Sample}_j}$$

$$\text{Est. Ann. Death}_{ij} = \frac{\#\text{Death}_{ij} \times \text{Pop}_{ij}}{\text{Sample}_{ij}}$$

$$\text{Case Fatality Rate}_{ij} = \frac{\#\text{Annual Death}_{ij} \times 1{,}000}{\text{Annual }\#\text{Episode}_{ij}}$$

The duration of illness in most age groups has a normal distribution, but in some groups, it is not normal and skewed to the right. In the calculation of the annual illness rate, the duration of illness is treated as a normally distributed variable, since the conversion to logarithmic scale makes the computation and interpretation of these basic statistics too difficult to comprehend. We must keep in mind that the normally distributed variable of duration of illness will have shorter average duration of illness than the mean duration of illness obtained from the

computed statistics, as presented in table 16. Therefore, the actual illness rate is slightly greater than the estimated illness rate presented in table 16; the case fatality rate is slightly smaller. However, for comparison of the relative advantages of different health care alternatives, this slightly greater illness rate will not produce erroneous conclusions, since all alternatives are treated equally.

There are three "pathological" observations in table 16. First, in the case of tetanus. There were no tetanus cases found during the survey, but there were twenty five tetanus deaths reported, eighteen of them among children below the age of one year. This situation may occur if an acute convulsive seizure, with tetanic spasm before death, was diagnosed as tetanus death. Clinical tetanus has also been diagnosed erroneously by the examining physician as encephalitis with convulsion. The acute onset of tetanus may also contribute to its escape from detection. The second "pathological" observation is the diagnosis of cholera among 5-14-year-olds and among the age group of ≥45 years. There was no morbidity found among these two age groups during the survey, but there are five reported cholera deaths among them. The cases with severe choleriform diarrhea, which must be treated immediately, were possibly diagnosed as severe gastroenteritis by the examining physician. This situation is understandable since there is no laboratory backup to confirm the presence of Vibrio

TABLE 16

ESTIMATION OF AGE SPECIFIC ANNUAL ILLNESS RATE, ANNUAL CASE LOAD, ANNUAL DEATH RATE, AND CASE FATALITY RATE, BASED ON COMPUTATION FROM THE NUMBER OF CASES FOUND, AVERAGE DURATION OF ILLNESS, AND THE NUMBER OF DEATHS REPORTED, IN BOGOR, IN 1980

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL		NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL		CASE FATALITY RATE PER 1,000 CASES
			ILLNESS RATE PER 1000 POP	NUMBER OF EPISODES		DEATH RATE PER 1,000 POP	NUMBER OF DEATHS	
1. Typhoid Fever								
< 1 yr	1	6.0	31	3,040	1	.52	50	16.44
1- 4 yrs	7	12.1	32	10,552	1	.15	50	4.74
5-14 yrs	23	12.7	41	33,034	1	.06	50	1.51
15-44 yrs	23	18.2	18	23,055	3	.12	150	6.50
≥45 yrs	6	43.7	6	2,504	3	.34	150	59.86
2. Dysentery								
< 1 yr	9	6.6	257	24,874	9	4.65	450	18.08
1- 4 yrs[1]	42	7.7	306	99,495	9	1.38	450	4.52
5-14 yrs	16	61.1	6	4,777	0	0.	0	0.
15-44 yrs[1]	33	17.6	27	34,207	1	.04	50	1.46
≥45 yrs[1]	13	95.3	6	2,488	0	0.	0	0.

[1]The distribution of the duration of illness in this age group deviates from normal.

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
3. Enteritis								
< 1 yr [1]	22	51.3	81	7,823	14	7.24	700	89.44
1- 4 yrs	88	7.1	694	226,082	15	2.30	750	3.32
5-14 yrs[1]	27	11.2	54	43,973	2	.12	100	2.27
15-44 yrs[1]	47	30.2	22	28,392	3	.12	150	5.28
≥45 yrs[1]	38	4.8	330	144,406	5	.57	250	1.73
4. Respiratory TB								
≤ 1 yr	3	16.5	34	3,317	1	.52	50	15.07
1- 4 yrs	17	184.2	5	1,683	0	0.	0	0.
5-14 yrs	21	234.9	2	1,631	0	0.	0	0.
15-44 yrs	117	481.3	5	5,848	10	.39	500	85.47
≥45 yrs	231	509.3	26	11,544	25	2.85	1,249	108.23

[1]The distribution of the duration of illness in this age group deviates from normal.

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
5. Malaria								
< 1 yr	0	.0	0	0	0	0.	0	0.
1- 4 yrs[1]	12	31.9	21	6,862	0	0.	0	0.
5-14 yrs[1]	34	13.0	59	47,706	0	0.	0	0.
15-44 yrs[1]	70	82.2	12	15,536	2	.08	100	6.43
≥45 yrs[1]	29	89.2	14	5,930	2	.23	100	16.85
6. A/Hypovitamin.								
< 1 yr	6	47.0	24	2,329	0	0.	0	0.
1- 4 yrs[1]	48	172.3	16	5,082	1	.15	50	9.83
5-14 yrs	33	71.5	10	8,419	0	0.	0	0.
15-44 yrs[1]	28	200.8	2	2,544	0	0.	0	0.
≥45 yrs	37	455.8	4	1,849	0	0.	0	0.

[1]The distribution of the duration of illness in this age group deviates from normal.

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
7. Anemia								
< 1 yr	2	60.0	6	608	0	0.	0	0.
1- 4 yrs	8	60.0	7	2,432	0	0.	0	0.
5-14 yrs	13	184.5	2	1,285	0	0.	0	0.
15-44 yrs[1]	138	181.3	11	13,886	1	.04	50	3.60
≥45 yrs	69	360.0	8	3,496	0	0.	0	0.
8. Eye Infection								
< 1 yr	8	5.8	260	25,160	0	0.	0	0.
1- 4 yrs[1]	62	31.4	111	36,017	0	0.	0	0.
5-14 yrs[1]	100	39.8	56	45,831	0	0.	0	0.
15-44 yrs[1]	111	22.6	70	89,603	0	0.	0	0.
≥45 yrs[1]	82	168.4	20	8,882	0	0.	0	0.

[1]The distribution of the duration of illness in this age group deviates from normal.

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
9. Cataract								
< 1 yr	0	.0	0	0	0	0.	0	0
1- 4 yrs	0	.0	0	0	0	0.	0	0
5-14 yrs	1	≥997.0	≤1	50	0	0.	0	0
15-44 yrs	13	695.8	1	650	0	0.	0	0.
≥45 yrs	98	555.5	11	4,898	0	0.	0	0.
10. Ear-Mastoid								
< 1 yr	5	77.0	12	1,184	0	0.	0	0.
1- 4 yrs	41	182.1	13	4,107	0	0.	0	0.
5-14 yrs	47	328.0	3	2,614	0	0.	0	0.
15-44 yrs	8	144.1	1	1,013	0	0.	0	0.
≥45 yrs	5	54.3	4	1,680	0	0.	0	0.

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
11. Heart-Vascular								
< 1 yr	1	30.0	6	608	0	0.	0	0.
1- 4 yrs	4	347.0	1	210	2	.31	100	475.34
5-14 yrs	8	202.0	1	722	0	0.	0	0.
15-44 yrs	51	269.9	3	3,447	2	.08	100	29.00
≥45 yrs	91	538.9	10	4,548	29	3.31	1,449	318.68
12. Hypertension								
< 1 yr	1	270.0	1	68	0	0.	0	0.
1- 4 yrs[1]	1	?	?	?	0	0.	0	0.
5-14 yrs	0	.0	0	0	0	0.	0	0.
15-44 yrs	94	269.9	5	6,354	1	.04	50	7.87
≥45 yrs	177	449.2	20	8,845	3	.34	150	16.95

[1]The distribution of the duration of illness in this age group deviates from normal.

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
13. U.R.I.								
< 1 yr [1]	30	17.8	318	30,743	0	0.	0	0.
1- 4 yrs[1]	185	6.4	1,619	527,270	0	0.	0	0.
5-14 yrs[1]	177	5.2	765	620,885	0	0.	0	0.
15-44 yrs[1]	155	15.6	142	181,226	0	0.	0	0.
≥45 yrs	91	32.4	117	51,232	0	0.	0	0.
14. Flu/C. Cold								
< 1 yr [1]	147	7.1	3,905	377,661	0	0.	0	0.
1- 4 yrs	667	6.7	5,577	1,815,903	0	0.	0	0.
5-14 yrs[1]	559	10.2	1,231	999,662	0	0.	0	0.
15-44 yrs[1]	443	14.1	450	573,185	0	0.	0	0.
≥45 yrs	191	19.2	414	181,457	0	0.	0	0.

[1]The distribution of the duration of illness in this age group deviates from normal.

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL		NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL		CASE FATALITY RATE PER 1,000 CASES
			ILLNESS RATE PER 1000 POP	NUMBER OF EPISODES		DEATH RATE PER 1,000 POP	NUMBER OF DEATHS	
15. Pneumonia								
< 1 yr	8	24.1	63	6,055	21	10.85	1,049	173.32
1- 4 yrs	20	5.6	200	65,145	13	2.00	650	9.97
5-14 yrs	10	6.8	33	26,825	3	.18	150	5.59
15-44 yrs	7	30.0	3	4,257	6	.24	300	70.45
≥45 yrs[1]	7	22.4	13	5,700	17	1.94	850	149.04
16. Bronch.-Asth.								
< 1 yr	9	38.3	44	4,286	1	.52	50	11.66
1- 4 yrs[1]	73	132.4	31	10,057	1	.15	50	4.97
5-14 yrs	52	160.0	7	5,928	1	.06	50	8.43
15-44 yrs	117	265.7	6	8,033	1	.04	50	6.22
≥45 yrs	243	443.9	28	12,144	7	.80	350	28.81

[1]The distribution of the duration of illness in this age group deviates from normal.

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
17. Peptic Ulcer								
< 1 yr	0	.0	0	0	0	0.	0	0.
1- 4 yrs	0	.0	0	0	0	0.	0	0.
5-14 yrs	6	20.2	7	5,418	0	0.	0	0.
15-44 yrs[1]	101	186.2	8	9,896	0	0.	0	0.
≥45 yrs	51	329.5	6	2,823	1	.11	50	17.70
18. Dermatitis								
< 1 yr	37	15.9	439	42,447	0	0.	0	0.
1- 4 yrs[1]	195	48.3	226	73,643	0	0.	0	0.
5-14 yrs[1]	149	66.5	50	40,870	0	0.	0	0.
15-44 yrs[1]	61	68.1	13	16,342	0	0.	0	0.
≥45 yrs[1]	44	138.8	13	5,782	0	0.	0	0.

[1]The distribution of the duration of illness in this age group deviates from normal.

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
19. Dermatosis								
< 1 yr [1]	25	103.7	45	4,397	0	0.	0	0.
1- 4 yrs	87	123.6	39	12,839	0	0.	0	0.
5-14 yrs	70	209.3	8	6,101	0	0.	0	0.
15-44 yrs	114	268.1	6	7,757	0	0.	0	0.
≥45 yrs	92	495	10	4,598	0	0.	0	0.
20. Accident								
≤1 yr	2	2.0	189	18,241	2	1.03	100	5.48
1- 4 yrs	13	64.7	11	3,665	1	.15	50	13.64
5-14 yrs	19	6.2	69	55,899	0	0.	0	0.
15-44 yrs	43	46.5	13	16,870	7	.27	350	20.74
≥45 yrs	37	178.6	9	3,779	7	.80	350	92.57

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
21. Measle								
< 1 yr	9	7.6	223	21,601	1	.52	50	2.31
1- 4 yrs	18	9.2	110	35,688	1	.15	50	1.40
5-14 yrs	13	9.8	30	24,197	1	.06	50	2.07
15-44 yrs	0	.0	0	0	0	0.	0	0.
≥45 yrs	0	.0	0	0	0	0.	0	0.
22. Tetanus								
< 1 yr	0	.0	0	0	18	9.30	900	?
1- 4 yrs	0	.0	0	0	4	.61	200	?
5-14 yrs	0	.0	0	0	1	.06	50	?
15-44 yrs	0	.0	0	0	2	.08	100	?
≥45 yrs	0	.0	0	0	0	0.	0	0.

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
23. Birth Trauma								
< 1 yr	41	280.0	28	2,671	23	11.89	1,149	430.34
1- 4 yrs	0	.0	0	0	0	0.	0	0.
5-14 yrs	0	.0	0	0	0	0.	0	0.
15-44 yrs	0	.0	0	0	0	0.	0	0.
≥45 yrs	0	.0	0	0	0	0.	0	0.
24. Cholera								
< 1 yr	1	3.0	63	6,080	5	2.58	250	41.10
1- 4 yrs	4	5.3	42	13,767	6	.92	300	21.78
5-14 yrs	0	.0	0	0	4	.25	200	?
15-44 yrs	2	15.5	2	2,354	4	.16	200	84.93
≥45 yrs	0	.0	0	0	1	.11	50	?

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
25. Dengue								
< 1 yr	1	4.0	47	4,560	2	1.03	100	21.92
1- 4 yrs	1	14.0	4	1,303	1	.15	50	38.36
5-14 yrs	4	7.0	13	10,423	1	.06	50	4.79
15-44 yrs	0	.0	0	0	0	0.	0	0.
≥45 yrs	0	.0	0	0	0	0.	0	0.
26. Worms								
< 1 yr	3	6.3	90	8,686	0	0.	0	0.
1- 4 yrs	54	62.9	48	15,660	0	0.	0	0.
5-14 yrs	41	148.9	6	5,023	0	0.	0	0.
15-44 yrs	32	52.7	9	11,078	0	0.	0	0.
≥45 yrs	0	.0	0	0	0	0.	0	0.

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
27. Scabies								
< 1 yr	11	57.9	36	3,465	0	0.	0	0.
1- 4 yrs	25	59.5	24	7,664	0	0.	0	0.
5-14 yrs[1]	67	67.9	22	17,999	0	0.	0	0.
15-44 yrs[1]	32	52.7	9	11,078	0	0.	0	0.
≥45 yrs	9	319.0	1	515	0	0.	0	0.
28. Maternity Ill.								
< 1 yr	0	.0	0	0	0	0.	0	0.
1- 4 yrs	0	.0	0	0	0	0.	0	0.
5-14 yrs	0	.0	0	0	0	0.	0	0.
15-44 yrs	9	153.2	1	1,072	2	.08	100	93.27
≥45 yrs	0	.0	0	0	1	.11	50	?

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
29. Nephritis								
< 1 yr	0	.0	0	0	0	0.	0	0.
1- 4 yrs	1	≥365	1	50	0	0.	0	0.
5-14 yrs	5	26.6	4	3,429	0	0.	0	0.
15-44 yrs	14	336.2	1	760	0	0.	0	0.
≥45 yrs	13	293.0	2	809	4	.46	200	247.00
30. Malignancy								
< 1 yr	0	.0	0	0	5	2.58	250	?
1- 4 yrs	1	3.0	19	6,080	0	0.	0	0.
5-14 yrs	1	≥365	≤1	50	0	0.	0	0.
15-44 yrs	4	433.0	≤1	200	2	.08	100	500.00
≥45 yrs	11	96.6	5	2,077	10	1.14	500	240.60

TABLE 16 (continued)

DIAGNOSIS / AGE GROUP	MONTHLY NUMBER OF CASES FOUND	AVERAGE DURATION OF ILLNESS (in days)	ESTIMATED ANNUAL ILLNESS RATE PER 1000 POP	ESTIMATED ANNUAL NUMBER OF EPISODES	NUMBER OF REPT'D DEATHS	ESTIMATED ANNUAL DEATH RATE PER 1,000 POP	ESTIMATED ANNUAL NUMBER OF DEATHS	CASE FATALITY RATE PER 1,000 CASES
31. Tonsil-Adenoid								
< 1 yr	0	.0	0	0	0	0.	0	0.
1- 4 yrs	7	7.0	56	18,241	0	0.	0	0.
5-14 yrs[1]	28	92.0	7	5,552	0	0.	0	0.
15-44 yrs	14	202.5	1	1,261	0	0.	0	0.
≥45 yrs	0	.0	0	0	0	0.	0	0.
32. Dental illness								
< 1 yr	2	5.0	75	7,296	0	0.	0	0.
1- 4 yrs[1]	10	29.3	19	6,225	0	0.	0	0.
5-14 yrs	17	62.9	6	4,977	0	0.	0	0.
15-44 yrs[1]	42	22.3	27	34,360	0	0.	0	0.
≥45 yrs[1]	19	26.5	30	13,078	0	0.	0	0.

[1]The distribution of the duration of illness in this age group deviates from normal.

cholera. If such cases had not been treated properly, they may have progressed to severe dehydration or even death. The third "pathological" observation is the diagnosis of malignancy among children. There were no cases of malignancy found by the examining physician among children below the age of one year. However, there are five reported deaths due to malignancy. In these cases, I am inclined to believe that the examining physicians made diagnostic errors, and that the mortality diagnosis is more accurate. Diagnostic error is commonplace in medicine, and to some extent tolerated by the medical community, provided that the diagnostician also thinks about the correct differential diagnosis.[5]

Even though there are 32 diseases presented in table 16, not all of them will be included for further analysis using more complex statistical techniques. This is due the fact that the number of cases of many diseases listed in ordinal numbers 21 through 32 in table 16 are not sufficiently large to make comparisons across age groups and across different health care facilities.

C. Seeking Care Behavior in Bogor

Most responding families in Bogor claim that they have a regular source of treatment outside their home whenever they are ill. In 72.0% of the cases, respondents claim to have access to more than one type of care in their village

or its surrounding area. Twenty eight percent the cases must depend solely on one source of care, while 5.4% must depend solely on self care, and 4.4% depend on the **dukun** (traditional health practitioner). Among those who admit that they have a particular source of care, it was found that they do not always use their regular source of care when they are ill. Among the respondents, 2.3% do not have a regular source of care when they are ill. They may have used a variety of health care providers, but they do not go to the same place every time.

TABLE 17

DISTRIBUTION OF REGULAR SOURCE OF TREATMENT, SOURCE OF TREATMENT WHEN ILL THE LAST TIME, AND SOURCE OF TREATMENT UNDER PROVIDER MONOPOLY

Type of Health Care Provider	Regular Source of Care		Source of Care When Ill the Last Time		Treatment Under Monopoly	
	Number	Percent	Number	Percent	Number	Percent
SELF CARE	1,541	18.8%	1,382	31.1%	454	19.4%
MEDICINE MAN	1,010	12.3%	260	6.3%	370	15.8%
S.H.C.	1,419	17.3%	464	11.2%	539	23.0%
A.M.P.	1,375	16.7%	653	15.8%	486	20.7%
H.C.	1,820	22.1%	612	14.8%	398	17.0%
HOSPITAL	396	4.8%	292	7.1%	52	2.2%
PHYSICIAN	657	8.0%	562	13.6%	45	1.9%
TOTAL	8,218	100.0%	4,125	99.9%	2,344	100.0%

Consumption of even marginal health services has a beneficial effect on health.[6] The role of the traditional healer to remedy several illnesses is very supportive, although not all types of traditional healers play an important role in the healing process.[7] The most prominent role of the traditional healer in West Java is in the area of maternity care, where eighty percent of all childbirths are attended by the traditional birth attendant.[8]

In Bogor the traditional healer is the regular source of treatment in 12.3% of the cases, and during the last illness the traditional healer had been used in 6.3% of the cases. In places where traditional birth attendants hold a monopoly on care, these figures are three times as much, or 15.8%. This means that people go to the traditional healer involuntarily, because they do not have any choice (see table 17).

In maternity care, the traditional birth attendant has a different image. Even though Bogor is one of the most developed regencies in West Java, 15.9% of all prenatal care is provided by traditional birth attendants, while 55.0% of all childbirths are attended by traditional birth attendants (see table 18). Mothers probably realize the importance of prenatal care and in the prenatal clinic, at least, they can receive something tangible in return for their efforts, such as the distribution of free powdered milk. This milk has made prenatal care attractive to mothers. When it comes to childbirth, many mothers prefer to deliver at home, attended

TABLE 18

DISTRIBUTION OF PRENATAL AND CHILD-BIRTH CARE BY PLACE/TYPE OF HEALTH CARE PROVIDER

PLACE/TYPE OF HEALTH CARE PROVIDER	PRENATAL CARE		CHILD-BIRTH CARE	
	Number	Percent	Number	Percent
Hospital	47	6.4%	101	5.6%
Health Center	138	18.8%	52	2.9%
Subhealth Center	68	9.3%	103	5.7%
A.M.P.	104	14.2%	103	5.7%
Physician	28	3.8%	-	-
Self Care	-	-	9	0.5%
Home-attended by government health personnel	-	-	198	10.9%
Home-unattended	221	30.1%	35	1.9%
Traditional Birth Attendant	117	15.9%	996	55.0%
No-Response	11	1.5%	-	-
Total	734	100.0%	1,812	100.0%

+Only women with amenorrhea and fundus of uterus above the symphysis are included as prenatal respondent (estimated pregnancy between 12 weeks to 40 weeks).

by the familiar face of the traditional birth attendant in their neighborhood.

The role of the traditional healer remains indispensable in the community. In the province of West Java, an average of 80.0% of all childbirths are attended by

traditional birth attendants. Physicians perform 3.8% of the prenatal care, but do not attend any childbirths in their private offices. On the other hand, members of the household (self care) attend 0.5% (9 cases) of childbirth, but do not provide any prenatal care. This is an attitudinal problem of the physician as well as member of the household. It is better if physicians also attend childbirth, since they have the necessary skill, while the member of the household who has the skill to attend childbirth is also encouraged to do prenatal care.

TABLE 19

MARKET SHARING AMONG DIFFERENT HEALTH CARE PROVIDERS IN BOGOR IN 1980

TYPE OF PROVIDER	EPISODE OF ILLNESS SERVED	
	NUMBER	PERCENT
SELF CARE	1,382	31.1%
PRIVATE SECTOR		
Traditional Practitioner	260	6.3%
Allied Medical Personnel	653	15.8%
Physician	562	13.6%
Total Private	1,475	35.7%
PUBLIC SECTOR		
Subhealth Center	464	11.2%
Health Center	612	14.8%
Hospital	292	7.1%
Total Public	1,368	33.1%

The share of the medical market between three

categories of provider--self care or care by family member, care by private practitioner, and care by public health care providers-- is presented in table 19. The share of the public, private, and self care is almost equal. Each of them captures one-third of the market.

TABLE 20

BIVARIATE RELATIONSHIP BETWEEN PERCEPTION OF ILLNESS AND PLACE OF RESIDENCE

PLACE OF RESIDENCE	DISEASE OCCURRENCE		
	Reported	Not Reported	All Episode
URBAN:			
Obs.	1,599	518	2,117
Exp.	1,471	648	
Row%	75.5	25.4	100.0
Col.%	27.4	20.2	25.2
RURAL:			
Obs.	4,238	2,043	6,281
Exp.	4,366	1,915	
Row%	67.5	32.5	100.0
Col.%	72.6	79.8	74.8
TOTAL	5,837	2,561	8,398
Tot.%	69.5	30.5	100.0

χ^2 = 48.05; df = 1; Number of cases = 8,398; Contingency coefficient = 0.0758 .

In the analysis of perception of personal illness using a contingency table, the people in rural areas show a greater proportion of unreported illness. The people in urban areas have better perception of their illness (see table 20: χ^2=48.05, p=0.0000, df=1, N=8,398 and contingency coefficient=0.0758). Using one-way analysis of variance, the

findings also show that people in the urban area of Bogor have a better knowledge about disease than people in the rural area of Bogor. The average score on the knowledge variable about disease in the rural area of Bogor is 1.605, and in the urban area is 2.2636. The difference is 0.65858, with $F=373.39$, $df=1$, $Eta^2=.0426$ and $p \leq 0.001$. The small eta-square indicates a small variation between the urban group and the rural group. There is greater variation within the groups themselves. Thus, even though people in the rural area, in general, have lower scores, the variation is great among the rural people themselves. Similar variation is also found among people in the urban area.

In the presence of two or more diseases at one time, the respondent tends to place treatment priority on the first reported disease. This tendency was confirmed by a chi-square test, $\chi^2=9.2896$, $p=0.0543$ at $df=4$, and the contingency coefficient = 0.04, which means very weak association. Therefore, we could treat the first reported disease and subsequent diseases in each individual with equal treatment priority.

Based on the results of the health household survey of 1972 in this area, we had expected to find that the detected episodes of illness per capita is decreasing. The recall period in HHS'80 is one month, while in HHS'72, it was two weeks. Therefore, we had expected greater recall errors in HHS'80. Instead, we have observed an increase in the perceived illness from 1.2 per capita in 1972 to 1.3 per

capita in 1980 (see table 21). Improvement of attitude about health and better perception of illness in the area probably account for this. Another possibility is the changes in survey methodology from passive to active case finding. In HHS'72, the physician passively waited for comments from the respondent, while in HHS'80 they actively look for any episode of illness, including the unperceived illness.

TABLE 21

COMPARISON OF FINDINGS OF EPISODES OF ILLNESS BETWEEN THE HEALTH HOUSEHOLD SURVEY OF 1972 AND THE HEALTH HOUSEHOLD SURVEY OF 1980, IN BOGOR

Variable to Compare	Health Household Survey	
	of 1972	of 1980
Prevalence of sick persons detected per capita per year	1.2	1.7
Episodes of illness perceived per capita per year	1.2	1.3
Percent seeking care of the total episodes	45.1%	54.2%
Estimated visits per capita per year	.55	.93

The estimated visits have increased by 110.0%. Most of this increase is due to the increase in accessibility and availability of the services. There has been a significant increase in the number of facilities in Bogor since the

middle of the 1970's measured in terms of the crude death rate. In the last eight years, the crude death rate has dropped from 19.2 per 1,000 population in 1972' to 16.7% per 1,000 population in 1980.

D. Selective Process in Seeking Care

A member of a society that has experienced interaction with several types of health care providers, has made his/her own evaluation about each interaction and behaves according to the results of that evaluation. No matter how objective the society, these judgements about the health care providers are based on incomplete information. Whatever their method of evaluation, they have some pre-conceived ideas about what the health care system could offer, and what the consequences of utilizing them are. They have some vague ideas about what particular diseases might do harm to them, and at what level of severity they should seek care. Finally, they will decide at what level of severity they can relax and wait.

There are multiple factors that influence an individual to take action when he/she is ill. Once they decide to do something, they must decide where to go. The action is the product of a complex behavioral process. As a result, each individual case treated at different health care facilities is unique, and should be analyzed separately. Despite the uniqueness, some generalizations

about the process of seeking care can be made.

Correlation analysis between sources of care and factors influencing the process of seeking care indicates that knowledge, educational attainment, occupation, status in the household, age, religious preference, marital status, distance from home to place of treatment, impression about cost of services, size of the household, value of household assets, number of bedrooms in the house, and place of residence, all have impact on the decision to seek care and where to seek it (see table 22). Each factor mentioned above behaves differently in relation to different types of health care providers.

Correlation analysis in table 22 shows that knowledge about the illness tends to stimulate respondents to seek care at higher levels of care. the correlation coefficient increases from self care to subhealth center, allied medical personnel, health center, hospital, and finally, physician, while the correlation coefficient with the medicine man, among the more knowledgeable people is the lowest.

Availability of more bedrooms in the house will increase the tendency to not use the hospital. Families prefer to treat their members at home, even though they use sources of care outside the home on an ambulatory basis.

It is known that urbanity increases psychological stress among individuals and poses an increased health risk. In a comparable society, higher urbanity and higher mobility has been linked to coronary heart diseases,

TABLE 22

CORRELATION ANALYSIS BETWEEN DUMMY VARIABLE SOURCES OF CARE AND KNOWLEDGE ABOUT ILLNESS, NUMBER OF BEDROOMS IN THE HOUSE, VALUE OF HOUSEHOLD ASSETS, AND SIZE OF THE HOUSEHOLD

Explan. Variables	Sources of Care						
	Self Care	Medic. Man	S.H.C.	A.M.P.	H.C.	Hospital	Priv. Doctor
Knowledge	.1111	.0033	.2483	.2823	.4679	.3391	.4442
Household Space	-.1083	n.s.	n.s.	n.s.	.1261	n.s.	.0830
Number of Bedrooms in House	-.0981	n.s.	n.s.	.0432	.1248	-.0517	.0428
Value of Household Assets	n.s.	.0794	n.s.	n.s.	.0913	-.0677	-.1492

Number of cases in the analysis are 3,887, df=3,885
$r^2_{.05}$=.0314, $r^2_{.01}$=.0413

accidents, disorders of pregnancy, gastric ulcers, cancer, mental hospital commitment, suicides, and school truancy.[10]

An urban or rural environment of the place of residence also influences the seeking care behavior. Urban residents prefer physicians (r^2=.3630). Urban residents also use more hospital services (r^2=.0889) and self care (r^2=.0505). They have greater access to these facilities in their environment, to information, and to pharmacies, where they can buy drugs without prescriptions. Urban residents exhibit less preference for subhealth centers (r^2=-.0631), health centers (r^2= .2036), and allied medical personnel

(r^2=-.1678). Since rural residents have less opportunity to contact more sophisticated health care providers, they use the more readily available facilities in rural area, such as the medicine man (r^2=.1660), allied medical personnel (r^2=.0636), and the health centers (r^2=.2036). The coefficient of correlation at the 5% level of significance is .0312, when N=3,952 and df=3,950.

Married people use more services of all types of health care providers than the single or divorced person, with the exception of self care. Single persons use less services offered by all types of health care providers, except self care (r^2=.1193). Divorcees use less self care (r^2=-.0569), more allied medical personnel (r^2=.0533), and more hospital care (r^2=.0411), with the coefficient of correlation at the 5% level of significance being .315, when N=3,869 and df=3,867. This finding reflects the greater health disturbances found among divorcees, and the lack of care among them. The divorcees also rarely treat themselves. Instead, they look for help from somebody else who wants to hear their complaints. The divorcees are also more likely to have severe illnesses that need hospitalization. It has been found by other researchers that persons experiencing psychological distress are likely to have more health problems,[11] and more likely to seek care than persons without such stress.[12] Another possibility is that persons experiencing psychological distress may use illness and care-seeking as an excuse for their failure in

marital life.[13]

Children tend to be treated at home (r^2=.1135). When children become ill, their parents do not bring them immediately to health services, unlike when the head of the household becomes ill. This indicates that the parents hesitate to trust the safety of their children to an outsider. The head of the household uses more health services, than his spouse, being somewhat indifferent to her needs. The head of the household is more willing to risk his own safety by seeking treatment, and is more concerned about his own health, than that of his spouse. When it come to self care, the head of the household treats the members of his household first, especially his children, preserving the medicine by not treating himself until absolutely necessary (see table 23).

The findings in table 19 are also consistent when the dependent variables are the dummy variable of age group. Children in age groups 1-4 years and 5-14 years continuously have lower contact with health care providers. The only exception is infants between the age of 0-1 year, where there is more self care through the parent (r^2=.0538). All children and infants are indifferent in their association with health care providers. Again, there is an element of hesitation among parents to use medical care intervention provided by outsiders.

Religious preferences may indicate a preference to adopt new values. Most of West Java, and of course the

TABLE 23

CORRELATION ANALYSIS BETWEEN DUMMY VARIABLE OF SOURCES OF CARE AND DUMMY VARIABLE OF STATUS IN THE HOUSEHOLD

SOURCES OF CARE	Head of the Household	Spouse	Children	Relatives	Others
Self Care	-.0834	n.s.	.1135	n.s	n.s.
Medicine-Man	n.s.	n.s	n.s.	n.s	n.s.
S.H.C.	.0340	n.s.	n.s.	n.s.	n.s.
A.M.P.	.0756	n.s.	-.0901	n.s.	n.s.
H.C.	.0631	n.s.	-.0887	n.s.	n.s.
Hospital	.0897	n.s.	-.0887	n.s.	n.s.
Private-Physician	n.s.	n.s.	n.s.	n.s.	n.s.

Number of cases= 3,885 df= 3,883 $r^2_{.05}$=.0314 $r^2_{.01}$=.0413

Regency of Bogor, is a very conservative Moslem area. The only exception is the northern part of Bogor, where there is a strong influence of Jakarta, especially after the process of the "reverse urbanization" of people who work in Jakarta but live in Bogor. The subdistrict of Depok in North Bogor is unique. In Depok, the Eurasian culture and Christianity have a lot of influence. In addition, there are a large number of people of Chinese decent with Buddhist, Confucian or Christian influences. On the other hand, the element of indigenous religion from the past, the **kebatinan**, still has strong influence. In this study the **kebatinan** and

Confucianism have been classified as "others." The Islamic population tends to use more health centers in their vicinity (r^2=.1021). The Christian population tends to use less health centers (r^2=-.0957), but more hospitals (r^2=.0359) and more physicians (r^2=.1104). The Buddhist is more likely to use hospitals (r^2=.0386), and private physicians (r^2=.0662). It is almost certain that the people of Buddhist faith are mostly of the Chinese decent. In Bogor, the Chinese Indonesians belong to the upper class in the economic strata, even though they do not necessarily enjoy upper class social prestige. Therefore, it is understandable that they can afford to use more expensive facilities, but still have lower association with physician care compared to Christians. The "others" category uses more subhealth centers (r^2=.1030), more hospitals (r^2=.0491), and more physicians (r^2=.0327). Religious preference in some way could be used as a proxy variable of social mobility and modernism. Willingness to adopt "non-indigenous" religion, such as Christianity is an indication of modernity; the mental attitude that creates a preference to consult modern health care providers.

The correlation between distance and sources of care is better summarized in table 24. Use of self care has a tendency to be limited to the home. Even when the service is provided by a relative who lives outside the home, the treatment process usually take place at home (r^2=.0593). The use of a medicine man is preferable, if the treatment can

TABLE 24

CORRELATION ANALYSIS BETWEEN SOURCES OF OF CARE AND DISTANCE FROM PATIENT'S HOME TO PLACE OF OF CARE

SOURCES OF CARE	DISTANCE FROM HOME TO PLACE OF CARE				
	AT HOME	NEAR	RATHER FAR	FAR	VERY FAR
Self care	.0593	n.s.	-.0435	n.s.	n.s.
Medicine Man	.1683	-.0425	-.0677	n.s.	n.s.
S.H.C.	-.1072	.0893	.0468	-.0670	-.0408
A.M.P.	.2572	-.1038	-.0747	n.s.	n.s.
Health Center	-.1228	.0503	n.s.	n.s.	n.s.
Hospital	-.0881	-.1699	.0567	.1349	.1492
Private-Physician	-.1047	n.s.	.0636	n.s.	n.s.

Number of cases =2,711 df=2,709 $r^2_{.05}$=.0376 $r^2_{.01}$=.0495

take place at home. More services will be used if the medicine man is willing to do home visits (r^2=.1683). Use of services provided by subhealth centers or health center personnel is more likely to take place outside of the patient's home. The use of such services decreases with distance: r^2=.0893 when the distance is near, r^2=.0468 when the distance is rather far, r^2=-.0670 when the distance is far, and r^2=-.0408 when the distance is very far. Home visits by subhealth center personnel are less likely (r^2=-.1072). Allied medical personnel are also willing to make home visits. Use of AMP service is very high when patients are treated at home (r^2=.2572), but the use of AMP

decreases, if the patient must see the AMPs outside of his home. There are two probable reasons for this. First, allied medical personnel have greater financial incentive to treat the patient at the patient's home due to the fee-for-service nature of their practice. The home-treated AMPs patients are usually severely ill. Secondly, once the AMPs have been requested to treat a patient at home, they have more freedom to determine the frequency of their follow-up visits. Both factors increase utilization.

The use of health services offered by health center personnel at patients' homes is less likely (r^2=-.1228). Use of the health center is more likely when the distance is near (r^2=.0503), while use of services becomes lower and less significant as the distance grows larger. The hospital where most patients receive their treatment is far (r^2=.0567) or very far (r^2=.1492). The use of services offered by physicians usually takes place rather far from home (r^2=.0636). This is probably due to the fact that there are not many physicians who live near patients' homes, or who are willing to do home visits (r^2=-.1047).

The education variable also plays a role in determining the type of care sought. The illiterate group has high correlation with the use of the medicine man (r^2=.0636). The illiterate group also tends not to use physicians (r^2=-.0588), allied medical personnel (r^2=-.0353), and subhealth centers (r^2=-.0658). People who can read, but have no previous formal schooling, have a

preference for Allied Medical Personnel (r^2=.1102), and the medicine men (r^2=.0452), but are less likely to use physicians (r^2=-.0978) and self care (r^2=-.0607). Schooling has a tendency to reduce the use of the traditional medical practitioner and stimulates the use of modern medical practitioners. Higher levels of education, in this study, reduce the use of less prestigious services, such as those offered by subhealth centers, Allied Medical Personnel, and health centers. Even to the extreme, those with college degrees or higher, have a high correlation with physician care only (r^2=.0490).

We can conclude then, that higher education changes the health behavior of patients, and shifts patient preference from services provided by lowly trained or untrained health workers to the services provided by highly trained practitioners. Higher education will also increase patient confidence in using medicine to treat themselves (see tables 25 and 26).

Occupation also has an impact on the selection of type of care. Occupation, of course, is closely associated with the type of education received prior to employment. Higher preparatory education opens the chances for employment in many types of jobs, which offer higher income and higher status. People with white collar employment, followed by traders are the most likely clients of the more prestigious health care providers, such as private physicians, hospitals, or health centers. This probably has something

TABLE 25

CORRELATION ANALYSIS BETWEEN EDUCATION OF THE PATIENT AND SOURCES OF CARE

LEVEL OF EDUCATION	SOURCES OF CARE						
	Self Care	Medic. Man	S.H.C.	A.M.P.	H.C.	Hospit.	Priv. Doctor
Pre-School	-.0587	-.0357	n.s.	-.0597	.0744	-.0652	-.0226
Illiterate	n.s.	.0636	-.0650	-.0353	.0701	.0417	-.0588
No Formal Schooling	-.0607	.0452	.0432	.1102	n.s.	n.s.	-.0978
Some Schooling	.0335	n.s.	n.s.	n.s.	n.s.	n.s.	-.0460
Completed Elementary School	n.s.	-.0348	n.s.	n.s.	n.s.	.0512	.0824
Completed Secondary School	n.s.	-.0314	n.s.	.0364	n.s.	.0379	.1106
Completed High School	n.s.	n.s.	n.s.	-.0590	n.s.	.0350	.1213
College Degree or Higher	n.s.	n.s.	n.s.	-.0275	n.s.	n.s.	.0490

Number of cases =3,962 df=3,960 $r^2_{.05}$=.0311 $r^2_{.01}$=.0409

to do, not only with their higher purchasing power, but also with their attitudes, which are different from those who are still attached to agricultural works. Purchasing power alone is not the most important determinant, since the correlation between the value of the household assets (see table 22) and

TABLE 26.

CORRELATION ANALYSIS BETWEEN EDUCATION OF THE HEAD OF THE HOUSEHOLD AND SOURCES OF CARE

LEVEL OF EDUCATION	SOURCES OF CARE						
	Self Care	Medic. Man	S.H.C.	A.M.P.	H.C.	Hospit.	Priv. Doctor
Illiterate	-.0455	.0319	-.0577	-.0425	n.s.	n.s.	-.0766
No Formal Schooling	-.0548	.0354	n.s.	.0263	-.0280	.0500	-.1138
Some Schooling	n.s.	n.s.	-.0245	n.s.	n.s.	-.0297	-.1086
Completed Elementary School	.0473	-.0312	.0270	n.s.	n.s.	.0410	.1009
Completed Secondary School	n.s.	-.0269	.0357	n.s.	n.s.	.0401	.1099
Completed High School	.0455	-.0303	.0402	-.0407	n.s.	.0440	.1998
College Degree or Higher	.0240	n.s.	n.s.	-.0286	n.s.	.0258	.0975

Number of cases =8,414 df=8,412 $r^2_{.05}$=.0214 $r^2_{.01}$=.0281

the use of hospital and physician services does not have positive signs. Occupation in white collar and trading jobs is an indication of upward movement in the social strata and adoption of new values.

People with occupations in agriculture are more static and less likely to adopt new values. Instead, they

firmly hold onto their traditions. They may use modern health providers, but this is limited only to whatever is available near them, such as allied medical personnel and subhealth centers. This group has lower mobility and is cultural estranged from the more prestigious health care providers.

TABLE 27

CORRELATION ANALYSIS BETWEEN OCCUPATION OF PATIENTS AND SOURCES OF CARE

SOURCES OF CARE	TYPE OF OCCUPATION					
	Jobless	White Collar	Trader	Blue Collar	Agriculture	Others
Self Care	n.s.	-.0405	n.s.	n.s.	n.s.	n.s.
Medicine-Man	n.s.	-.0665	n.s.	n.s.	.0561	n.s.
Subhealth -Center	-.0650	n.s.	n.s.	n.s.	.1288	n.s.
A.M.P.	-.0413	-.0788	n.s.	.0513	n.s.	n.s.
Health-Center	n.s.	n.s.	n.s.	n.s.	n.s.	-.0473
Hospital	n.s.	.0549	n.s.	n.s.	n.s.	n.s.
Private-Physician	n.s.	.1655	.0818	-.0451	-.1444	.0614

Number of cases = 2,759 df=2,757 $r^2_{.05}$=.0373 $r^2_{.01}$=.0490

Blue collar workers, despite their low social status, have shown their willingness to move out of the traditional realm of agricultural life. This group is more receptive to modernism than the people who live on subsistence

agriculture. Blue collar workers have a better correlation with allied medical personnel (r^2=.0513) and are indifferent toward the medicine man.

People without jobs are indifferent about using health care providers (see table 27). Their use of subhealth centers and AMP is less. As will be demonstrated in this research, use of subhealth centers and AMP is more expensive relative to the cost of comparable health care providers. If the head of the household is unemployed or retired, but the patient who lives with the head of the household is employed in the modern sector, the patient is more likely to use the services (see table 28).

Finally, we may conclude that the process of seeking care does not occur at random. The process is influenced by many factors. The most dominating factor is the conflict between the elements of cultural modernity and cultural traditionalism. These two factors create a polarization among health care providers and their respective clients. Therefore, it will be misleading if we simply compare cases of bronchitis among young children treated at the subhealth center, with similar cases treated at the private physician's office. Their fathers' occupations are not the same. Their fathers' education is probably not the same either and their attitude and health behavior is probably different. Thus, each is unique.

Doctors' offices are among the health care providers with the strongest modernizing influence in health care

TABLE 28

CORRELATION ANALYSIS BETWEEN OCCUPATION OF THE HEAD OF THE HOUSEHOLD AND PATIENT SOURCE OF CARE

SOURCES OF CARE	TYPE OF OCCUPATION					
	JOBLESS	WHITE COLLAR	TRADER	BLUE COLLAR	AGRICULTURE	OTHERS
Self Care	n.s.	n.s.	n.s.	n.s.	n.s.	.0697
Medicine-Man	n.s.	-.1097	n.s.	-.0548	.1534	-.0426
Subhealth-Center	n.s.	-.0528	n.s.	n.s.	.0939	n.s.
A.M.P.	n.s	-.1346	n.s.	.0399	.0561	n.s.
Health-Center	.0450	n.s.	n.s.	n.s.	n.s.	-.0670
Hospital	.0628	.0414	n.s.	n.s.	-.0371	n.s.
Private-Physician	n.s.	.2485	.0465	n.s.	-.2365	.0422

Number of Cases = 3,920 df= 3,918 $r^2_{.05}$=.0313 $r^2_{.01}$=.0411

delivery, and in modernizing patients' attitudes. Their clients also possess similar cultural identities. On the other side of the pole are the medicine men, with their culture preserving characteristics in dealing with patients and in treatment. Likewise, their clients are culturally similar to themselves. Thus, comparison can only be made after all potential sources of variation have been controlled. Then, comparison between subhealth centers and private physicians' offices, for instance, shows the pure effect of each type of health care provider in the

treatment process.

E. Cost of Health Care

In the provision of health care, two types of aggregate costs exist: first, the actual cost of providing the services; and second, the cost of services as paid by the patient. This is better known as service charges.

In a profit-seeking institution, the cost paid by the patient is greater than the actual cost of providing the service. In most publicly provided health services, the actual cost of providing the services usually equals or is greater than the cost paid by the patient.

Among the publicly provided health services in the Regency of Bogor, users usually pay whenever they use the facilities for curative care. The revenue obtained from patient care is submitted to the regency treasury. The regency government, in turn, will pay the salaries of health personnel, the costs of providing preventive care, administrative costs, drug supply costs, maintenance costs of government health facilities, and maintenance and replacement costs of equipment.

In Bogor, the government health service, as a whole, is loosing money each year. The Regency Health Office is unable to operate without the subsidies. The government is willing to support the health service because historically they have been doing so, and also because health services

produce social goods.

Cost of Services: The Provider Point of View

The cost of services paid by the patient in government health facilities is controlled by government price setting. In 1978, a law was passed to set the service charge equal to Rp. 150.00 for one outpatient consultation in a subhealth center or a health center. The service charge was set at Rp. 300.00 for one outpatient consultation in a government hospital.

In 1980, the service charge still remains the same, and in Bogor there is additional Rp. 30.00 for the so-called, **pungutan daerah.**[14] Basic service charges have been earmarked for reuse in the health services, but the **pungutan daerah** has not been earmarked. Rather, it goes to the general fund of the local government. Theoretically, every sector of public service is an eligible recipient of the funds. In practice, only in the event of natural disaster, such as epidemic, flood, or earthquake, can this **pungutan daerah** be used. With these basic fee, patients are entitled to a physical examination, routine diagnostic tests, and medication. In practice, it only covers the physical examination, very limited diagnostic tests, and simple medication. If the patient requires additional medication, then the health personnel in charge will issue a prescription for the patient. The patient can then buy the

medicine at a dispensary "outside"[15] of the hospital/clinic.

In government facilities, the standard medication for upper respiratory infection is a shot of penicillin, oral antibiotics for three days, and antipyretics for three days. The clinic cannot afford to give a full dose treatment for the standard price they must charge. Thus, hope for the patient to return a second time for additional or follow-up treatment. If the patient returns, the clinic anticipates that the second service charge will pay for the additional treatment. Two payments are always better than one. Additional service charges will be assessed for CBC, X-ray, EKG, Blood Chemistry, Urinalysis, Anesthesia, and many others. The only exceptions from payment are laboratory services for national programs supported by the Communicable Disease Control (CDC), such as blood films for malaria and filaria, microbiology tests for suspected cases of Cholera, penicillin-in-oil for framboesia, and streptomycin and INH for cases of tuberculosis. All laboratory services sponsored by CDC are free of charge. It is understandable that the health facilities in the rural area of Bogor cannot exactly play by the rules. If they did, they would not stay in business for more than three months.

Therefore, in the outpatient clinic, it is in the best interest--even necessary to the very survival--of the clinic if they provide limited diagnostic tests and medicines, just to meet the bare minimum, and make up the difference by urging patients to buy supplementary medicine from an

outside dispensary at their own expense.

In the inpatient department of the government hospital, the hospital has more flexibility for adjusting their to cover the cost of providing services. The inpatient department does not charge the patient on a flat rate, but bills them on the basis of type of room used, type and amount of diagnostic tests, food, medical supplies, and consultancy fees for consulting specialists. The justification for payment for the consulting specialist is the fact that most consulting specialists in the general hospital in Bogor are not hospital employees or employees of the Ministry of Health. Instead, they are faculty members of the University of Indonesia Medical School, who also use the hospital for internship and residency training.

In 1979, the revenue from hospital inpatient care was Rp. 402 million, while the revenue from the outpatient department was only Rp. 6.8 million. Before the price setting by the Ministry of Health in 1978 to Rp. 300 for one consultation in the hospital outpatient department, the revenue share of the outpatient department of the total revenue was larger (see table 29).

The Rp. 300 service charge is lower than the average cost of treating one episode of illness in 1976, as has been disclosed by the Ministry of Health's own study in the Regency of Purwodadi. The cost is Rp. 400 for one episode of illness.'[6] Adjusted for inflation, in 1980 the average cost of treating one episode of illness should be Rp. 585. This

TABLE 29

SUMMARY OF REVENUE AND EXPENDITURES OF THE GENERAL HOSPITAL IN BOGOR, IN 1977 - 1979

BUDGET CATEGORY	YEAR		
	1977	1978	1979
INCOME			
Revenue From:			
Inpatient Care	273,427,807	321,176,633	401,968,363
Outpatient Clinic	14,911,494	8,240,652	6,802,665
Inpatient/Outpatient	288,339,301	329,417,285	408,771,028
MOH Subsidy[1]	37,794,150	42,571,110	45,595,504
TOTAL INCOME	326,133,451	371,988,395	454,366,532
EXPENDITURE			
Salary			
MOH Personnel	37,794,150	42,571,110	45,595,504
Hospital Personnel	53,718,515	85,055,640	101,465,602
Total Salary	91,512,665	127,626,750	147,061,106
Drugs	80,837,765	104,053,522	131,422,939
Food	24,858,103	30,891,364	40,110,089
General	40,542,792	56,823,223	60,723,920
Maintenance	14,560,907	27,588,917	40,049,530
Training	7,794,900	6,895,711	4,844,099
Depreciation[2]	20,910,528	20,910,528	20,910,528
TOTAL EXPENDITURE	281,017,660	374,790,015	445,122,211

[1]The Ministry of Health subsidy for the hospital in Bogor is earmarked for the salary of Ministry of Health employees assigned to the hospital.
[2]The depreciation cost is calculated based on prorated depreciation of the building (30 years), vehicle, office equipment, medical equipment and furniture (5 years).

means that the government and the inpatient department are

subsidizing the outpatient department. Also, it creates administrative problems by "allowing" health care providers to charge "unofficial charges" officially.

At the health center level, the structure of revenue and expenditures is simpler than in the hospital. The health centers also have a smaller inventory and less equipment.

Even in Bogor, there are great variation in health center size, catchment area, number of consultations, number of personnel, and cost of land. The variation in the cost of land of the total health center investment is very great (see table 30). It ranges from 11.0% in Cigudeg to 78.0% in Cibinong. The cost of land is extremely expensive in the business area of the subdistrict. In the health center package of 1974 and 1975, the provision of land had not been addressed properly. Then, there were delays in the construction of the health center, because the local government could not provide suitable sites. Another problem was that the health centers were built in the wrong location, because that is the only site available. In building the health center of the future, a trade off between the cost of land and the size of the catchment area, to produce a more effective health center, should be considered.

In places where outpatient visits are very high, the drug cost is also high. The drug cost at each health center depends on the number of patients seen and the type of illness in the subdistrict. These factors will be reflected

TABLE 30

SUMMARY OF INVESTMENT COSTS AND OPERATING COSTS OF GOVERNMENT HEALTH CENTERS IN BOGOR IN 1979

DESCRIPTION	HEALTH CENTER LOCATION						
	Jonggol	Cibinong	Cigudeg	Sawangan	Gunung Putri	South Bogor	Central Bogor
CAPITAL INVESTMENT							
Land	9,360,000	51,750,000	1,026,000	5,000,000	6,000,000	12,000,000	15,000,000
Building	8,030,000	9,240,000	6,060,000	7,350,000	6,830,000	10,200,000	12,000,000
Vehicle/Transportation	800,000	4,700,000	980,000	670,000	530,000	420,000	376,000
Office Equipment	501,500	611,500	657,000	223,000	343,500	812,000	1,000,000
Medical Equipment	373,175	321,250	255,250	946,500	441,750	1,674,406	1,644,768
Total Investment[2]	19,064,675	66,622,750	8,978,250	14,190,400	14,145,250	25,106,606	30,020,678
OPERATING COSTS							
Salary	4,959,120	6,568,620	4,534,080	4,807,887	2,775,359	5,243,800	5,124,096
Drugs	699,961	6,689,545	780,124	986,361	952,197	5,979,093	5,623,480
General/Miscellaneous	291,600	1,729,370	375,000	116,667	348,000	585,333	851,000
Depreciation[1]	736,451	1,588,550	681,450	735,580	604,550	921,321	1,204,136
Total Operating Cost	6,687,116	16,576,085	6,370,654	6,648,495	4,680,106	12,729,547	12,802,712
INCOME							
Patient Care Revenue	557,180	7,277,530	2,651,500	1,888,350	703,070	1,687,950	no data
MOH Local Subsidy	4,959,120	6,568,620	4,534,080	4,807,887	2,775,359	5,243,800	5,124,096

The Ministry of Health helps finance the health center through the Provincial Health Office in Bandung, which in turn allocates the money to all regency and municipal health services.

All health service revenue from health centers should be submitted to the regency health office, and the regency health office will allocate the budget they receive from the provincial government and from the regencial government to cover the deficit in health services.

[1]Depreciation is calculated based on the prorated depreciation of the building (20 years), vehicle, office equipment, and medical equipment (5 years).

[2]The assumption, there is no residual value.

in the different composition of type of treatment, and type and quantity of drug used. The largest drug subsidy can be founded in the health center of the urban subdistrict of South Bogor, where the cost of drugs per year is almost Rp. 6 million, while the revenue from patient care is only Rp. 1.7 million. The health center in the subdistrict of Cibinong has the highest drug bill, almost Rp. 6.7 million. At the same time, it also has the highest revenue. The total revenue from patient care in government health care facilities in the subdistrict of Cibinong is almost Rp. 7.3 million. The health center of the subdistrict of Sawangan was also able to cover its drug cost from outpatient revenue, but as a whole, the health centers stay in business only because of heavy government subsidies.

At the subhealth center level, the structure of revenue and expenditure is even simpler than at the health center. Subhealth centers do not always administer their financial matters by themselves. Some have their financial matters administered by the health centers above them. It is dependent on the status of the personnel assigned to the subhealth centers. If the subhealth centers have permanent Allied Medical Personnel, they may have a separate administrative arrangement on financial matters. But if the subhealth centers are staffed by Allied Medical Personnel from the health center on a rotational basis, then the subhealth center has a unified administrative arrangement with the health center above it. All equipment and drug may

be from the health center, and all revenues from everyday practice may be submitted to the health center (see table 31).

TABLE 31

SUMMARY OF INVESTMENT COSTS AND OPERATING COSTS OF THE SUBHEALTH CENTERS IN THE REGENCY OF BOGOR IN 1979.

DESCRIPTION	LOCATION			
	L.Wangi, Cigudeg	Bj.Sari, Sawangan	Dayeuh, Jonggol	Tapos, Cibinong
CAPITAL INVESTMENT				
Land	440,000	3,000,000	free	free
Building	2,100,000	160,000	320,000	150,000
Transportation	none	none	none	none
Office Equipment	171,000	37,000	41,500	b.h.c.[1]
Medical Equipment	25,000	136,500	23,000	b.h.c.[1]
Total Investment[+]	2,736,000	3,333,500	384,500	150,000
OPERATING COSTS				
Salary	483,060	p.h.c.	p.h.c.	p.h.c.[2]
Drugs	3,565,855	31,989	160,651	p.h.c
General/Miscellaneous	none	none	none	none
Depreciation[3]	249,200	50,700	44,900	15,000
Total Operating Cost	4,298,115	82,689	205,551	15,000
INCOME				
Patient Care Revenue	1,706,040	198,720	211,900	r.h.c.[4]
MOH Local Subsidy	483,060	p.h.c.	p.h.c.	p.h.c.

[1]b.h.c.=borrowed from health center
[2]p.h.c.=paid by health center
[3]Depreciation is calculated based on prorated depreciation of building (10 years), equipment (5 years)
[4]r.h.c.=revenue is included in health center revenue
[+]The assumption, there is no residual value

In terms of the number of patients seen, the subhealth center of Lebak Wangi is the top performer. It operates with

TABLE 32

ANNUAL PATIENT LOAD IN GOVERNMENT HEALTH CARE FACILITIES IN BOGOR IN 1979 AND NUMBER OF PERSONNEL IN EACH FACILITY

TYPE OF FACILITY	NUMBER OF	
	Patients	Personnel
HOSPITAL		
Inpatient	3,840	?
Outpatient	17,888	?
HEALTH CENTER		
Central Bogor	13,177	19
South Bogor	13,592	14
Cigudeg	17,792	15
Gunung Putri	4,718	10
Cibinong	59,574	26
Jonggol	5,328	13
Sawangan	12,671	13
SUBHEALTH CENTER		
Lebak Wangi, Cigudeg	9,478	2
Tapos, Cibinong	2,532	2
Dayeuh, Jonggol	3,606	2
Bojong Sari, Sawangan	1,104	1

Allied Medical Personnel of the lowest educational category (juru kesehatan) and one pharmacy worker, also of the lowest category (juru obat), but it saw 9,478 patients in 1979 and spent almost Rp. 3.6 million on drugs. At the same time, its revenue from service charge was Rp. 1.7 million In terms of number of patients seen, the subhealth center of Lebak Wangi sees as many as the combined patients of the health center of Gunung Putri, staffed by 10 health personnel, and the

health center of Jonggol, staffed by 13 health personnel (see table 32).

Cost of Services: The Patient's Point of View

Use of services in the Regency of Bogor requires out-of-pocket payment. Out-of-pocket payment is the amount of money spent by a patient or his family in their effort to treat one episode of illness. Average out-of-pocket payment is equal to the amount of out-of-pocket payment divided by the number of times services were used during one episode of illness.

In this study, we have seen that there are a lot of cases treated by the patient himself or by his relatives. In case of self care, the out-of-pocket payment is equal to the amount of all expenditure for medicine, supplies, etc., related to the effort to treat one episode of illness. Despite the subsidy received by the health services, and the fact that service charges in government health care facilities are usually below the actual cost, not all patients pay the full amount of the service charge. This phenomenon is occurring in all types of health care providers in Bogor. It is also true that not all cases can get sufficient treatment with the standard government service charge. Often there is additional costs for medicine and diagnostic tests. Those who have the government health insurance policy are waived from the basic service charge

when seeking care at government facilities. They are also entitled to free, or partially free inpatient care. The type of room they receive, of course, depends on their pay grade within the government salary scale. The payment of the premium is compulsory and the amount is equal to approximately 2% of the base pay. Payment is automatically deducted from the civil servant's salary. The highest ranking official is entitled to a private room, while lower level officials can be treated in semi-private rooms, and the lowest level employee, may be treated in the **bangsal** (communal ward).

If the respondent has a health insurance policy, then we count out-of-pocket payment as any additional out-of-pocket payment they make for certain services which are not covered by the policy. The employee, his or her spouse, and the first three children are eligible for the health insurance benefits.

Since the number of civil servants in the Regency of Bogor is less than 5% of the people in the work force, then, in calculating the health service charge at the community level, the premium payment for government health insurance is ignored. Similar treatment is given for the health insurance premiums paid by members of the military and employees of the plantation. These have their own separate health facilities, and receive health benefits comparable to those of the civil servant, if not better. Most of them live in the subdistrict of Semplak, near the Air Force Base, and

around the Puncak-Tugu area. Those areas are not included in the survey.

Employees of the private industrial complex around Cibinong, Jonggol, Gunung Putri, and other industries along the Jakarta-Bogor Highway also receive health benefits from their employers. These live in the survey area, but their benefits were not included in our calculations, since we did not have access to their company budget.

Health care providers from the private sector have not been invited to participate in any form of health insurance sponsored by the government. They charge their patients accordingly, for every service rendered. However, they do not charge their patients on a flat-rate basis as in the government facilities. The charges depend on the type of work done, and the length of time required to do it. Some patients also admit they receive a discount for being a regular patient, or for being poor. Other patients even receive free treatment if they do not have money to pay. Most patients want to pay for the treatment they receive and feel embarrassed if they do not pay. Such differential pricing is not a standard policy. It depends on the individual judgement of the health care provider. Payment for the service is not always in cash, but sometimes in natura. Also payment is not always cash and carry, but sometimes delayed (**bon dulu**, an equivalent of I.O.U.). In a more traditional environment, the transaction is conducted in "non-market" fashion. Health care providers may not

receive payment immediately after the service has been completed, but wait for until quite some time. Then, during the lebaran (Id'l Fitr), or new year, the patient will send a present to their healer. Traditional birth attendants are usually paid this way. Whatever form of payment was found in the survey, as long as the payment was made directly, we quantified it into monetary terms (rupiah).

The out of-pocket-payment made for outpatient care, inpatient care, and self care, has a very skewed distribution. Therefore, logarithmic transformation has been made on these variables to make their distribution closer to normal. It is found that for one episode of illness, the average service charge for outpatient service is Rp. 1,619, for inpatient care is Rp. 50,212, and for self care is as low as Rp. 149 (see table 33).

The average out-of-pocket payment is associated with the disease's severity, sources of care, duration of illness, and quality of care. Pairwise correlation analysis between the average out-of-pocket payment and the dummy variables of disease's severity (mild, moderate, severe), sources of care (self care, subhealth center care, care by Allied Medical Personnel, health center care, hospital care, and private physician care), quality of care, and the natural logarithm of days ill, has been made. It indicates which factor has significant association with average out-of-pocket payment (see table 34).

Milder cases have negative correlation with the

TABLE 33

NUMBER OF CASES RECEIVING TREATMENT IN DIFFERENT TYPES OF SERVICES, THE AVERAGE SERVICE CHARGE FOR ONE EPISODE OF ILLNESS, AND ITS 90% AND 95% CONFIDENCE INTERVAL

Type of Services	Number of Cases	Average Service Charge	Service Charge at 90% C.I.		Service Charge at 95% C.I.	
			Min. (Rp.)	Max. (Rp.)	Min. (Rp.)	Max. (Rp.)
SELF CARE	1,076	149	10	2,144	10	2,264
OUTPATIENT CARE						
Medicine-Man	119	771	7	82,653	7	90,926
S.H.C.	398	1,156	57	23,313	54	24,788
A.M.P.	593	994	48	20,409	46	21,707
H.C.	515	807	40	16,344	37	17,379
Hospital	228	4,964	91	272,090	83	295,257
Private-Physician	463	6,109	191	195,779	178	210,134
Outpatient Average	2,333	1,619	40	65,498	37	70,639
INPATIENT CARE						
Medicine-Man	2	69,286	537	8,937,978	486	9,869,897
S.H.C.	4	14,760	2,402	90,724	2,314	94,150
A.M.P.	1	3,000	-	-	-	-
Hospital	50	59,278	1,237	2,840,890	1,143	3,074,338
Private-Physician	8	133,519	10,860	1,641,617	10,318	1,727,870
Inpatient-Average	73	50,212	1,240	2,033,091	1,150	2,192,603

90% Confidence Interval is obtained from Mean±1.96 Standard Deviation.
95% Confidence Interval is obtained from Mean ± 2 Standard Deviation.
The number of cases in group the total are greater than the subgroup total presented in the table above, due to case deletion for missing variable.

TABLE 34

PAIRWISE CORRELATION ANALYSIS BETWEEN AVERAGE OUT-OF-POCKET PAYMENT WITH DUMMY VARIABLES OF SEVERITY OF ILLNESS, SOURCES OF CARE, QUALITY OF CARE, AND DURATION OF ILLNESS

Variables Correlated Pairwise with Average Out-of-Pocket Payment	Coefficient of Correlation	t-Stat.	Signif.
D.V.SEVERITY OF CASES			
Severe	.0220	1.1395	.2546
Moderate	.0614	3.1889	.0014
Mild	-.0794	-4.1270	.0000
D.V.SOURCES OF CARE			
Self Care	.0119	.61586	.5380
Medicine Man	-.2523	-13.506	.0000
Subhealth Center	.0063	.3263	.7422
A.M.P.	.0650	3.3721	.0008
Health Center	-.0513	-2.6635	.0078
Hospital	.1062	5.5344	.0000
Private Physician	.1865	9.9960	.0000
QUALITY OF CARE	.0590	3.0605	.0022
DURATION OF ILLNESS	.0606	3.1418	.0017

Number of valid observation are 2,686 cases; the correlation is significant if the level of significancy is ≤ .0500

average out-of-pocket payment. When the severity increases, then the correlation between severity and cost becomes positive. This means that average cost of a severe illness is also more expensive. However, the association between average cost and severity is insignificant in severe cases.

Treatments at the traditional healer and health center also are negatively correlated with the average cost of care, indicating that the average cost of care is lower when

the patient is treated at a health center or at the traditional healer. This relationship demonstrates that the health center, compared to other government facilities, complies more with the policy of flat basis service charges. The traditional healer, in general, also does not charge much for treatments provided. The only exception is the case of inpatient care by the traditional healer. Table 33 shows two cases which were treated on an inpatient care basis by the traditional healer. One case was charged a very high amount. No conclusion can be made about the cost of inpatient services by the traditional healer, since there are only two of these cases. It is possible that some traditional healers charge their patients exorbitantly.

Treatment by subhealth centers, AMPs, hospitals and private physicians are positively correlated with out-of-pocket payment. The association is particularly strong for physicians and hospital care. The association is not significant at subhealth centers. We can conclude that the amount of out-of-pocket payment is higher among cases treated at the hospital, and at private physicians, than among cases treated at any other health care provider.

We expect that self care will bring out-of-pocket payment down. However, the data is not very conclusive in this regard. The association between self care and average out-of-pocket payment is positive, but the relationship is not significant. Our earlier findings also indicate that more knowledgeable and more educated respondents use more

self care. In doing so, they may purchase and use medicines above what they actually need. On the other hand, poor people who cannot afford to pay for treatment at conventional sources of care, also practice self care with whatever materials they can find. When the two phenomena occur simultaneously, the resultant outcome is a "blurred" association between self care and average cost of service.

Quality of care is also positively correlated with out-of-pocket payment. This is justifiable, however, if higher quality of care requires higher costs. The question is to what extent the cost of services can be assessed to increased quality of care. Is the increase in quality of care followed proportionately by the "increase" in outcome of treatment?

Duration of illness may increase the cost of illness. If the duration of illness is long, the disease is more likely to be severe or debilitating. Therefore, these cases require more consultation or a hospital stay, more manipulation, more diagnostic tests, and more medications. These will be reflected by higher cost of services. Another possibility is that duration of illness is longer because the time lag between the onset of illness and treatment is longer than normal. Patients were seen at more serious stages, requiring more manipulation, and thus costing more.

Our general conclusion from the analysis of out-of-pocket payment for care is:

Severity of illness, longer duration of illness, provision of more sophisticated treatment, and better quality of care will increase the cost of medical care significantly, even if the government has tried to keep prices down through price setting. Such regulation, if unrealistic, will be violated to meet the actual cost of providing services.

F. Outcome of Treatment

In aggregate, the use of treatment has improved the health condition of the population in the service area. Of those who use the services, 28.8% claim that they have had complete cures, 45.7% claim that their health has improved, 23.7% claim their condition has more or less the same. Only 2.0% claim that the health services have not given positive results. There are 1.1% who claim that their condition becomes worse; 0.4% claim they have had debilitating and crippling sequelae of the diseases; and 0.1% of the treated patients have had their diseases terminated by death.

Using case fatality rates as a measuring stick, we may conclude that the difference between those who have used health care facilities and those who have not used them is enormous. For example, there are 5,590 sick persons in the previous month and 3,918 of them have sought treatment, while 1,572 persons did not seek treatment. Of those who have sought treatment, 4 person have died, which means the

overall case fatality rate is 1.02 per 1,000 population. Of those who did not seek treatment, 63 persons have died, which means the overall case fatality rate for not seeking treatment is 40.08 per 1,000 population.

As has been mentioned in the section on the process of seeking care, dying is a complex process, its occurrence being influenced by multiple factors. Since the number of deaths are too small, the use of multivariate statistics to explore the complexities of factors influencing the process of dying becomes impossible. We need more cases in order to further explore the process of dying.

Outcome of treatment using incapacitation as a measurement, however, is more appropriate for the size of the data set. There are a sufficient number of cases with incapacitation due to illness in our data. Therefore, the exploration of the variation of incapacitation due to illness will be used to compare the relative advantage of different health care facilities in the area. This exploration is described in chapter VII.

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[3]For description of "Annual Illness Rate" see chapter III, part B.

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[5]Scheff, T.J., "Preferred Errors in Diagnosis," Medical Care Vol. 2, July-Sept. 1964, pp. 166-172.

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[8]Alisjahbana, Anna et al., Penelitian Kematian dan Kesakitan Perinatal di Bandung-Indonesia (Study of Perinatal Mortality and Morbidity in Bandung-Indonesia), Fakultas Kedokteran Universitas Padjadjaran, Bandung, 1978.

[9]Pundarika, Ratna L. and Sulianti-Saroso, J., "Household Survey in Indonesia," Bulletin Penelitian Kesehatan Vol. 2, No. 2, 1974, pp. 70-72.

[10]Pilisuk, Marc, and Froland, Charles, "Kinship, Social Networks, Social Support and Health," Social Science & Medicine Vol. 12, No. 4B, 1979, pp. 273-280.

[11]Pilisuk, Marc, and Froland, Charles, Ibid, p. 273.

[12]Tessler, R.; Mechanic, D.; Dimond, M., "The Effect

of Psychological Distress on Physician Utilization: A Prospective Study," J. Health Soc. Behav. Vol. 17, 1976, pp. 353-364.

[13]Cole, S. and Lejune, R. "Illness and the Legitimation of Failure," Am. Sociol. Rev. Vol. 37, 1972, pp.347-356.

[14]**pungutan daerah** is another form of excise tax or "sales tax" imposed by the regency or municipal government.

[15]"Outside" dispensary does not always means outside of the hospital compound. In the Jakarta Central Hospital for instance, the "outside" dispensary is located right in the middle of the hospital compound. The doctor never tell the patient that they should buy the medicine in that dispensary, but for practical reason the patient's family buy the medicine there, since it is conveniently located. The profits from that "outside" dispensary goes to the hospital employee's benefits funds.

[16]Laporan Lokakarya Dana Sehat/Asuransi Kesehatan (Report of the Health Funds/Health Insurance Workshop) Vol. 1, 12-22 October 1976, Jakarta: Badan Penelitian dan Pengembangan Kesehatan, Departemen Kesehatan Republik Indonesia, 1977.

CHAPTER VI

MODEL OF HEALTH CARE UTILIZATION

The utilization of health services in this study is defined as the number of outpatient consultations plus the number of inpatient days per episode of illness.

Since the number of inpatient cases is only 0.87% of all episodes, or 1.77% of the number of cases who seek care, then utilization of facilities, when the ill person requires both inpatient and outpatient care, is dominated by the number of outpatient consultations.

As has been defined earlier, self care covers care provided by the individual, his or her family, and members of their extended family, where none of them can be classified as one of the other six types of health care provider. Each consultation made is not counted in variable utilization, except if the treatment was provided by a person who does not live under the same roof.

The pattern of utilization of health services--the types and quantities of service used--is influenced by multiple factors. Therefore, there is a need to control for the influence of each factor. These include the severity of the clinical manifestation, diagnosis of illness, duration

of illness, clinical onset, type of health care provider, the individual's knowledge about the disease, health behavior and health practice, education, employment, type of occupation, and socioeconomic status of the sick person in the family. Only if each factor is controlled can we actually compare the relative effectiveness of different types of health care providers, and the variation in their utilization.

The utilization model is developed through a sequence of correlation analysis, multivariate analysis of variance, and multiple classification analysis. Variation in utilization will determine variation in case load, which will, in turn, determine variation in the need for health personnel, supplies, and drugs. These variations accounts for the variation in the actual cost of providing the service.

A. Determinants of Utilization of Health Care

In general, utilization of the outpatient clinic, in all types of health care providers has median values ranging from 1 to 4 visits per episode of illness across different diagnoses. In all types of diseases, the utilization of the outpatient clinic has a median value of 2 times per episode of illness. The mean number of outpatient visits for all types of disease is 2.5 times per episode of illness. The utilization of the inpatient care across different

diagnoses, measured in duration of inpatient stay,[1] has a median value ranging from 1 to 12 days per episode of illness. The median duration of inpatient stays for all diseases is only one day, while the average mean duration of stay is 2.4 days. According to our intuitive understanding this figure is very low. Analysis of HFPA data, which is collected from the hospital, however, shows higher inpatient days, with the average mean duration at 4.6 days. This figure changes to 6.63 days if the analysis is limited to those who live in the same subdistrict as where the facility (hospital or health center) is located, 4.51 days when the patient resides in different subdistrict, but still in the Regency of Bogor, and 3.2 days among those who have been treated as inpatient cases in the facility, but actually are inhabitants of other regencies. In the case of hospital inpatients who come from outside of the Regency of Bogor, 85% are victims of traffic accidents. They are immediately transferred to another hospital near their home as soon as their condition is stable.

The distribution of outpatient visits per episode of illness is slightly skewed to the right, which means that there are more people with a low intensity of utilization than those who use the outpatient services at higher intensity. The distribution of inpatient stays is even more skewed to the right. The dominance of low utilization between people and health care facilities is more prominent among the inpatients. It indicates hesitation among the

people to use health services beyond a basic minimum. People avoid contact with health care facilities, especially contact with inpatient services. Most inpatients request discharge as soon as possible. Hesitation to use the facilities could be due to financial reasons or cultural inhibitions.

Several variables that may have influenced utilization of the health services, have significant association with the utilization variable. Any variables with an insignificant coefficient of correlation were excluded from further analytical exploration.

Correlation analysis using Spearman's ρ has been made between the variable of utilization and all potential categorical-scaled variables. Correlation analysis using Pearson's r has been made between the variable of utilization and all potential interval-scaled variables. The summary of the correlation analysis between the utilization variable and the categorical-scaled explanatory variables are presented in table 35.

Table 35 shows that there is no difference between the results of pairwise correlation analysis using transformed dependent variables, and correlation analysis using log-transformed dependent variables. Therefore, both scales, the log-transformed and the original variables, could be used interchangeably with the above categorical-scaled explanatory variables.

Correlation analysis using Pearson's r is made between

TABLE 35

CORRELATION ANALYSIS BETWEEN FREQUENCY OF OUTPATIENT AND INPATIENT UTILIZATION PER EPISODE OF ILLNESS, WITH ALL POTENTIAL CATEGORICAL-SCALED EXPLANATORY VARIABLES

EXPLANATORY VARIABLES	CORRELATION COEFFICIENT WITH VARIABLE OF *UTILIZATION* PER EPISODE			
	ORIGINAL VARIABLES		LOG-TRANSFORMED VARIABLES	
	Spearman's *rho*	Significancy	Spearman's *rho*	Significancy
Severity of illness	.2125	.000	.2124	.000
Place of first treatment	.0685	.001	.0685	.001
Quality of care	-.1860	.000	-.1862	.000
Diagnosis of illness	-.1470	.000	-.1489	.000
Clinical onset	.5486	.000	.5495	.000
Status in household	-.2195	.000	-.2191	.000
Age group	.3147	.000	.3147	.000
Sex	-.0236	n.s.	-.0244	n.s.
Marital status	-.1600	.000	-.1601	.000
Religion	-.009	n.s.	-.0029	n.s.
Education of the sick	.1461	.000	.1456	.000
Occupation of the sick	.0343	n.s.	.0344	n.s.
Education of the HHH	-.1203	.000	-.1207	.000
Occupation of the HHH	.0223	n.s.	.0244	n.s.
Evidence of health care monopoly	.0150	n.s.	.0160	n.s.
Physical condition of the house	-.0801	.002	-.0803	.002

HHH = Head of the household.

T A B L E 35 (continued)

EXPLANATORY VARIABLES	CORRELATION COEFFICIENT WITH VARIABLE OF *UTILIZATION* PER EPISODE			
	ORIGINAL VARIABLES		LOG-TRANSFORMED VARIABLES	
	Spearman's *rho*	Significancy	Spearman's *rho*	Significancy
Regular source of care	.0279	n.s.	.0267	n.s.
Place of residence	.0639	.011	.0655	.001
Latrine availability and type	.115	.000	.1136	.000
Drinking water quality	.0785	.000	.0798	.000
Drinking water physical condition	.0262	n.s.	.0262	n.s.
Waste disposal	-.0796	.002	-.0805	.002
Distance: latrine - water source	-.1508	.000	-.1496	.000
Impression about:				
Distance: house - clinic	.0679	.002	.0667	.002
Cost of service	.1017	.000	.1020	.000
Quality of care	-.0744	.003	-.0755	.003
Motivation to seek care	-.0547	n.s.	-.0570	n.s.

the variable of utilization and all potential analytical-scaled explanatory variables. The summary of the correlation analysis between the dependent variables with the analytical-scaled explanatory variables is summarized in table 36.

Correlation analysis between the original form or the natural-log-transformed dependent variable of utilization and potential explanatory variables, produces almost similar correlation coefficients and a similar level of significancy. Table 36 demonstrates that the exceptions are the correlations between utilization and the **average cost** of service paid per consultation, the **knowledge** about the disease, and the **number of bedrooms** in the house, respectively. Therefore, in order to ensure the appropriateness of the analysis and to maintain the consistency of the scaling standard in the computation process, the variable of utilization is log transformed before further use in the analysis.

Pairwise correlation analysis indicates the strength of the association between the dependent variable and the explanatory variable. It also tests the significance of the association. However, the strength of the association is not identical to the strength of the explanatory power. A variable may have a strong association with the variable of utilization, but not necessarily be included among the best predictors of utilization.

SEARCH analysis finds that utilization, in descending

TABLE 36

CORRELATION ANALYSIS BETWEEN FREQUENCY OF OUTPATIENT AND INPATIENT UTILIZATION PER EPISODE OF ILLNESS, WITH ALL POTENTIAL ANALYTICAL-SCALED EXPLANATORY VARIABLES

EXPLANATORY VARIABLES	CORRELATION COEFFICIENTS WITH VARIABLE OF *UTILIZATION* PER EPISODE			
	ORIGINAL VARIABLES		LOG-TRANSFORMED VARIABLES	
	Pearson's *r*	Significancy	Pearson's *r*	Significancy
Natural log of days ill	.5609	<.01	.5890	<.01
Natural log of cost of service paid	.043	<.05	.0367	n.s.
Quality of care	-.1891	<.01	-.2038	<.01
Knowledge about disease	.0646	<.01	.0314	n.s.
Treatment result	-.2155	<.01	-.2349	<.01
Household space in M^2	.0644	<.01	.0755	<.01
Number of bedrooms at home	.0072	n.s.	.0262	n.s.
Estimated value of family assets	.0872	<.01	.0967	<.01
Family size	-.0638	<.01	-.0687	<.01

order, is a function of type of clinical onset, duration of illness, diagnosis of illness, type of health care provider, and the availability of latrine and its type in the household. The summary of the explanatory power of each explanatory variable, and the total explanatory power are presented in table 37.

TABLE 37

SUMMARY OF THE RESULTS OF *SEARCH* ANALYSIS IN EXPLAINING VARIATION OF ONE EPISODE OF UTILIZATION OF BOTH INPATIENT AND OUTPATIENT HEALTH CARE FACILITIES

SOURCES	VARIATION	D.F.
EXPLAINED	425.86	9
ERROR	646.54	2,048
TOTAL	1,072.40	2,057

EXPLANATORY VARIABLES	VARIATION EXPLAINED	Percentage Variation Explained From Total Variation
Clinical onset	305.80	28.52%
Duration of illness	78.13	7.29%
Diagnosis of illness	22.84	2.14%
Type of health care provider	12.37	1.15%
Availability and type of latrine	6.72	.63%
Combination of five variables	425.86	39.73%

These five variables have divided the data set into ten subsets, where the variation within the group, across these five variables, is minimal and the total variation of utilization explained by the dichotomous splitting account

for 39.73% of the total variation in utilization (see figure 8). These ten subsets are:

I. Group 8 consists of 467 cases. The average duration of illness is less than 2.72 days and the average utilization is 1.16 times.

II. Group 9 consists of 583 cases with the duration of illness ranging from >2.72 days to ≤7.39 days. The average utilization is 1.45 times.

III. Group 18 consists of 70 cases where each lives in houses without latrine. The members of their households usually defecate in the stream, river or sewer canal, or in the neighborhood latrine. The people in this group have been diagnosed as suffering from typhoid, dysentery, enteritis, respiratory tuberculosis or malaria cases. The duration of illness ranges from 7.39 days to 54.60 days. Clinically they have been classified as acute or subacute onset cases. The average utilization is 2.02 times

IV. Group 19 consists of 52 cases, where some of them live in houses without latrines and members of their household usually defecate in the bush. Some of them live in houses with latrines. They have been diagnosed as suffering from typhoid, dysentery, enteritis, respiratory tuberculosis, or malaria. The duration of illness ranges from 7.39 days to 54.60 days. Clinically they have been classified as acute or subacute onset cases. The average utilization is 3.25

times.

V. Group 11 consists of 338 cases with the average duration of illness ranging from >7.39 days but ≤54.60 days. Clinically they have been classified as acute or subacute cases. The diagnoses of illness include avitaminosis, anemia, eye infection, cataract, diseases of the ear, nose, and throat, diseases of the heart and vascular system, hypertension, upper respiratory tract infection, flu, pneumonia, bronchitis/asthma/emphysema, peptic ulcer, dermatitis, or dermatosis. The average utilization is 1.76 times.

VI. Group 14 consists of 65 cases of typhoid, dysentery, and respiratory tuberculosis, with the duration of illness ranging from 54.60 days to 403.43 days. The diseases have progressed to the chronic stage. The average utilization in this group is 3.75 times.

VII. Group 15 consists of 195 cases of malaria, avitaminosis/malnourishment, anemia, eye infection, cataract, disease of the ear and mastoid, diseases of the heart and vascular system, hypertension, upper respiratory tract infection, flu, pneumonia, bronchitis/asthma/emphysema, peptic ulcer, dermatitis, dermatosis, or accident. The average utilization is 2.68 times in this group.

VIII. Group 16 consists of 60 cases of enteritis, respiratory tuberculosis, malaria, and avitaminosis/ malnourishment. These patients have been treated at

the health center, AMP private office, subhealth center, medicine man, or through self care. The duration of illness is greater than or equal to 403.43 days. They have been classified as chronic cases. The average utilization in this group is 4.75 times.

IX. Group 17 consists of 127 cases of anemia, eye infection, cataract, diseases of the ear and mastoid, diseases of the heart and vascular system, hypertension, flu, bronchitis/asthma/emphysema, peptic ulcer, dermatitis, dermatosis, or accident. These patients have been treated in the health center, AMP private office, subhealth center, medicine man, or through self care. The average duration of illness is 403.43 days, and they have been classified as chronic onset cases. The average utilization is 3.16 times.

X. Group 13 consists of 101 cases of chronic onset disease, with a duration of illness of greater than 403.43 days, treated in the hospital or in private physicians' offices. The average utilization in this group is 2.04 times.

Overall, the intensity of utilization varies from case to case, but, in general, the intensity of utilization is best explained by five explanatory variables: type of clinical onset, duration of illness, diagnosis of illness, type of heath care provider, and availability of latrine in the household and its type. Each variable has its own level of explanatory power in explaining the intensity of

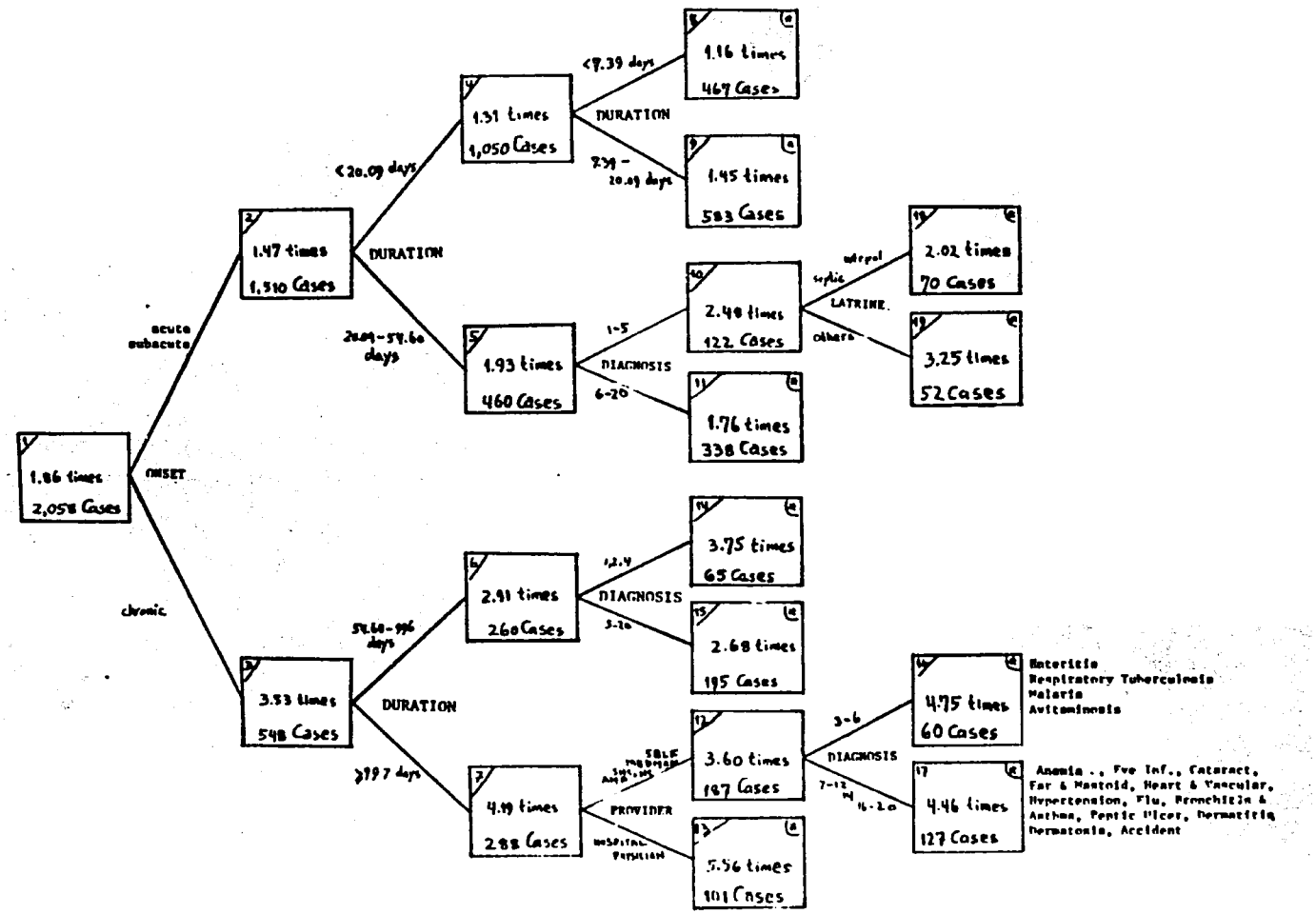


Fig. 8. Tree Diagram of *SEARCH* Analysis of Utilization

utilization.

The summary of the process of dichotomous split is demonstrated in figure 8. The diagram shows symmetry. The symmetry of the dichotomous split of *SEARCH* analysis is an important cornerstone for further analysis using multivariate statistics. Dichotomous split with symmetry indicates minimum interaction among the explanatory variables. Therefore, there is no need to develop construct variables or pattern variables to control the effect of interaction among explanatory variables. Multiple Classification Analysis of utilization on the same explanatory variables produces $R^2_{MCA/util}$ = .39937. This figure is greater than the explanatory power of *SEARCH* analysis, where $R^2_{SEARCH/util}$ = .3973. Higher R^2 in *MCA* is further confirmation of the absence of meaningful interaction among the explanatory variables of utilization.

B. Intensity of Use of Service

Simple bivariate analysis between the best five explanatory variables and the variable of utilization explain the direction and magnitude of the relationship between each explanatory variable and the level of utilization.

Since the dependent variable is interval scaled, while the explanatory variables are either interval, ordinal or nominal scaled, then the best bivariate statistical analysis

technique to use is Simple Regression Analysis for the variable duration of illness, and One-Way Analysis of Variance for variables of clinical onset, type of heath care provider, diagnosis of illness, and latrine availability and type. The summary of the appropriate techniques is presented in table 38.

TABLE 38

RECOMMENDED TYPE OF BIVARIATE STATISTICAL TECHNIQUES TO BE USED IN EXPLAINING BIVARIATE RELATIONSHIP BETWEEN UTILIZATION AND DIFFERENT EXPLANATORY VARIABLES

EXPLANATORY VARIABLE		RECOMMENDED BIVARIATE STATISTICAL TECHNIQUE
LIST	SCALE	
Clinical Onset	Ordinal	ANOVA
Duration of Illness	Interval (Natural log.)	Simple Regression
Type of Health Care Providers	Nominal	ANOVA
Diagnosis of Illness	Nominal	ANOVA
Latrine Availability and its Type	Ordinal	ANOVA

Without controlling for other independent variables, clinical onset of illness has significant association with utilization of the health service at an average of 1.36 times per episode of illness for the acute cases, 2.03 times for the subacute cases, and 3.41 times for the chronic cases, where $F_{2,2678} = 617.98$ at level of significance <0.001 (see table 85, appendix A).

Using simple regression analysis, it is found that increasing duration of illness will increase utilization. The relationship between duration of illness and the frequency of utilization can be expressed as:

$$^{e}\text{Log UTILIZATION} = .2009\,^{e}\text{Log DURATION} + \varepsilon$$

where: $r^2 = .34688$
$F_{2,2678} = 1{,}421.3$
$p < .0000$
$E(\varepsilon) = 0$

The first consultation takes place after one day of illness. The second consultation takes place at day 32. If the disease is not cured by the second consultation, then the third consultation takes place at day 241, and if the third consultation does not cure the disease, the fourth consultation takes place at day 1,014.

The process of seeking care is not random. People with a certain level of severity of illness will seek a "compatible" health care provider. The patients or their families seem able to identify what their immediate health problems are, and what level of competency is required to help them. Severe cases are more likely to be treated in subhealth centers, AMP private offices, health centers, hospitals, or physician's private offices. Mild and moderate cases are more likely to be treated through self care. Medicine men tend to attend more moderate cases and less mild or severe cases (see table 89, Appendix A).

Clinical onset may also influence where to seek

care. Utilization of health care providers varies across different types. The term self care is used when the patient is treated by a lay person not living under the same roof with the patient. Self care is utilized 1.35 times per episode of illness. Other types of health care providers are utilized at higher intensity. The averages are 1.98 times for medicine men, 1.87 times for subhealth centers, 1.85 times for allied health personnel, 2.00 times for health centers, 2.65 times for hospitals and 1.95 times for private physicians.

Diagnoses of illness also creates variation in the intensity of health services, at least between two types of diagnoses, with 26.52% of the variation of utilization explained by one-way analysis of variance (see table 92, appendix A).

The intensity of utilization also varies across different levels of availability of physical amenities in the household. When the availability of physical amenities in the household is in the middle of the spectrum, utilization is the lowest. When the physical amenities are reduced to the lowest level, then utilization of the health care provider increases. Utilization of health services is also increased by increasing availability of physical amenities (see figure 9).

The complexities of the process of seeking care and utilization of the health services discount the pure effect of each explanatory variable presented in bivariate

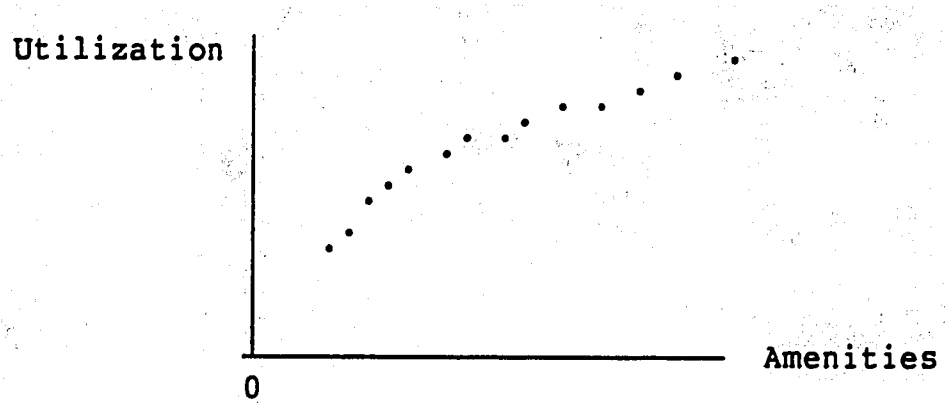


Fig. 9. HYPOTHETICAL RELATIONSHIP BETWEEN AMENITIES AND UTILIZATION OF HEALTH SERVICES

analysis. The redundancy of the explanatory power of the explanatory variables should be controlled, using the multivariate model of utilization. The product should be the pure effect of the individual explanatory variable.

C. Additive Model of Health Care Utilization

In the absence of significant interaction among the explanatory variables of utilization of health services, the explanatory variables explain the variations in utilization in additive fashion. Multiple Classification Analysis is the most appropriate statistical technique to build the model.

The additive model of utilization has five explanatory variables, previously selected through the application of *SEARCH* analysis. They become the independent variables of the "Utilization of the Health Services." Insignificant

variables are excluded from the *MCA* analysis. These five independent variables are:

1. Clinical Onset,
2. Duration of Illness,
3. Diagnosis of Illness,
4. Type of Health Care Provider, and
5. Latrine Availability in the Household and its Type (as a proxy for level of physical amenities).

The order of importance of these five independent variables in *MCA* analysis, however, does not exactly follow the order of importance in *SEARCH* analysis, but is based on a correlation ratio between each explanatory variable with the adjusted score of dependent variable utilization ($beta^2$ and beta). The order of explanatory variable importance in *MCA* analysis is as follows:

Name of Variable	Beta
1. Duration of Illness	.298652
2. Clinical Onset	.235882
3. Diagnosis of Illness	.215546
4. Type of Health Care Provider	.114631
5. Latrine Availability and Type	.060907

R^2 = Proportion variation explained by the fitted model = .39937, is slightly higher than the $R^2_{SEARCH/util}$ which is = .39711

The *MCA* analysis of the additive model of utilization of the health services computes the grand mean of utilization, the mean of utilization in each stratum of the

explanatory variables, and the unadjusted mean of utilization in each strata of explanatory variable after controlling other explanatory variables. Therefore, the difference in utilization across the strata of the individual explanatory variables is the pure effect of those strata.

1. Duration of Illness

As has been mentioned earlier, the variable of duration of illness is the most important and influential explanatory variable of utilization. Variation utilization across different strata of duration of illness is presented in table 39.

The mean average of utilization shows a small increment as duration of illness increases from the lowest stratum of duration of illness to the highest stratum. The the unadjusted mean of utilization at the lowest stratum is 1.22 times, and after adjustment for the influence of other explanatory variables it is 1.24 times. It is 4.22 times at the highest strata before adjustment and it is 3.00 after adjustment. This finding confirms that the longer the duration of illness, the higher the utilization of health services. Therefore, we expect more utilization among the chronic cases and less utilization among the acute cases.

TABLE 39

AVERAGE OF UTILIZATION ACROSS DIFFERENT STRATA OF DURATION OF ILLNESS USING *M.C.A.* ANALYSIS

STRATA OF DURATION	NUMBER OF CASES	PERCENTS	STRATA MEAN	ADJUSTED MEAN
- 2.72 days	17	1.22%	1.12	1.24
- 7.39 days	228	16.41%	1.22	1.48
- 20.09 days	372	26.78%	1.49	1.82
- 54.60 days	286	20.59%	1.82	1.97
- 148.41 days	97	6.98%	2.44	2.16
- 403.43 days	69	4.97%	2.61	1.96
- 996.99 days	93	6.70%	3.22	2.36
≥ 997.00 days	227	16.34%	4.22	3.00

eta^2 = .332146 $beta^2$ = .089193
eta = .576321 beta = .298652
eta^2 = correlation ratio of the unadjusted raw score of the dependent variable.
$beta^2$ = correlation ratio of the adjusted score of the dependent variable.
The class of the duration is obtained after the inverse of natural logarithm from 0 to 7 in each corresponding class. The only exception is the last two classes, since the maximum duration of illness recorded is ≥ 997 days and coded 997 days in the interview.

2. Clinical Onset of Illness

The second most important explanatory variable of utilization is the clinical onset of illness. As has been mentioned in the description of the variables, the clinical onset of illness is divided into three classes--acute onset,

subacute onset, and chronic onset. Variation of utilization across the strata of clinical onset is presented in table 40.

TABLE 40

MEAN AVERAGE OF UTILIZATION ACROSS DIFFERENT STRATA OF CLINICAL ONSET OF ILLNESS USING *M.C.A.* ANALYSIS

STRATA OF CLINICAL ONSET	NUMBER OF CASES	PERCENTS	STRATA MEAN	ADJUSTED MEAN
Acute Onset	675	48.60%	1.39	1.72
Subacute Onset	280	20.16%	1.93	1.94
Chronic Onset	434	31.25%	3.56	2.56

eta^2 = .303402 $beta^2$ = .055640
eta = .550819 beta = .235882

The unadjusted average utilization of the health services among the acute onset cases is 1.39 times, but after adjustment for the influence of other explanatory variables, the utilization becomes 1.72 times per episode of illness. Among the subacute cases, the unadjusted average of utilization is 1.93 times and the adjusted average utilization is 1.94 times. The unadjusted average utilization among the chronic cases is 3.56 times and the adjusted average is 2.56 times. The adjustment reduces variation across strata, and the difference across strata is significant (see table 90, Appendix A).

3. Diagnosis of Illness

The third most important explanatory variable of utilization is diagnosis of illness. There are twenty diseases included in the analysis. The variation of the utilization rate across different clinical diagnoses is presented in table 41.

In bivariate analysis, the variation of utilization rates across different strata of diagnosis of illness is significantly different, (see table 92, Appendix A), at least between two diagnoses. Table 41 presents the average utilization of the health services across different diagnoses, after holding the influence of other explanatory variables constant. Therefore, the variation across the diagnoses is the pure effect of the diagnoses of illness themselves.

4. Type of Health Care Provider

The fourth most important explanatory variable of utilization is the type of health care provider. As has been mentioned in the description of the variables, there are seven types of health care providers. In the bivariate condition of one-way analysis of variance, the utilization of self care is less than any other type of health care provider. The utilization of health services among cases

TABLE 41

MEAN AVERAGE OF UTILIZATION ACROSS DIFFERENT DIAGNOSES OF ILLNESS USING *M.C.A.* ANALYSIS

DIAGNOSIS OF ILLNESS	NUMBER OF CASES	PERCENTS	STRATA MEAN	ADJUSTED MEAN
Typhoid Fever	27	1.94%	2.12	2.38
Dysentery	33	2.38%	1.40	1.82
Enteritis	61	4.39%	1.79	2.43
Respiratory Tuberculosis	169	12.17%	3.74	2.51
Malaria	46	3.31%	1.82	2.04
Avitaminosis-Hypovitaminosis-Malnourishment	29	2.09%	2.46	1.87
Anemia	30	2.16%	2.25	1.92
Eye Infection	40	2.88%	1.93	2.01
Cataract	10	.72%	1.42	.95
Disease of the Ear-Mastoid	21	1.51%	1.43	1.50
Disease of the Heart-Vascular	63	4.54%	3.56	2.49
Hypertension	60	4.32%	2.89	2.24
Upper Respiratory Infection	87	6.26%	1.31	1.70
Flu/Common Cold	338	24.33%	1.42	1.86
Pneumonia	13	.94%	1.75	2.12
Bronchitis-Asthma-Emphysema	160	11.52%	2.36	1.93
Peptic Ulcer	42	3.02%	2.25	2.14
Dermatitis	62	4.46%	1.54	1.69
Dermatoses	61	4.39%	1.82	1.54
Accident	37	2.66%	2.08	2.42

eta = .476951 eta² = .227482 beta = .215546 beta² = .046460

who use medicine men, subhealth centers, A.M.P. private offices, health centers, and physicians' private offices, is approximately the same.

After controlling for the effect of other explanatory variables, the pure effect of type of health care provider is presented in table 42.

TABLE 42

MEAN OF UTILIZATION ACROSS DIFFERENT STRATA OF HEALTH CARE PROVIDERS USING *M.C.A.* ANALYSIS

STRATA OF HEALTH CARE PROVIDER	NUMBER OF CASES	PERCENTS	STRATA MEAN	ADJUSTED MEAN
Self Care	40	2.88%	1.46	1.45
Medicine Man	163	11.74%	1.80	1.95
Subhealth Center	209	15.05%	2.01	2.08
A.M.P.	334	24.77%	1.84	1.93
Health Center	352	25.34%	1.90	1.91
Hospital	123	8.86%	2.94	2.36
Physician	158	11.38%	2.32	2.17

eta^2 = .040838 $beta^2$ = .013140
eta = .202085 beta = .114631

The number of self care cases is under represented in the analysis in table 42 because all treatments made by the patient or members of his household are not counted in the enumeration of utilization. Only consultations made by members of his extended family, who can not be classified as one of the other six types of health care providers, were

classified as self care and counted in the frequency of utilization. That is why the figure in table 42 shows that the utilization of self care "facility" covers only 2.88% of the episodes, while, in fact, self care covers 31.1% of all consultations. The variation across different types of health care providers still demonstrates the difference in utilization after controlling for other explanatory variables. Again, the utilization of self care is 1.45 times, the lowest among all types of health care providers. The utilization of hospitals at 2.36 times per episode of illness, remains the highest among all types of health care providers. The utilization of medicine men, subhealth centers, A.M.P. private offices, and physicians' private offices, ranges from 1.95 times per episode of illness among users of medicine men, to 2.17 times among users of physicians' private offices. The difference among the latter group are very small.

5. Latrine Availability in the Household and its Type

Latrine availability in the household and variation of its types represents the availability of healthful physical amenities in the household, and regular access to health care services (see table 94, Appendix A). In one-way analysis of variance, the quality and type of latrine used indicates utilization of health services. The utilization of health services is higher among members of the household who

defecate in the bush or on the ground and bury their feces, or by polluting a nearby body of water. The utilization is lower whenever they use permanent latrines, either owned by the public or the neighborhood.

Higher utilization rate among those who live in a home equipped with a latrine reflects that easier access to health services are found among those who have more physical amenities in the house. Therefore, their utilization is also higher (2.74%). The utilization among those who have their own pit latrine in their home is higher than among those with a septic tank (2.16 times). This finding means that a healthier environment is found among those who live in a home equipped with a septic tank, than in a home equipped with pit latrine. Therefore, when they are ill, the severity of illness and the number of consultations required to treat them is lower.

After controlling for variation among other explanatory variables, computation of the pure effect of latrine availability and its type is presented in table 43.

There is a difference between utilization of health services across strata of latrine availability and type. Those differences are demonstrated in table 94 (appendix A) and table 43. In table 94 the influence of other explanatory variables has not been taken into consideration, while in table 43 the influence of other explanatory variables has been controlled.

TABLE 43

MEAN OF UTILIZATION ACROSS DIFFERENT STRATA OF AVAILABILITY AND TYPE OF LATRINE USING *M.C.A.* ANALYSIS

STRATA OF LATRINE AVAILABILITY/ AND ITS TYPE	NUMBER OF CASES	PERCENTS	STRATA MEAN	ADJUSTED MEAN
No/Pollute water	885	63.71%	1.88	1.96
No/Bush	239	17.21%	2.34	2.16
No/Buried	36	2.59%	1.93	1.96
No/Public	13	.94%	1.70	2.11
No/Neighborhood	55	3.96%	1.80	1.79
Yes/Pit latrine	98	7.06%	2.56	2.10
Yes/Septic tank	63	4.54%	1.86	1.95

eta^2 = .021837 $beta^2$ = .003710
eta = .147774 beta = .060907

Profile of Utilization of Health Care

The best set of explanatory variables of utilization of health care is duration of illness, clinical onset of illness, diagnosis of illness, type of health care provider, and latrine availability in the household and its type. Each individual explanatory variable has a pure effect of its own on variation of utilization.

The Additive Model of Utilization is meant to compare the pure effect of each explanatory variable on different health care facilities, across age group and diagnosis of

illness. Therefore, what will be compared in this model is the age-specific utilization across several types of health care providers, after controlling for the effect of each explanatory variable. Since the variable of age group of the sick is not selected as a component of the best explanatory variables of utilization, age group is automatically excluded from the additive model of utilization using *M.C.A.*, leaving the profile of utilization to specific utilization. The development of the utilization profile is a subset of the development of the Product Disease Profile. The computation formula for calculating the Specific Utilization Rate (SUR) is as follows:

$$^{e}\text{Log } SUR_{ik} = GM_{util} + a_i DIAGNOSIS_i + c_k PROVIDER_k + \varepsilon$$

Where: SUR_{ik} = Specific Utilization Rate of health care provider type k among people who suffer disease i

GM_{util} = Grand Mean of utilization

a_i = adjusted deviation from grand mean of utilization due to disease i

c_k = adjusted deviation from grand mean of utilization due to seeking care at health care provider type k

$E(\varepsilon)$ = Expected residual error of the model, which is equal to zero in the unbiased estimator of utilization.

The profile of utilization is presented in table 44, which describes the utilization across different types of health care providers per episode of illness. A measure of this utilization is the total number of consultations.

TABLE 44

PROFILE OF UTILIZATION OF HEALTH SERVICES ACROSS DIFFERENT TYPES OF HEALTH CARE PROVIDERS AND DIAGNOSIS OF ILLNESS USING THE ADDITIVE MODEL OF *M.C.A.*

DIAGNOSIS OF ILLNESS	TYPE OF HEALTH CARE PROVIDER (Frequency of Utilization)						
	SELF CARE	MEDICINE MAN	S.H.C.	A.M.P.	H.C.	HOSPITAL	PHYSICIAN
Typhoid Fever	1.74	2.33	2.48	2.31	2.28	2.82	2.59
Dysentery	1.33	1.78	1.90	1.76	1.75	2.15	1.98
Enteritis	1.77	2.37	2.53	2.35	2.33	2.87	2.64
Respiratory Tuberculosis	1.83	2.45	2.62	3.44	2.41	2.97	2.73
Malaria	1.48	1.99	2.12	1.97	1.95	2.41	2.21
Avitaminosis-Hypovitaminosis-Malnourishment	1.36	1.82	1.95	1.81	1.79	2.21	2.03
Anemia	1.40	1.87	2.00	1.86	1.84	2.27	2.09
Eye Infection	1.46	1.96	2.09	1.94	1.92	2.37	2.18
Cataract	.69	.92	.99	.92	.91	1.12	1.03
Disease of Ear & Mastoid	1.09	1.46	1.56	1.45	1.43	1.77	1.63
Disease of Heart & Vascular System	1.82	2.43	2.60	2.42	2.39	2.95	2.71
Hypertension	1.63	2.18	2.33	2.17	2.14	2.64	2.43
Upper Respiratory Infection	1.24	1.66	1.77	1.65	1.63	2.01	1.85
Flu/Common Cold	1.36	1.82	1.94	1.81	1.79	2.20	2.03
Pneumonia	1.54	2.07	2.21	2.05	2.03	2.51	2.30
Bronchitis-Asthma-Emphysema	1.40	1.88	2.01	1.87	1.85	2.28	2.09
Peptic Ulcer	1.56	2.08	2.23	2.07	2.05	2.52	2.32
Darmatitis	1.23	1.65	1.76	1.63	1.62	1.99	1.83
Dermatoses	1.12	1.50	1.61	1.49	1.48	1.82	1.68
Accident	1.76	2.36	2.52	2.34	2.32	2.86	2.63

TABLE 45

AGE SPECIFIC DISTRIBUTION OF PERCENT SEEKING CARE ACROSS DIFFERENT TYPES OF HEALTH CARE PROVIDERS

DIAGNOSIS OF ILLNESS	TYPE OF HEALTH CARE PROVIDER						
Age Group	SELF CARE	MEDICINE MAN	S.H.C.	A.M.P.	H.C.	HOSPITAL	PHYSICIAN
1. Typhoid Fever							
0 - 1 yr	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1 - 4 yrs	0.00%	28.57%	0.00%	28.57%	0.00%	0.00%	14.29%
5 - 14 yrs	26.09%	17.39%	0.00%	0.00%	4.35%	8.70%	17.39%
15 - 44 yrs	8.70%	16.39%	13.04%	13.04%	8.70%	4.35%	8.70%
≥ 45 yrs	0.00%	50.00%	0.00%	16.67%	16.67%	0.00%	16.67%
2. Dysentery							
0 - 1 yr	22.22%	0.00%	0.00%	0.00%	11.11%	0.00%	11.11%
1 - 4 yrs	26.19%	9.52%	4.76%	7.14%	14.29%	0.00%	4.76%
5 - 14 yrs	25.00%	0.00%	6.25%	12.50%	12.50%	0.00%	6.25%
15 - 44 yrs	12.12%	9.09%	15.15%	12.12%	6.06%	0.00%	9.09%
≥ 45 yrs	15.38%	0.00%	7.69%	15.38%	7.69%	7.69%	0.00%
3. Enteritis - G.E.D.							
0 - 1 yr	18.18%	0.00%	4.55%	3.64%	0.00%	13.64%	9.09%
1 - 4 yrs	32.95%	1.14%	5.68%	6.82%	10.23%	5.68%	9.09%
5 - 14 yrs	33.33%	7.41%	0.00%	14.81%	7.41%	3.70%	0.00%
15 - 44 yrs	19.15%	6.38%	10.64%	25.53%	8.51%	4.26%	4.26%
≥ 45 yrs	28.95%	0.00%	5.26%	15.79%	7.89%	2.63%	13.16%
4. Respiratory Tuberculosis							
0 - 1 yr	0.00%	0.00%	33.33%	0.00%	33.33%	33.33%	0.00%
1 - 4 yrs	11.76%	5.88%	0.00%	0.00%	0.00%	5.88%	29.40%
5 - 14 yrs	0.00%	4.75%	0.00%	0.00%	19.05%	23.81%	9.52%
15 - 44 yrs	4.27%	5.13%	5.13%	10.26%	18.80%	18.80%	11.97%
≥ 45 yrs	8.66%	4.33%	7.36%	14.29%	16.88%	6.49%	8.66%

TABLE 45 (continued)

DIAGNOSIS OF ILLNESS / Age Group	TYPE OF HEALTH CARE PROVIDER						
	SELF CARE	MEDICINE MAN	S.H.C.	A.M.P.	H.C.	HOSPITAL	PHYSICIAN
5. Malaria							
0 - 1 yr	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1 - 4 yrs	41.67%	8.33%	8.33%	0.00%	8.33%	0.00%	0.00%
5 - 14 yrs	50.00%	5.88%	0.00%	11.76%	5.88%	0.00%	2.94%
15 - 44 yrs	30.00%	10.00%	8.57%	11.43%	11.43%	5.71%	0.00%
≥ 45 yrs	41.38%	13.79%	3.45%	6.90%	13.79%	6.90%	6.90%
6. A-Hypo-Vitaminosis Malnourishment							
0 - 1 yr	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1 - 4 yrs	2.08%	4.17%	4.17%	12.50%	2.08%	0.00%	4.17%
5 - 14 yrs	3.03%	0.00%	3.03%	3.03%	0.00%	0.00%	0.00%
15 - 44 yrs	7.14%	3.57%	10.71%	3.57%	14.29%	0.00%	0.00%
≥ 45 yrs	0.00%	0.00%	8.11%	2.70%	5.41%	2.70%	0.00%
7. Anemia							
0 - 1 yr	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1 - 4 yrs	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	12.50%
5 - 14 yrs	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
15 - 44 yrs	7.97%	2.90%	3.62%	5.80%	5.07%	1.45%	5.07%
≥ 45 yrs	7.25%	0.00%	2.90%	10.14%	5.80%	7.25%	1.45%
8. Eye Infection							
0 - 1 yr	12.50%	0.00%	0.00%	25.00%	0.00%	0.00%	0.00%
1 - 4 yrs	19.35%	6.45%	4.84%	3.23%	3.23%	3.23%	1.61%
5 - 14 yrs	21.00%	3.00%	5.00%	4.00%	2.00%	4.00%	0.00%
15 - 44 yrs	23.42%	2.70%	6.31%	3.60%	3.60%	2.70%	1.80%
> 45 yrs	10.98%	0.00%	1.22%	4.88%	3.66%	4.88%	4.88%

T A B L E 45 (continued)

DIAGNOSIS OF ILLNESS	TYPE OF HEALTH CARE PROVIDER						
Age Group	SELF CARE	MEDICINE MAN	S.H.C.	A.M.P.	H.C.	HOSPITAL	PHYSICIAN
9. Cataract							
0 - 1 yr	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1 - 4 yrs	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5 - 14 yrs	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
15 - 44 yrs	0.00%	0.00%	0.00%	0.00%	15.38%	15.38%	7.69%
≥ 45 yrs	3.06%	4.08%	0.00%	2.04%	1.02%	3.06%	1.02%
10. Disease of the Ear and Mastoid							
0 - 1 yr	0.00%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1 - 4 yrs	7.32%	2.44%	4.88%	4.88%	12.20%	0.00%	0.00%
5 - 14 yrs	12.77%	4.26%	4.26%	4.26%	8.51%	2.13%	4.26%
15 - 44 yrs	0.00%	12.50%	12.50%	12.50%	0.00%	25.00%	0.00%
≥ 45 yrs	0.00%	0.00%	20.00%	0.00%	0.00%	40.00%	0.00%
11. Disease of Heart and Vascular System							
0 - 1 yr	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1 - 4 yrs	0.00%	0.00%	0.00%	25.00%	0.00%	25.00%	0.00%
5 - 14 yrs	12.50%	0.00%	0.00%	12.50%	50.00%	0.00%	12.50%
14 - 44 yrs	3.92%	3.92%	7.84%	5.88%	13.73%	5.88%	7.84%
≥ 45 yrs	6.59%	10.99%	3.30%	12.09%	7.69%	6.59%	25.27%
12. Hypertension							
0 - 1 yr	0.00%	0.00%	0.00%	0.00%	0.00%	0.00	100.00%
1 - 4 yrs	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5 - 14 yrs	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
15 - 44 yrs	9.57%	2.13%	9.57%	6.38%	7.45%	2.13%	11.70%
≥ 45 yrs	6.78%	0.56%	3.95%	2.82%	9.04%	5.65%	10.17%

T A B L E 45 (continued)

DIAGNOSIS OF ILLNESS	TYPE OF HEALTH CARE PROVIDER						
Age Group	SELF CARE	MEDICINE MAN	S.H.C.	A.M.P.	H.C.	HOSPITAL	PHYSICIAN
13. Upper Respiratory Tract Infection							
0 - 1 yr	16.67%	0.00%	6.67%	13.13%	10.00%	3.33%	16.67%
1 - 4 yrs	20.54%	4.32%	3.78%	4.32%	3.78%	1.62%	4.86%
5 - 14 yrs	22.60%	3.95%	3.95%	2.82%	3.95%	0.56%	6.78%
15 - 44 yrs	27.10%	0.00%	3.87%	7.74%	5.16%	0.65%	6.45%
≥ 45 yrs	25.27%	2.20%	2.20%	5.49%	3.30%	3.30%	4.40%
14. Flu / Common Cold							
0 - 1 yr	13.61%	1.36%	10.88%	6.80%	5.44%	2.72%	12.24%
1 - 4 yrs	12.59%	1.50%	4.20%	4.35%	3.15%	1.35%	7.20%
5 - 14 yrs	18.60%	2.50%	5.90%	4.29%	5.90%	0.54%	4.47%
15 - 44 yrs	27.09%	2.93%	5.19%	11.96%	9.03%	0.68%	8.13%
≥ 45 yrs	25.13%	3.14%	4.19%	14.66%	10.99%	1.57%	4.71%
15. Pneumonia							
0 - 1 yr	0.00%	12.50%	0.00%	12.50%	0.00%	12.50%	12.50%
1 - 4 yrs	20.00%	0.00%	5.00%	5.00%	5.00%	0.00%	10.00%
5 - 14 yrs	10.00%	0.00%	10.00%	0.00%	10.00%	0.00%	10.00%
15 - 44 yrs	0.00%	0.00%	14.29%	0.00%	14.29%	14.29%	0.00%
≥ 45 yrs	14.29%	0.00%	0.00%	14.29%	14.29%	0.00%	0.00%
16. Bronchitis							
0 - 1 yr	0.00%	11.11%	0.00%	0.00%	11.11%	11.11%	0.00%
1 - 4 yrs	19.18%	0.00%	2.74%	8.22%	15.07%	2.74%	4.11%
5 - 14 yrs	23.08%	1.92%	3.85%	9.62%	11.54%	5.77%	3.85%
15 - 44 yrs	11.11%	6.84%	5.98%	13.68%	11.11%	8.55%	5.98%
≥ 45 yrs	13.99%	2.47%	9.05%	9.88%	15.23%	5.35%	4.94%

T A B L E 45 (continued)

DIAGNOSIS OF ILLNESS	TYPE OF HEALTH CARE PROVIDER						
Age Group	SELF CARE	MEDICINE MAN	S.H.C.	A.M.P.	H.C.	HOSPITAL	PHYSICIAN
17. Peptic Ulcer							
0 - 1 yr	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1 - 4 yrs	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5 - 14 yrs	33.33%	0.00%	0.00%	16.67%	0.00%	0.00%	0.00%
15 - 44 yrs	21.78%	0.99%	1.98%	9.90%	4.95%	2.97%	12.87%
≥ 45 yrs	15.69%	0.00%	11.76%	11.76%	11.76%	9.80%	19.61%
18. Dermatitis							
0 - 1 yr	18.92%	5.41%	5.41%	0.00%	2.70%	2.70%	0.00%
1 - 4 yrs	9.74%	2.56%	4.10%	7.69%	4.10%	0.00%	3.59%
5 - 14 yrs	12.08%	4.03%	1.34%	4.03%	3.36%	2.68%	3.36%
15 - 44 yrs	11.48%	1.64%	9.84%	3.28%	8.20%	3.28%	1.64%
≥ 45 yrs	20.45%	2.27%	9.09%	9.09%	2.27%	4.55%	2.27%
19. Dermatosis							
0 - 1 yr	8.00%	0.00%	12.00%	4.00%	8.00%	0.00%	8.00%
1 - 4 yrs	8.05%	2.30%	5.75%	9.20%	4.60%	5.75%	0.00%
5 - 14 yrs	11.43%	5.71%	2.86%	7.14%	11.43%	2.86%	4.29%
15 - 44 yrs	5.26%	3.51%	2.63%	5.26%	2.63%	1.75%	3.51%
≥ 45 yrs	8.70%	1.09%	5.43%	5.43%	7.61%	3.26%	4.35%
20. Accident & Trauma							
0 - 1 yr	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1 - 4 yrs	28.30%	7.69%	0.00%	0.00%	15.38%	7.69%	0.00%
5 - 14 yrs	10.53%	0.00%	0.00%	0.00%	10.53%	5.26%	5.26%
15 - 44 yrs	16.28%	6.98%	4.65%	4.65%	20.93%	13.95%	6.98%
≥ 45 yrs	10.81%	18.92%	5.41%	5.41%	10.81%	2.70%	2.70%

Some sick persons do not seek care at all; others seek care from different types of health care providers at varying level of intensity. The percentage of those who seek care from different types of health care providers is presented in table 45.

D. Hypothesis Testing of the Additive Model of Utilization

It has been postulated earlier, as the working hypothesis of this research, that utilization of health services is influenced by **predisposing factors, enabling factors,** and **need factors.**

In developing health care alternatives, the public health sector can only scrutinize several key variables within its jurisdiction. The public health sector is more likely to exert influence in the following areas:

1. Cost of service at government facilities;
2. Setting maximum cost of consultation in the private sector;
3. Reducing distance from house to clinic by adding more facilities in the area;
4. Improving quality of care in government facilities through in-service training for medical personnel, and redefining the objective, the role, and the budget of the health sector. To some extent, the government is able to improve quality of care through licensing and

good monitoring of the private sector.

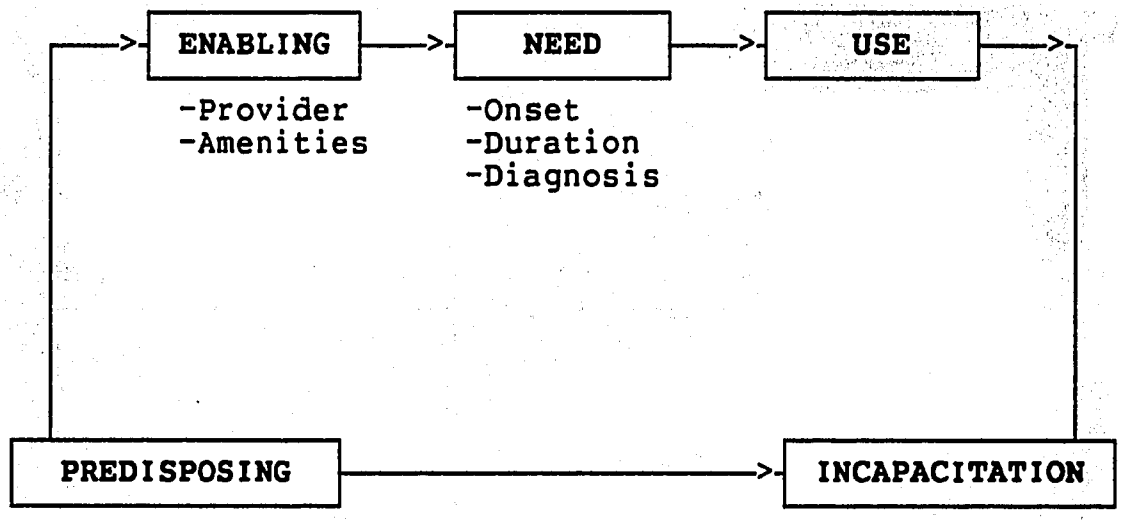


Fig. 10. MODEL OF UTILIZATION AND INCAPACITATION

Repetitive analysis of variance through *SEARCH* analysis of utilization of health care facilities, with all possible combinations of explanatory variables, has produced five explanatory variables: clinical onset, duration of illness, type of health care provider, diagnosis of illness, and latrine availability and its type. The variables of distance, cost, and quality do not appear as the best explanatory variables. They have been "masked" by some of the best five explanatory variables in explaining variation of utilization due to redundancy in their explanatory power Three out of five of the explanatory variables are components of the need-factor. "Latrine availability and its type" represents the availability of physical amenities and access to health services at home. Together with "type of health care provider," these variables are the components of

TABLE 46

REGRESSION ANALYSIS OF UTILIZATION ON DISTANCE, QUALITY OF CARE, AVERAGE COST OF SERVICE, AND ESTIMATED VALUE OF FAMILY ASSETS

ANALYSIS OF VARIANCE:

SOURCES	D.F.	SUM OF SQR	MEAN SQR	F	p
Regression	5	77.885	15.577	31.014	.0000
Error	2,625	1,318.4	.50226		
Total	2,630	1,396.3			

Multiple-R = .23617 R^2 = .05578 S.E.= .70871

VARIABLE	Mean	Std-Dev	Reg. Coeff.	t	p	Elasticity
Dependent Variable:						
LnUTIL	.66955	.72681				
Independent Variables:						
ASSETS	4.7778	2.4440	.024855	4.3871	.0000	.17736
LnAvCOST	5.3626	3.1082	.010152	2.2651	.0236	.08131
QUALITY	4.2733	1.8009	-.21929	-10.132	.0000	-1.39958
DVHome	.07768	.26771	-.12315	-2.3525	.0187	- .01429
DVveryfar	.071002	.25687	.18970	3.4867	.0005	.02012
Intercept			1.6869	13.518	.0000	

Dependent variable is in natural logarithm
DVHome = Dummy variable of distance when treatment takes place at home
DVveryfar = Dummy variable of distance when the place of treatment is very far.
Quality = Interval-scaled quality of care
ASSETS = Estimated value of family assets
LnAvCOST = Natural logarithm of average cost of treatment.
Elasticity = (regression coefficient x mean independent variable) : mean dependent variable.

the enabling-factor. The dominance of the need factor is observed here, where diagnosis of illness, clinical onset,

and duration of illness explain 37.95% of the variation in utilization. The enabling factor, which is represented by "type of health care provider" and "latrine availability and its type," explains only 1.78% of the variation in utilization (see table 37). These figures reflect the dominance of equity of access to health services over inequity of access. High equity of access to health services exists if the **need factor** and demographic characteristics are the dominant factors in determining utilization of health services, and the enabling factor is less dominant.[2]

The additive model built by *SEARCH* and *MCA* analysis does not exclude the exploration of another model using all policy manipulable variables as the explanatory variable. However, other models are not as efficient as the additive model developed by *SEARCH* and *MCA*. The fitness of other models with policy manipulable variables in their explanatory variables is very low, with R^2=.05578 (see table 46).

In mathematical expression, the multiple regression in table 46 can be formulated as follows:

```
LnUTIL = 1.6869 - .12312 DVHome + .1879 DVveryfar
t:       (13.518) (-2.3525)       (3.4867)
p:         <.01     <.05            <.01

         - .21929 QUALITY + .024855 ASSETS
         (-10.132)          (4.3871)
           <.01               <.01

         + .010152 LnAvCOST   +  e
          (2.2651)
            <.05

         R² = .05578   SE = .70871
```

Individually, policy manipulable independent variables of average cost of consultation, and distance from home to place of treatment, explain a little variation of utilization after controlling for the effect of other independent variables in the model. While explanatory variable quality of care explain a substantial variation of utilization after controlling for the effect of other explanatory variables.

1. Family Assets

An increase in family assets will increase the utilization of health services. The elasticity of demand for family assets = .17736 and the slope of the regression = .024855; the linear relationship is logarithmic. An increase in family asset of one million rupiah will increase the average utilization per episode of illness from the average $e^{1.6869}$ or 5.40 times, to $e^{(1.6869 + .024855)} = e^{1.71185}$ or 5.54 times. An increase of twenty million rupiah in the family assets will increase the utilization of health services per episode of illness from the average to $e^{1.6869 + .4971}$ or 8.88 times, holding other independent variables constant.

A policy of increasing utilization by expecting an increase in the estimated value of family assets is simply beyond the jurisdiction of the public health sector, and therefore, it is not policy manipulable from the public

health point of view.

2. Average Cost of Service

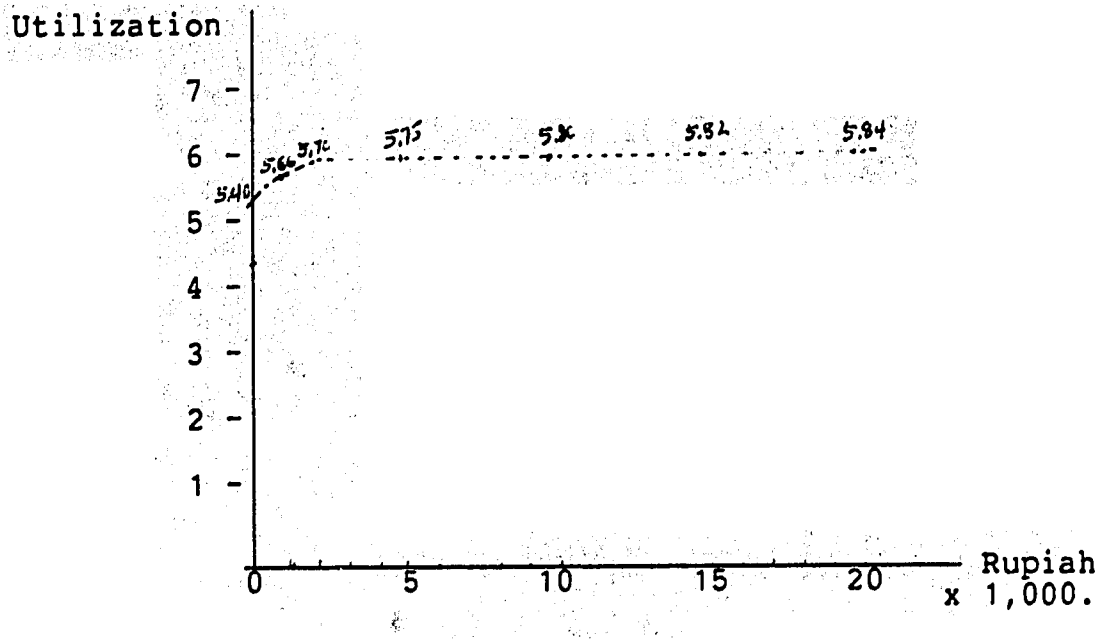


Fig. 11. LINEAR RELATIONSHIP BETWEEN UTILIZATION AND AVERAGE COST OF SERVICE

The cost of service or service charge is still within the control of the Ministry of Health. The slope of the regression is = .010152 and the price elasticity is = .08131 at a utilization of 1.95 times and out-of-pocket payment equal to Rp. 205.61. This means that an increase in the average cost of services is followed by an increase in the utilization of health services. Both variables are scaled in natural logarithm. This is not the normal economic rationale among consumers of services. Even when the type of health care provider is included and controlled, the regression of utilization on cost, quality of care, and

distance and type of health care provider, using stepwise dummy variable multiple regression is as follows:

```
LnUTIL = 1.5956 + .029557 ASSETS + .0080806 LnAvCOST
t:      (12.937)    (5.175)        (1.8002)
p:        <.01        <.01            <.1

         - .21259 QUALITY  +  .16293 DVveryfar
          (-9.8851)          (3.0266)
            <.01               <.01

         + .31519 DVselfcare  +  .322 DVhospital
          (-4.3095)             (6.7224)
            <.01                  <.01

         + .08967 Dvphysician    + e
           (2.4155)
             <.05

         R² = .07882      SE = .70065
```

The slope and elasticity remain positive. The slope of the regression of cost of service is = .0080806 and price elasticity is = .06472 at utilization equal to 1.95 times, and out-of-pocket payment equal to Rp. 205.62.

The are several possible explanations for this increase. The first possibility is that higher status is probably associated with more expensive types of health care. Therefore, once the users commit themselves to seeking care, they are more likely to consume a more expensive type of care. The second possibility is that more expensive type of care are consumed when the illness is more severe, or a particular diagnosis needs expensive and continuous treatment. The third possibility is that the patient complies with the treatment regimen prescribed by health care providers, and more expensive facility is usually more concerned about follow-up treatment. As a consequence of a

lack of consumer freedom in determining what type of treatment to buy and how much, patients eventually comply with the elaborate treatment procedure suggested by the provider who operates out of the more expensive facility.

3. Quality of Care

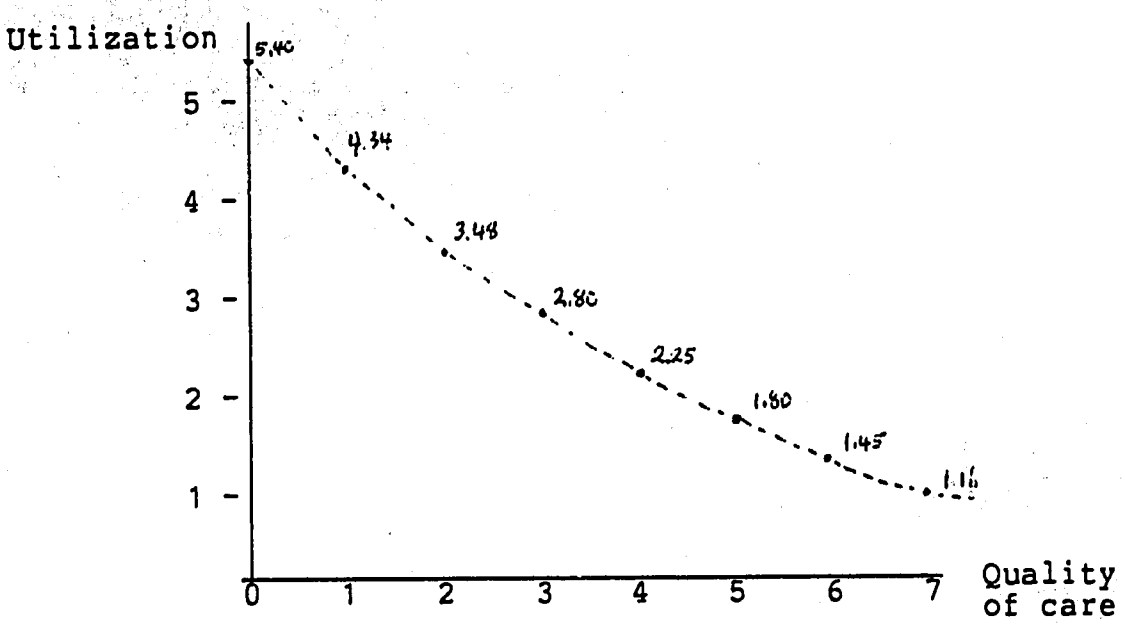


Fig. 12. LINEAR RELATIONSHIP BETWEEN UTILIZATION AND QUALITY OF CARE

Quality of care is also a policy manipulable variable. Regression of utilization on all dependent variables produces a slope of quality of care = .21929 and elasticity = -1.39958. This is true even if the type of health care provider is controlled by adding the variable of "type of health care provider" to the equation. The slope is decreasing to - .21259 and the elasticity to -1.35682. This negative slope means a decline in utilization of health

services per episode of illness, with increasing quality of care. Improvement of the quality of care probably rapidly reduces the duration of illness and also, therefore, the utilization per episode of illness.

4. Distance from Home to Place of Treatment

Distance from home to place of treatment is measured in ordinal scale. The transformation from ordinal scale to continuous scale through dummy variable transformation is done before stepwise dummy variable multiple regression is made. Dummy variable stepwise multiple regression only selects the dummy variable of distance when treatment take places at home or in a facility very far from home. Other dummy variables of distance are rejected. Therefore, their values are equal to the value of the constant of the regression equation.

	Regression Coefficient	Elasticity
DVHome	- .12315	- .01429
DVveryfar	.18970	.02012

These findings suggest that treatment has reduced the utilization of services through home visits, while consultation at the far away facility tends to increase the utilization per episode of illness. The bar diagram of utilization by distance in figure 13 tell us about the direction of the hypothetical slope of the regression of utilization on distance.

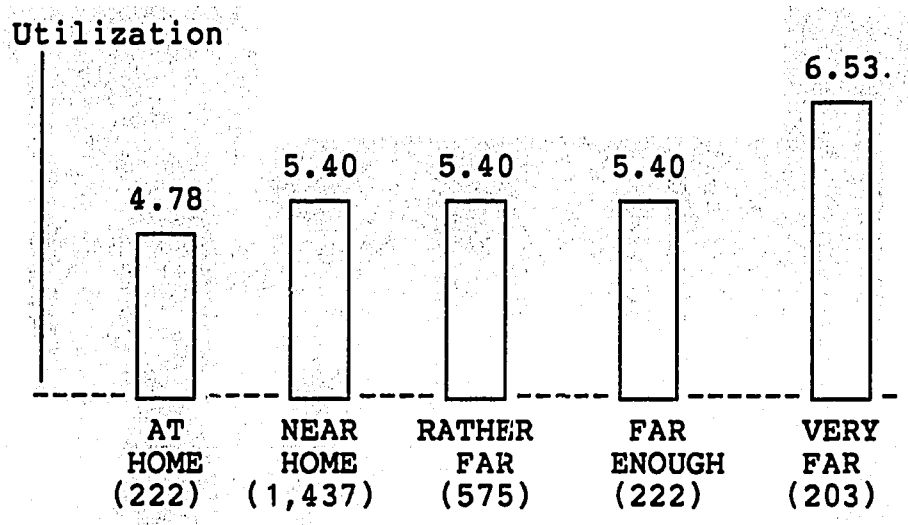


Fig. 13. UTILIZATION OF HEALTH CARE FACILITY BY DISTANCE

The conclusion derived from the linear multiple regression model of utilization on average cost of treatment for one consultation, quality of care, estimated value of family assets, and distance from home to place of treatment, is inconclusive due to the low fitness of the model (coefficient of determination R^2 = .05578). As has been mentioned earlier, an optimum model of utilization does not include variables of average cost of service, quality of care, and distance, as part of the explanatory variables. Financial barriers, distance, and low quality of care may become obstacles to seeking care among many people who have not sought it (see tables 12 ,13 and 14). Once the decision to seek care has been made, financial barriers, quality of care, and distance from home to place of treatment are no longer important obstacles to consuming greater quantities of health care.

A policy toward improving utilization of services,

through lowering the service charge, or regulating the service charge, improving the quality of care, or increasing the density of facilities in order to reduce distance from home to place of treatment, all cannot guarantee an increase in utilization among current-users. These measures may attract non-users to become users of the service, or they may attract users to seek care at earlier stages of illness.

Footnotes to Chapter VI:

[1]Distinction should be made between duration of hospital stay and duration of inpatient stay, since not all inpatient stay takes place in hospital.

[2]Andersen, Ronald, "Health Service Distribution and Equity, in Equity in Health Services: An Empirical Analyses in Social Policy, Ronald Andersen, Joanna Kravits and Odin W. Anderson (eds.), Cambridge, Mass.: Ballinger Publishing Co., 1975, pp. 9-11.

CHAPTER VII

MODEL OF INCAPACITATION DAYS DUE TO ILLNESS

Incapacitation days due to illness is a quantifiable outcome of health care programs. It is not only influenced by health programs themselves but, most importantly, it is influenced by multiple factors that are not necessarily in the domain of the health sector. Therefore it is necessary to identify those factors and to measure them in order to be able to explain the quantifiable difference of age-specific incapacitation days due to illness under a variety of circumstances.

Several variables that may have a close relationship with incapacitation days due to illness have been measured and compiled during the survey. Some of those variables are closely related to incapacitation. In the process of identifying those variables, correlation analysis and *SEARCH* analysis are used as the standard statistical procedure in searching for multivariate relationships.

Correlation analysis was used to identify all potential explanatory variables of incapacitation that were surveyed. *SEARCH* analysis selects the best combination of variables that will provide the highest explanatory power in

explaining variation of incapacitation. Multiple Classification Analysis reveals a quantitative relationship between incapacitation days and its explanatory variables in additive terms.

A. Determinants of Incapacitation Days Due to Illness

The distribution of incapacitation days per episode of illness in this data is severely skewed to the right. The variable of incapacitation has a mean of 33.197 days, skewness = 5.546, and kurtosis = 30.338 . Natural log transformation improves the normality of the distribution in incapacitation, where the mean of natural log of incapacitation days becomes 0.89016 day, the skewness = 2.165 and the kurtosis = 4.513 .

Several variables that may have influenced variation of incapacitation days have significant association with incapacitation. Pairwise correlation analysis between incapacitation days and categorical-scaled explanatory variables uses Spearman's ρ, while the correlation analysis between incapacitation days and analytical-scaled explanatory variables uses Pearson's r. Table 47 presents the correlation analysis between incapacitation days and categorical scaled explanatory variables.

The correlation analysis between potential categorical explanatory variables of incapacitation, using the original incapacitation variable and the log-transformed one,

TABLE 47

CORRELATION ANALYSIS BETWEEN INCAPACITATION DAYS DUE TO ILLNESS AND CATEGORICAL-SCALED EXPLANATORY VARIABLES

EXPLANATORY VARIABLES	CORRELATION COEFFICIENT WITH VARIABLE OF *INCAPACITATION*			
	ORIGINAL VARIABLES		LOG-TRANSFORMED VARIABLES	
	Spearman's *rho*	Significancy	Spearman's *rho*	Significancy
Severity of Illness	.5093	.000	.5093	.000
Treatment Category	.0864	.000	.1368	.000
Type of Health Care Provider	.0621	.000	.0621	.000
Quality of Care	.1738	.000	.1738	.000
Diagnosis of Illness	-.1770	.000	-.1170	.000
Clinical Onset	.0621	.000	.0589	.000
Status of the Sick in Household	-.0466	.005	-.0466	.005
Age Group of the Sick	.0885	.000	.0885	.000
Sex	-.0687	.000	-.0687	.000
Marital Status	-.0488	.004	-.0488	.004
Religion	.0387	n.s.	.0387	n.s.
Education of the Sick	.0743	.000	.0743	.000
Occupation of the Sick	-.0368	n.s.	-.0368	n.s.
Education of the HH	-.0853	.000	-.0853	.000
Occupation of the HH	.0288	n.s.	.0288	n.s.

HHH - head of the household; n.s. = not significant

TABLE 47 (continued)

EXPLANATORY VARIABLES	CORRELATION COEFFICIENT WITH VARIABLE OF *INCAPACITATION*			
	ORIGINAL VARIABLES		LOG-TRANSFORMED VARIABLES	
	Spearman's *rho*	Significancy	Spearman's *rho*	Significancy
Evidence of Health Care Monopoly	.0366	n.s.	.0366	n.s.
Physical Condition of the House	-.0213	n.s.	.0213	n.s.
Availability of Regular Source of Care	.0080	n.s.	.0080	n.s.
Place of Residence (Urban/Rural)	.1361	.000	.1361	.000
Latrine Availability and Its Type	.0374	n.s.	.0374	n.s.
Drinking Water Quality	-.0046	n.s.	-.0046	n.s.
Drinking Water Physical Properties	.0002	n.s.	.0002	n.s.
Waste Disposal	.0048	n.s.	.0048	n.s.
Impression about:				
Distance: House - Clinic	.0483	.036	.0483	.036
Cost of Services Paid	.0919	.000	.919	.000
Quality of Care Received	-.0119	n.s.	-.0119	n.s.
Motivation to Seek Care	-.0748	n.s.	-.0748	n.s.
Treated or not-Treated	-.1749	.000	-.1479	.000

n.s. = not significant

produces almost similar results. The log transformed incapacitation variable, however, shows a higher coefficient of correlation than the original incapacitation variable with the variable of "treatment category," and lower correlation coefficient with the variable of "clinical onset." The level of significance of all coefficients of correlation, using either the log-transformed incapacitation variable or the original incapacitation variable, are the same in each explanatory variable. For further analysis, however, the log-transformed incapacitation variable is preferable to the original incapacitation variable. Its distribution is closer to normal. Pairwise correlation analysis between both the log-transformed and the original incapacitation variables, with their analytical-scaled potential explanatory variables of incapacitation days, is presented in table 48.

The strength of the association does not necessarily represent the strength of the explanatory power. Several variables individually may have a high correlation with the variable of incapacitation days, but when they are combined with other explanatory variables in one analysis, some of them will be deleted because of the redundancy of their explanatory power, while other variables represent the group better. This deletion process is done through repetitive analysis of variance with several explanatory variables simultaneously.

SEARCH analysis finds that incapacitation days due to

TABLE 48

CORRELATION ANALYSIS BETWEEN INCAPACITATION DAYS DUE TO ILLNESS AND ANALYTICAL SCALED EXPLANATORY VARIABLES

EXPLANATORY VARIABLES	CORRELATION COEFFICIENT WITH VARIABLE OF *INCAPACITATION*			
	ORIGINAL VARIABLES		LOG TRANSFORMED VARIABLES	
	Pearson's r	Significancy	Pearson's r	Significancy
Natural Logarithm of Days Ill	.3347	< .01	.2725	< .01
Natural Logarithm of Cost of Service	.0635	<.01	.0635	< .01
Quality of Care	.0493	<.01	.1756	<.01
Knowledge about Disease	.0336	< .05	.0605	< .01
Treatment Result	-.2251	<.01	-.1358	<.01
Household Space in M²	.0012	n.s.	.0302	< .05
Number of Bedrooms at Home	-.0152	n.s.	.0205	n.s.
Estimated Value of Family Assets	.0122	n.s.	.0551	<.01
Family Size	-.0470	< .01	-.0536	<.01

n.s. - not significant

TABLE 49

SELECTED EXPLANATORY VARIABLES OF INCAPACITATION DAYS DUE TO ILLNESS AS OBTAINED BY *SEARCH* ANALYSIS

SOURCES	VARIATION	DF
EXPLAINED	3,762.21	10
ERROR	6,585.39	4,525
TOTAL	10,347.60	4,535

EXPLANATORY VARIABLES	VARIATION EXPLAINED	Percentage Variation Explained From Total Variation
Severity of Illness	2,658.55	25.69%
Duration of Illness	584.37	5.65%
Quality of Care	203.03	1.96%
Type of Health Care Provider	98.04	.95%
Age Group of the Sick	96.31	.93%
Treatment Result	64.45	.62%
Diagnosis of Illness	57.47	.56%
Combination of Seven Variables	3,762.21	36.36%

illness, in descending order, is the function of: severity of illness, duration of illness, quality of care, type of health care provider, age group of the sick, treatment result and diagnosis of illness. The summary of the explanatory power of each explanatory variable and the combined explanatory power of those seven variables is presented in table 51. The new groups of explanatory variables produce the best explanatory power in explaining

variation of incapacitation days.

These seven variables have divided the data set into eleven subsets in order to explain the variation of incapacitation days due to illness. The proportion of variation of incapacitation explained by these seven variables is 36.36% of the total variation. The variation of incapacitation within those eleven groups is negligible (see figure 12). Those eleven subsets are as follows.

I. Group 4 consists of 2,301 mild cases with the average incapacitation days due to illness equal to 1.25 days.

II. Group 8 consists of 1,032 moderate cases who feel better after receiving care. The average incapacitation in this group is 2.11 days.

III. Group 12 consists of 156 moderate cases who have receive treatment, with a duration of illness of less than 2.72 days. Their condition after treatment either becomes worse, is the same, is cured or is cure with permanent impairment. Therefore, the interpretation of outcome of treatment in this group is rather indecisive. The average incapacitation due to illness in this group is 1.85 days.

IV. Group 13 consists of 503 moderate cases with a duration of illness greater than 2.72 days. This group has received treatment and their condition either becomes worse, is the same, is cured or is cured with permanent impairment. Similar to group 12, the interpretation of the outcome of treatment in this

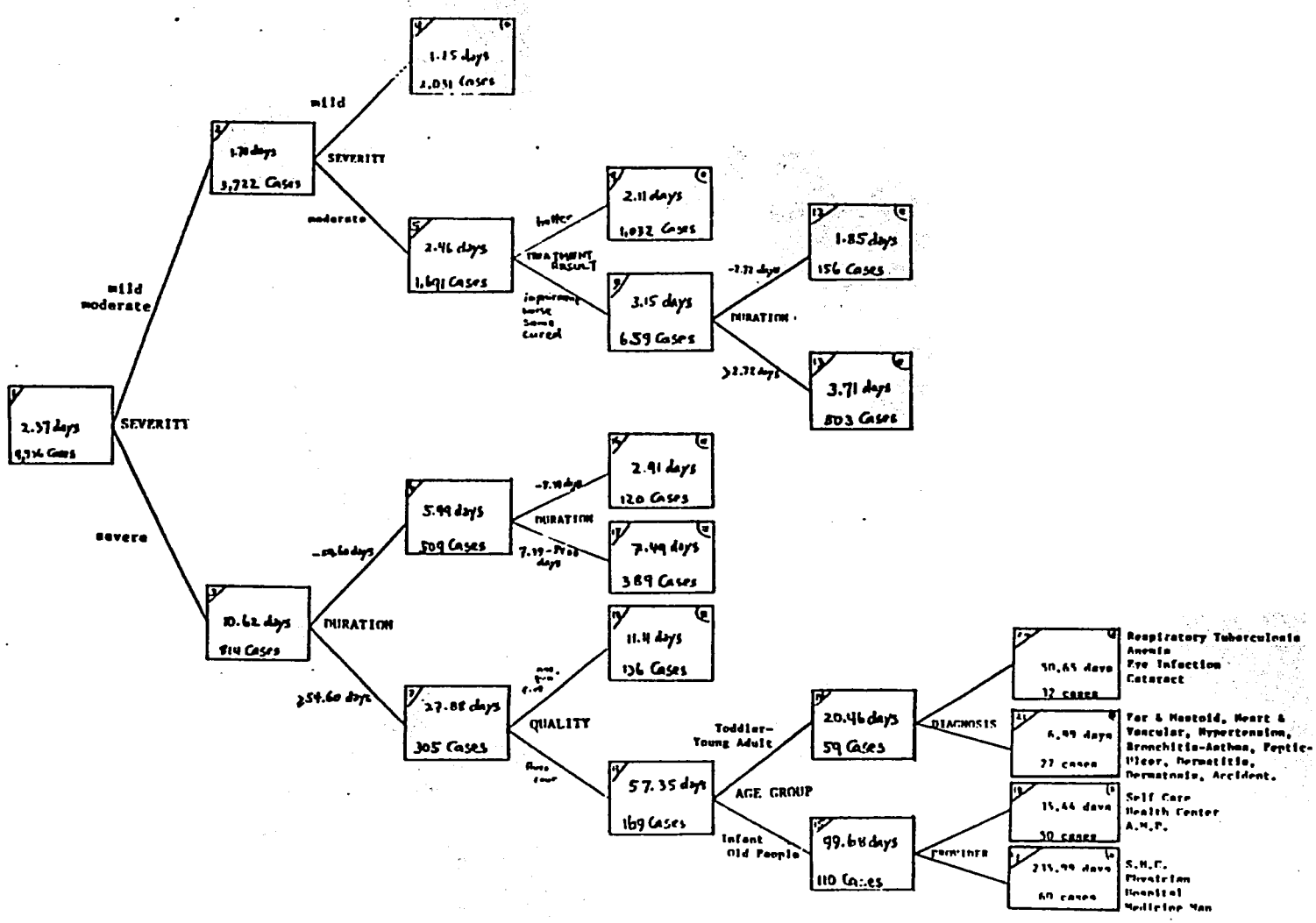


Fig. 14. Tree Diagram of SEARCH Analysis of Incapacitation

group is rather indecisive.

V. Group 16 consists of 120 severe cases with a duration of illness of less than 2.72 days. In these acute and severe cases, the average incapacitation is equal to 2.91 days.

VI. Group 17 consists of 389 severe cases with a duration of illness between 2.72 days and 54.60 days. In this group, the average incapacitation is equal to 7.49 days.

VII. Group 10 consists of 136 severe cases with a duration of illness greater than 54.60 days, who have received care, where the quality of care is either poor or good. The average incapacitation in this group is equal to 11.11 days.

VIII. Group 20 consists of 32 severe cases, ranging from toddler to adult (age 1 to 44 years old). The duration of illness is greater than 54.60 days. They have received moderate quality health care. Their illnesses have been diagnosed as either respiratory tuberculosis, anemia, avitaminosis-hypovitaminosis-malnourishment, eye infection, or cataract. The average incapacitation in this group is equal to 50.65 days.

IX. Group 21 consists of 27 severe cases, ranging from toddler to adult (age 1 to 44 years old). The duration of illness in this group is greater than 54.60 days They have received moderate quality health care. Their

illnesses have been diagnosed as either ear and mastoid diseases, disease of the heart and vascular system, hypertension, bronchial asthma, peptic ulcer, dermatitis, dermatosis, or accident. The average incapacitation in this group is equal to 6.99 days.

X. Group 18 consists of 50 severe cases with a duration of illness of more than 54.60 days. By age group, they are classified as infant (age < 1 year old) and old people (age ≥ 45 year old). They have received moderate quality health care from either an A.M.P. private office, a health center, or self care. The average incapacitation days due to illness in this group is equal to 35.44 days.

XI. Group 19 consists of 60 severe cases with a duration of illness of more than 54.60 days. By age group, they are either infants (age < 1 year old) or adults (age ≥ 45 year old). They have received moderate quality health care from either a subhealth center, a physician's private office, a hospital or a medicine man. The average incapacitation in this group is equal to 235.99 days.

In general, the incapacitation days variable has association with almost all the potential explanatory variables listed in table 49 and table 50. The best combination of variables to explain the variation of incapacitation days due to illness, however, is made up of those seven explanatory variables which produce the highest

percentage of variation of incapacitation explained.

The dichotomous split in figure 14 shows some form of symmetry. This is an indication of negligible interaction among the seven explanatory variables. Therefore, there is no need to develop construct variables or pattern variable to control the interaction effect among the explanatory variables. Using the same set of explanatory variables produced by the *SEARCH* analysis, Multiple Classification Analysis has $R^2_{MCA/incap}$ = .38053, which is greater than the explanatory power of *SEARCH* analysis, where $R^2_{SEARCH/incap}$ = .3636. Higher R^2 in *MCA* is a confirmation of absent or negligible interaction effect among the seven explanatory variables of incapacitation days due to illness.

B. Length of Incapacitation Days Due to Illness

Simple bivariate analysis between the best seven explanatory variables and the variable of incapacitation days explains the direction and magnitude of the relationship between each explanatory variable and the length of incapacitation days.

Since the dependent variable is interval scaled, while the explanatory variables are either interval, ordinal, or nominal scaled, then the best bivariate statistical analysis techniques are Simple Regression Analysis for the variable duration of illness; One-Way Analysis of Variance for variables of clinical severity of illness, type of heath

TABLE 50

THE RECOMMENDED TYPE OF BIVARIATE STATISTICAL TECHNIQUES TO BE USED IN EXPLAINING BIVARIATE RELATIONSHIP BETWEEN INCAPACITATION AND SEVERAL EXPLANATORY VARIABLES

EXPLANATORY VARIABLE		RECOMMENDED BIVARIATE STATISTICAL TECHNIQUE
LIST	SCALE	
Severity of Illness	Ordinal	ANOVA
Duration of Illness	Interval (Natural log.)	Simple Regression
Type of Health Care Providers	Nominal	ANOVA
Diagnosis of Illness	Nominal	ANOVA
Quality of Care	Ordinal	ANOVA
Treatment Result	Ordinal	ANOVA
Age Group of the Sick	Ordinal	ANOVA

care provider, diagnosis of illness, quality of care, treatment result, and age group of the sick. The summary of the appropriate technique is presented in table 50.

Without controlling for the effect of the other explanatory variables, severity of illness has the strongest association with incapacitation days due to illness per episode. On the average, mild cases are incapacitated for 1.98 days per episode of illness, moderate cases for 3.71 cases, and severe cases for 8.92 days; with $F_{2,5751}$ = 1,051.9 and level of significancy < 0.0001 (see table 96, appendix B). This is obvious if incapacitation increases with growing severity. The differences across different

strata of severity of illness is very meaningful. The strength of the correlation across different strata of severity is moderate, at eta^2= .2678 (see table 97, appendix B).

Duration of illness is the second most important explanatory variable of incapacitation days. Simple regression analysis between incapacitation days due to illness and natural logarithm of duration of illness produces r^2 = .3347, at level of significancy <.01 (see table 48).

$$^{e}\text{Log INCAPACITATION} = .27599 + .20355\,^{e}\text{Log DURATION} + \varepsilon$$

t :	7.9425	21.562
p :	.0000	.0000

Multiple-r = .27247 r^2= .0742 SE=1.5170

Increasing duration of illness indicates a greater chance of having more days of incapacitation due to illness. The bivariate model shows low fitness (r^2= .0742), which means that only 7.42% of the variation of incapacitation days can be explained by the duration of illness variable. When the regression is limited to only severe cases, the fitness of the model increase to r^2= .1631, but it is still a model with a low fit (see table 99, appendix B). Therefore, the duration of illness should not be used as a single explanatory variable of incapacitation days due to illness.

Quality of care, developed from the subjective evaluation of the respondent using principal component analysis, has low association with incapacitation days; Goodman-Kruskal γ = .2161 and Spearman's ρ = .1368 at level

of significance < .0001 (see table 47). One-way analysis of variance of incapacitation days by strata of quality of care explains only 3.63% of the variation in incapacitation indicating a very low fitness in this particular one-way analysis of variance. Positive correlation means higher incapacitation days due to illness will lead to higher quality of care and vice-versa. A logical explanation of this positive correlation is that patients or their families make the decision to seek care and where to seek it according to the prospects for disease progression as they see it.

With respect to the type of health care provider, again the more incapacitated patients seek care from more sophisticated health care providers. It seems there is a redundancy between quality of care and type of health care provider in explaining variation in incapacitation days. Patients with mild illnesses may settle down with self care, while patients with severe illnesses may request more sophisticated health care providers, such as health centers, physicians, or hospitals (see table 102, appendix B). Eta^2 = .0439 means that only 4.39% of the variation of incapacitation days is explained by the type of health care provider.

Age group of the sick person also as a low correlation with incapacitation days due to illness with Spearman's ρ = .0885 and Goodman-Kruskal γ = .1159, at level of significance <.0001 (see table 47). A small positive

coefficient of correlation indicates a small increase in incapacitation days with increasing age. One-way analysis of incapacitation days due to illness across strata of age groups demonstrates that, at least, there is one pair of age groups with significant difference in their incapacitation. Incapacitation explained by the age group variable is 3.19% ($eta^2 = .0319$).

Treatment result also has a positive correlation with incapacitation days due to illness. As has been mentioned in the description of the variable, treatment result has been divided into six ordinal levels:

1. *Death*,
2. *Permanent Impairment*,
3. *Worse*,
4. *More or Less the Same*,
5. *Better*, and
6. *Complete Cure*.

The findings in table 47 show that incapacitation days due to illness are reduced among those whose incapacitation has been terminated by a worsening condition or permanent impairment. They mean that most deaths are caused by acute fulminating illness.

Bivariate analysis of incapacitation days due to illness and diagnosis of illness also shows significant difference in the incapacitation days between at least two diagnoses of illness. The model of incapacitation with

diagnosis of illness as the sole explanatory variable has low fitness with eta^2 = .1058, even though it is greater than the sum of the explanatory power of health care provider (eta^2 = .0439), outcome of treatment (eta^2 = .0571), quality of care (eta^2 = .0363), and age group (eta^2 = .0319). It is also greater than the explanatory power of the duration of illness (r^2 = SSR/SST = .07424) (see table 105, appendix B).

Even though *SEARCH* analysis has placed diagnosis of illness at the seventh rank, it is actually one of the most important explanatory variables of incapacitation (see table 106, appendix B). Diagnosis of illness explains more of the variation of incapacitation days in bivariate analysis than most of the explanatory variables, except the severity of illness variable. Its seventh rank in *SEARCH* analysis means that most of the explanatory power of diagnosis of illness is redundant with the explanatory power of other significant explanatory variables. In fact, each of the explanatory variable mentioned earlier has redundant explanatory power among themselves. The computation of the pure effect of each of the explanatory variables can only be obtained through the use of multiple explanatory variables simultaneously. The computation of the multivariate additive model of incapacitation days due to illness is presented below.

C. Additive Model of Incapacitation Days Due to Illness

There is no indication of significant interaction among the seven explanatory variables of incapacitation days due to illness. Therefore, to build an efficient model of incapacitation days due to illness, Multiple Classification Analysis is the most appropriate statistical technique.

MCA is different from *SEARCH* analysis. *SEARCH* analysis is based on the analysis of variance and its final product is the construction of several groups which have minimal variation within each group through a series of dichotomous splits. *MCA* explains variation of incapacitation based on an assumption of additivity. Presence of interaction will produce some biases on the product of *MCA*. That is why SEARCH analysis is employed first, in order to screen the presence of interaction and select potential explanatory variables that are free from interaction. The order of importance among the explanatory variables in SEARCH analysis and *MCA* may change. Based on the correlation ratio of the adjusted score of the explanatory variable (beta), the order of importance of the explanatory variables in *MCA* analysis is as follows:

Name of Variable	Beta
1. Severity of Illness	.408700
2. Diagnosis of Illness	.195702
3. Duration of Illness	.178819
4. Treatment Result	.129798
5. Age Group of the Sick	.079600
6. Type of Health care Provider	.078002
7. Quality of Care	.070477

Proportion of incapacitation days explained by the fitted model is $R^2_{MCA/incap} = .38053$. It is greater than the proportion variation explained by the SEARCH analysis, $R^2_{SEARCH/incap} = .3635$.

In describing the additive model of incapacitation days due to illness, *MCA* calculates the grand mean of incapacitation days, the mean of incapacitation days in each stratum of the explanatory variable, and the mean of incapacitation days due to illness in each stratum of the explanatory variable after controlling for the effect of other explanatory variables. Therefore, the deviation of incapacitation days from the grand mean across each strata of the explanatory variables are the pure effect of those strata and could be compared to one another. The grand mean of incapacitation days in the model is $e^{1.012}$ or 2.75 days. Further discussion of the pure effect in each strata of the explanatory variable is as follows:

1. Severity of Illness

Severity of illness is the most important explanatory variable of incapacitation days during the process of dichotomous split in *SEARCH* analysis as well as in the additive model of *MCA*. Each level of severity such as, mild, moderate, and severe, has its own level of incapacitation (see table 51).

TABLE 51

AVERAGE INCAPACITATION DAYS DUE TO ILLNESS ACROSS DIFFERENT STRATA OF SEVERITY OF ILLNESS USING *M.C.A.* ANALYSIS

STRATA OF SEVERITY	NUMBER OF CASES	PERCENTS	STRATA MEAN	ADJUSTED MEAN
Mild	1,361	42.37%	1.31 days	1.58 days
Moderate	1,189	37.02%	2.72 days	2.64 days
Severe	662	20.61%	12.81 days	9.23 days

eta^2 = .278775 $beta^2$ = .167036
eta = .527992 beta = .408700

The means and the adjusted means in table 51 have been transformed from natural logarithmic scale to decimal scale. The average incapacitation among the mild cases is 1.31 days. These cases consist largely of group 4, one of the eleven final groups produced by *SEARCH* analysis of incapacitation (see figure 14). The average incapacitation among the moderate cases is 2.72 days, and among severe

cases is 12.81 days. Each of these values is significantly different from one another. The finding confirms that incapacitation days increases with increasing severity of illness.

2. Diagnosis of Illness

Even though diagnosis of illness is the last of the seven explanatory variables of incapacitation ranked during the dichotomous split of *SEARCH* analysis, in the additive model of incapacitation days, diagnosis of illness is the second most prominent explanatory variable. The mean incapacitation days among diagnosis of illness, and the mean incapacitation days among diagnosis of illness after controlling for the effect of other explanatory variables, are presented in table 52.

Each diagnosis of illness has its own level of incapacitation days, with or without holding the effect of other explanatory variables constant. The variation of incapacitation days across different strata of diagnosis of illness, presented in the adjusted mean of incapacitation days, is the pure effect of those illnesses. It means that the figures in all cells of table 52 are comparable across diagnosis of illness, holding other explanatory variables constant. A low unadjusted correlation ratio ($eta^2 = .12927$) indicates low explanatory power in explaining variation of incapacitation days. This explanatory power is further

TABLE 52

AVERAGE INCAPACITATION DAYS ACROSS DIFFERENT DIAGNOSIS OF ILLNESS USING M.C.A. ANALYSIS

DIAGNOSIS OF ILLNESS	NUMBER OF CASES	PERCENTS	STRATA MEAN	ADJUSTED MEAN
Typhoid Fever	45	1.40%	9.49 days	4.99 days
Dysentery	71	2.21%	2.56 days	3.08 days
Enteritis	159	4.95%	2.16 days	2.36 days
Respiratory Tuberculosis	263	8.19%	5.81 days	2.36 days
Malaria	116	3.61%	6.69 days	4.83 days
Avitaminosis-Hypovitaminosis-Malnourishment	36	1.12%	11.13 days	5.84 days
Anemia	64	2.12%	2.23 days	1.88 days
Eye Infection	141	4.39%	1.92 days	2.44 days
Cataract	20	.62%	1.92 days	2.44 days
Disease of the Ear-Mastoid	39	1.21%	1.57 days	1.24 days
Disease of the Heart-Vascular	99	3.08%	11.47 days	4.96 days
Hypertension	118	3.67%	2.92 days	2.13 days
Upper Respiratory Infection	300	9.34%	1.97 days	3.09 days
Flu/Common Cold	950	29.58%	1.99 days	3.09 days
Pneumonia	23	.72%	3.71 days	2.82 days
Bronchitis-Asthma-Emphysema	298	9.28%	3.60 days	2.16 days
Peptic Ulcer	103	3.21%	2.66 days	2.32 days
Dermatitis	163	5.07%	1.70 days	1.97 days
Dermatoses	133	4.14%	1.25 days	1.27 days
Accident	67	2.09%	4.10 days	3.75 days

eta = .359541 eta² = .129270 beta = .195702 beta² = .038299

reduced by adjustment for other explanatory variables--the adjusted correlation ratio of diagnosis of illness (beta² = .038299). Therefore, diagnosis of illness should not be used as the only explanatory variable of incapacitation days. Instead, diagnosis of illness should be used simultaneously with other explanatory variables in order to give more satisfactory results.

3. Duration of Illness

Duration of illness is the third most important variable among the predictor of incapacitation days. The duration of illness has been coded into eight classes. The class code is developed according to their score in the natural log scale: - 0, - 2, - 3, - 4, - 5, - 6, - 7. The presentation in table 53 has transformed mean and adjusted mean back to decimal scale.

Each class of this stratum mean has a value of its own. Incapacitation in the lowest stratum is 1.67 days and in the highest stratum is 4.97 days. The fitness of the model decreases from eta² = .112667 for the raw score of each stratum of duration of illness to beta² = .031976 after the adjustment for the effect of other explanatory variables. This low correlation ratio means that duration of illness should not be used as the only predictor, but should be used simultaneously with other explanatory variables. Reduction in the measurement of fitness after

TABLE 53

AVERAGE INCAPACITATION DAYS ACROSS DIFFERENT STRATA OF DURATION OF ILLNESS USING *M.C.A.* ANALYSIS

STRATA OF DURATION	NUMBER OF CASES	PERCENTS	STRATA MEAN	ADJUSTED MEAN
- 2.72 days	73	2.27%	1.39 days	1.67 days
- 7.39 days	863	26.87%	1.52 days	2.05 days
- 20.09 days	900	28.02%	2.27 days	2.54 days
- 54.60 days	500	15.57%	3.56 days	3.06 days
- 148.41 days	182	5.67%	3.22 days	2.97 days
- 403.43 days	120	3.74%	5.05 days	3.91 days
- 996.99 days	157	4.89%	4.06 days	2.83 days
≥ 997.00 days	417	12.98%	7.92 days	4.97 days

eta^2 = .112667 $beta^2$ = .031976
eta = .335660 beta = .178819
The class of the duration is obtained after the inverse of natural logarithm from 0 to 7 in each corresponding class. The only exception is the last two classes, since the maximum duration of illness recorded is ≥ 997 days and coded 997 days in the interview.

adjustment means some of the variation of incapacitation days, which could be identified within the strata of duration of illness, have been explained by other explanatory variables. The data in table 53 confirms that incapacitation days due to illness increases with duration of illness.

4. Treatment Result

The variable of treatment result is the fourth most important explanatory variable of incapacitation days in the *MCA* additive model. Treatment result has been divided into six classes, 1 = death, 2 = permanent impairment, 3 = worse, 4 = the same, 5 = better, and 6 = cure. As has been found earlier through one-way analysis of variance, the average incapacitation days across different strata of treatment result shows significant differences from each other. Incapacitation days before and after controlling for the effect of other explanatory variables is presented in table 54.

The outcome of treatment gives favorable results by making the cases better or producing a complete cure in 78.08% of the cases. Treatment keeps the cases in similar condition, without any improvement, in 20.55% of the cases; produces bad health effects or is totally ineffective because terminated by death or permanent impairment, or becomes worse in 1.36% of the cases. Based on these figures, we could conclude that existing health care facilities have beneficial effects on four-fifths of the episodes of illness and fail on the remaining one-fifth.

The variable of treatment result could not be used as the only predictor of incapacitation days since it has a very low fitness ($eta^2 = .055296$ and $beta^2$ =

TABLE 54

AVERAGE INCAPACITATION DAYS DUE TO ILLNESS ACROSS DIFFERENT STRATA OF TREATMENT RESULT USING *M.C.A.* ANALYSIS

STRATA OF TREATMENT RESULT	NUMBER OF CASES	PERCENTS	STRATA MEAN	ADJUSTED MEAN
Death	3	.09%	17.46 days	1.26 days
Impairment	13	.40%	79.97 days	11.66 days
Worse	28	.87%	27.39 days	10.02 days
Same	660	20.55%	3.97 days	2.85 days
Better	1,513	47.10%	2.23 days	2.42 days
Cure	995	30.98%	2.66 days	3.23 days

eta^2 = .055296 $beta^2$ = .016847
eta = .235150 beta = .129798

.016847). Therefore, treatment result should be used as predictor of incapacitation days simultaneously with other explanatory variables. The large difference between the unadjusted correlation ratio eta^2 and the adjusted correlation ratio $beta^2$ indicates that the explanatory power of treatment result is reduced after the effect of other explanatory variables on incapacitation days has been taken into account.

The low and positive correlation ratios also indicate that an increasing outcome of treatment in the ordinal scale is not always followed by a decrease in incapacitation days. Death, for instance, has the adjusted average

incapacitation of 1.26 days, while permanent impairment has an adjusted average incapacitation of 11.66 days. A better condition after treatment has an adjusted average incapacitation of 2.42 days, while complete cure has an adjusted average incapacitation of 3.23 days.

5. Age Group of the Sick

Age group of the sick is the fifth most important explanatory variable of incapacitation days due to illness in the additive model of *MCA*. Each of the five age groups also has its own incapacitation days. One-way analysis of variance of incapacitation days by age group of the sick has found that the incapacitation among each age group is significantly different, except between infant and small children age 1-4 years old, and infant and big children age 5-14 years old. Table 55 presents the average incapacitation days in each age group before and after controlling for the effect of other explanatory variables.

The adjusted average mean of incapacitation days per episode of illness among the old people is the highest (3.36 days), among small children age 1 - 4 years old is the lowest (2.37 days), and among the infants, and big children age 5 - 14 years old is in the middle.

The fitness of the model using age group as the only predictor is extremely low (eta^2 = .05171 and $beta^2$ = .006336). Therefore, age group should be used simultaneously

TABLE 55

AVERAGE INCAPACITATION DAYS DUE TO ILLNESS ACROSS DIFFERENT STRATA OF AGE GROUP USING *M.C.A.* ANALYSIS

STRATA OF AGE GROUP	NUMBER OF CASES	PERCENTS	STRATA MEAN	ADJUSTED MEAN
0 - 1 yr	147	4.58%	1.88 days	2.52 days
1 - 4 yrs	619	19.27%	1.77 days	2.37 days
5 - 14 yrs	590	18.37%	2.14 days	2.70 days
15 - 44 yrs	997	31.04%	2.80 days	2.60 days
≥ 45 yrs	859	26.34%	4.71 days	3.36 days

eta^2 = .051710 $beta^2$ = .006336
eta = .227399 beta = .079600

with the explanatory variables of incapacitation.

6. Type of Health Care Provider

The type of health care provider is the sixth most important explanatory variable of incapacitation days due to illness in the additive model of *MCA*. The average days of incapacitation among cases who receive treatment from each type of health care provider, both adjusted and unadjusted, is presented in table 56.

After controlling for the effect of other explanatory variables, the incapacitation days across different strata of health care provider is more homogenous. This is the result of having each case modified to make it comparable to

TABLE 56

AVERAGE INCAPACITATION DAYS DUE TO ILLNESS ACROSS DIFFERENT STRATA OF TYPE OF HEALTH CARE PROVIDER USING *M.C.A.* ANALYSIS

STRATA OF HEALTH CARE PROVIDER	NUMBER OF CASES	PERCENTS	STRATA MEAN	ADJUSTED MEAN
Self Care	1,050	32.69%	1.88 days	2.50 days
Medicine Man	221	6.88%	5.26 days	3.08 days
S.H.C.	336	10.46%	3.03 days	2.97 days
A.M.P.	486	15.13%	3.82 days	3.28 days
H.C.	491	15.29%	2.66 days	2.45 days
Hospital	217	6.76%	5.31 days	3.49 days
Physician	411	12.80%	2.41 days	2.55 days

eta^2 = .048705 $beta^2$ = .006084
eta = .220692 beta = .078002

the others after taking into consideration variation in all of the explanatory variables. Before the adjustment, the incapacitation days in self care is 1.88 days. Of course there are many mild , moderate, and even severe cases in this single category of care, similar to the cases in hospital care. It consists of many different cases with variety in severity, virulence, and duration. After the adjustment, average incapacitation in self care is 2.50 days and in the hospital is 3.49 days. The difference in incapacitation days between self care and hospital care, before the adjustment, is greater than after the

adjustment. This means that after the adjustment, variation of incapacitation due to other explanatory variables has been controlled.

Both correlation ratio eta^2 = .048705 and $beta^2$ = .006084 are extremely low. These tell us that the variable of type of health care provider should not be used alone in explaining incapacitation days due to illness, but simultaneously with other explanatory variables.

7. Quality of Care

The seventh most important explanatory variable of incapacitation days due to illness is the variable of quality of care. Patients have received treatment from a variety of health care providers with different quality ratings. Each patient is assigned his/her own quality rating, developed through factor analysis of several variables representing quality of care. The question is whether different quality of care makes any difference in incapacitation days due to illness.

One-way analysis of variance confirms that there is some significant difference in incapacitation days among people who have received different quality of care. Table 57 presents the unadjusted and adjusted average incapacitation days due to illness across different strata of quality of care, after the effect of other explanatory variables has been controlled.

TABLE 57

AVERAGE INCAPACITATION DAYS DUE TO ILLNESS ACROSS DIFFERENT STRATA OF QUALITY OF CARE USING *M.C.A.* ANALYSIS

STRATA OF QUALITY OF CARE	NUMBER OF CASES	PERCENTS	STRATA MEAN	ADJUSTED MEAN
ONE	2	.06%	25.79 days	11.98 days
TWO	230	7.16%	1.99 days	2.43 days
THREE	933	29.05%	2.27 days	2.94 days
FOUR	725	22.57%	4.53 days	3.17 days
FIVE	1,322	41.16%	2.53 days	2.47 days

eta^2 = .051710 $beta^2$ = .006336
eta = .227399 beta = .079600

The pure effect of the quality of care on incapacitation days due to illness could be seen in the adjusted mean of incapacitation days. The incapacitation among those who have received treatment with quality of care ONE is 11.98 days, while the incapacitation among those who receive treatment with quality of care TWO, THREE and FIVE ranges from 2.43 days to 2.94 days. Those who have received treatment with quality of care FOUR have the adjusted average incapacitation of 3.17 days per episode of illness. This grouping is similar to the result of one-way analysis of variance of incapacitation by quality of care.

The Profile of Incapacitation

After controlling for the effect of all explanatory variables, the development of a comparable profile of incapacitation across different types of health care providers is made by calculating the incapacitation days from the grand mean of incapacitation. The deviation from the grand mean in each variable occurs due to the pure effect of each explanatory variable. The development of the incapacitation profile is a subset of the development of the Product Disease Profile. In the development of this profile, diagnosis of illness, age group, and type of health care provider is taken into account. The other explanatory variables are held constant. The computation formula for calculating Age-Specific Incapacitation Days (ASID) is as follows.

$$^{e}\text{Log ASID}_{ijk} = GM_{incap} + a_i \text{ DIAGNOSIS} + b_j \text{ AGE} + c_k \text{ PROVIDER} + \varepsilon$$

Where : $ASID_{ijk}$ = Age-Specific Incapacitation Days

GM_{incap} = Grand Mean of Incapacitation Days

a_i = adjusted deviation from grand mean of incapacitation days due to disease i

b_j = adjusted deviation from grand mean of incapacitation days due to age group j

c_k = adjusted deviation from grand mean of incapacitation days due to health care

type k

$E(\varepsilon)$ = expected residual error of the model, which is equal to zero among the unbiased estimator of incapacitation days.

The profile of incapacitation days is presented in table 58. In this table, age-specific incapacitation days are comparable among each other across all cells of table 58, since the effect of all other influential explanatory variables has been controlled. Therefore, the incapacitation figures in table 58 are a perfect subset of the Product Disease Profile and an appropriate input for cost effectiveness analysis of different alternative courses of health care development in the regency.

D. Hypothesis Testing of the Additive Model of Incapacitation Days Due to Illness

As demonstrated in tables 47 and 97, the correlation analysis of potential explanatory variables of incapacitation and the variable of incapacitation days due to illness produces many significant associations. Some of these variables do not have significant correlation coefficients and have been excluded from further analysis. All variables with significant association are further screened by *SEARCH* analysis. *SEARCH* analysis excludes many redundant variables, while variables of severity of illness, type of health care provider, diagnosis of illness, quality of care, treatment result, and age group of the sick remain in the model (see table 49).

TABLE 58

PROFILE OF INCAPACITATION DAYS DUE TO ILLNESS ACROSS DIFFERENT TYPES OF HEALTH CARE PROVIDERS, DIAGNOSIS OF ILLNESS, AND AGE GROUP OF THE SICK USING THE ADDITIVE MODEL OF M.C.A.

DIAGNOSIS OF ILLNESS / Age Group	DAYS OF INCAPACITATION PER EPISODE OF ILLNESS							
	NOT SEEKING CARE	TYPE OF HEALTH CARE PROVIDER						
		SELF CARE	MEDICINE MAN	S.H.C.	A.M.P.	H.C.	HOSPITAL	PHYSICIAN
Typhoid Fever								
0 - 1 yr	4.57	4.15	5.11	4.93	5.45	4.07	5.80	4.25
1 - 4 yrs	4.30	3.90	4.82	4.65	5.13	3.83	5.46	4.00
5 - 14 yrs	4.89	4.44	5.48	5.29	5.84	4.36	6.21	4.55
15 - 44 yrs	4.71	4.28	5.28	5.09	5.62	4.20	5.98	4.38
≥ 45 yrs	6.10	5.53	6.83	6.59	7.27	5.44	7.74	5.67
Dysentery								
0 - 1 yr	2.82	2.56	3.16	3.05	3.36	2.51	3.58	2.62
1 - 4 yrs	2.66	2.41	2.97	2.87	3.17	2.37	3.37	2.47
5 - 14 yrs	3.02	2.74	3.38	3.26	3.60	2.69	3.83	2.81
15 - 44 yrs	2.91	2.64	3.26	3.14	3.47	2.59	3.69	2.70
≥ 45 yrs	3.77	3.42	4.22	4.07	4.49	3.36	4.78	3.50
Enteritis								
0 - 1 yr	2.17	1.97	2.43	2.34	2.58	1.93	2.75	2.01
1 - 4 yrs	2.04	1.85	2.28	2.20	2.43	1.82	2.59	1.90
5 - 14 yrs	2.32	2.11	2.60	2.51	2.77	2.07	2.94	2.16
15 - 44 yrs	2.23	2.03	2.50	2.41	2.66	1.99	2.83	2.08
≥ 45 yrs	2.89	2.62	3.24	3.12	3.45	2.58	3.67	2.69
Respiratory Tuberculosis								
0 - 1 yr	2.54	2.30	2.84	2.74	3.03	2.26	3.22	2.36
1 - 4 yrs	2.39	2.17	2.68	2.58	2.85	2.13	3.03	2.22
5 - 14 yrs	2.72	2.47	3.05	2.94	3.24	2.43	3.45	2.53
15 - 44 yrs	2.62	2.38	2.93	2.83	3.12	2.33	3.32	2.44
≥ 45 yrs	3.39	3.08	3.80	3.66	4.04	3.02	4.30	3.15

TABLE 58 (continued)

DIAGNOSIS OF ILLNESS Age Group	DAYS OF INCAPACITATION PER EPISODE OF ILLNESS							
	NOT SEEKING CARE	TYPE OF HEALTH CARE PROVIDER						
		SELF CARE	MEDICINE MAN	S.H.C.	A.M.P.	H.C.	HOSPITAL	PHYSICIAN
Malaria								
0 - 1 yr	4.42	4.01	4.95	4.77	5.27	3.94	5.61	4.11
1 - 4 yrs	4.16	3.78	4.66	4.50	4.96	3.71	5.28	3.87
5 - 14 yrs	4.74	4.30	5.30	5.11	5.65	4.22	6.01	4.40
15 - 44 yrs	4.56	4.14	5.10	4.92	5.44	4.06	5.78	4.24
≥ 45 yrs	5.40	5.35	6.61	6.37	7.04	5.26	7.49	5.48
Avitaminosis-Hypovitaminosis-Malnourishment								
0 - 1 yr	5.35	4.85	5.99	5.78	6.38	4.77	6.79	4.97
1 - 4 yrs	5.04	4.57	5.64	5.44	6.01	4.49	6.39	4.68
5 - 14 yrs	5.73	5.20	6.42	6.19	6.83	5.11	7.27	5.33
15 - 44 yrs	5.52	5.01	6.18	5.96	6.58	4.92	7.00	5.13
≥ 45 yrs	7.14	6.48	8.00	7.71	8.52	6.37	9.06	6.64
Anemia								
0 - 1 yr	1.72	1.56	1.93	1.86	2.05	1.53	2.18	1.60
1 - 4 yrs	1.62	1.47	1.81	1.75	1.93	1.44	2.06	1.51
5 - 14 yrs	1.84	1.67	2.06	1.99	2.20	1.64	2.34	1.71
15 - 44 yrs	1.78	1.61	1.99	1.92	2.12	1.58	2.25	1.65
≥ 45 yrs	2.30	2.09	2.57	2.48	2.74	2.05	2.92	2.14
Eye Infection								
0 - 1yr	2.24	2.03	2.51	2.42	2.67	2.00	2.84	2.08
1 - 4 yrs	2.11	1.91	2.36	2.28	2.51	1.88	2.68	1.96
5 - 14 yrs	2.40	2.18	2.69	2.59	2.86	2.14	3.04	2.23
15 - 44 yrs	2.31	2.10	2.59	2.49	2.75	2.06	2.93	2.15
≥ 45 yrs	2.99	2.71	3.35	3.23	3.56	2.66	3.79	2.78

TABLE 58 (continued)

DIAGNOSIS OF ILLNESS Age Group	DAYS OF INCAPACITATION PER EPISODE OF ILLNESS							
	NOT SEEKING CARE	TYPE OF HEALTH CARE PROVIDER						
		SELF CARE	MEDICINE MAN	S.H.C.	A.M.P.	H.C.	HOSPITAL	PHYSICIAN
Cataract								
0 - 1 yr	6.94	6.30	7.77	7.49	8.27	6.18	8.80	6.45
1 - 4 yrs	6.63	5.93	7.32	7.06	7.79	5.82	8.29	6.07
5 - 14 yrs	7.43	6.75	8.32	8.03	8.86	6.63	9.43	6.91
15 - 44 yrs	7.16	6.49	8.01	7.73	8.53	6.38	9.08	6.65
≥ 45 yrs	9.26	8.41	10.37	10.00	11.05	8.26	11.75	8.61
Diseases of the Ear and Mastoid								
0 - 1 yr	1.13	1.05	1.29	1.25	1.38	1.03	1.47	1.07
1 - 4 yrs	1.07	.99	1.22	1.18	1.30	.97	1.38	1.01
5 - 14 yrs	1.21	1.12	1.39	1.34	1.48	1.10	1.57	1.15
15 - 44 yrs	1.17	1.08	1.34	1.29	1.42	1.06	1.51	1.11
≥ 45 yrs	1.51	1.40	1.73	1.67	1.84	1.38	1.96	1.43
Disease of the Heart and Vascular System								
0 - 1 yrs	4.54	4.12	5.09	4.91	5.42	4.05	5.77	4.22
1 - 4 yrs	4.28	3.88	4.79	4.62	5.10	3.82	5.43	3.98
5 - 14 yrs	4.87	4.42	5.45	5.26	5.81	4.34	6.18	4.53
15 - 44 yrs	4.69	4.25	5.25	5.06	5.59	4.18	5.95	4.36
≥ 45 yrs	6.07	5.51	6.79	6.55	7.24	5.41	7.70	5.64
Hypertension								
0 - 1 yr	1.95	1.77	2.18	2.10	2.32	1.74	2.47	1.81
1 - 4 yrs	1.83	1.67	2.05	1.98	2.19	1.64	2.33	1.71
5 - 14 yrs	2.09	1.89	2.34	2.25	2.49	1.86	2.65	1.94
15 - 44 yrs	2.01	1.82	2.25	2.17	2.40	1.79	2.55	1.87
≥ 45 yrs	2.60	2.36	2.91	2.81	3.10	2.32	3.30	2.42

TABLE 58 (continued)

DIAGNOSIS OF ILLNESS / Age Group	DAYS OF INCAPACITATION PER EPISODE OF ILLNESS							
	NOT SEEKING CARE	TYPE OF HEALTH CARE PROVIDER						
		SELF CARE	MEDICINE MAN	S.H.C.	A.M.P.	H.C.	HOSPITAL	PHYSICIAN
Upper Respiratory Infection								
0 - 1 yr	2.83	2.57	3.17	2.06	3.37	2.52	3.59	2.63
1 - 4 yrs	2.66	2.42	2.98	2.88	3.18	2.38	3.38	2.48
5 - 14 yrs	3.03	2.75	3.39	3.27	3.61	2.70	3.85	2.82
15 - 44 yrs	2.92	2.65	3.27	3.15	3.48	2.60	3.70	2.71
≥ 45 yrs	3.78	3.43	4.23	4.08	4.50	3.37	4.79	3.51
Flu/Common Cold								
0 - 1 yr	2.83	2.57	3.17	3.06	3.38	2.52	3.59	2.63
1 - 4 yrs	2.67	2.42	2.99	2.88	3.18	2.38	3.38	2.48
5 - 14 yrs	3.03	2.75	3.40	3.28	3.62	2.70	3.85	2.82
15 - 44 yrs	2.92	2.65	3.27	3.16	3.48	2.60	3.71	2.72
≥ 45 yrs	3.78	3.43	4.23	4.08	4.51	3.37	4.80	3.51
Pneumonia								
0 - 1 yr	2.59	2.35	2.90	2.79	3.08	2.30	3.28	2.40
1 - 4 yrs	2.44	2.21	2.73	2.63	2.90	2.17	3.09	2.26
5 - 14 yrs	2.77	2.51	3.10	2.99	3.30	2.47	3.51	2.58
15 - 44 yrs	2.67	2.42	2.99	2.88	3.18	2.38	3.38	2.48
≥ 45 yrs	3.45	3.13	3.87	3.73	4.12	3.08	4.38	3.21
Bronchitis-Asthma-Emphysema								
0 - 1 yr	1.98	1.79	2.21	2.14	2.36	1.76	2.51	1.84
1 - 4 yrs	1.86	1.69	2.09	2.01	2.22	1.66	2.36	1.73
5 - 14 yrs	2.12	1.92	2.37	2.29	2.53	2.89	2.69	1.97
15 - 44 yrs	2.04	1.85	2.28	2.20	2.43	1.82	2.59	1.90
≥ 45 yrs	2.64	2.40	2.96	2.85	3.15	2.35	3.35	2.45

TABLE 58 (continued)

DIAGNOSIS OF ILLNESS / Age Group	DAYS OF INCAPACITATION PER EPISODE OF ILLNESS							
	NOT SEEKING CARE	TYPE OF HEALTH CARE PROVIDER						
		SELF CARE	MEDICINE MAN	S.H.C.	A.M.P.	H.C.	HOSPITAL	PHYSICIAN
Peptic Ulcer								
0 - 1 yr	2.13	1.93	2.38	2.30	2.54	1.90	2.70	1.98
1 - 4 yrs	2.00	1.82	2.24	2.16	2.39	1.79	2.54	1.86
5 - 14 yrs	2.28	2.07	2.55	2.46	2.72	2.03	2.89	2.12
15 - 44 yrs	2.19	1.99	2.46	2.37	2.62	1.96	2.78	2.04
≥45 yrs	2.84	2.58	3.18	3.07	3.39	2.53	3.60	2.64
Dermatitis								
0 - 1 yr	1.80	1.64	2.02	1.95	2.15	1.61	2.29	1.68
1 - 4 yrs	1.70	1.54	1.90	1.83	2.03	1.51	2.16	1.58
5 - 14 yrs	1.94	1.75	2.16	2.09	2.30	1.72	2.45	1.80
15 - 44 yrs	1.86	1.69	2.08	2.01	2.22	1.66	2.36	1.73
≥ 45 yrs	2.41	2.19	2.70	2.60	2.87	2.15	3.06	2.24
Dermatoses								
0 - 1 yr	1.16	1.06	1.30	1.26	1.39	1.04	1.48	1.08
1 - 4 yrs	1.10	1.00	1.23	1.18	1.31	.98	1.39	1.02
5 - 14 yrs	1.25	1.13	1.40	1.35	1.49	1.11	1.58	1.16
15 - 44 yrs	1.20	1.09	1.34	1.30	1.43	1.07	1.52	1.12
≥ 45 yrs	1.55	1.41	1.74	1.68	1.85	1.39	1.97	1.44
Accident Trauma								
0 - 1 yr	3.44	3.12	3.85	3.71	4.10	3.06	4.36	3.20
1 - 4 yrs	3.24	2.94	3.63	3.50	3.86	2.89	4.11	3.01
5 - 14 yrs	3.68	3.34	4.12	3.98	4.39	3.28	4.67	3.42
[illegible]	3.55	3.22	3.97	3.83	4.23	3.16	4.50	3.30
[illegible]	[illegible]	[illegible]	[illegible]	4.96	5.47	4.09	5.82	4.27

TABLE 59

REGRESSION ANALYSIS OF INCAPACITATION DAYS DUE TO ILLNESS ON THE AVERAGE COST OF SERVICE, QUALITY OF CARE, ESTIMATED VALUE OF FAMILY ASSETS, AND DISTANCE FROM HOME TO PLACE OF TREATMENT

ANALYSIS OF VARIANCE:

SOURCE	D.F.	SUM OF SQR	MEAN SQR	F	p
Regression	6	543.05	90.508	32.449	.0000
Error	2,621	7,310.7	2.7893		
Total	2,627	7,853.7			

Multiple-R = .26295 R^2 = .06915 S.E.= 1.6701

VARIABLE	Partial R	Regression Coefficient	Std. Error	t	p
Intercept		2.2928	.29516	7.7680	.0000
DVHome	.10739	.68830	.12447	5.5299	.0000
DVfarnough	.07903	.37700	.09288	4.0589	.0001
DVveryfar	.15044	1.0107	.12973	7.7908	.0000
ASSETS	.08371	.05746	.01336	4.3007	.0000
LnAvCOST	.07732	.042036	.010587	3.9705	.0001
QUALITY	-.12761	-.33647	.051081	-6.5869	.0000

DVHome = dummy variable of distance when treatment take place at home.
DVfarnough = dummy variable of distance when treatment take place in a facility far enough from home.
DVveryfar = dummy variable of distance when treatment take place in facility very far from home.
LnAvCOST = average cost of service per consultation.
QUALITY = interval scaled quality of care.

Policy manipulable variables are average cost of service or service charge in government facility, quality of Care, and distance from home to place of treatment. These are the best variables that can be used to influence

incapacitation days. Quality of care is the only policy manipulable variable selected for the list of explanatory variables of the additive model of incapacitation days due to illness. Reduction of incapacitation days due to illness through manipulation of service charge and distance from home to place of treatment is possible, but is not the most efficient approach. Stepwise dummy variable multiple regression is used to build the model with the highest possible fitness using this policy manipulable variable as an independent variable. The highest fitness is obtained in the regression of incapacitation days on average cost of service, quality of care, dummy variable of distance when treatment takes place at home, dummy variable of distance when treatment takes place in a facility far enough from home, dummy variable of distance when treatment takes place in a facility very far from home, and the variable of estimated value of family assets. The coefficient of determination of the multiple regression $R^2 = .06915$, is a very low fitness (see table 59).

All independent variables of incapacitation days, except quality of care, have positive slope. Quality of care has a negative slope.

1. Quality of Care

The variable of quality of care is the only policy manipulable variable in the explanatory variable list of the

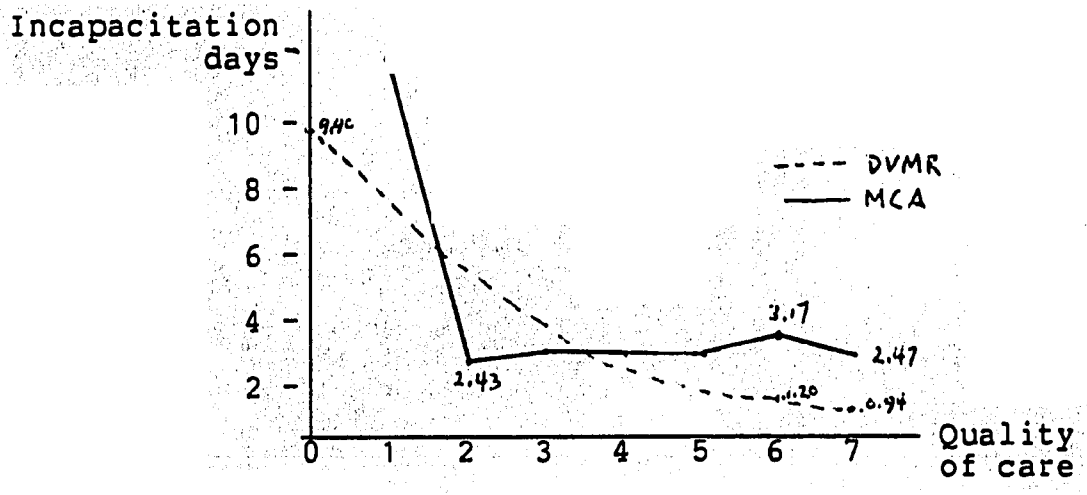


Fig. 15. LINEAR RELATIONSHIP BETWEEN INCAPACITATION DAYS AND QUALITY OF CARE

additive model of incapacitation days. Quality of care in multiple regression of incapacitation days has a negative slope, which means an increase in the quality of care will be followed by a decrease in incapacitation days due to illness. The regression has an intercept of $e^{2.2928}$ or 9.90 days. An increase in quality of care from the average 4.2645 to 6.2645 will decrease incapacitation days from 2.36 days to $e^{2.2928-2.1078}$ or 1.20 days. If we compare this figure to the more specific figure obtained from the additive model of incapacitation days, the average incapacitation days will not even decrease, but increase from $e^{1.0112}$ or 2.75 days to $e^{1.0112+.1141}$ or 3.17 days. If the quality of care is further increased to the level of the best quality now, then the average incapacitation days due to illness becomes $e^{1.0112-.1064}$ or 2.47 days (see table 57). It seems that only the

best or the worst quality of care makes an observable difference in incapacitation days due to illness.

2. Average Cost of Service

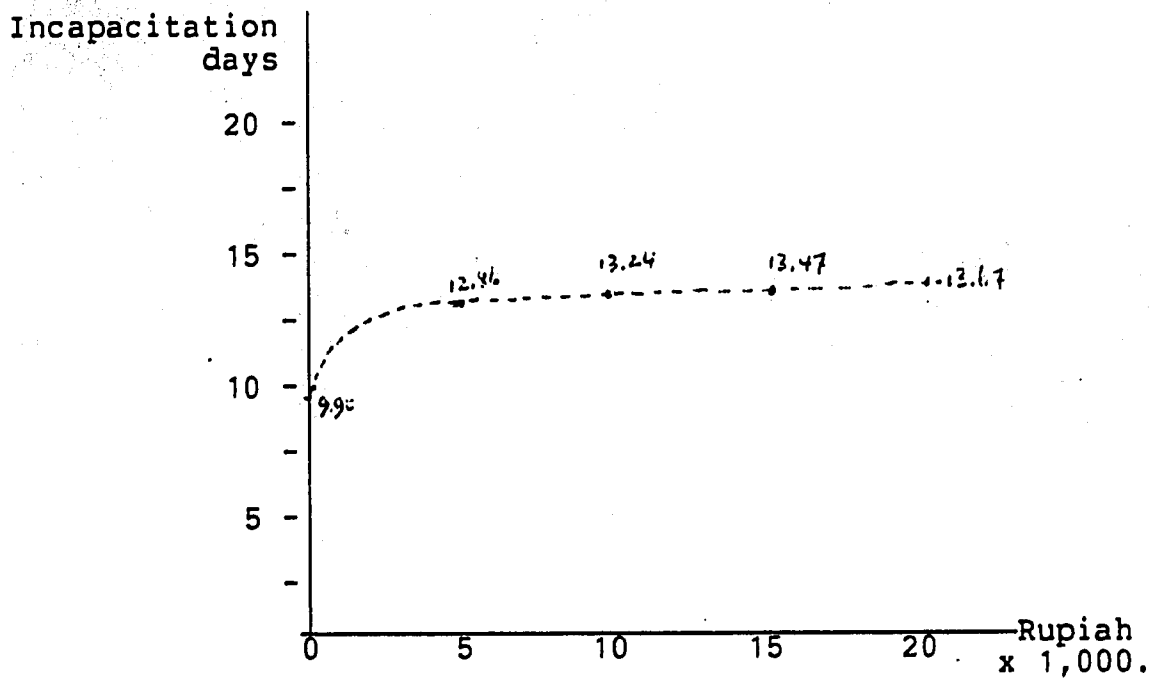
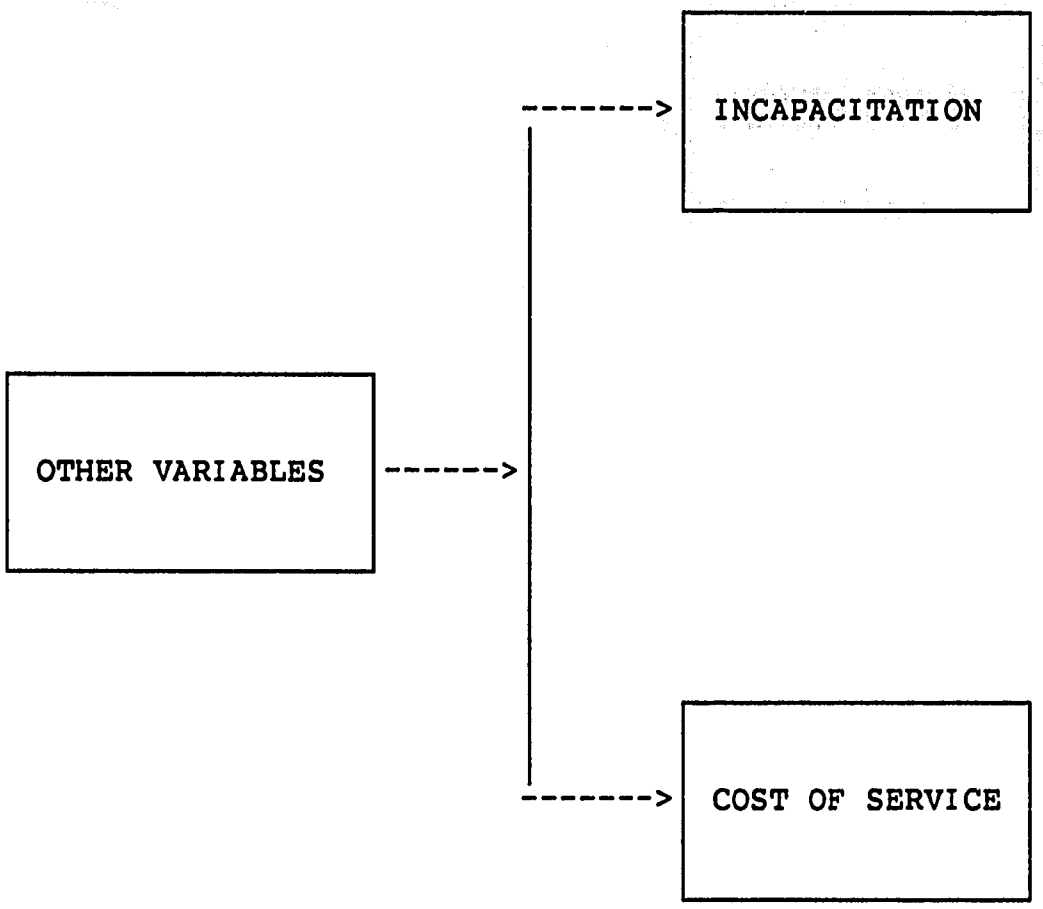


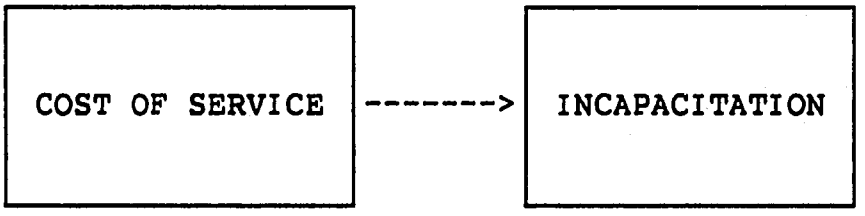
Fig. 16. LINEAR RELATIONSHIP BETWEEN INCAPACITATION DAYS AND AVERAGE COST OF SERVICE

The variable average cost of service is not an explanatory variable of the additive model of incapacitation. However, inclusion of average cost of service in the regression model produces the linear relationship between cost of service and incapacitation with a regression slope = .042036 (see table 59). An increase in cost of service means a very small increase in incapacitation days. It is possible that incapacitation and

average cost of service do not have a cause-effect relationship; rather, both variables are affected by other variables.



It is also possible that cost of service is an exogenous variable of incapacitation days due to illness.



If average cost of service is an exogenous variable of incapacitation days due to illness, an increase in the average cost of service from Rp. 300 to Rp. 500 will

increase incapacitation from 12.59 days to 12.86 days.

3. Distance from Home to Place of Treatment

Dummy variables have been developed to make the ordinal scale variable of distance suitable for multiple regression. The stepwise dummy variable multiple regression selects three dummy variables of distance into the model. These include the dummy variable of distance when treatment takes place at home, dummy variable of distance when treatment takes place in a facility far enough from home, and dummy variable of distance when treatment takes place in a facility very far from home.

The regression coefficient when treatment takes place at home is = .68830, when treatment takes place in a facility far enough from home is = .377, and when treatment takes place in a facility very far from home is = 1.0107 (see table 59). Holding other variables constant, these slopes mean incapacitation is 19.71 days when treatment takes place at home, 14.44 when treatment takes place in a facility far enough from home, and 27.21 days when treatment takes place in a facility very far from home.

Home treatment is not very common. As has been mentioned in the discussion of the utilization model, home visits by the health personnel will decrease the number of consultations per episode of illness. Incapacitation days increase when treatment takes place at home. Incapacitation

days are lower when treatment takes place in a facility "near home" or "rather far." Treatment in a "very far" facility has the highest incapacitation days due to illness. The very far health care facility in the Regency of Bogor is the hospital. This finding makes sense since many severe cases require hospital treatment, with or without inpatient care. They will have higher incapacitation days due to illness. When the cases are severe but not severe enough for hospitalization, then the family of the sick person will call health personnel to treat the patient at home. The result, in incapacitation days among patients who cannot walk to a health care facility and and treated at home, is greater than the incapacitation among those who are still able to walk.

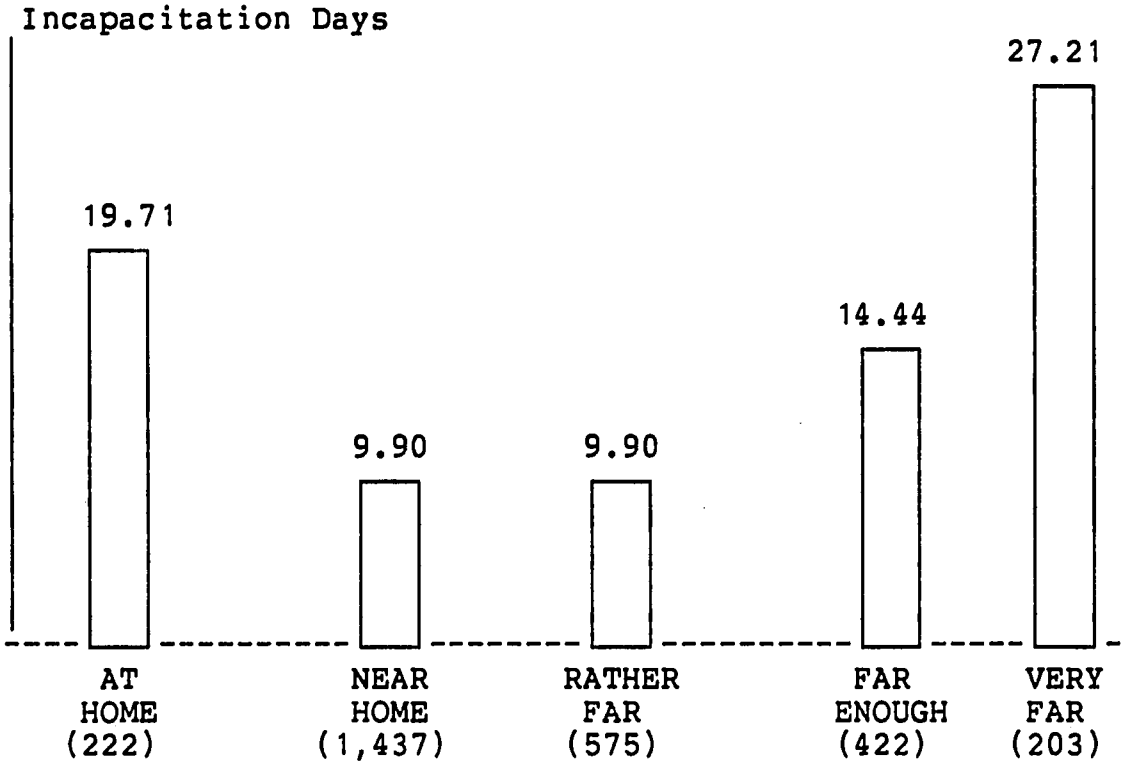


Fig. 17. INCAPACITATION DAYS DUE TO ILLNESS BY DISTANCE

4. Estimated Value of Family Assets

The variable of estimated value of family assets is not a policy manipulable variable from the public health point of view. In the regression equation, the slope of estimated value of family assets is = .057458 with $p < 0.01$. This means that increasing family assets will increase incapacitation days per episode of illness, quite the contrary to the usual convention. Usually, the wealthier the family the healthier its members. In Bogor, there must be another explanation as to why the wealthier family tends to have higher incapacitation days per episode of illness. Wealthier families may have a different attitude toward illness. They may take more recuperation days and longer bed rest when ill. On the other hand, poor people cannot afford to stay in bed for too long. They may just ignore their illness and work as usual. During the survey, the wealthier family may report all their complaints and the number of their sick days, while the poor people admit only their true incapacitation days.

In general, all findings about these policy manipulable variables are inconclusive. The regression model of incapacitation has a very low coefficient of determination $r^2 = .06915$, and therefore, very unreliable estimation.

The only open possibility for improving the health condition in general is not an intervention directed toward the current user of health care facilities, but toward the non-users. Barriers to access to health service have been mentioned by the non-users. Economic barriers account for 50.0% of the cases, distance for 1.7%, geographical inaccessibilities to facility for 0.3%, and attitude for 21.8% of all non-users (see table 13).

Reduction of incapacitation days among non-users is conceivable, if the health service is able to persuade people to seek care early enough, before the disease develops to an advanced stage. This could be achieved by providing radical treatment that would reduce the duration of the illness or inhibit the development of chronicity of illness.

Using the additive model of incapacitation as an illustration, if the severe and chronic malaria cases among the old people could be attenuated into subacute and moderate severity, the incapacitation days due to malaria could be reduced from 35.77 days to 6.10 days. In order to do so, active case finding for malaria should be made, the case containment method should be applied to prevent further transmission, and follow up of suspected cases through home visits should be made regularly. Regular supply of medication should be guaranteed. All this requires good organization, effective monitoring and supervision, and a sufficient budget. Other diseases may requires different

strategies. The strategy that should be adopted is the one that deals with the most damaging disease in this regency.

CHAPTER VIII

HEALTH CARE DEVELOPMENT MODEL

Annual illness rate, percentage of population seeking care when ill, type of health care provider used, average frequency of consultation for each episode of illness, and average duration of incapacitation per episode of illness have been tabulated in tables 16, 45, 58 and 66. These data, together with population distribution data in table 10 has enabled the computation of the total number of cases, total number of consultations, total days of incapacitation due to illness, average consultations per person per year and average days of incapacitation per person per year.

A. Present Incapacitation and Utilization

Each type of health care provider helps to avert the threat of incapacitation in varying degrees and each has its own days of incapacitation due to illness. The formula for computing incapacitation days is as follows.

$$\sum_{i=1}^{n} \sum_{j=1}^{m} \sum_{k=1}^{p} DIRX_{ijk} = Pop_j \times \frac{Rate_{ij}}{1,000.} \times \frac{PSC_{ijk}}{100.} \times DL_{ijk}$$

Where: $DIRX_{ijk}$ = Number of incapacitation days among people who suffer disease i in age group j and receive care from health care provider type k

Pop_j = Number of population of the regency in age group j

PSC_{ijk} = Percentage of the sick population due to disease i, among the people in age group j, who seek care from health care provider type k

$Rate_{ij}$ = Number of cases with disease i among people in age group j per 1,000 population per year

DL_{ijk} = Average days of incapacitation due to illness among people in age group j, suffering from disease j and seeking care from health care provider type k.

The computation of number of cases, number of patients seeking care, number of visits, number of cases not seeking care, and days of incapacitation due to illness among those who do not seek care, uses the following formulas.

$$\sum_{i=1}^{n} \sum_{j=1}^{m} \sum_{k=1}^{p} CARE_{ijk} = Pop_j \times \frac{Rate_{ij}}{1,000.} \times \frac{PSC_{ijk}}{100.} \qquad (1)$$

Where: $CARE_{ijk}$ = Number of cases seeking care from health

care provider type k, after suffering from disease i, among the population in age group j.

The total number of cases per year will be:

$$\sum_{i=1}^{n} \sum_{j=1}^{m} \sum_{k=1}^{p} CASE_{ij} = Pop_j \times \frac{Rate_{ij}}{100.} \quad (2)$$

Where: $CASE_{ij}$ = Number of cases suffering from disease i, among the people in age group j.

Total number of cases not seeking care per year will be:

$$\sum_{i=1}^{n} \sum_{j=1}^{m} \sum_{k=1}^{p} NNSC_{ij} = CASE_{ij} - CARE_{ij} \quad (3)$$

Where: $NNSC_{ij}$ = Number of cases suffering from disease i among the people in age group j, but do not seek care from any type of health care provider.

Total number of days of incapacitation due to illness who do not seeking care per year will be:

$$\sum_{i=1}^{n} \sum_{j=1}^{m} DINRX_{ij} = NNSC_{ij} \times DLNRX_{ij} \quad (4)$$

Where: $DINRX_{ij}$ = Number of incapacitation days due to disease i, among the people in age group j, who do not seek care from any type of health care provider

$DLNRX_{ij}$ = Average incapacitation days due to disease i, among people in age group j who do not

seek care from any type of health care provider.

The Computation of Incapacitation

In the process of calculating incapacitation days due to illness, the intermediate results, such as total number of cases, total number seeking care, total number of visits, and days lost with or without treatment, are all computed simultaneously.

Using the input data from tables 10, 16, 22, 44, and 58, we obtained the results which are presented in table 60.

The average days of incapacitation among different age groups within the existing system of health care is as follows:

15.6 days per year in age group 0 - 1 year,
22.9 days per year in age group 1 - 4 years,
7.3 days per year in age group 5 - 14 years,
2.3 days per year in age group 15 - 44 years,
3.7 days per year in age group ≥ 45 years, and
6.6 days per year in all age groups.

Total number seeking care per year is 3,231,179 persons, with 5,588,561 total number of visits or 1.9 visits per capita per year.

Sick persons or their families' responses to attacks of illness depend on the severity of their illness, the duration of their illness, and their perception of their

TABLE 60

RESULTS OF COMPUTATION OF THE BASIC PARAMETER OF PROFILE OF ILLNESS IN BOGOR IN 1980

DIAGNOSIS	TOTAL NUMBER OF CASES	TOTAL NUMBER SEEKING CARE	TOTAL NUMBER OF VISITS	TOTAL DAYS LOST WITHOUT TREATMENT	TOTAL DAYS LOST WITH TREATMENT	TOTAL DAYS LOST
1. Typhoid Fever	72,250	51,388	117,992	98,183	256,959	355,142
2. Dysentery (Amebic & Bacillary)	166,366	103,796	170,597	173,774	281,493	455,267
3. Enteritis - G.E.D.	450,192	324,172	708,262	295,054	761,945	1,056,998
4. Respiratory Tuberculosis	24,291	17,401	44,408	20,867	53,568	74,435
5. Malaria	76,152	58,680	100,296	81,355	274,201	355,556
6. A-Hypovitamin. & Malnourishment	19,948	3,589	6,437	91,987	20,819	112,806
7. Anemia	21,990	6,258	11,375	28,951	11,956	40,907
8. Eye Infection	204,624	84,316	148,247	279,251	196,576	475,827
9. Cataract	6,090	1,177	1,132	43,847	10,602	54,450
10. Disease of Ear & Mastoid	10,854	4,407	6,609	7,514	6,043	13,557
11. Disease of Heart & Vascular	9,916	5,921	14,805	20,263	33,066	53,329
12. Hypertension	15,546	6,624	14,588	21,027	15,380	36,407
13. Upper Respiratory Tract Infection	1,411,120	641,185	957,458	2,231,027	1,815,481	4,046,506
14. Flu/Common Cold	3,947,371	1,734,910	2,943,773	6,265,394	4,987,009	11,252,404
15. Pneumonia	107,527	47,149	92,228	156,870	118,846	275,716
16. Bronchitis-Asthma-Emphysema	39,933	22,362	40,633	37,863	50,971	88,833
17. Peptic Ulcer & Gastritis	18,495	10,600	20,409	17,882	24,911	42,793
18. Dermatitis	178,886	60,202	91,931	214,878	110,949	325,827
19. Dermatosis	35,564	12,684	18,640	27,694	15,939	43,633
20. Accident & Trauma	98,375	34,361	78,751	231,540	121,579	353,119
All Diseases	6,915,486	3,231,179	5,588,561	10,345,216	9,168,285	19,513,412

illness. When they decide to seek care, they take the sick person to the health care provider who may suit their specific need. For instance, they may take mild cases to the subhealth center, but consult the hospital for severe cases. Comparison in terms of incapacitation days due to illness among those who seek care and among those who do not seek care reveals that there are 6,915,486 incidents of illness per year. Among those, 3,231,179 cases seek care and 3,684,307 people do not seek care. The total incapacitation days due to illness among those who seek care is 9,168,285 days, and among those who do not seek care is 10,345,216 days. The total incapacitation days for both are 19,513,412. The average incapacitation days among those who seek care is 2.8374 days per episode of illness, and among those who do not seek care is 2.8079 days. The average incapacitation for all cases is 2.8217 days per episode of illness (see table 61).

The average incapacitation among those who seek care is slightly higher than among those who do not. This does not mean that treatment intervention has not been able to reduce days of incapacitation. Rather, it points to the differences in the nature of the illnesses among those who seek care and among those who do not. Those who seek care have a higher proportion of severe and chronic illnesses. If a health care provider is not accessible for those who presently seek care, their incapacitation due to illness will be substantially higher than 2.84 days. The reverse

TABLE 61

AVERAGE UTILIZATION OF HEALTH CARE PROVIDERS AND AVERAGE INCAPACITATION DAYS DUE TO ILLNESS AMONG THE SICK POPULATION OF BOGOR IN 1980

ACTION TAKEN	NUMBER OF CASES	UTILIZATION		INCAPACITATION (In days)	
		Total	Mean	Total	Mean
Seeking Care	3,231,179	5,588,561	1.7296	9,168,285	2.8374
No Care	3,684,307	-	-	10,345,216	2.8079
All Cases	6,915,486	5,572,400	.8081	19,513,412	2.8217

also holds true, so that if health care providers are accessible to those who presently do not seek care, their incapacitation will probably be lower than 2.81 days.

In many countries, visits to a doctor are used to justified absence from work.[1] This behavior may apply to those who are employed in the modern sector of Bogor.[2] These people are in the minority, comprising only 11.4% of the work force (see table 11). This is even less than those who work in a less competitive atmosphere, such as in government or in a government owned company. Examination of age-specific incapacitation days due to illness also indicates that incapacitation among the productive age group is 2.3 days, the lowest among all age groups, while the average incapacitation is 6.6 days per capita per year

Under-reporting in the Public Health Sector

As has been mentioned in table 22, market sharing between self care, private sector care, and public sector care is almost equal. Self care covers 31.1% of all those who seek care, the private sector covers 35.7%, and the public sector covers 33.1%.

Using this ratio, the estimated total number of cases in the public sector per year should be 1,069,520 cases in 1980. The total number of cases from the study of medical records presented in table 32 produces 747,678 cases in 1979, which is about 69.91% of the finding from the survey; out of that, 17,888 cases are inpatient cases. The formula for computing this number is as follows:

$$(HOSP_{inp} + HOSP_{out}) + \frac{29}{7}\left(\sum_{k=1}^{29} HC_k\right) + \frac{48}{12}\left(\sum_{l=1}^{4} SHC_l\right)$$

Where: $HOSP_{inp}$ = Number of hospital inpatient cases per year

$HOSP_{out}$ = Number of hospital outpatient cases per year

HC_k = Number of health center cases per year

SHC_l = Number of subhealth center cases per year.

During the last quarter of 1979, the Regency Health Office of Bogor reported that the total outpatient cases treated in public health facilities was 114,258 cases, which means that the estimated number of cases in 1979 was 457,032. These numbers represent only 61.13% of the actual

TABLE 62

PUBLIC SECTOR OUTPATIENT VISITS IN THE REGENCY OF BOGOR FROM OCTOBER THROUGH DECEMBER 1979+

DIAGNOSIS	NUMBER OF NEW VISITS	NUMBER OF FOLLOW-UP VISITS	TOTAL VISITS
Influenza	22,933	5,497	28,430
Gastroenteritis	14,537	3,121	17,658
Skin Infection	14,461	2,958	17,419
Anemia	7,474	1,708	9,182
Upper Resp. Infection	6,367	2,471	8,838
Other Skin Diseases	5,757	1,321	7,078
Resp. Tuberculosis	2,404	3,241	5,645
Eye Diseases	4,646	752	5,398
Scabies	3,797	1,056	4,853
Worms (excl.Ancylost)	3,933	743	4,676
Lower Resp. Infection	3,756	737	4,493
Arthritis/Arthralgia	3,103	901	4,004
Dysentery(bact./ameb.)	3,098	613	3,711
Gastritis/Duodenitis	2,393	615	3,008
Ear/Mastoid Diseases	2,281	586	2,867
Nutritional Deficiency	2,320	536	2,856
Other G.I. Diseases	2,116	365	2,481
Allergy	1,824	532	2,356
Other Resp. Diseases	1,434	412	1,846
Preg.-part-deliv Dis.	1,203	263	1,466
Accident/Intoxication	1,004	259	1,263
Rheumatic Fever	1,054	1,771	2,825
Vaccinia	523	140	663
Measles	711	181	829
Pertusis	314	95	409
Malaria	116	36	152
Typhoid/para-typhoid	82	38	120
Diphteri	6	1	7
Tetanus	3	1	4
Beriberi	536	206	742
Trachoma	46	6	52
Pulmonary Silicosis	26	52	78

+SOURCE: Coded and Computed from Quarterly Report Regencial Health Office Bogor, October 1979 - December 1979, Regencial Health Office Bogor, January 1980. (mimeograph).

number of cases found, for the same period, through direct

enumeration of medical records in a sample of public health care facilities in the area. The official data collection compiles quarterly reports from all public facilities. The statisticians at the regency health office then create a master table of visits in the regency. The statisticians may not be responsible for large errors in their compilation. Rather, the error in reporting may take place at the sources of data--at subhealth centers and health centers. This is understandable to some extent, because proper medical records personnel at the health center and subhealth center level have been grossly ignored. In addition, the statisticians at the Regency Health Office do not have the means to cross check the accuracy of the subhealth center and health center quarterly reports. The combined statistics of health care facilities underreport the magnitude of incidence of illnesses and subsequent consequences, even though the pattern of illness may be the same. For planning purposes then, the number of actual episodes should be 60% - 65% larger than the number of incidents of illness reported.

B. Considerations in Health Care Expansion

Expansion of the existing facilities will inevitably take place sometime in the future. The direction of the expansion is not yet predictable. In fact, the Regency Health Office, higher health authorities, and local

governments need to be advised about the most desirable path for health sector growth. The rationale for expansion, among others could be:

1) To maintain a stable, if not better, facility-to-population ratio to compensate for future population growth and rising demand for health care;
2) To increase the coverage of the public health sector to the "unreachable";
3) To increase access to health services in order to stimulate sick persons to seek care at an earlier stage of their illness;
4) To increase the effectiveness of the health services though early diagnosis and treatment, by adding more facilities providing better follow up of cases; and
5) To increase the mobility of services in their outreach programs, and in responding to emergency events such as the outbreak of an epidemic.

Besides all kinds of rational reasons for expansion, there are--as has been observed in the past--irrational reasons as well:

1) The expansion of the bureaucracy for the sake of expanding it, to keep up with the growth of other government bureaucracies;
2) The creation of new positions, new offices, new organizations, and new titles, as a way to create jobs and to enable continuous promotion of present staff members;and

3) Political pressure from interest groups.

Incapacitation Days Due to Illness

The purpose of health services to produce health is oftentimes forgotten. If we borrow the W.H.O. definition of health, then the purpose of health services is to produce physical, mental, and social well-being.[3] In this research, incapacitation days due to illness has been considered to be an appropriate measure of health disruption. Therefore, whatever alternative of health care development is available, the outcome should be a more cost effective solution for reducing incapacitation days due to illness than the present system.

After controlling for the variables of severity of illness, diagnosis of illness, duration of illness, treatment result, age group of the sick, and quality of care, the pure effect of different types of health care providers in treatment is presented in table 56. The adjusted means of incapacitation due to illness are:

2.50 days for self care,

3.08 days for care in the hands of medicine men,

2.97 days for care in subhealth centers,

3.25 days for care in the hand of private allied medical personnel,

2.45 days for care in health centers,

3.49 days for care in the hospital, and

2.55 days for care in the hands of private physicians.

A test of significance of difference between pairs of adjusted means of incapacitation was done.[4] The results are presented in table 63.

Of all the pairs in table 63, only four pairs have a significant difference in their means at the level of significancy $p \leq 0.05$. They are the difference between mean incapacitation in self care and in the hands of private allied medical personnel, where the mean incapacitation in self care is less than the mean incapacitation in private allied medical personnel; between self care and hospital care, where the mean incapacitation in self care is less than in hospital care; between care by private allied medical personnel and care in the hands of private physicians, where mean incapacitation in private medical personnel is greater than in private physicians; and between the health center care and hospital care, where the mean incapacitation in health center care is less than the mean incapacitation in hospital care. If the level of significancy is relaxed to $p \leq 0.1$, then three additional pairs will be included in the group with significantly different mean incapacitation days due to illness. There is a difference between mean incapacitation days in self care and in subhealth center care, where the mean incapacitation days in self care is less than in subhealth center care; between care by private allied medical personnel and health center, where the mean incapacitation days in private allied

TABLE 63

PAIRWISE TEST OF SIGNIFICANT DIFFERENCE MEAN INCAPACITATION DAYS DUE TO ILLNESS ACROSS DIFFERENT TYPES OF HEALTH CARE PROVIDERS, CONTROLLING FOR OTHER INDEPENDENT VARIABLES OF THE ADDITIVE MODEL OF INCAPACITATION

PAIRWISE COMPARISON	$\bar{Y}_1 - \bar{Y}_2$		Std. Dev.	Z-score	p
	^{e}Log days	days	(^{e}Log days)		
Self Care					
Med. man	-2.090	.811	.138	-1.510	.1310
S.H.C.	- .174	.840	.100	-1.746	.0802
A.M.P.	- .273	.761	.087	-3.155	.0000
H.C.	.018	1.018	.077	.235	.8104
Hospital	- .335	.715	.154	-2.169	.0300
Physician	- .024	.976	.088	- .272	.7872
Medicine Man					
S.H.C.	.035	1.036	.165	.213	.8336
A.M.P.	- .064	.938	.157	- .408	.6818
H.C.	.227	1.255	.152	1.495	.1336
Hospital	- .126	.882	.203	- .622	.5352
Physician	.185	1.203	.158	1.170	.2420
S.H.C.					
A.M.P.	- .099	.906	.124	- .797	.4238
H.C.	.192	1.212	.118	1.633	.1032
Hospital	- .161	.851	.178	- .903	.3682
Physician	.150	1.162	.125	1.195	.2302
A.M.P.					
H.C.	.291	1.338	.107	2.729	.0064
Hospital	- .062	.940	.171	- .362	.7188
Physician	.249	1.283	.115	2.159	.0308
H.C.					
Hospital	- .353	.703	.167	-2.120	.0340
Physician	- .042	.959	.108	- .388	.6966
Hospital					
Physician	.311	1.365	.172	1.806	.0702

medical personnel is greater than the mean incapacitation in health center care; between hospital care and care in the

hands of private physicians, where the mean incapacitation days due to illness in hospital care is greater than the mean incapacitation days in private physicians' care.

Therefore, using days of incapacitation as the parameter, the relative effectiveness of different types of health care, after controlling for other independent variables such as severity of illness, duration of illness, and quality of care, is almost the same. Self care performs just as well as other types of health care providers. Private physicians perform better than private allied medical personnel, and private allied medical personnel perform better than the hospital. Thus, in the population under study, the patients with different levels of illness severity seek care from a variety of health care providers, each of them with varying effectiveness. The overall outcome, however, measured in terms of incapacitation days, is the same across different strata of health care providers. Of course this equilibrium can be altered by intervention, such as improvement in quality of care, reduction in service charge, or addition of health care facilities.

Considerations about the Cost of Service

There are two types of costs in different types of facilities: first, the cost of running the service, and second, out-of-pocket payment by the patient. The

information about out-of-pocket payment is presented in table 33, where the average out-of-pocket payment for self care is Rp. 149; for the medicine man is Rp. 771; for the subhealth center is Rp. 1,156; for allied medical personnel is Rp. 994; for the health center is Rp. 807; for hospital outpatient consultation is Rp. 4,964; and for the private physician is Rp. 6,109. The average inpatient care payment is Rp. 50,212. per episode.

The money to run the service is paid from two major sources, government subsidy and patient care revenue. Table 29 summarizes the cost of the general hospital in 1977, 1978, and 1979. Table 30 summarizes the cost of the health center in 1979, and table 88 summarizes the cost of the subhealth center in 1979. Table 64 presents the comparison between the cost of hospital operations, the average cost of health center operations, and the average cost of subhealth center operations.

The hospital book does not show any deficit. The cost to the government of providing hospital service for 3,840 inpatients and 17,888 outpatients is the difference between government subsidy and financial surplus in each type of facility. This amount to is Rp. 36,351,183 (see tables 64 and 75). Using the ratio 10:1 between the cost of inpatient care and outpatient care, the average government subsidy for outpatient care is Rp. 645.81 and for inpatient care is Rp. 6,458.10.

The survey results have found that the cost of

TABLE 64

EXPENDITURE AND INCOME COMPARISON BETWEEN THE HOSPITAL, HEALTH CENTERS, AND SUBHEALTH CENTERS IN BOGOR IN 1979

CATEGORIES	HOSPITAL	HEALTH CENTER (Average of 7 HCs)	SUBHEALTH CENTER (Average of 4 SHCs)
INCOME			
Revenue from:			
Inpatient Care	401,468,363		
Outpatient Clinic	6,802,665		
Total Patient Revenue	408,771,028	2,460,930[1]	705,553[2]
MOH & local subsidies	45,595,504	4,858,995	483,060[1]
TOTAL INCOME	454,366,532	7,319,925	1,188,613
EXPENDITURE			
Salary	147,061,106[5]	4,858,995[5]	483,060[3] [5]
Drugs	131,422,939[5]	3,101,537[5]	1,252,832[4] [5]
Food	40,110,089		
General/Miscellaneous	40,049,530		
Training	4,844,099[5]		
Maintenance, repair and replacement	20,918,528[5]	924,577[5]	89,950 [5]
TOTAL EXPENDITURE	445,122,211	9,498,961	1,343,265
Balance	+ 9,244,321	- 2,129,320	- 154,652
NUMBER OF CASES SERVED:			
Inpatient	3,840		
Outpatient	17,888		
Inpatient & Outpatient	21,728	18,122	4,180

[1]Total patient revenue of the health center is the average of total patient revenue from six health centers, since we do not obtain data from the health center of Central Bogor.
[2]Total patient revenue of the subhealth center is the average of three subhealth centers since the patient revenue of the subhealth center of Tapos is included in the revenue of its parent health center of Cibinong.
[3]Only the subhealth center of Cigudeg has a separate salary accounting from its parent health center.
[4]The average expenditure for drugs is calculated based on the expenditure in three subhealth centers, since the drug expenditure of the subhealth center of Tapos has been included in the drugs expenditure of its parent health center of Cibinong.
[5]These items are doubled if quality of care is going to be improved.

providing inpatient care is ten times costlier than the cost of providing outpatient care. In this case then, the average cost of providing service to hospital outpatient cases is Rp. 7,908 per episode of illness. The patient is charged Rp. 4,964 per episode of illness. The difference is Rp. 2,944, which is probably equal to the amount paid by the third party payor. If this figure is multiplied by the number of cases in the hospital, the total difference then becomes Rp. 165,708,579. This is a substantial amount for Bogor. If the government could tap these funds, there would be a substantial difference in approach to regency health planning. This approach of course has both administrative and political weight

The health center, on the other hand reports an average deficit of Rp. 2,129,320 per year. The average charge of providing service in the health center is Rp. 524 per episode of illness. The official service charge is Rp. 180 per visit. With the average visit per episode at 1.9 times, the total official charge should not exceed Rp. 342 per episode of illness. In their response to the household survey, respondents admit that they had been charged Rp. 807 for one consultation at the health center. The difference between what the patient pays and what the health center needs to run the system is Rp. 283. The difference between what the patient has paid and the health center's official charge is even higher. If the difference between what the patient has paid and what the

health center needs to break even is multiplied by the average number of patients in the health center, then the total difference becomes Rp. 5,128,526, which means that the health center would have a surplus instead of a deficit. However, auditing of the health center bookkeeping reported a deficit. As has been observed in many other parts of Indonesia, the health centers of Bogor probably have two books, but use one of them for official reporting and the other for their daily operations.

The subhealth centers report an average deficit of Rp. 154,652 per year. The average cost of providing service in the subhealth center is Rp. 321 per episode of illness. The household survey finds the average cost of consultation at the subhealth center is Rp. 1,154. The difference is Rp. 835. If this difference were multiplied by the number of patients in the subhealth center, it becomes Rp. 3,490,300. Several possible explanations for this difference are:

1) The recall error among patients about actual expenses. The patients probably include transportation and the cost of filling prescriptions at the "outside" dispensary in their cost estimation. There is no way to control errors in estimating the incidence of costs during the study. We simply accepted what the patient claims to be their costs when seeking care, and we could not counter check these figures to confirm whether the patient is correct or not.

2) The outpatient charge is set by the central and local government and closely monitored. Such policy cannot be implemented in inpatient care due to the diverse variations in the process of care among the inpatient cases. This situation opens the chances for health care providers to make a profit from inpatient care, laboratory tests, and special procedures.
3) The health center has limited administrative resources. There is no trained administrator or bookkeeper. One "clerk" performs all administrative functions, including the monitoring of cash flow. The "clerk" is not specially trained for the position, but rather, is the only non-technical employee among health center personnel with general primary or secondary education.
4) The official drug inventory at the health center level is limited to the standard drug list for the health center. Other type of drugs are not suppose to be there. The examining physician or other health personnel cannot be forced to prescribe only the standard health center/subhealth center drugs. Therefore, there is a chance for prescribing non-standard drugs, usually better drugs. The patients are directly charged for the use of those non-standard drugs, but the money does not go to the government account. Instead, it is used to buy replacements for those non-standard drugs which have been used in the

treatment process. The prescriptions sometimes have to be filled at a private dispensary outside of the health center. This makes the monitoring of cost incidence is even more difficult, both for the inexperienced health center clerk and for users of the service.

5) The health center and subhealth center patients usually do not receive receipts, beyond their **karcis** (examination ticket), for any payment they have made.
6) The subhealth center situation is similar to the health center, if not worse. With one or two paramedical personnel in the subhealth center, the capacity to monitor cash flow is even worse. Some subhealth centers do not do their own bookkeeping, instead their books are maintained by their parent health center.
7) Under present auditing practices, corruption and graft in the system cannot be monitored or effectively prevented.

Again, reducing financial leakage is one alternative that should be considered, provided its implementation is feasible from the political and administrative point of view.

The cost of providing services is equal to the amount of the expenditure in each type of health care provider. The cost of providing service to the government is equal to the amount of government subsidy less the revenue surplus. If

there is a deficit, then the revenue surplus is negative. The total cost of the service to the government is equal to the government net cost. Net government cost in the hospital is equal to Rp. 36,257,183. The health centers report an average deficit of Rp. 2,129,320. This deficit will be borne by the local government. Therefore, the average government cost of running the health centers is Rp. 6,988,315. The subhealth centers report an average deficit of Rp. 154,652. This deficit is also borne by the local government. Therefore, the average government cost of running a subhealth center is Rp. 637,712. If all these government costs are divided by the number of episodes of illness, then the average government subsidy per episode of illness is Rp. 153 in the subhealth center, Rp. 386 in the health center, Rp. 646 in hospital outpatient care, and Rp. 6,458 in hospital inpatient care (see table 64).

It is clear that the governments do not directly subsidize private practitioners. The cost of providing services at a private clinic is unknown. The provider's gross cost of providing service for one episode of illness in a public facility is equal to the amount of expenditure divided by the number of services offered. The provider's net cost is equal to the difference between the provider's gross cost and the government subsidy.

Out-of-pocket payment is equal to the money paid by the patient per episode of illness, and not payment per visit. There is a large difference between the out-of-pocket

TABLE 65

COST OF PROVIDING SERVICE, AT DIFFERENT TYPES OF HEALTH CARE PROVIDERS, TO THE GOVERNMENTS, USERS, AND OTHER PAYERS

TYPE OF HEALTH CARE PROVIDER	GOVERNMENT NET COST (in Rp.)	PROVIDER NET COST (in Rp.)	PROVIDER GROSS COST (in Rp.)	OUT-OF-POCKET PAYMENT (in Rp.)	"THIRD PARTY PAYER" (in Rp.)	UNIDENTIFIABLE COST (in Rp.)
Self Care	0	149	149	149	0	0
Medicine Man	0	d.k.	d.k.	771	0	d.k.
Subhealth Center	153	168	321	1,156	d.k.	988
Private A.M.P.	0	d.k.	d.k.	944	0	d.k.
Health Center	386	138	524	807	d.k.	669
Hospital outpatient	646	7,262	7,908	4,964	2,298	d.k.
inpatient	6,458	72,622	79,080	50,212	22,410	d.k.
Private Physician	0	d.k	d.k.	6,109	d.k.	d.k.

+The cost of inpatient care is estimated to be ten times the cost of outpatient care. This ratio is obtained based on the ratio of average cost of hospital inpatients relative to hospital outpatients in the household survey.

payment and the provider's net cost. Out-of-pocket payment is the average payment made by the patient per episode of illness as reported during the household interview. Out-of-pocket payment in the subhealth center and the health center is greater than the provider's net cost. The difference could be explained by the presence of a third-party payer, or simply because of the "double bookkeeping practice" where what was reported was not what had occurred. Subhealth centers and health centers also serve the members of the civil servant health insurance program, without any direct out-of-pocket payment; and yet the out-of-pocket payment made in health centers and subhealth centers is far greater than the provider's net cost. The likely explanation for this is the use of an outside dispensary. The health practitioners at health centers and subhealth centers often write only the prescription without providing any drugs. The patients must fill their prescriptions at the dispensary outside of the health center or subhealth center. In their response during the household interview, respondents included the cost of filling the prescription in their cost estimation, which accounts for the large discrepancy between the health center and subhealth center auditing and household interview. The hospital, on the other hand, operates its own dispensary. Therefore, its cost accounting is more accurate, which makes the difference between hospital auditing and the household interview smaller.

Comparative Advantages of Different Health Care Providers

Both the public and private sectors have their own merits in reducing incapacitation days due to illness, and in preventing death due to illness. Holding other explanatory variables constant, comparison of the relative effectiveness among different types of health care providers in averting incapacitation days due to illness shows the same level of effectiveness across different types of health care providers. Actually, each health care provider has its own level of effectiveness in averting incapacitation days due to illness. If the process of seeking care is occurring randomly, pairwise comparison of the variation of incapacitation days by strata of health care provider may be significant in most pairs. The non-random process of seeking care has made the adjusted incapacitation days due to illness, after being treated at various types of health care providers more or less similar. Users behave rationally in selecting a health care provider. A certain health care provider is consulted for a certain type of illness. Most of the users do not use expensive or sophisticated health care providers to solve many of their individual health complaints.

Plain interpretation of the incapacitation days per episode of illness, between treated and not treated cases, is more or less the same (see table 66). No doubt, without

TABLE 66

COMPARISON BETWEEN INCAPACITATION DAYS AMONG SICK PERSONS WITH TREATMENT AND WITHOUT TREATMENT, BY DISEASE

DIAGNOSIS	PERCENT SEEKING CARE	AVERAGE INCAPACITATION DAYS WITHOUT TREATMENT	AVERAGE INCAPACITATION DAYS WITH TREATMENT	Work of health care provider beneficial?
Typhoid Fever	71.3%	4.71	5.00	-
Dysentery	62.39%	2.66	2.71	yes
Enteritis-G.E.D	72.01%	2.34	2.35	-
Respiratory TB	71.64%	3.03	3.08	-
Malaria	77.06%	4.66	4.67	-
A/Hypovit. & Maln.	17.99%	5.62	5.80	-
Anemia	28.46%	1.84	1.91	-
Eye Infection	41.21%	2.32	2.33	-
Cataract	19.33%	8.92	9.01	-
Ear & Mastoid	40.60%	5.07	5.58	-
Heart & Vascular	59.71%	5.07	5.58	-
Hypertension	42.61%	2.36	2.32	yes
U.R.I.	45.44%	2.90	2.83	yes
Flu/C.Cold	43.95%	2.83	2.87	-
Pneumonia	43.85%	2.60	2.52	yes
Bronchitis-A.-E.	56.00%	2.15	2.28	-
Peptic Ulcer & G.	57.31%	2.26	2.35	-
Dermatitis	33.65%	1.21	1.26	-
Accident & Trauma	34.93%	3.62	3.54	yes
[illegible]	46.72%	2.81	2.84	yes

the health care system, diseases would take a heavy toll, reflected by higher incapacitation days and mortality (see table 15). At present, there is an equilibrium between incapacitation days among the sick person who seeks care and the sick person who does not seek care. Among the twenty diseases listed in table 66, only **dysentery, hypertension, upper respiratory tract infection, pneumonia**, and **accident/ trauma** have lower incapacitation days when treated. Plain observation shows that the severity of illness among those who do not seek care is less than among those who seek care. The person who does not seek care ends up with fewer incapacitation days. If the group who presently seeks care does not seek care, then incapacitation days due to illness among them would certainly be a lot higher. Hypertension, dysentery and upper respiratory tract infection, pneumonia and accident/trauma respond to treatment better than other diseases in Bogor.

The development of a health care system based on promotion of "non-conventional" health care providers, such as village health workers, could not be done in this research, since the field data do not detect any activity of village health workers in Bogor. The field data would allow the estimation of incapacitation days if the health sector expanded using some combination of the existing types of health care providers. Therefore, the most likely analysis of alternative expansion of the health care system in Bogor is through:

1) Multiplication of the existing subhealth centers,
2) Multiplication of the existing health centers,
3) Multiplication of the existing hospital (only one available now), or
4) Some combination of those three types of facilities.

Since most private modern practitioners are also government health personnel practicing medicine after government hours, expansion of the government facilities will increase the number of private practitioners. The location of private medical offices may be influenced more by the highest effective economic demand for medical care and not by the biological needs of the population. Government hiring policy may not affect the location of other types of health practitioners who are not employed by the government, but it may affect them indirectly. Increasing density of practitioners may increase competition and reduce work load, a condition which will stimulate better service and more frequent home visits.

A policy to increase health care facilities in the regency will increase their density, thereby reducing the mean distance between home and place of treatment. Correlation analysis in table 47 shows that the correlation between distance and incapacitation is significant and positive, with Spearman's $\rho = .0483$, and $p \leq .05$. Therefore, increasing density will reduce the incapacitation days. Similarly, correlation analysis in table 30 shows positive correlation between distance from home to place of

treatment and utilization, where $\rho = 0.0796$, $p \leq 0.01$. This means that increasing facility density will also increase utilization.

Whenever the first treatment does not prove to be satisfactory, the sick person may go to another provider. The median distance between home and place of treatment is classified as "near" in the ordinal scale (see table 67).

TABLE 67

DISTANCE FROM HOME TO PLACE OF FIRST TREATMENT BY TYPE OF HEALTH CARE PROVIDER

TYPE OF HEALTH CARE PROVIDER	DISTANCE					MEDIAN OF DISTANCE
	AT HOME	NEAR	RATHER FAR	FAR ENOUGH	VERY FAR	
Self Care+	18	56	12	18	3	near
Medicine Man	58	134	32	34	14	near
Subhealth Center	8	257	108	43	24	near
A.M.P.	105	260	87	94	47	near
Health Center	14	349	130	87	40	near
Hospital	5	99	75	73	41	rather far
Physician	14	278	131	73	34	near

$\chi^2 = 338.32$ d.f.=24 p=.000 N=2,855 Cont. Coef.=.3314

When the health care provider attends the sick person at his home, the distance is "at home."

+Self Care also means care by other members of the household or by other relatives, and is only counted in the enumeration of utilization of health care providers if the treatment is provided by other relatives who do not live under the same roof.

The variable of quality of care has been developed from several variables that reflect the subjective perception about quality of care in places where the users had been treated. These variables are weighed based on the factor loading of each variable in the principal component analysis of quality of care (see chapter III). Variation in the mean score of perceived quality of care across different types of health care providers is not large. Almost all types of health care providers have been rated with the mean score of quality above 5.0, except self care with a mean score = 1.7374 (see table 68).

Test of significant differences among the mean scores of quality of care proves that physicians have the highest score. The second group is that of subhealth center, health center, and A.M.P., with approximately the same quality. The third group is the hospital care, the fourth is the medicine man, and the last is self care.

The effect of variation in quality of care, by type of health care provider, in the additive model of incapacitation does not show substantial variation in incapacitation days due to illness. All types of providers with a mean score of quality of care > 5.0 have been grouped as one. Holding other explanatory variables constant, the reduction in incapacitation days is as follows (see table 69).

The data shows that quality of care within the same type of health care provider has a large range. This

TABLE 68

ONE-WAY ANALYSIS OF VARIANCE OF QUALITY OF CARE ACROSS DIFFERENT STRATA OF HEALTH CARE PROVIDERS

ANALYSIS OF VARIANCE:

SOURCE	D.F.	SUM OF SQR	MEAN SQR	F	p
Between	6	11902.	1983.7	5,157.1	.0000
Within	4,118	1,584.0	.38465		
Total	4,124	13,486.			

Eta = .9394 Eta² = .8825 Var-Comp= 3.5347 %Var-Among= 90.1

PROVIDER	NUMBER	MEAN	VARIANCE	STD. DEV
SELF	1,282	1.7374	.25158	.50158
MED. MAN	260	5.1037	.50334	.70946
S.H.C.	464	5.4046	.45695	.67598
A.M.P.	653	5.3733	.45336	.67332
H.C.	612	5.4177	.47601	.68994
HOSPITAL	292	5.2885	.61302	.78296
PHYSICIAN	562	5.6022	.27619	.52554
ALL	4,125	4.2616	3.2702	1.8084

TYPE OF HEALTH CARE PROVIDER	MULTI-STRATA COMPARISON		
	DIFFERENCE	F	p
Self care			
Med. man	-3.3663	6368.4	.0000
S.H.C.	-3.6672	11911.	.0000
A.M.P.	-3.6360	14870.	.0000
H.C.	-3.6804	14587.	.0000
Hospital	-3.5512	7797.3	.0000
Physician	-3.8648	15172.	.0000
Med. man			
S.H.C.	-.30084	39.207	.0000
A.M.P.	-.26963	35.148	.0000
H.C.	-.31402	46.780	.0000
Hospital	-.18482	12.213	.0005
Physician	-.49847	114.83	.0000
S.H.C.			
A.M.P.			
S.H.C.	.03121	.68682	.4073
H.C.	-.01318	.11916	.7300
Hospital	.11603	6.2722	.0123
Physician	-.19763	25.808	.0000
A.M.P.			
H.C.	-.04439	1.6181	.2034
Hospital	-.01318	3.7737	.0521
Physician	-.228843	41.121	.0000
H.C.			
Hospital	.12920	8.5793	.0034
Physician	-.18445	25.913	.0000
Hospital			
Physician	-.31366	49.148	.0000

TABLE 69

REDUCTION IN INCAPACITATION DAYS DUE TO ILLNESS DUE TO IMPROVEMENT IN QUALITY OF CARE

	No Care	Self Care	Other Care
Incapacitation Days	2.7542	2.4303	2.4744
% Relative to No Care		88.34%	89.94%
% Reduction Relative to No Care		11.66%	10.06%

indicates that many sick persons received different quality of care from the same type of health care provider. There are 41.16% cases who received care with the quality of care around the mean score. This was due to prevalent discriminatory practices in the process of treatment. It seems that health care providers served their favored clientele to their best ability, while others received less attention.

Service Charge Reduction Policy

Over 50% of those not seeking care have mentioned that their reason for not seeking care is the cost. They do not have money to pay for the service or the service is too expensive for them (see table 13). A policy toward the reduction of out-of-pocket payment may make a difference in use of services among the sick who do not seek care, even

though it does not make any meaningful difference among those who have been using the service. The cost variable has been excluded from the optimum combination of explanatory variables of incapacitation days during the *SEARCH* analysis.

The suboptimum multiple regression model of incapacitation days in table 59 indicates a very small positive slope of the cost variable. Therefore, the reduction in out-of-pocket payment among current users affects only a very small proportion of the present incapacitation days among current users, where their price elasticity of demand is 0.0831 (see table 46). This is an indication of users' indifference about the out-of-pocket payment once they seek care. Reduction of out-of-pocket payment may stimulate the use of services among the non-users. The combined price elasticity of demand among both the users and non-users is very low, which is equal to 0.09196 (see table 70). Utilization of the service is dictated more by the economic level of the family. The estimated value of family assets certainly has greater elasticity of demand (η_{assets} = 0.89937) than the demand elasticity of out-of-pocket payment. Therefore, a policy to reduce out-of-pocket payment below the current charges will be followed by a minimal reduction in incapacitation days.

Reduction of out-of-pocket payment could be used to attract some of the non-users who have claimed that high cost of service is an obstacle to seeking care. Their responses are based on what they have heard about the cost

TABLE 70

REGRESSION ANALYSIS OF UTILIZATION ON OUT-OF-POCKET PAYMENT, DISTANCE FROM HOME TO PLACE OF TREATMENT, TYPE OF PROVIDER, AND ESTIMATED VALUE OF FAMILY ASSETS

ANALYSIS OF VARIANCE:

SOURCES	D.F.	SUM OF SQR	MEAN SQR	F	p
Regression	6	30.812	5,135.4	933.90	.0000
Error	5	27.494	5.4998		
Total	11	30,840.			

Multiple-R = .99955 R^2 = .99911 S.E.= 2.3450

VARIABLE	Mean	Std-Dev	Regr. Coeff.	t	p	Elasticity
Dependent Variable:						
NUSC	212.83	52.949				
Independent Variables:						
Av. Cost	467.64	347.36	- .041853	-10.200	.0002	- .09196
Distance:						
Near	119.67	35.212	.52059	16.126	.0000	.29272
Rather far	47.750	12.800	2.8224	26.294	.0000	.63323
Care by:						
A.M.P.	54.333	34.529	- .48355	-10.008	.0002	- .12344
H.C.	50.750	34.460	- .30386	-4.3438	.0074	- .07246
ASSETS	4.7028	1.3044	40.072	13.639	.0000	.89937

of service, or what they have experienced in previous contacts with health care providers.

Stepwise multiple regression using the number seeking care as dependent variables and all other variables as independent variables has produced the out-of-pocket payment elasticity of demand = -0.09196, when the average number

TABLE 71

INCREMENTAL INCREASE IN NUMBER OF PEOPLE SEEKING CARE IN EACH SUBDISTRICT WITH 5% DECREMENT IN SERVICE CHARGE

Average cost Rp. 467.64
Average Number Seeking Care = 212.83
Price Elasticity of Demand = - 0.091969

New Cost as % of Old Cost	New Cost	dq	q'	Increase in Utilization
95%	444.26	.98	213.81	0.46%
90%	420.88	1.96	214.79	.92%
85%	397.49	2.94	215.77	1.38%
80%	374.11	3.91	216.74	1.84%
75%	350.73	4.89	217.72	2.30%
70%	327.35	5.87	218.70	2.76%
65%	303.97	6.85	219.68	3.22%
60%	280.58	7.83	220.66	3.68%
55%	257.20	8.81	221.68	4.14%
50%	233.82	9.79	222.62	4.60%

seeking care per subdistrict are 212.83 cases, and the average out-of-pocket payment per consultation = Rp. 467.64 (see table 70).

Reduction of out-of-pocket payment from the average Rp. 467.64 per consultation to Rp. 325.00 will increase seeking care by only 2.81%.[5] At the present level of utilization and cost, an increase in family assets will have a more meaningful impact towards increasing utilization.

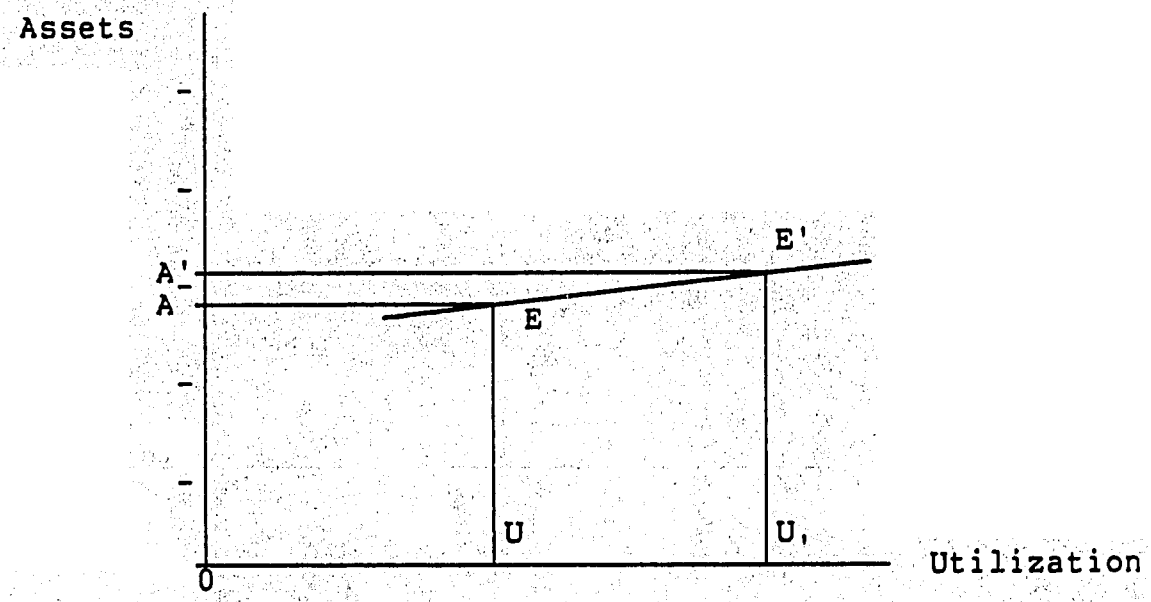


Fig. 18. RELATIONSHIP BETWEEN ESTIMATED VALUE OF FAMILY ASSETS AND THE UTILIZATION OF HEALTH SERVICES

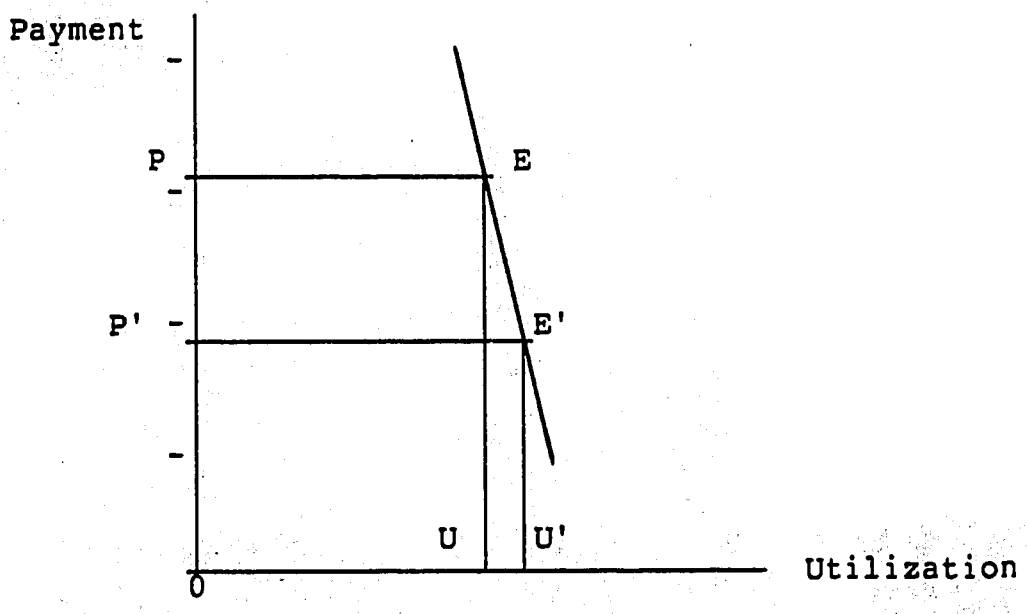


Fig. 19. OUT-OF-POCKET PAYMENT ELASTICITY OF DEMAND FOR HEALTH SERVICE

"Out-of-pocket payment" and "estimated value of family assets" variables explain the pecuniary influence on utilization of health services. Their redundancy in

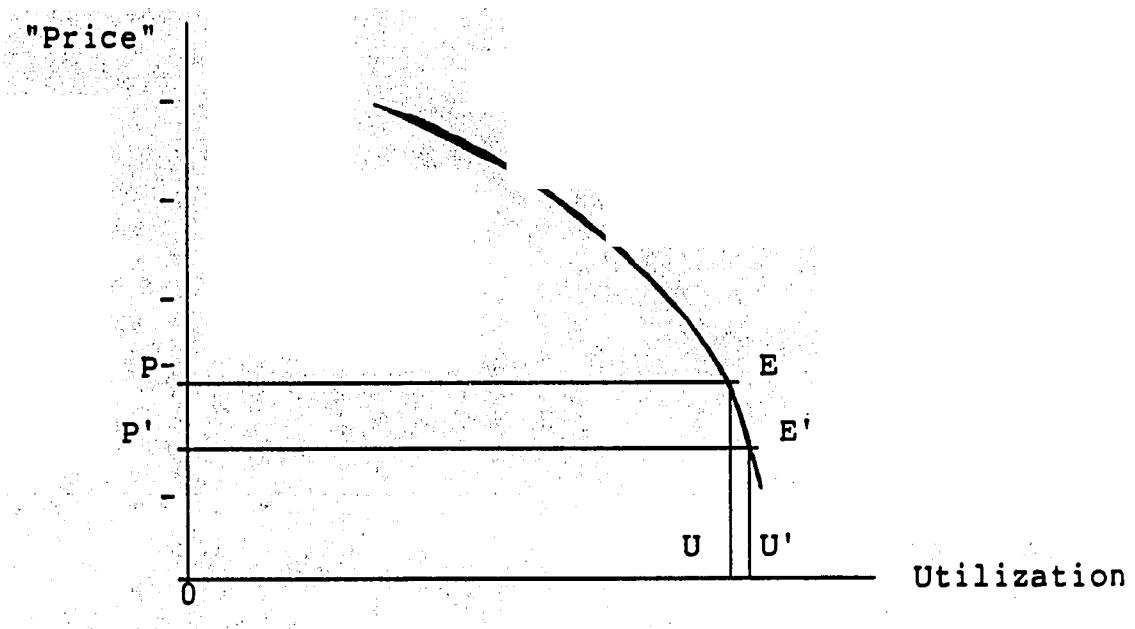


Fig. 20. "PRICE" ELASTICITY OF DEMAND FOR HEALTH SERVICES

explaining utilization has been controlled by the use of the multiple regression model, where both variables are among the explanatory variables of the model. Asset elasticity of utilization is very elastic and out-of-pocket payment elasticity of utilization is very inelastic. These two elasticities look inconsistent but this tendency will easily mislead those without prior insight into the nature of the problem. The striking difference between asset elasticity and out of pocket elasticity uncover the hypothetical question in the cost of service. To the users, the cost of utilization of health services is not merely the out of pocket payment as the health care providers see it. It also includes the associated costs of seeking care.

Besides its non-randomness, the decision to seek care is not primarily determined by the out-of-pocket payment. It

is dominated more by the associated costs. Part of the associated costs for instance, is the cost of clothing. There has been a customary difference in the way patients dress when they seek care and in what they normally wear. They usually dress better when seeking care. In addition, there are transportation costs, opportunity costs due to absence from work, especially among the self employed or among people who live on a subsistence economy. These associated costs have made the overall cost of treatment expensive, even if the out-of-pocket payment is very low. Among the wealthier families, these associated costs are relatively cheaper. The "estimated value of family assets" is a surrogate for the ability to afford the associated costs of seeking care, and it is very elastic. Change in out-of-pocket payment will be followed by very minimal changes in utilization, while improvement in the value of family assets will be followed by a markedly higher level of utilization.

The combination of estimated value of family assets and out-of-pocket expenses may constitute the hypothetical "price" of health services as shown in figure 20. At equilibrium point E, where the out-of-pocket payment is low, but the overall cost of care is high, manipulation of out-of-pocket payment will not stimulate an observable increase in utilization of health services.

The effect of reduction of the service charge in decrements of 5% is presented in table 71. Further

reduction of the service charge below 50% is not computed since reduction of costs even below 30% will be a great financial burden for the government. There has been serious discussion in the Ministry of Health in 1980 about the possibility of reducing the service charge by 30%. So far, that idea has not been implemented. Results of the survey indicate evidence of many non-paying patients. Likely ranges of the average service charge do not fall below Rp. 200.

C. Feasible Alternatives for Health Care Development

The population of Bogor is growing at 2.035% per year. The estimated population of Bogor in the year 2001 will be 4,796,891 people in an area of 2,253.9 km^2. Population density per square kilometer will be 2,128 people, and the average number of population per subdistrict will be 165,410 people.

The national policy of health care development at the moment is to achieve the ratio of one subhealth center for every 15,000 people, one health center for every 30,000 people, and one general hospital for one regency. If the government of Bogor is going to comply with this ratio, then the Regency of Bogor in the year 2001 will need:

160 health centers, or 5 - 6 health centers for each subdistrict;

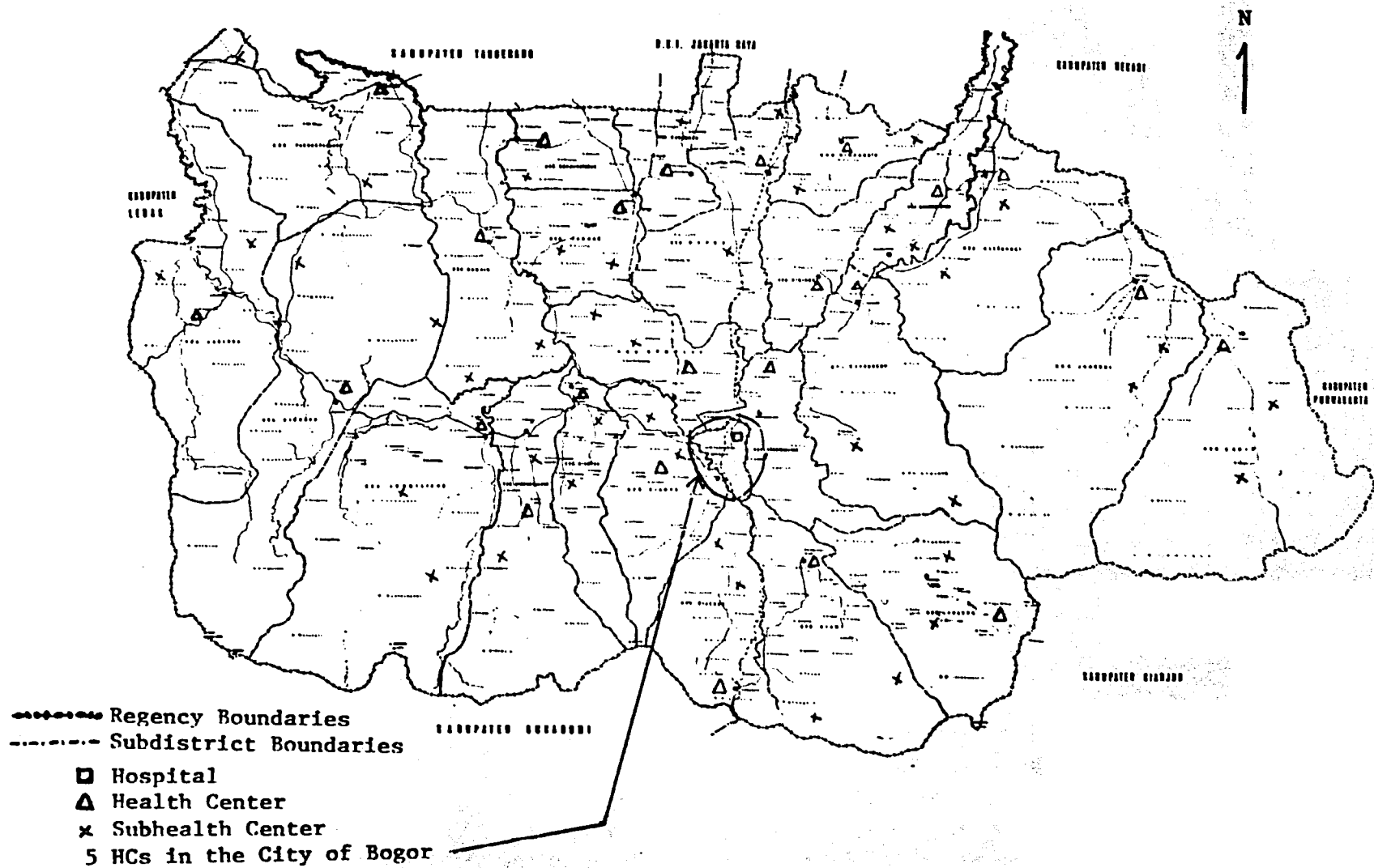
320 subhealth centers, or 11 subhealth centers for each subdistrict; and

1 hospital for 4.8 million people, which means a possible overflow of patients in the regency hospital.

There were 37 government owned hospitals and 9 private general hospitals in all of West Java in 1979.[4] Instead of using the ratio of one hospital for one regency, hospital service would be better with a facility-to-population ratio. If one general hospital is allocated for every one million people, the Regency of Bogor will need four general hospitals in the year 2001. This straight-forward linear expansion means a 4 - 5 times increase in the number of facilities for only a 55.4% increase in population size, given the fact that there is some variation in utilization of the existing facilities. Some are operating below capacity, while others are overloaded. This national policy of population-to-facility ratio has been mentioned since 1976 by the Ministry of Health. It is often repeatedly stated by health officers at the regency level. In Bogor, this policy has not been implemented.

A more realistic expansion policy should be based on the actual needs of the area. The illness rate and the percentage of people seeking care should dictate the number of facilities in the area. The mix of health care facilities should be based on the effectiveness of various types of facilities in treating illnesses. More facilities means shorter distance from home to place of treatment.

The Regency of Bogor is in the shape of a



MAP 4. REGENCY OF BOGOR SHOWING FACILITIES IN 1980

quadrangle. Each subdistrict has an irregular shape. If the twenty-nine subdistricts are assumed to have a rather circular form, then the computation of maximum distance from household to the center of the subdistrict and to the center of Bogor could be made. This assumption does not create much distortion, since the irregular boundary of each subdistrict is adjacent to other subdistricts. Also, there is no limitation in movement across subdistrict borders. The people are free to seek care wherever they want. For instance, a household in the subdistrict of Sawangan may be located far away from the center of the subdistrict of Sawangan but located closer to the center of the subdistrict of Cibinong. This household is allowed to seek care at the health center of Cibinong.

The health planning of Bogor should be synchronized with development planning in other sectors. The Regency of Bogor has been divided into eight development areas by the Regency Development Coordinating Board (BAPEMKA). This division should be the basis of further health sector expansion. The radius of the service area for the existing health center ranges from 3.82 to 7.63 km outside the city of Bogor, but only 1.17 km inside the city of Bogor,[7] while the radius of the hospital service area is 25.79 km (see table 72).

In practice, however, the users of the Bogor hospital are restricted to those who live near the hospital. In East Java, three quarters of the users come from places less than

TABLE 72

DEVELOPMENT AREAS OF BOGOR, POPULATION DENSITY, AND RADIUS OF THE SERVICE AREA OF EXISTING FACILITIES

DEVELOPMENT AREAS	NUMBER OF SUB-DISTRICTS	AREA		Population Density per km² in 2001	Radius of Service Area in km		
		Total (in km²)	Average size per Subdistrict (in km²)		Subhealth Center	Health Center	Hospital
I. Jasinga	2	244.09	122.05	1,040	4.41	6.23	-
II. Parung Panjang	2	193.03	96.52	1,206	3.92	5.54	-
III. Leuwiliang	3	333.65	111.22	1,863	4.21	5.95	-
IV. Parung	3	137.37	45.79	3,445	2.70	3.82	-
V. Cibinong	5	310.95	62.19	3,067	3.15	4.45	-
VI. Cileungsi	3	248.47	82.82	1,664	3.63	5.13	-
VII. Jonggol	2	365.99	183.00	825	5.40	7.63	-
VIII. Greater Bogor	4	398.74	99.69	2,474	3.98	5.63	-
City of Bogor	5	21.60	4.32	19,931	-	1.17	2.62
All Areas	29	1,2353.89	77.72	2,128	3.87	4.97	26.79

5 km away from the hospital, and 82% come from places less than 10 km away from the hospital.[8] If this analogy is also applicable to Bogor, then most users of the Bogor hospital come from the city of Bogor and from the greater Bogor area, where the combined radius is 11.57 km.

The users of health centers come from relatively smaller geographical areas and users of subhealth centers are from even smaller ones. The relationship between the type of facility and the place of residence is presented in table 73. It is clear that the coverage of the hospital inpatient and outpatient care is very much limited to the people who come from the surrounding area. Users classified as "other subdistrict" in hospital care are mostly from those four subdistricts within the city of Bogor. The general hospital is located in the subdistrict of East Bogor. The catchment size of the inpatient care is greater than the catchment size of the outpatient care. The catchment size of the hospital is greater than the catchment size of the health center, and catchment size of the health center is greater than the catchment size of the subhealth center. Most of the "Other Regency" inpatients are hospitalized due to traffic accidents that has taken place near Bogor (85.0%).

In the health centers and subhealth centers, the patients do not represent a particular diagnostic group, but rather, people who live in the neighboring subdistrict or regency, whose place of residence is closer to the health

TABLE 73

DISTRIBUTION OF USERS' RESIDENCE ACROSS DIFFERENT TYPES OF CARE IN BOGOR IN 1980

USERS RESIDENCE		TYPE OF CARE			
		HOSPITAL		HEALTH CENTER	SUBHEALTH CENTER
		Inpatient	O.P.D		
Same Subdistrict:[1]	Obs.	60	476	6,469	1,576
	Col.%	9.3%	14.9%	60.4%	71.1%
Other Subdistrict:[2]	Obs.	543	2,546	4,100	607
	Col.%	84.4%	79.8%	38.3%	27.4%
Other Regency:[3]	Obs.	40	167	143	34
	Col.%	6.2%	5.2%	1.3%	1.5%
Total:	Obs.	643	3,189	10,712	2,217
	Col.%	100.0%	100.0%	100.0%	100.0%

χ^2 = 2,891.3, p = 0.0000 Contingency Coef. = .3836

[1]Same Subdistrict means the facility and the place of residence is in the same subdistrict

[2]Other Subdistrict means the facility and the place of residence is not located in the same subdistrict but both are located in the Regency of Bogor.

[3]Other Regency means that user place of residence is not in the Regency of Bogor but has used the facility in the Regency of Bogor.

care facility in the Regency of Bogor than to the facility in their own subdistrict or regency.

The population of the subdistrict of East Bogor in 1980 is estimated to be 46,151 people, living in a place which is located within approximately a 1.17 km radius from the hospital of Bogor. In two months, 60 people have been hospitalized, with an average duration of stay of 6.63 days. Therefore, if we expect the hospital will operate at

an 80% bed occupancy rate (B.O.R), where there should be minimum geographical barrier to inpatient care, bed population ratio should be maintained at [(6x60x6.6275)/(365x.8)] : 46,151 or 1 : 5,648.2 people. This ratio will be used to determine the future bed population ratio in the area.

Inpatients from other regencies stay for 3.2 days, a little less than half of the average duration of stay of locals. This is understandable since 85% of these inpatients are victims of traffic accidents. It is likely that these traffic accident victims have asked to be transferred to another hospital closer to their home.

An expansion policy should be based on the present utilization pattern in various facilities, the patient's place of residence, and the estimated service area of various facilities. Combined with the results of the study of catchment size of the general hospitals and health centers in East Java, there should be more reasonable guidelines for expansion. For instance, the basic guidelines for expansion should be:

1. Radius of hospital service area is approximately 10 km;
2. Radius of health center service area is approximately 3 km;
3. Radius of subhealth center service area is approximately 1 km;
4. Population of the hospital service area is

approximately 1 million people;

5. Population of the health center service area is approximately 30,000 people;
6. Population of the subhealth center service area is approximately 15,000 people; and
7. Bed population ratio is one bed for every 5,650 people.

By setting the radius of each type of health care facility, then different modes of expansion will produce different density of facilities, which means different "maximum distance traveled" in seeking care. The changing density will change the percentage seeking care, the level of utilization of the health service, and the number of incapacitation days due to illness. Facility expansion policy, based on assumptions 1 through 7 above, will produce results as follows (see table 74).

In Bogor, the hospital requirement in year 2001 will be four hospitals with the following specifications:

1. One 196-bed hospital serving the development area of Jasinga, Parung Panjang, and Leuwiliang, to be located near the intersection of the Bogor-Jasinga highway and the road between Leuwiliang and Rumpin;
2. One 253-bed hospital serving the development area of Parung and Cibinong, located on the Old Jakarta-Bogor highway near the Depok exit;
3. One 126-bed hospital serving the development of Jonggol and Cileungsi, located in the town of Jonggol;

TABLE 74

REASONABLE NUMBER OF HEALTH CARE FACILITIES TO MEET THE DEMAND FOR HEALTH SERVICES IN THE YEAR 2001, IN BOGOR, UNDER NO BUDGETARY CONSTRAINTS

DEVELOPMENT AREAS	SUB DISTRICT	Area (in km²)	Ave. Density (per km²)	HEALTH CENTER			SUB HEALTH CENTER			HOSPITAL		
				#	Pop./ H.C.	Radius (in km)	#	Pop./ S.H.C.	Radius (in km)	#	Pop./ Hospital	Radius (in km)
I. Jasinga	2	244.09	1,040	8	31,732	3.12	16	15,866	2.20			
II. Parung Panjang	2	193.03	1,206	6	38.799	3.20	15	15,520	2.02	1(196)[2]	1,108,238	15.66
III. Leuwiliang[1]	3	333.65	1,863	11[1]	56,508	3.11	41	15,161	1.61			
IV. Parung	3	137.37	3,445	5[1]	94,648	2.96	25	18.930	1.32	1(253)[2]	1,426,923	11.95
V. Cibinong[1]	5	310.95	3,067	11[1]	86,699	3.00	55	17,340	1.34			
VI. Cileungsi	3	248.47	1,644	9	45,387	2.96	27	15,129	1.71	1(126)[2]	710,426	13.99
VII. Jonggol[1]	2	365.99	825	10	30,194	3.41	20	15,097	2.41			
VIII. Greater Bogor	4	398.74	2,474	14[1]	70,463	3.01	65	15,177	1.40	1(275)	1,416,992	11.57
City of Bogor	5	21.60	19,931	5[1]	86,102	1.17	-	-	-			
All Areas	29	2,253.9	2,128	79	60,720	3.01	264	18,450	1.65	4(850)		

[1]Place of new hospital
[2]Each health center in this area has two physicians.
[3]Figure between parentheses is the number of hospital beds in each hospital.

and

4. Maintenance of the current 275-bed hospital serving the development area of Greater Bogor, which covers the subdistricts of Ciomas, Cijeruk, Ciawi, Cisarua, and the city of Bogor.

Bogor health center and subhealth center requirement in year 2001 will be as follows:

1. Eight health centers and 16 subhealth centers in the development area of Jasinga, distributed according to the location of the population center in the subdistricts of Jasinga and Cigudeg;
2. Six health centers and 15 subhealth centers in the development area of Parung Panjang, distributed according to the location of the population center in the subdistricts of Parung Panjang and Rumpin;
3. Eleven health centers and 41 subhealth centers in the development area of Leuwiliang, distributed according to the location of the population center in the subdistricts of Leuwiliang, Cibulang, and Ciampea, each health center in this area will have two physicians.
4. Five health centers and 25 subhealth centers in the development area of Parung, distributed according to the location of the population center in the subdistricts of Semplak, Parung, and Gunung Sindur; each health center in this area will have two physicians;

5. Eleven health centers in the development area of Cibinong, distributed according to the location of the population center in the subdistricts of Cibinong, Sawangan, Depok, and Cimanggis; each health center in this area will have two physicians; in addition, there will be 55 subhealth centers in this area;
6. Nine health centers and 27 subhealth centers in the development area of Cileungsi, distributed according to the location of the population center in the subdistricts of Citeureup, Gunung Putri, and Cileungsi;
7. Ten health centers and 20 subhealth centers in the development area of Jonggol, distributed according to the location of the population center in the subdistricts of Jonggol and Cariu;
8. Fourteen health centers and 65 subhealth centers in the development area of Greater Bogor, distributed according to the location of the population distribution in the subdistricts of Ciomas, Cijeruk, Ciawi, and Cisarua; each health center in this area will have two physicians; and
9. In the city of Bogor, there should not be any additional health centers or subhealth centers since the radii of health center service areas have been small enough (average 1.17 km). Instead, each subhealth center in the city of Bogor will receive one additional physician to cope with the increasing work-

load Similarly, the number of beds in the general hospital in the city of Bogor will not be increased. The present 275 beds will be utilized below optimum. The optimum number of beds for the city of Bogor, provided that the three proposed hospitals are operational, will be 251 beds, with an 80% bed occupancy rate (B.O.R).

In the year 2001, the total number of health centers will be 79 units; subhealth centers, 264 units; and hospitals, 4 units. The total number of new beds in these three proposed hospitals will be 575. The number of new health centers that need to be built between now and 2001 should be 50 units. Among these new health centers, 26 will be staffed by two physicians and 24 will be staffed by one physician, following the 1975 model. Each of the other twenty old health centers will receive one additional physician. There will be 216 new subhealth centers, each be staffed by two paramedics. Each subhealth center will be supervised by a health center physician or senior paramedical personnel at least once a week.

D. Budget Growth and Allocation

There is no sign of rapid changes in the pattern of budgetary processes in the area since there is no sign of drastic changes in the political process at the higher levels of government. As far as we can see, rapid change in

the budgetary process, due to change in the political structure, is unlikely.

The growth of the health sector budget will remain incremental, and support for the public health sector will continue to come from various government agencies at various levels.

If there is no budgetary constraint, the expansion of the public health sector from its present equilibrium to the highest level of equilibrium with the least incapacitation days due to illness is attainable. However, budgetary constraint will put a limit on the expansion of health care facilities. Under budgetary constraint, the expansion of health care facilities should be based on the effectiveness of each type of facility relative to its cost.

Information about health expenditures for the Regency of Bogor could not be compiled for immediate use, since the cost of providing the service is administered by several offices where each office independently provides partial support to selected budgetary items. The budget information for the city of Bogor, in fiscal year 1979/1980, consists of:'

1)	Local government subsidy	Rp. 54,128,205
2)	Central government subsidy	Rp. 3,457,260
3)	INPRES Funds'°	Rp. 34,037,000 +
	T o t a l	Rp. 91,633,465

This total figure is equivalent to Rp. 414.11 per capita. Apparently the expenditure of the five present health

centers in the city of Bogor is Rp. 66.5 million in 1980. The expenditure of the Bogor hospital is Rp. 445.1 million in the same year. Less the revenue from those facilities, the net cost of running the health centers and hospital will cost the city of Bogor Rp. 71.5 million. Most of the local subsidy mentioned in the Municipal Health Service report is used to run the municipal health administration, not to subsidize health center and hospital operating costs. The INPRES funds have been earmarked to renew one old health center, to build one new house for the health center physician, to build several pilot family latrines and pump wells, to purchase drugs, and to purchase bicycles for paramedics. The Communicable Disease Control Programs (CDC), for instance, are not even mentioned. The CDC programs are administered directly by the Ministry of Health from Jakarta and by the Provincial Health Office from Bandung.

There is no information available on the budget of the health service outside the city of Bogor proper. Therefore, the cost of public health service will be estimated from the expenditure of health care facilities. Auditing of the annual expenditure of Bogor hospital dates from 1977-1980, and the expenditure of the seven health centers and four subhealth centers, for the same bookkeeping period, reveals information about resource utilization and availability in those facilities. Auditing reveals that the expenditure of the hospital alone is Rp. 445.1 million in 1980. The

TABLE 75

INVESTMENT AND EXPENDITURE AT DIFFERENT TYPES OF FACILITIES IN BOGOR IN 1980
(in thousand rupiah)

CATEGORY	HOSPITAL (1 unit)	HEALTH CENTER (29 units)	SUBHEALTH CENTER (48 units)	TOTAL
Expenditure	455,122.	275,478.	50,216.	770,816.
Revenue	408,771.	71,367.	33,867.	514,005.
Net Cost	36,351.	204,111.	16,350.	256,812.
Net Cost per unit	36,351.	6,988.	341.	-
One time investment cost per unit	733,974.	25,447.	1,651.	-

estimated total expenditure in the twenty nine health centers in the regency is Rp. 275.5 million. The estimated expenditure in the forty eight subhealth centers is Rp. 50,2 million (see table 75). Total expenditure is Rp. 770.8 million per year, the equivalent of Rp. 261.72 per capita per year. The net cost to the government, however, is as low as Rp. 85.16 per capita per year.

The Ministry of Health budget was numerically increased from 1974 to 1978. This growth, however, should be adjusted to the population growth and inflation rate. The Ministry of Health budget is divided into development budget, routine budget, Inpres funds and foreign aid.

The development budget was allocated as follows:

1.	Health education	8.4%
2.	Health promotion	2.7%
3.	Medical care	46.9%
4.	Communicable Disease Control	27.6%
5.	Nutrition development	2.7%
6.	Food and drug control	4.4%
7.	Research and development	1.1%
8.	General construction	3.2% +
	T o t a l	100.0%

The routine budget was allocated for:

1.	Ministry of Health Secretariat	15.7%
2.	Technical Training	8.6%
3.	In-service Training	0.7%
4.	Medical Care	54.8%
5.	Communicable Disease Administration	13.9%
6.	Pharmaceutical Production & Distribution	4.1%
7.	Food and Drug Administration	2.9% +
	T o t a l	100.0%

Out of 6.6 billion rupiah disbursed through Inpres funds in fiscal year 1974/1975, 5.3 billion rupiah were allocated through the Ministry of Health and 1.3 billion rupiah through the Ministry of Internal Affairs. Those 6.6 billion rupiah have been used for:

1.	a. Health facilities construction	25.2%	
	b. Drug and supply subsidy	15.2% +	
	Sub-total 1.		40.4%
2.	Water supply		17.4%
3.	Family latrine		27.9%
4.	Salary		10.6%
5.	Travel and Supervision		3.7% +
	T o t a l		100.0%

Foreign aid was used primarily for the provision of insecticides, the purchase of medical equipment, and the training of personnel.

The major component of the Ministry of Health budget since 1978 consists of routine budget, development budget, and INPRES budget. Foreign aid has not been mentioned since 1978.

During the period from 1974 to 1978, medical care had been receiving the lion's share of the development and routine budget (46.9% and 54.8%, respectively).''

The Ministry of Health budget in fiscal year 1977/1978 is Rp. 504.28 per capita (see table 76). After controlling for inflation and population growth, the per capita health budget in fiscal year 1977/1978 is 12.9% higher than in fiscal year 1974/1975.

Estimation of budget growth using data from fiscal year 1974/1975 to fiscal year 1977/1978, with fiscal year 1974/1975 as $year_1$, produces:

$$BUDGET_t = 101.25 + 3.51\ YEAR_t + e$$

t : (13.137) (1.2472)
p : (0.0057) (0.3386)

Multiple - r = 0.66142 r^2 = 0.43748 S.E.=6.2931
N = 4 $F_{1,2}$ = 1.5554 p=0.3386

There is a 3.51% increase in the health budget per capita per year. Unfortunately, this increment is not statistically significant, since t = 1.2472 and p > 0.1. The conclusion is that the annual increase in the health budget per capita cannot be guaranteed. The statistical evaluation of the increment during the period of observation is insignificant.

The Ministry of Health development budget and INPRES funds for all of Indonesia represent 35.9% of all health budgets in 1974/1975; 54.2% in 1975/1976; 62.46% in 1976/1977; and 68.7% in 1977/1978. As has been mentioned earlier, the term "development budget" does not mean that the budget has been earmarked entirely for the construction of health care facilities. The general development budget is also used to purchase and maintain equipment. Before the beginning of the "First Five Year Development," the public sector budget contained only the routine budget. At that time, the budget was rigidly earmarked and reallocation was almost impossible. Today, a routine budget is still maintained and rigidly earmarked for specific purposes, such as salary, rice allowances, some maintenance work, gasoline, utilities, rent, and supplies. The supplies budget (**belanja barang**) is rigidly earmarked to purchase stationery, printing services, office equipment, vehicles, basic drugs,

TABLE 76

MINISTRY OF HEALTH BUDGET FROM FISCAL YEAR 1974/1975 TO FISCAL YEAR 1977/1978[1]
(in billion rupiah)

BUDGET	FISCAL YEAR			
	1974/1975	1975/1976	1976/1977	1977/1978
SOURCES:				
Development	8.6	13.0	15.7	21.0
INPRES	5.3	15.2	20.9	26.3
Routine	11.3	19.2	17.4	21.6
Foreign Aid	13.5	4.6	4.6	-
Total	38.7	52.0	58.6	68.9
Growth relative to 1973/1974	-	34.4%	51.4%	78.1%
Growth after controlling for 14% annual inflation	-	17.9%	15.7%	20.2%
Growth after controlling for 14% annual inflation and 2.01% annual population growth	-	15.4%	11.8%	12.9%

[1]Source: Ministry of Health Republic of Indonesia, Keadaan Perkembangan Program Kesehatan, Kegiatan-kegiatan dan Sarana-sarana Kesehatan Serta Hambatan-hambatan Pelaksanaannya, (Health Programs, Activities, Health Infrastructure and Obstacles in their Implementation), Jakarta 1977, unpaginated, table 11.c

etc. Realizing the counter-productive effect of the rigidly earmarked routine budget, the more flexible development

budget was introduced. Budget reallocation within the development budget is possible. INPRES funds is another category. It has more emphasis on facility construction, even though a great proportion of INPRES funds are still earmarked for drug and supply subsidies. INPRES funds also cover some costs of assignment and relocation of health personnel, development of water supply in rural areas, and pilot development of the family latrine. INPRES funds constitute from 13.7% to 38.2% of the entire Ministry of Health Budget from fiscal year 1974/1975 to fiscal year 1977/1978.

Overall, during the development of the INPRES health center in 1975, 54.9% of INPRES funds are allocated for health care facility construction, and furnishing and staffing of the health center.[12] During this development, every rupiah of INPRES funds is matched by Rp. 0.20 to Rp. 0.30 by the local government.[13] If this ratio could be maintained, then the total health care facility construction fund would remain within a range of Rp. 59.15 (low estimate) to Rp. 178.67 (high estimate), per capita per year, all the way to year 2001, measured in constant 1980 rupiah. Low and high estimates of the health care facility construction fund, until the year 2001, are projected in table 77.

The cost of running the system is not included in the health care facility construction fund, but the revenue from service charges helps the local government avoid shouldering the burden of paying all operating costs.

TABLE

LOW AND HIGH ESTIMATES OF BUDGET FOR HEALTH CARE FACILITY CONSTRUCTION
High Estimates Rp. 178.67 per capita; low estimates Rp. 59.15 per capita

FISCAL YEAR	ESTIMATED MID YEAR POPULATION	TOTAL CONSTRUCTION BUDGET		CUMULATIVE CONSTRUCTION BUDGET (in million rp.)		CUMULATIVE CONSTRUCTION BUDGET PER PLANNING PERIOD (in million rp.)	
		High Estimates	Low Estimates	High Estimates	Low Estimates	High Estimates	Low Estimates
1980	2,945,202	526.22	174.21	526.22	174.22		
1981	3,014,414	538.59	178.30	1,069.80	352.51		
1982	3,085,253	551.24	182.49	1,616.05	535.00		
1983	3,157,756	564.20	186.78	2,180.24	721.79		
1984	3,231,964	577.45	191.17	2,757.70	912.96		
1985	3,307,915	591.03	195.66	3,348.72	1,108.62		
1986	3,385,651	604.91	200.26	3,953.64	1,308.88	3,953.64	1,308.88
1987	3,465,213	519.13	204.97	4,572.77	1,513.85		
1988	3,546,646	633.68	209.78	5,206.45	1,723.63		
1989	3,629,992	648.57	214.71	5,855.02	1,938.35		
1990	3,715,297	663.81	219.76	6,518.83	2,158.11		
1991	3,802,606	679.41	224.92	7,198.24	2,383.03	3,244.60	1,074.15
1992	3,891,968	695.38	230.21	7,893.62	2,613.24		
1993	3,983,429	711.72	235.62	8,605.34	2,848.86		
1994	4,077,040	728.44	241.16	9,333.78	3,090.02		
1995	4,172,850	745.56	246.82	10,079.35	3,336.84		
1996	4,270,912	763.08	252.62	10,842.43	3,589.46	3,644.19	1,206.44
1997	4,371,278	781.02	258.56	11,623.45	3,848.03		
1998	4,474,003	799.37	264.64	12,422.82	4,112.66		
1999	4,579,142	818.16	270.86	13,240.97	4,383.52		
2000	4,686,752	837.38	277.22	14,078.35	4,660.74		
2001	4,796,891	857068	283.74	14,935.41	4,944.48	4,092.98	1,355.01

E. Cost Effectiveness Analysis

The health care facility construction budget has more potential if used as a health development budget with flexible reallocation. In that case, there is a need to assess differential costs and the effectiveness of various types of health care providers. What is the best health care expansion path, and how much does it cost?

Tables 29, 30, 31, and 75 show unit costs of the hospital, health centers, and subhealth centers in 1980. In the years to come, there is a good chance that this unit cost will increase due to increasing real value of land acquisition, increasing unit cost of technology goods, or increasing capital cost of equipment due to improvement of the standard equipment in health care facilities.

Assuming that by the year 2001 the investment cost of building a new hospital will increase by 40.%, a one-physician health center by 60.%, a two-physician health center by 100.% of the present cost of the one-physician health center, and a subhealth center by 100.%, then the investment cost per unit of a:

1) hospital with 275 beds will be Rp. 1,027,563,877;
2) two-physician health center will be Rp. 50,893,888;
3) one-physician health center will be Rp. 40,715,110;
4) addition of one more physicians to the existing one-physician health center will be Rp. 10,178,778; and

5) subhealth center will be Rp. 3,302,000.

Then, the investment cost of alternative health care expansion I to alternative health care expansion III, for the size of expansion mentioned in table 86, will be:

Alternative I: Subhealth center expansion will need 216 new subhealth centers at Rp. 3,302,000 per unit. Total investment cost for alternative I is Rp. 713.2 million.

Alternative II: Health center expansion will need 24 new one-physician health centers, the addition of 20 physicians to the existing one-physician health centers, and the construction of 26 new two-physician health centers. All require:

1) 24 new one-physician health centers at Rp. 40,715,110 per unit, costing Rp. 977.2 million;
2) 26 new two-physician health centers at Rp. 50,893,888 per unit, costing Rp. 1,323.2 million;
3) 20 additional physicians to the existing one-physician health centers at Rp. 10,178,778 per unit, costing Rp. 203.6 million.

The total investment cost of alternative II is Rp. 2,504. million.

Alternative III: Hospital expansion will need 3 new

hospitals with a total of 575 new hospital beds. This will increase the total hospital bed capacity in Bogor to 850 beds. The investment cost of this expansion is Rp. 3,736,596 per bed. The total investment cost of alternative III is Rp. 2,148.5 million.

The total investment cost of 100.% expansion of all types of facilities which has been computed based on service area coverage and population density analysis will be Rp. 5,365.8 million, affordable only if the availability of the future budget is under the most favorable terms. This is 1.22 times the amount of future construction budgets under pessimistic estimates. If any other policy manipulable intervention will be introduced, the budget is even far short. The uncertain future of the Indonesian economy opens the possibility of having future health care development budgets even far less than our most pessimistic projection. Not only the decision makers at the national level, but also those at the provincial and even regency levels, should be provided with options for dealing with the worst possible economic conditions in the future.

Multivariate analysis of different types of health care providers demonstrates that the pure effect of subhealth centers in reducing incapacitation days due to illness is not significantly different from the pure effect of health centers or the hospital (see table 63). The

average net government cost of providing the service is Rp. 116 per case in the subhealth center, Rp. 268 per case in the health center, Rp. 2,613 per case in outpatient hospital care, and Rp. 26,130 per case in inpatient hospital care (see table 65).

The simplistic approach, based on the cost effectiveness of different types of providers, then, should favor subhealth centers first, health center seconds, and the hospital last. However, a simplistic approach is not always valid. In times of extreme scarcity, subhealth center expansion could be the most cost effective alternative. If there is a substantial budget available for the expansion of health care facilities, then the budgetary needs for subhealth center expansion could be easily saturated. In that case, the most cost effective alternative health facility expansion could be the health center or hospital. Whatever is the most appropriate alternative for Bogor, it needs to be tested. The available information allows for a more accurate way of selecting alternative for health care facility expansion.

Any addition of subhealth centers, health centers, or hospitals will change the present equilibrium of the proportion seeking care and the proportion not seeking care. Hypothetically, greater availability of subhealth centers will increase access to subhealth centers at the cost of a reduction in attendance to other types of care. Since most government health personnel in the area tend to

have their own private offices, additional health personnel assigned to subhealth centers, health centers, or the hospital will increase the number of private practitioners after government office hours in the area.

The Consequences of Subhealth Center Expansion

Expansion of the present 48 subhealth centers into 264 subhealth centers by the year 2001 will reduce the average radius of their service area from 3.87 km to 1.65 km. If health centers and subhealth centers maintain their own territories and remain operating with very low incidence of referral, the radius of these predominantly outpatient care facilities will decrease from 3.05 km to 1.45 km. This reduction means that the distance from home to place of treatment is reduced by half, effecting the percentage of people seeking care and the utilization rate.

Stepwise multiple regression of percentage seeking care on place of treatment, in the twelve subdistricts, yields:

$$PSC_i = 72.183 + 1.5041HSHC_i - 1.1264FSHC_i - .88878DH_i + \varepsilon$$

t :	(14.2)	(2.4)	(-3.8875)	(-3.3201)
p :	(<.01)	(<.05)	(<.01)	(<.05)

Multiple -r =.89943 r^2 = .80898 SE =5.6145
N = 12 $F_{3,8}$ = 11.293 at p <.01.

Where: PSC_i = Percentage seeking care in subdistrict$_i$

$HSCH_i$ = Treatment taking place at home attended by

subhealth center personnel in subdistrict$_i$

$FSHC_i$ = Treatment taking place at subhealth center far away from home in subdistrict$_i$

DH_i = Distance from home to the nearest hospital in subdistrict$_i$

The average percentage seeking care in the twelve subdistricts is 47.29%, and the average incapacitation due to illness is 2.75 days. The average percentage of people who seek care at a subhealth center in the twelve subdistricts is 10.7%. When the number of subhealth centers is increased from the present 48 units to 264 units, then there will not be any distantly located subhealth center. The maximum distance from home to a subhealth center will be ± 1.65 km. The overall percentage seeking care among the population will increase by 16.7%.

Incapacitation days due to illness is also influenced by distance between home and subhealth center. The relationship between incapacitation days due to illness and distance from home to subhealth center could be formulated as follows:

$$DII_i = 1.9091 - .002341\ PCV_i + .1141\ SEV_i$$

t :	(2.5919)	(-3.3875)	(5.4863)
p :	(<.05)	(.01)	(<.01)
Elasticity :		-.40	.87

$$-.0085445\ NSHC_i + \varepsilon_i$$
$$(-1.2061)$$
$$(-.15747)^{ns}$$

Multiple-r = .93195 r^2 = .86852 SE = .39333
N = 12 $F_{3,9}$ =17.616 at $p < .01$.

Where: PCV_i = Number of perceived illnesses in $subdistrict_i$

SEV_i = Percentage of severe cases in $subdistrict_i$

$NSHC_i$ = Percentage of treatment in subhealth center located near home in $subdistrict_i$

Increasing the density of subhealth centers will make the subhealth center practically near home. Controlling for other explanatory variables, this reduced distance will reduce incapacitation by 14.57%. However, this reduction has a low confidence interval, with the level of significancy p = .2622. Therefore any reduction of incapacitation days due to illness from the present level, as the result of increasing the number of subhealth centers, is subject to sensitivity analysis.

The Consequences of Health Center Expansion

Expansion of the present 29 one-physician health centers into 76 health centers staffed by 125 physicians will reduce the average radius of the health center service area from its present 4.97 kms to 3.01 kms. This reduction of distance from home to health center supposedly increases accessibility. A multiple regression model where the dependent variable is the variable of percentage seeking care and the independent variables are the variables of average distance from home to health center, and to hospital (in km), in the twelve subdistricts, yields:

$$PSC_i = 110.66 - .84728\ SELF - 8.1162\ DUR_i - .16631\ DHC_i$$

t :	(12.667)	(-9.4888)	(-4.3745)	(-1.1844)
p :	(<.01)	(<.01)	(<.01)	(.2749)
Elasticity:		-.50	- .53	- .0573

$$- .64518\ DH_i + \varepsilon_i$$

(-5.5561)
- .2496

Multiple-r = .98498 r^2 = .97108 SE = 2.3716
N = 12 $F_{4,8}$ = 56.931 at $p < .001$

Where: $SELF_i$ = Percentage number of sick persons who use self treatment in $subdistrict_i$

DUR_i = Average duration of illness in $subdistrict_i$

DHC_i = Average distance from home to health center in $subdistrict_i$ (in kilometers)

DH_i = Average distance from home to hospital in $subdistrict_i$ (in kilometers)

Every percent decrease in distance from home to health center will be followed by .0573% increase in percent seeking care, level of significancy p = .2749. We can conclude that decreasing distance from home to health center at the present setting, holding other explanatory variables constant, may increase percent seeking care by 4.78%. However, the low significancy of this figure makes it subject to sensitivity testing.

Increasing health center density, however, has a significant impact on incapacitation. Regression of incapacitation on distance yields:

$$DII_i = .79693 + .095557\ DHC_i + .021882\ DH_i + \varepsilon_i$$

t :	(.81396)	(2.4847)	(.61305)
p :	(.4567)	(<.05)	(.555)
Elasticity:		.57	.15

Multiple-r = .64152 r^2 = .41155 SE = .78453
N = 12 $F_{2,10}$ = 3.1472 at p < .1

Decreasing radius of service area from its present average of 4.97 kms to 3.01 kms, represents a 39.44% reduction in distance. It will be followed by a 6.8% reduction in incapacitation days. This reduction is the result of earlier diagnosis and treatment, and higher intensity of contact.

The Consequences of Hospital Expansion

Expansion of the present general hospital from one unit to four units will reduce the average radius of the hospital service area from 26.79 kms to 13.39 kms. The 50.% reduction in distance from home to hospital will be followed by an increase in percentage seeking care by 4.71%, with level of significancy p= -.2496. This increase reduces the overall incapacitation days by 10.65%, with low level of significancy p = .555. Thus, this figure also is subject to sensitivity analysis.

The Effect of Increasing Quality of Care

Quality of care in all types of health care facilities has an average score above 5.0, with wide ranges from 0.0 to 7.0 respectively. This indicates that all types of health care providers have the potential and capability of providing good quality of care. The fact that they did not provide homogenous quality of care is our real concern. This variation could be a function of illness severity, patient expectation, onset of illness, availability of medical equipment and medical technicians, payment schedule, and level of health personnel remuneration. If a combination of additional remuneration for government health personnel, and tighter quality control and supervision is implemented, then the operating costs will increase. On the other hand, the multiple regression model of percentage seeking care, in twelve subdistricts, on severity, onset, type of care, estimated value of family assets, and quality of care, yields:

$$PSC_i = 56.825 - 1.0303\ SEV_i + .35403\ SA_i$$

t :	(6.7935)	(-8.0747)	(2.2589)
p :	(<.01)	(<.01)	(.1)
Elasticity:		-.45	.19

$$-.78553\ SELF_i + 2.5726\ ASSETS_i + 6.9416\ QUALITY_i + \varepsilon_i$$

(-10.754)	(3.3025)	(4.4891)
(<.01)	(<.05)	(<.01)
-.46	.26	.34

Multiple-r = .99462 r^2 = .9892 SE = 1.5369
N = 12 $F_{5,7}$ = 110.58 at $p < .001$.

Where: $ASSETS_i$ is the average estimated value of family assets in each $subdistrict_i$, measured in million rupiah

SA_i is the percentage of subacute cases in $subdistrict_i$

$SELF_i$ is the average percentage of self care cases in $subdistrict_i$

$QUALITY_i$ is the average quality of care rating in $subdistrict_i$

Therefore, changes in the average rating of quality of care from its present level of 2.3413 to ≥ 5.0 will increase the overall percentage of those seeking care by 39.03%.

In the multivariate additive model of incapacitation, quality of care with the score of ≥ 5.0 will reduce incapacitation from 2.75 days to 2.47 days. This change represents a 10.18% reduction. On the other hand, improvement of quality of care within the existing facility and future facility to be built, may require doubling the personnel and equipment costs in those facilities.

The Consequences of Service Charge Reduction

Reduction of service charges for service provided in a government health care facility is another policy manipulable variable. It has been mentioned earlier that lack of consumer independence has made consumers unable to determine how much service they want once they have "trusted

their cases to a health care provider." It is shown by the very inelastic demand (see table 71). Reduction of service charges by 25.% will be followed by only a 2.3% increase in percent seeking care. Computed from table 59, a 25% reduction in service charge will be followed by a 1.2% reduction in incapacitation days.

In the additive model of incapacitation, the cost of service variable is not included in the model since it has a very low explanatory power regarding variation of incapacitation days due to illness.

Different health care expansion alternatives and health policy interventions, or a combination of both will produce different levels of utilization of health services. This difference, in turn, will cause variation in the amount of government subsidy. A summary of the consequences of health facility expansion, as well as improvement of quality of care, removal of drug and supply subsidies and reduction of service charges, is presented in table 78. Based on this information, cost effectiveness analysis for priority setting is computed using morbidity data, cost data, and variation in effectiveness across different types of facility expansion policies. Computation of the cost of expansion consists of fixed investment and variable cost of providing the service to users of the facility. The size of this variable cost is a function of the number of patients seeking care. The subsidy for providing the services per capita is equal to total revenue

TABLE 78

VARIATION IN THE EFFECTIVENESS OF DIFFERENT HEALTH CARE DEVELOPMENT STRATEGIES IN BOGOR FOR THE YEAR 2001

DEVELOPMENT POLICY	EFFECT ON				Remarks
	Percentage Seeking Care When Ill		Days of Incapacitation Due to Illness		
	Increased by	p	Decreased by	p	
1. SUBHEALTH CENTER EXPANSION	16.70%	<.01	14.57%	.2622	DII decrements may range from 0 - 14.57%
2. HEALTH CENTER EXPANSION	4.78%	.2749	6.80%	<.05	PSC decrement may range from 0 - 4.78%
3. HOSPITAL EXPANSION	4.71%	<.01	10.65%	.555	DII decrements may range from 0 - 10.65%
4. QUALITY OF CARE IMPROVEMENT	39.03%	<.01	10.18%	<.005	
5. 25% Reduction in Service Charge	2.30%	<.001	1.20%	<.1	This variable is excluded from the model due to lower explanatory power.
6. Drug & Supply Subsidy Removal	-2.40	<.001	-.98%	.1	This variable is excluded from the model due to lower explanatory power.

minus total expenditure divided by the number of patients, all measured in constant 1980 rupiah.

The estimated fixed cost of subhealth center expansion, health center expansion, and hospital expansion, the cost of improving the quality of care, and the cost of reducing patient revenue through a 25% service charge reduction in all facilities, or a combination of any of these, is presented in table 79.

Overall incapacitation days due to illness in 1980 was 6.63 days per person per year. The number of people seeking care that year was 3,231,178 persons, with a total number 5,588,561 visits (see Appendix C).

In multi-year planning, changes in the number of population is expected. This change will also alter future patient load for a given facility. The consequences are increasing drug and supply need. In order to maintain the existing mode of providing services, the government will be hard pressed to increase drug and supply subsidies. On the other hand, the prospect of increasing government support in terms of budgetary commitment is not very good. It was analyzed earlier in this research that the health care budget will increase just enough to compensate for population growth and inflation. In real terms, the health care budget per capita will be constant.

The projection of the cumulative health care development budget for facility construction from 1980-2001 is estimated to range from Rp. 4,944.74 million to

TABLE 79

ESTIMATED TOTAL COST OF HEALTH CARE DEVELOPMENT IN BOGOR FROM 1980 TO 2001

(in million 1980 Rupiah)

ADDITIONAL NUMBER OF FACILITIES	HEALTH CARE DELIVERY POLICY			
	No Change	Quality of Care Improvement	Service Charge Reduction by 25%	Quality of Care Improvement and Service Charge Reduction
No Addition	0.	7,729.1	2,698.5	10,427.6
216 Subhealth Centers	713.0	11,041.5	4,211.9	14,540.1
50 Health Centers	2,504.0	16,305.8	5,848.5	19,605.3
3 Hospitals	2,148.5	17,466.2	9,334.3	24,651.9
216 Subhealth Centers + 50 Health Centers	3,217.2	19,618.2	7,361.8	23,762.8
216 Subhealth Centers + 3 Hospitals	2,861.8	20,778.6	10,847.6	28,764.4
50 Health Centers + 3 Hospitals	4,652.6	26,042.9	12,484.3	33,874.6
216 Subhealth Centers + 50 Health Centers + 3 Hospitals	5,365.8	29,355.3	13,997.6	37,987.2

Rp. 14,935.41 million (see table 77), or between ± Rp. 1,250 to ± Rp. 3,750 per capita in 1980 rupiah. This construction budget will be used to build more health care facilities and to cover costs of additional drugs and supplies. Costs of additional drugs and supplies are not covered by the routine budget, instead they are covered by the development budget. Increasing the number of patients will burden the development budget considerably.

Assuming that there will not be any demographic transition in the next twenty years, then the reference population for the computation is the mid-point population between 1980 and 2001. The mid-point population of the twenty-one-year planning period will be 3,7871,047 people, which is a little larger than the expected number of the Bogor population in 1991. The effect of this assumption is a reduction in the sensitivity of the model in estimating utilization of the health service per episode of illness, especially since the multivariate additive model of incapacitation is sensitive to changes in age structure. Therefore, the computation of incapacitation days per person per year in the next twenty years, could be somewhat higher or lower than what has been estimated. The relative effectiveness of different health care providers and different health care intervention policies, however, is expected not to change.

The present level of service could not be maintained if the health care development budget is only Rp. 59.15 per

year per capita. If the government does not increase service charges in the future or remove drug and supply subsidies, but intends to implement health care facility expansion, provision of the present level of health care service, with a development budget of Rp. 59.15 per capita per year will only be able to cover 48% of the regency jurisdiction. The other 52% must depend on the old health service infrastructure, without any addition of new health care facilities. An increase in service charge or removal of the drug and supply subsidy is expected to reduce the percentage seeking care and to increase the days of incapacitation in each unit of care. However, the overall outcome is different. The money saved from the removal of the subsidy could be used for something else, which may increase the percentage seeking care and reduce incapacitation days. To maintain the present level of service alone, for the next twenty years the government and a third party payor should provide a total subsidy of Rp. 2,566.22 per capita or Rp. 122.20 per capita per year.

The removal of the drug and supply subsidy is equal to a 26.13% increase in the service charge. It will reduce the percentage seeking care by 2.4% (see table 71). Computed from table 59, removal of the drug and supply subsidy will be followed by a .98% reduction in the overall incapacitation days.

The combination of health care expansion and program intervention presents 64 options. Each option has its own

effectiveness and its own cost. After the removal of the drug and supply subsidy, without any increase in the number of health care facilities, the effect on the overall incapacitation days under the most pessimistic development budget is the same--6.63 days per capita per year. There will be a reduction of over 52,000 cases in the average annual number of seeking care and a reduction of over 106,750 visits in the average annual visits over the entire length of the planning period. The best outcome is obtained by the addition of three new hospitals, fifty new health centers, and 215 new subhealth centers, combined with the intervention policy of reducing service charges by 25%, and removal of the drug and supply subsidy. This program combination is attainable even if the entire health care development budget only grows to Rp. 1,386.13 per capita. The difference between the best and the worst outcome is 1.13 incapacitation days per capita per year. This is equal to 91.9 million days in 21 years. The difference in program cost is Rp. 66.01 per capita per year. If the average minimum wage per day in 1980 was Rp. 900.00 and unemployment was 20%, then the productivity loss is approximately (Rp. 900.00 x proportion of the population in productive age group x 80%), or Rp. 418.25 per capita. Assume that marginal propensity to consume is 75% (modest estimate for a Less Developed Country), then the effect of averting those incapacitation days will be an increase of Rp. 1,673 in GNP per capita per year.[15] Assuming

that the government's earning from taxes is 10% of the GNP (again a modest estimate), then the government could benefit from the increasing tax revenue by Rp. 167.30 per capita per year. This sum is 253.5% of what the government will spend if the government decides to invest in the best health facility expansion and in health policy intervention.

Many planners in Less Developed Countries see investment in health projects from the short-run point of view, where the increase in health will increase labor supply in the presence of underemployment and low opportunity cost for employed labor.[16] Therefore, they tend to rule out investment in health projects, because it is "a losing game" in the short-run. They may change their minds if they view health projects as long-term investment, provided that improvement in health is also accompanied by control of rapid population growth.[17]

This research finds that investment in hospitals, health centers, and subhealth centers, and a 25% reduction in service charge is defensible from the cost benefit perspective. The difficulties in implementing many beneficial health projects involve the usual obstacles posed by political and administrative realities. The actual administrative and budgetary process in the implementation of health projects does not always follow a cost benefit or cost effectiveness rationale. Therefore, the selection of alternatives should be made to answer questions that may arise from different estimates of budgetary growth. The best

TABLE 80
THE ORDINAL PREFERENCE OF HEALTH CARE GROWTH OPTIONS OF LOCAL GOVERNMENT UNDER THE MOST PESSIMISTIC BUDGETARY GROWTH

ALTERNATIVE PROGRAM ADDITION	D.I.I.	ADD. COVER -AGE	P.S.C
1. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers + removal of the drug and supply subsidy	5.61	90%	58%
2. 3 Hospitals + 216 Subhealth Centers + removal of drug and supply subsidy	5.74	100%	56%
3. 50 Health Centers + 216 Subhealth Centers + removal of the drug and supply subsidy	5.87	100%	56%
4. 3 Hospitals + 50 Health Centers + removal of drug and supply subsidy	6.07	100%	51%
5. 50 Health Centers + 216 Subhealth Centers + removal of the drug and supply subsidy + 25% service charge reduction	6.05	100%	54%
6. 216 Subhealth Centers + removal of the drug and supply subsidy	6.11	100%	54%
7. 50 Health Centers + 216 Subhealth Centers + removal of the drug and supply subsidy + 25% service charge reduction	6.12	66%	53%
8. 3 Hospitals + 216 Subhealth Centers + removal of drug and supply subsidy + 25% service charge reduction	6.12	45%	51%
9. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers + removal of the drug and supply subsidy + 25% service charge reduction	6.23	35%	51%
10. 50 Health Centers + 216 Subhealth Centers + maintenance of drug and supply subsidy	6.26	32%	51%

TABLE 81
THE ORDINAL PREFERENCE OF HEALTH CARE GROWTH OPTIONS TO LOCAL GOVERNMENT UNDER THE MOST OPTIMISTIC BUDGETARY GROWTH

ALTERNATIVE PROGRAM COMBINATION	D.I.I.	ADD. COVER -AGE	P.S.C
1. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers + removal of the drug and supply subsidy	5.50	100%	59%
2. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers + removal of the drug and supply subsidy + 25% service charge reduction	5.63	100%	58%
3. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers + maintenance of the drug and supply subsidy	5.71	79%	57%
4. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers + removal of the drug and supply subsidy + 25% service charge reduction	5.72	100%	57%
5. 3 Hospitals + 216 Subhealth Centers + maintenance of the drug and supply subsidy	5.39	100%	56%
6. 3 Hospitals + 216 Subhealth Centers + maintenance of the drug and supply subsidy	5.77	95%	57%
7. 50 Health Centers + 216 Subhealth Centers + removal of the drug and supply subsidy + 25% service charge reduction	5.85	100%	57%
8. 50 Health Centers + 216 Subhealth Centers + removal of the drug and supply subsidy	5.87	100%	56%
9. 216 Subhealth Centers + removal of the drug and supply subsidy + quality of care improvement	5.89	100%	58%
10. 3 Hospitals + 50 Health Centers + removal of the drug and supply subsidy + 25% service charge reduction	5.91	92%	56%

ten alternatives under the most pessimistic budgetary growth, in ordinal ranking, are presented in table 80. On the other hand, the best ten alternatives under the most optimistic budgetary growth are presented in table 81.

The long-term effect of building more hospitals, health centers, and subhealth centers is not as expensive as maintaining the subsidization of drugs and supplies, or the 25% service charge reduction, or the improvement of quality of care. Even under the most pessimistic budget, the Regency of Bogor is capable of building 3 additional hospitals, 50 additional health centers, and 216 additional subhealth centers, with 90% program coverage. This means that the Regency of Bogor could have two new hospitals with the present specifications, plus one other smaller hospital. The total new beds would be 517 instead of 575. There will be 45 additional health centers and 194 additional subhealth centers. It become affordable if the existing drug and supply subsidy is removed. The budget saved could be used for facility construction. The percentage seeking care in this scheme is 58% of all episodes of illness. If the drug and supply subsidy is not removed, a similar health care facility expansion policy could make the program coverage decline from 90% to 32%. Worse still, overall incapacitation then increases from 5.61 days per capita per year to 6.26 days.

The second choice under the most pessimistic budget is the addition of 50 new health centers and 216 subhealth

centers, also with the removal of the drug and supply subsidy. Under this alternative, program coverage is 100% and there will be budget surplus. The percentage of people seeking care is 52% of all episodes of illness and the level of incapacitation is 5.87 days per capita per year. This selection is the best in terms of program coverage. If the drug and supply subsidy is maintained, unit cost will increase followed by program reduction from 100% coverage to 38%. The percentage of people seeking care is reduced from 56% to 51% and the overall incapacitation will increase from 5.74 days to 6.28 days per capita per year.

Under the most optimistic budget, among the best selections are still the program combination where there would be the addition of three new hospitals with 575 new beds, 50 health centers and 216 subhealth centers. The drug and supply subsidy should be removed. Program coverage is 100% while the percentage of people seeking care is 59% of all episodes of illness. There will be budget surplus, but the surplus is not sufficient to maintain the present drug subsidy. If the drug and supply subsidy is maintained, then the increase in unit cost will decrease program coverage from 59% under the best selection to 56%. Incapacitation days increase from 5.50 days to 5.91 days per capita per year. This decision would cause this program combination to drop from the best to number ten of the alternatives.

The second and the third best alternatives are still dominated by the expansion of hospitals, health centers, and

subhealth centers. The second best alternative is the construction of three additional hospitals, fifty health centers, and 216 subhealth centers, with 100% program coverage and 58% of all episodes of illness seeking care. The overall incapacitation is 5.63 days per capita per year. The third best alternative is similar to the second best one, but with the inclusion of the maintenance of the drug and supply subsidy. Program coverage is 79%, and 57% of the people seek care when ill. The overall incapacitation is 5.71 days per capita per year.

It seems that the selection of the alternative with the addition of three new hospitals, 50 health centers, and 216 subhealth centers, combined with the removal of the drug and supply subsidy is the best across all budgetary levels. When the budget become larger, the government could introduce a service charge reduction, proportional with the estimated budgetary surplus. In the beginning of the development period, the government should start with subhealth center expansion first, which will make the overall incapacitation drops to 6.11 days per capita per year; then by adding hospitals, the overall incapacitation will drop further to 5.74 days per capita per year; then the addition of health centers will make the combined incapacitation drops to 5.50 days per capita per year; then finally the adoption of 25% service charge reduction policy drops the combined incapacitation to the lowest 5.47 days per capita per year.

F. Sensitivity Analysis

If the concern in health planning is to stretch the government resources as far as possible in reducing incapacitation days due to illness among the population in a regency, then it is important to examine the stability of the estimates of incapacitation across different alternatives, since they are sensitive to changes in several parameters. Briefly, we have discussed the variation of the order of preference among several alternatives due to variation in the health care development budget. Other uncertainties are:

1) that the percentage seeking care will increase by 4.78% with the addition of 50 new health centers;
2) that the days of incapacitation due to illness will decrease by 14.57% with the addition of 216 new subhealth centers; and
3) that the overall incapacitation decreases by 10.65% with the addition of 3 new hospitals.

Any changes in these parameters will be followed by changes in the estimated incapacitation days and it may change the order of preference. The relationship between one alternative and the others may be different under different program combinations. One program combination may look best under certain circumstances, but as soon as these circumstances change, the program combination is no longer

INSTRUCTIONS TO READ SENSITIVITY ANALYSIS IN TABLE 82

P.S.C. H.C. 2.39 = The effectiveness of 50 additional health centers increase percentage seeking care by 2.39%

P.S.C. H.C. 0.00 = The effectiveness of 50 additional health centers increase percentage seeking care by 0.0%

D.I.I. S.H.C. 7.29 = The effectiveness of additional 216 subhealth centers reduce incapacitation by 7.29%

D.I.I. S.H.C. 0.00 = The effectiveness of additional 216 subhealth centers reduce incapacitation by 0.0%

D.I.I. HOSPITAL 5.33 = The effectiveness of additional 3 hospitals reduce incapacitation by 5.33%

D.I.I. HOSPITAL 0.00 = The effectiveness of additional 3 hospitals reduce incapacitation by 0.0%.

INTERPRETATION OF COEFFICIENT:

Program combination 8,2 means the uses of alternative development of health care facility type 8 and health policy intervention type 2. Similarly, program combination 3,6 means the uses of uses alternative development of health care facility type 3 and health policy intervention type 6.

KEY TO CODES:

Alternative 1 = No addition of health care facility beyond the existing facility in 1980

Alternative 2 = Addition of 216 subhealth centers

Alternative 3 = Addition of 50 health centers

Alternative 4 = Addition of 50 health centers and 216 subhealth centers

Alternative 5 = Addition of 3 Hospitals

Alternative 6 = Addition of 3 Hospitals and 216 subhealth centers

Alternative 6 = Addition of 3 Hospitals and 50 health centers

Alternative 8 = Addition of 3 Hospitals, 50 health centers and 216 subhealth centers.

Intervention 1 = Maintenance of the present drug and supply subsidy

Intervention 2 = Removal of the present drug and supply subsidy

Intervention 3 = Maintenance of the present drug and supply subsidy, and improvement of the quality of care

Intervention 4 = Removal of the present drug and supply subsidy, and improvement of the quality of care

Intervention 5 = Maintenance of the present drug and supply subsidy, and 25% service charge reduction

Intervention 6 = Removal of the present drug and supply subsidy, and 25% service charge reduction

Intervention 7 = Maintenance of the present drug and supply subsidy, improvement of quality of care and 25% service charge reduction

Intervention 8 = Removal of the present drug and supply subsidy, improvement of quality of care and 25% service charge reduction

TABLE 82

SENSITIVITY ANALYSIS ON ORDER OF PREFERENCE OF THE PROGRAM COMBINATION FOR HEALTH CARE DEVELOPMENT IN BOGOR FROM 1980 - 2001
Budget Rp. 1.250. per capita

ORDINAL RANKS OF PREFERENCE	SENSITIVITY ANALYSIS ON OUTCOME OF EXPANSION										
	BASE DATA	P.S.C. H.C. 2.39	P.S.C. H.C. 0.00	D.I.I. S.H.C. 7.29	D.I.I. S.H.C. 0.00	D.I.I. HOSPITAL 5.33	D.I.I. HOSPITAL 0.00	P.S.C. H.C. 2.39 D.I.I. S.H.C. 7.29	P.S.C. H.C. 2.39 D.I.I. HOSPITAL 5.33	D.I.I. S.H.C. 7.29 D.I.I. HOSPITAL 5.33	P.S.C. H.C. 2.39 D.I.I. S.H.C. 7.29 D.I.I. HOSPITAL 5.33
1	8,2	8,2	8,2	8,2	8,2	8,2	4,2	8,2	8,2	8,2	8,2
2	6,2	6,2	6,2	6,2	7,2	4,2	8,2	6,2	4,2	4,2	4,2
3	4,2	4,2	4,2	7,2	6,2	6,2	2,6	7,2	6,2	6,2	6,2
4	7,2	2,6	2,6	4,2	5,2	2,6	6,2	4,2	2,6	7,2	7,2
5	2,6	7,2	7,2	4,6	4,2	2,2	2,2	4,6	2,2	4,6	4,6
6	2,2	2,2	2,2	5,2	8,6	4,6	4,6	5,2	4,6	2,6	2,6
7	4,6	4,6	4,6	8,6	7,6	7,2	2,4	8,6	7,2	2,2	2,2
8	6,6	6,6	6,6	6,6	8,1	8,6	4,1	6,6	8,6	8,1	8,6
9	8,6	8,6	8,6	8,1	3,2	6,6	8,6	8,1	6,6	3,2	8,1
10	8,1	6,1	6,1	2,6	3,6	2,4	2,8	2,6	2,4	6,6	6,6

Program combination 8,2 in this table and its continuation means selection of alternative health care expansion 8 combined with alternative program intervention 2.

T A B L E 82 (continued)

SENSITIVITY ANALYSIS ON ORDER OF PREFERENCE OF THE PROGRAM COMBINATION FOR HEALTH CARE DEVELOPMENT IN BOGOR FROM 1980 - 2001
Budget Rp. 1,870. per capita

ORDINAL RANKS OF PREFERENCE	SENSITIVITY ANALYSIS ON OUTCOME OF EXPANSION										
	BASE DATA	P.S.C. H.C. 2.39	P.S.C. H.C. 0.00	D.I.I. S.H.C. 7.29	D.I.I. S.H.C. 0.00	D.I.I. HOSPITAL 5.33	D.I.I. HOSPITAL 0.00	P.S.C. H.C. 2.39 D.I.I. S.H.C. 7.29	P.S.C. H.C. 2.39 D.I.I. HOSPITAL 5.33	D.I.I. S.H.C. 7.29 D.I.I. HOSPITAL 5.33	P.S.C. H.C. 2.39 D.I.I. S.H.C. 7.29 D.I.I. HOSPITAL 5.33
1	8,2	8,2	8,2	8,2	8,2	8,2	8,2	8,2	8,2	8,2	8,2
2	6,2	6,2	6,2	6,2	7,2	4,6	4,6	6,2	4,6	4,6	4,6
3	4,6	4,6	4,6	7,2	6,2	4,2	4,2	7,2	4,2	4,2	6,2
4	4,2	4,2	4,2	4,6	8,6	6,2	6,2	4,6	6,2	6,2	7,2
5	6,6	6,6	6,6	4,2	7,6	2,6	2,6	4,2	2,6	7,2	8,6
6	8,6	8,6	8,6	8,6	5,2	2,2	2,2	8,6	2,2	8,6	8,1
7	7,2	2,6	2,6	6,6	8,1	8,6	2,4	6,6	8,6	8,1	6,6
8	8,1	7,2	7,2	8,1	7,1	6,6	4,1	8,1	6,6	6,6	2,4
9	2,6	8,1	8,1	6,1	6,6	2,4	8,6	6,1	2,4	2,4	4,1
10	2,2	2,2	2,2	7,6	4,6	4,1	8,1	5,2	4,1	4,1	2,6

Program combination 8,2 in this table and its continuation means selection of alternative health care expansion 8

T A B L E 82 (continued)

SENSITIVITY ANALYSIS ON ORDER OF PREFERENCE OF THE PROGRAM COMBINATION FOR HEALTH CARE DEVELOPMENT IN BOGOR FROM 1980 - 2001
Budget Rp. 2,500. per capita

ORDINAL RANKS OF PREFERENCE	SENSITIVITY ANALYSIS ON OUTCOME OF EXPANSION										
	BASE DATA	P.S.C. H.C. 2.39	P.S.C. H.C. 0.00	D.I.I. S.H.C. 7.29	D.I.I. S.H.C. 0.00	D.I.I. HOSPITAL 5.33	D.I.I. HOSPITAL 0.00	P.S.C. H.C. 2.39 D.I.I. S.H.C. 7.29	P.S.C. H.C. 2.39 D.I.I. HOSPITAL 5.33	D.I.I. S.H.C. 7.29 D.I.I. HOSPITAL 5.33	P.S.C. H.C. 2.39 D.I.I. S.H.C. 7.29 D.I.I. HOSPITAL 5.33
1	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2
2	6.2	6.2	6.2	6.2	7.2	4.6	4.6	6.2	4.6	4.6	4.6
3	6.6	6.6	6.6	8.6	7.6	6.2	4.2	8.6	4.2	4.2	4.2
4	8.6	8.6	8.6	6.6	8.1	8.6	2.4	8.1	6.2	8.6	8.1
5	4.6	4.6	4.6	8.1	8.6	6.6	4.1	7.2	8.6	8.1	6.2
6	4.2	4.2	4.2	7.2	6.2	2.4	8.6	4.6	6.6	6.6	6.6
7	8.1	8.1	8.1	4.6	7.1	8.1	2.6	6.1	2.4	2.4	7.2
8	6.1	6.1	6.1	4.2	6.6	6.1	6.2	4.2	8.1	7.2	4.1
9	2.4	2.4	2.4	6.1	5.6	2.6	2.2	7.6	4.1	4.1	6.1
10	4.1	4.1	4.1	7.6	5.2	2.2	8.1	2.4	6.1	2.8	4.4

Program combination 8,2 in this table and its continuation means selection of alternative health care expansion 8 combined with alternative program intervention 2.

T A B L E 82 (continued)

SENSITIVITY ANALYSIS ON ORDER OF PREFERENCE OF THE PROGRAM COMBINATION FOR HEALTH CARE DEVELOPMENT IN BOGOR FROM 1980 - 2001
Budget Rp. 3,125. per capita

ORDINAL RANKS OF PREFERENCE	SENSITIVITY ANALYSIS ON OUTCOME OF EXPANSION										
	BASE DATA	P.S.C. H.C. 2.39	P.S.C. H.C. 0.00	D.I.I. S.H.C. 7.29	D.I.I. S.H.C. 0.00	D.I.I. HOSPITAL 5.33	D.I.I. HOSPITAL 0.00	P.S.C. H.C. 2.39 D.I.I. S.H.C. 7.29	P.S.C. H.C. 2.39 D.I.I. HOSPITAL 5.33	D.I.I. S.H.C. 7.29 D.I.I. HOSPITAL 5.33	P.S.C. H.C. 2.39 D.I.I. S.H.C. 7.29 O.I.I. HOSPITAL 5.33
1	8,2	8,2	8,2	8,2	8,2	8,2	8,2	8,2	8,2	8,2	8,2
2	8,6	8,6	8,6	8,6	8,6	8,6	4,6	8,6	8,6	8,6	8,6
3	8,1	6,6	6,6	8,1	7,2	8,1	4,2	8,1	4,6	8,1	8,1
4	6,6	8,1	6,2	6,6	7,6	4,6	2,4	6,6	8,1	4,6	4,6
5	6,2	6,2	8,1	6,2	8,1	4,2	4,1	6,2	4,2	4,2	4,2
6	6,1	6,1	6,1	6,1	7,1	6,6	8,6	6,1	6,6	4,1	6,6
7	4,6	4,6	4,6	7,2	6,6	2,4	8,1	7,6	6,2	2,4	2,4
8	4,2	4,6	2,4	7,6	6,2	4,1	2,8	7,2	4,1	6,2	4,1
9	2,4	2,4	4,2	4,6	6,1	6,2	4,4	4,6	6,1	6,1	6,2
10	4,1	4,1	4,1	4,2	7,4	6,1	4,5	6,4	2,8	4,4	6,1

Program combination 8,2 in this table and its continuation means selection of alternative health care expansion 8 combined with alternative program intervention 2.

T A B L E 82 (continued)

SENSITIVITY ANALYSIS ON ORDER OF PREFERENCE OF THE PROGRAM COMBINATION FOR HEALTH CARE DEVELOPMENT IN BOGOR FROM 1980 - 2001
Budget Rp. 3,750. per capita

ORDINAL RANKS OF PREFERENCE	SENSITIVITY ANALYSIS ON OUTCOME OF EXPANSION										
	BASE DATA	P.S.C. H.C. 2.39	P.S.C. H.C. 0.00	D.I.I. S.H.C. 7.29	D.I.I. S.H.C. 0.00	D.I.I. HOSPITAL 5.33	D.I.I. HOSPITAL 0.00	P.S.C. H.C. 2.39 D.I.I. S.H.C. 7.29	P.S.C. H.C. 2.39 D.I.I. HOSPITAL 5.33	D.I.I. S.H.C. 7.29 D.I.I. HOSPITAL 5.33	P.S.C. H.C. 2.39 D.I.I. S.H.C. 7.29 D.I.I. HOSPITAL 5.33
1	8,6	8,6	8,6	8,2	8,6	8,6	8,6	8,6	8,6	8,6	8,6
2	8,2	8,2	8,2	8,6	8,2	8,2	8,2	8,2	8,2	8,2	8,2
3	8,1	8,1	8,1	8,1	8,1	8,1	4,1	8,1	8,1	8,1	8,1
4	6,6	6,6	6,6	6,6	7,6	4,1	4,6	6,6	4,6	4,4	4,4
5	6,1	6,1	6,1	6,1	7,1	4,6	8,1	6,4	4,1	4,6	4,6
6	6,2	6,2	6,2	6,2	7,2	4,2	2,8	6,2	4,2	4,1	4,1
7	4,1	6,4	6,4	7,6	5,4	2,8	4,2	6,4	2,8	4,2	4,2
8	4,6	4,6	2,8	7,1	7,4	6,6	2,4	7,6	4,2	2,8	2,8
9	6,4	3,8	4,6	8,5	6,4	2,4	4,4	7,1	6,6	6,6	6,6
10	4,2	2,8	4,1	7,2	6,6	6,1	4,5	8,5	2,4	2,4	2,4

Program combination 8,2 in this table and its continuation means selection of alternative health care expansion 8 combined with alternative program intervention 2.

attractive. The crucial point in the selection from those many options is the elaborate elimination process for determining which program combination produces lower incapacitation, greater stability and higher consistency in its ordinal ranking relative to other program combinations under changing assumptions.

Sensitivity analysis uses overall incapacitation days due to illness as the criteria of determining preference. At Rp. 1,250, per capita over the next twenty-one years, sensitivity analysis indicates that the three best program combinations with local governments, under all assumptions are:

1) 3 Hospitals + 50 Health Centers + 216 Subhealth Centers + removal of the drug and supply subsidy (with only 90% program coverage);
2) 50 Health Centers + 216 Subhealth Centers + removal of the drug and supply subsidy, where the program coverage is 100%; and
3) 3 Hospitals + 50 Health Centers + removal of the drug and supply subsidy, with 100% program coverage (see table 94).

As the budgetary level increases, the best alternative is still the combination of hospitals, health centers, and subhealth centers. The second preference is the construction of health centers and subhealth centers. The third preference is the expansion of hospitals and subhealth centers. An increase in budget availability will increase

the program coverage, and reduce incapacitation. The construction of more health care facilities will produce less incapacitation days due to illness than service charge reduction, or improvement in quality of care. Policy manipulable intervention program, such as removal of the drug and supply subsidy, are less cost effective compared to the addition of more hospitals, health centers, and subhealth centers. The reason for this is the immense amount of money required to subsidize drugs and supplies in the long run, while the impact of this program is less than health care facility expansion. Therefore, its removal will not cause any harm. The budget saved from removing the drug and supply subsidy could be used to build more health care facilities. The outcome of this trade off is a higher percentage seeking care and lower incapacitation days per unit, but the overall incapacitation is lower and the overall percentage seeking care is greater. When the budget allows, gradual reduction in service charge is advisable. This course is even better than improving quality of care through the up-grading of medical equipment and improvement of the salaries of health personnel. Once service charge reduction is completely implemented, then any budgetary surpluses could be used to improve the quality of care. Re-installation of the drug subsidy should be the last priority in health care development programs.

If there is no change in the number and composition of the health care facilities in the Regency of Bogor until the

year 2001, then the expected average annual expenditure over the next twenty-one years by type of health care provider would be:

1. Self Care	Rp.	257.1 million	
2. Medicine Man	Rp.	191.7 million	
3. Subhealth Center	Rp.	521.5 million	(public)
4. Allied Medical Personnel	Rp.	555.6 million	
5. Health Center	Rp.	408.3 million	(public)
6. Hospital	Rp.	1,198.9 million	(public)
7. Private Physician	Rp.	3,697.8 million	

The average annual expenditure in all types of health care providers would be Rp. 6,829.9 million, or it would be equal to Rp. 1,764.36 per capita per year.

Public sector share of the market is Rp. 2,128.7 million, or 31.2% of the total expenditure, while the amount of the government subsidy is Rp. 518.97 million per year, which is equal to Rp. 134.07 per capita per year, or only 7.60% of the market. The net cost to the users of the service in the area is Rp. 1630.29 per capita per year. In earlier analysis, selection of alternatives was based on the lowest incapacitation days due to illness under several levels of development budget for health care allocated by the government. The maximum benefit to society from any health care development program is based on the social cost of the health care development program. In cost effectiveness analysis of various options for health care

development, the financial constraint is not only the level of government budget for health care development, but also out-of-pocket payment made by the population of the regency. Suppose the out-of-pocket payment for health care per capita per year is held constant, the government budget for health care development ranges from the pessimistic projection of Rp. 1,250 per capita over the entire planning period to Rp. 3,750 per capita, in 1980 rupiah. The assumption in the social cost effectiveness is the ability of the government to mobilize and reallocate the payment made by users of services for health care development. The ten best alternatives under the most pessimistic budget projection are presented in table 83, and the ten best alternatives under the most optimistic budget projection are presented in table 84.

Consideration of health care facility expansion based on the minimization of days of incapacitation due to illness, under certain social cost constraints, also indicates that the addition of 3 hospitals, 50 health centers, and 216 subhealth centers is still among the best alternatives for the expansion of health care facilities, both under the most pessimistic and optimistic budgetary growth. An additional 3 hospitals and 216 subhealth centers is the second best alternative, and the addition of 50 health centers and 216 subhealth centers is the third best. Expansion by adding 3 hospitals and 50 health centers without the expansion of subhealth centers is not included

TABLE 83

LISTING OF SOCIALLY MOST PREFERRED GROWTH OPTIONS UNDER THE MOST PESSIMISTIC BUDGETARY PROJECTION

ALTERNATIVE PROGRAM ADDITION	D.I.I.	ADD. COVER -AGE	P.S.C
1. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers + quality of care improvement	5.45	86%	60%
2. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers	5.47	100%	60%
3. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers + 25% service charge reduction	5.50	95%	60%
4. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers + quality of care improvement + 25% service charge reduction	5.50	82%	60%
5. 3 Hospitals + 216 Subhealth Centers + quality of care improvement	5.61	91%	59%
6. 3 Hospitals + 216 Subhealth Centers + quality of care improvement + 25% service charge reduction	5.64	87%	58%
7. 50 Health Centers + 216 Subhealth Centers + quality of care improvement	5.71	92%	59%
8. 3 Hospitals + 216 Subhealth Centers	5.72	100%	57%
9. 3 Hospitals + 216 Subhealth Centers + quality of care improvement + 25% service charge reduction	5.72	97%	57%
10. 50 Health Centers + 216 Subhealth Centers + quality of care improvement + 25% service charge reduction	5.72	89%	59%

TABLE 84

LISTING OF SOCIALLY MOST PREFERRED GROWTH OPTIONS UNDER THE MOST OPTIMISTIC BUDGETARY PROJECTION

ALTERNATIVE PROGRAM ADDITION	D.I.I.	ADD. COVER -AGE	P.S.C
1. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers + quality of care improvement	5.45	86%	60%
2. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers	5.47	100%	60%
3. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers + 25% service charge reduction	5.50	95%	60%
4. 3 Hospitals + 50 Health Centers + 216 Subhealth Centers + quality of care improvement + 25% service charge reduction	5.50	82%	60%
5. 3 Hospitals + 216 Subhealth Centers + quality of care improvement	5.61	91%	59%
6. 3 Hospitals + 216 Subhealth Centers + quality of care improvement + 25% service charge reduction	5.64	87%	58%
7. 50 Health Centers + 216 Subhealth Centers + quality of care improvement	5.71	92%	59%
8. 3 Hospitals + 216 Subhealth Centers	5.72	100%	57%
9. 3 Hospitals + 216 Subhealth Centers + quality of care improvement + 25% service charge reduction	5.72	97%	57%
10. 50 Health Centers + 216 Subhealth Centers + quality of care improvement + 25% service charge reduction	5.72	89%	59%

in the ten best alternatives, even though it is the third best facility expansion strategy from the government's point of view.

Improvement of the quality of care is the best policy intervention option under the social cost effectiveness of health care development, both under the most optimistic and pessimistic projections of the government health care development budget. The subsidy removal is not discussed here since, under the content of social cost effectiveness, the subsidy for health service has similar effect with cost reduction.

The outcome of selection between the most pessimistic and optimistic projections of the government health care development budget is exactly the same alternative. Under the social cost effectiveness, where the government is assumed to have control over "the would-be patient revenue," the government's share of the overall health care development budget becomes a very small part of the financial resources. Therefore, a minor increase due to an increasing government health care development budget does not make any marked difference.

Both from the government's and the social cost point of view, it is acceptable that expansion of the health care facilities will bring about the best outcome if there will be an additional 3 hospitals, 50 additional health centers, and 216 additional subhealth centers by the year 2001.

There are many other uncertainties that might effect

the validity of this model, including the possibility of medical breakthroughs in the health care delivery system, possible genetic mutation of the agents of diseases, and increasing environmental problems. Nor has there been any account taken of possible changes in health administration, in quality and qualification of health care personnel, in health practice behavior, and in patient behavior. There has not been any accommodation made for future economic conditions, or changes in age structure. However, the uncertainty of several measurable variables in the survey, as well as possible variations in the budget, have been tested. If all other possible changes do, indeed, occur, then there is a need to update the data base. The basic multivariate models of utilization and incapacitation that have been used to construct the product disease profile (PDP) are changing with the changing environment. Some of the present explanatory variables may not be among the best explanatory variables in a different environment.

Within the limits of the most recent survey data, the strongest alternative is the selection of health care facility expansion with 3 additional hospitals, 50 additional health centers, and 216 additional subhealth centers implemented simultaneously. The best way to make this alternative affordable, under the most pessimistic level of funding, is to remove the drug and supply subsidy from government health care facilities and use the money for facility construction. Even if the budget allows, it is

better to implement up to a 25% discount on out-of-pocket service charges rather than subsidizing the hidden cost of drugs and supplies.

Footnotes to Chapter VIII:

[1]Cole, S. and Lejeune, R. "Illness and the Legitimation of Failure," Am. Sociol. Rev. Vol. 37, 1972, pp. 347-356.

[2]Mechanics, David, "Illness Behavior, Social Adaptation and the Management of Illness," in Issues in Health Services, Stephen J. William (ed.), New York: Wiley, 1980, pp. 33-34.

[3]World Health Organization, "Constitution", in Basic Documents, 26th Edition, Geneva: World Health Organization, 1976, p. 1.

[4]Mendenhall, William, Introduction to Probability and Statistics, 5th edition, North Scituate, Mass: Duxbury Press, 1979, pp. 235-238.

[5]elasticity $\eta = (\Delta q/q):(\Delta p/p)$, therefore dq/212.83 x (325-467.64) : 467.64 = -.09196. Hence, dq = 5.97 or 2.81%, increase in seeking care with 30% reduction in service charge.

[6]Biro Pusat Statistik, Statistical Pocket Book of Indonesia, Jakarta: Biro Pusat Statistik, 1979, p. 146.

[7]By applying radius (r) = $\sqrt{(area/\pi)}$

[8]Soetopo, M.H.W., Soemana, P., "An Analysis of the Utilization of Two General Hospitals in Pasuruan Regency," Bulletin Penelitian Kesehatan, Vol. 1, No. 1, 1973, pp.

[9]Program Kesehatan Dinas Kesehatan Kotamadya Bogor 1979/1980 (Health Program of the Municipal Health Services of Bogor 1979/1980), unpaginated, (mimeograph).

[10]INPRES funds are groups of Presidential Development Funds for programs in the field of social services, among others the construction of health care facilities.

[11]Ministry of Health Republic of Indonesia, Keadaan Perkembangan Program Kesehatan, Kegiatan-kegiatan dan Sarana-sarana Kesehatan Serta Hambatan-hambatan Pelaksanaannya, (Health Programs, Activities, Health Infrastructure and Obstacles in Their Implementation),

Jakarta 1977, unpaginated, table 11.a and 11.b, (mimeograph).

[12]Petunjuk Pelaksanaan Instruksi Presiden Republik Indonesia, No. 5 tahun 1975, 17 April 1974 (Guidelines for Implementation of the Presidential Instruction of Republic Indonesia), Departemen Kesehatan RI, Jakarta 1974.

[13]Ferster, G.; Hapsara; and Tengko, Pong, "An Economic Analysis and Estimates to Finance Health Care Development in Indonesia by year 2001", Invited Paper, World Congress on Health Economics, Leyden, The Netherlands, 8-11 September 1980, p. 11.

[14]Elasticity = (mean independent variable x coefficient independent variable)/mean dependent variable

[15]Reynolds, Lloyd G., Macroeconomics: Analysis and Policy, Homewood Illinois: Irwin, 1976, pp. 106-111., where: $\Delta Y=\Delta I/(1-mpc)$

[16]Stevens, Carl M., "Health and Economic Development: Longer Run View," Soc. Sci. & Med. Vol. 11, 1977, pp. 809-817.

[17]Barlow, Robin, "The Economic Effect by Malaria Eradication," Am. Econ. Rev., Proceeding, May 1977.

SUMMARY AND CONCLUSION

The diversity of Indonesia requires the development of plans for her health care infrastructure accommodating local variation and needs. The task of specifically "tailoring" regency health planning to meet the needs of ±300 regencies is enormous, if not impossible. Therefore, the availability of a methodology for developing health plans that are appropriate and suitable for the needs of each regency becomes critical. Such a methodology could provide basic guidelines for the regencies, either completely or partially, in developing their own health plans.

In the absence of readily accessible health data for developing regency health planning, a health household survey and a survey of health facilities was organized in the Regency of Bogor, West Java, Indonesia. The survey data describes the health characteristics, health needs, health practices, seeking care behavior, health care facility utilization, cost of health care, and outcomes of subsequent treatment intervention.

Specific to the Regency of Bogor, are many factors that explain the process of seeking care when ill. Utilization of health care providers is influenced by:

1. Perception of Illness,
2. Severity of Illness,
3. Clinical Onset of Illness,
4. Duration of Illness,
5. Type of Health Care Provider,
6. Diagnosis of Illness, and
7. Level of Physical Amenities in the Household (latrine availability is used as a proxy variable).

Once treatment intervention has taken place, the outcome of treatment is measured in the number of days of incapacitation due to illness. These are influenced by:

1. Severity of Illness,
2. Diagnosis of Illness,
3. Duration of Illness,
4. Treatment Result,
5. Age Group of the Sick,
6. Type of Health Care Provider, and
7. Quality of Care Received.

These explanatory variables are screened from a list of potential explanatory variables by correlation analysis. Only variables with significant correlation to the dependent variable are included for further analysis. From the remaining candidates for the best explanatory variables, *SEARCH* analysis builds the most efficient models of utilization and incapacitation respectively. Multiple Classification is used to quantify the pure effect of these

most efficient explanatory variables on incapacitation and on utilization.

Computation of the coefficient of age-specific morbidity information and the comparison of the pure effect among different health care providers is done with the application of the quantitative relationship between utilization and incapacitation, with their respective explanatory variables.

Since not all of the policy manipulable variables are in the additive models of utilization and incapacitation, a suboptimal model using stepwise multiple regression has been developed. This suboptimal model quantifies the effect of decreasing distance from place of treatment on percentage seeking care and incapacitation days due to illness, and the effect of changing service charges on percentage seeking care and incapacitation days due to illness.

At the time of the survey, incapacitation due to illness was 6.63 days per capita per year, ranging from 2.32 days among the 15-44 year-olds to 22.92 days among the 1-4 year-olds. The number of visits per person was 1.9 times per capita per year, and the percentage of the population seeking care when ill was 47%.

Several alternatives for expansion of the health care facilities during the twenty-one-year planning period in the Regency of Bogor are:

I. Subhealth center expansion with 216 new subhealth centers, costing about Rp. 713.2 million;

II. Health center expansion with 50 new health centers, costing about Rp. 5,514. million;

III. Hospital expansion with 3 new hospitals, costing about Rp. 2,148.5 million;

or any combination of the above.

There are also several alternatives of policy intervention. Alternative policy interventions deal with the way the health care facility operates. These are:

I. Removal of the present drug and supply subsidy;

II. Reduction of the service charge by 25%;

III. No change at all;

or any combination of the above.

The cost of alternative policy interventions I through III fluctuates according to the number of cases seeking care. The number of cases seeking care and place of seeking care depends on the combination of alternatives health care facility expansion, and the combination of alternatives policy intervention chosen.

Projection of the health care development budget in the Regency of Bogor ranges from the pessimistic Rp. 1,250 per capita to the optimistic Rp. 3,750 per capita over the twenty-one-year planning period. Minimization of incapacitation days due to illness is the main concern. Under various levels of the government development budget, as the resource constraint, government cost effectiveness analysis arrives at its best solution, which

consists of:

Addition of 3 new hospitals + 50 new health centers + 216 new subhealth centers + removal of the drug and supply subsidy.

Under the most pessimistic budgetary growth, incapacitation due to illness is 5.61 days per capita per year. Percentage seeking care is 58% and program coverage is 90%. Under the most optimistic estimate of budgetary growth, incapacitation due to illness is 5.50 days per capita per year, percentage seeking care is 59% and program coverage is 100%.

Sensitivity analysis on this solution shows its stability over changes in percentage seeking care due to increasing number of health centers, and/or changes in the days of incapacitation due to illness due to increasing number of subhealth centers, and/or changes in the days of incapacitation due to illness due to an increasing number of hospitals, and/or variation in the level of government budget for health care development.

Social cost effectiveness analysis of various alternatives of health care facility expansion and alternatives of health policy intervention over the next twenty-one-year planning period produces slight difference from government cost effectiveness analysis. The best solution according to social cost effectiveness analysis is:

Addition of 3 new hospitals + 50 new health centers +

216 new subhealth centers + improvement of quality of care in all health care facilities.

Incapacitation due to illness becomes 5.45 days per capita per year, percentage seeking care is 60%, and program coverage is 86%

Variation in the government health care development budget does not make any difference under social cost effectiveness of different alternatives for health care facility expansion and alternatives for health policy intervention. This is easy to understand since the government development budget is very small relative to the social cost. The government development budget is only 7.6% of the social cost and it ranges from 3.35% to 10.13% of the social cost in the future.

Sensitivity analysis of the solution obtained from social cost effectiveness analysis shows that the best solution demonstrates stability, not only over variation in the future government budget for health care development, but also over changes in the percentage seeking care after the increase in the number of health center, and/or changes in days of incapacitation due to illness after the increase in the number of subhealth center, and/or changes in the days of incapacitation after the increase in the number of hospitals.

This research has demonstrated the potential application of population based health household survey data and health care facility study, in planning the selection of

the most desirable path for health care development in the Regency of Bogor. This development strategy is designed specifically to meet the needs, and adapted to the characteristics, of Bogor. Similar application in other regencies of Indonesia or in any other place may produce an entirely different path for health care development. Such variation is expected. In this context, a country may provide broad guidelines for health planning, while opening the channels for local governments to fine-tune their own development plans objectively, with less uncertainties, and more confidence.

APPENDICES

APPENDIX A

BIVARIATE ANALYSIS OF UTILIZATION

Each the explanatory variables of utilization of health services may have redundancy with the others. The basic bivariate analysis techniques, such as one-way analysis of variance, simple regression analysis, and contingency table analysis have been used to reveal the direction, strength and significance of the association between the utilization variable and all other explanatory variables. These relationships are presented below:

1. Clinical Onset

The association between clinical onset and utilization of the health services is the highest. The correlation in Goodman-Kruskal γ = .6588 and in Spearman's ρ = .5495. The significancy level of the association is = .000. One-way analysis of variance of utilization, across the strata of clinical onset, confirms the significance of difference among the strata, where F = 617.96 and the level of significance is = .000. The acute cases utilize the services, on the average, at $e^{.29726}$ or 1.35 times per

episode of illness, the subacute cases at $e^{.70642}$ or 2.03 times, and the chronic cases at $e^{1.228}$ or 3.41 times (see table 85).

TABLE 85

ONE-WAY ANALYSIS OF VARIANCE OF UTILIZATION ACROSS DIFFERENT STRATA OF CLINICAL ONSET

ANALYSIS OF VARIANCE:

SOURCES	D.F.	SUM OF SQR	MEAN SQR	F	p
Between	2	448.34	224.17	617.96	0.
Within	2,678	971.45	.36275		
Total	2,680	1,419.80			

Eta = .5619 Eta² = .3158 Var-Comp = .26873 %Var-Among = 42.52

Clinical Onset	Number of Cases	Mean Number of e^{Log} Utilization	Variance	Std. Dev.
Acute	1313	.29726	.23199	.48165
Subacute	516	.70642	.37498	.61236
Chronic	852	1.2280	.55695	.74629
All Cases	2681	.67178	.52977	.72785

The difference between strata mean are significant at a level of significance for rejecting the null hypotheses = .000

The chronic progression of the diseases has increased the frequency of consultations significantly. The acute cases tend to seek care for one or more consultations, but the average is only 1.35 times per episode of illness. This indicates that most cases are treated once or twice, and only some of them exceed that figure.

TABLE 86

MULTI STRATA COMPARISON OF NUMBER OF UTILIZATIONS OF THE HEALTH SERVICES

PAIRWISE STRATA	MULTIPLE COMPARISON		
	Difference	F-Statistics	Significance
Acute Subacute	-.40915	170.95	.000
Chronic	-.93069	1233.80	.000
Subacute Chronic	-.52154	240.97	.000

When the diseases have passed the acute stage of their development without cure, then patients have the tendency to bring their illness to the attention of health care providers by seeking treatment one or two more times. The average utilization among the subacute cases is 2.03 times. Even when the process has become chronic, the average utilization is still at the overall average of 3.4 consultations per episode of illness. Since the duration of illness for some chronic cases could be as long as several years, it is obvious that many episodes of chronic diseases are inappropriately attended to.

2. Duration of Illness

Utilization may vary with the duration of illness. The relationship between the natural logarithm of utilization

and the natural logarithm of duration of illness has a coefficient of correlation r^2=.589. When the utilizations are correlated by strata of clinical onset, the correlation coefficient is even weaker. The r^2_{acute} = .2413, $r^2_{subacute}$ = .0769, and $r^2_{chronic}$ = .2346. In simple regression analysis between utilization and duration of illness by strata of clinical onset, the slopes of each regression are always positive and they are slightly different. The constantly positive slopes clearly indicate the logarithmic association between utilization of the health services and duration of illness in all strata of clinical onset, since dependent and independent variables are both measured in logarithmic scale.

TABLE 87

SLOPE OF FOUR REGRESSION ANALYSES BETWEEN UTILIZATION OF THE SERVICES AND DURATION OF ILLNESS

Type of Onset	Slope	r^2	t	p	Number of Cases
Acute	.18421	.05822	24.64	0.	1310
Subacute	.20639	.00591	26.22	0.	516
Chronic	.20108	.05506	49.91	0.	852
All Cases	.20029	.34688	70.04	0.	2678

All regression lines--the acute cases, the subacute cases, the chronic cases, and the "all cases"--have insignificant intercepts. Therefore, there is no need to

include the intercepts in the regression lines. By forcing all regression lines through the origin, the regression lines become simpler. The measure of fitness among the regression lines (R^2), after they are forced through the origin, remains at the same level.

Separate regression models for acute, subacute, and chronic onset diseases do not improve the fitness of all regression models. The fitness of the regression of utilization on duration of illness is better in the model of "all cases" than in the separate models of acute or chronic cases. The regression model of the acute or chronic cases is better than the models of the subacute cases ($r^2_{\text{all cases}}=.34688 > r^2_{\text{acute}}=.05822 > r^2_{\text{chronic}}=.05506 > r^2_{\text{subacute}}=.00591$). This finding suggests that the prediction of variation in utilization of the services by the explanatory variable duration of illness, using separate regression analysis for acute, subacute, and chronic groups, does not improve the fitness of the models. Quite the contrary, use of the "all cases" models gives better fit. The $r^2_{\text{all cases}}=.34658$ indicates moderate to strong fitness in estimating utilization using duration of illness as the explanatory variable.

What we can conclude from the regression models is that patients seek care at a particular interval. When the diseases are healed, then the patient stops seeking care. If the treatment does not provide a cure, then the patients will seek care for a second time, after a reasonable time

interval. If the second treatment does not provide a cure, the patient will probably come for a third time, at a longer time interval than the time interval between the first and second consultations.

In a simple regression equation, the relationship between duration of illness and frequency of utilization can be expressed as:

$$^{e}\text{Log UTILIZATION} = .2009\,^{e}\text{Log DURATION} + \varepsilon$$

where: $r^2 = .34688$
$F_{2,2678} = 1{,}421.3$
$p < .0000$
$E(\varepsilon) = 0$

The first consultation takes place after one day of illness. The second consultation will take place at day 32. If the disease is not cured by the second consultation, then the third consultation will take place at day 241, and if the third consultation does not cure the disease, the fourth consultation will take place at day 1,014. (see table 88).

3. Type of Health Care Provider

The correlation between the type of health care provider and utilization of the health services is low. Goodman-Kruskal $\gamma = .0720$ and Spearman's $\rho = .0685$, but with high level of significancy $p = .0013$. This rather low correlation could be the result of non-random selection of

TABLE 88

THE LEAST SQUARE RELATIONSHIP BETWEEN DURATION OF ILLNESS AND FREQUENCY OF UTILIZATION OF THE HEALTH SERVICES

DURATION OF ILLNESS (in days)	FREQUENCY OF UTILIZATION OF THE HEALTH SERVICES
1.	1
31.84	2
241.07	3
1,013.77	4

cases when seeking care from health care providers. The coefficient of correlations mentioned earlier slightly indicates increasing utilization with increasing levels of sophistication of health care providers. Severe cases are more likely to be treated in subhealth centers, AMP private offices, health centers, hospitals, or physicians' private offices. Mild and moderate cases are more likely to be treated through self care. Medicine men tend to attend more moderate cases, less mild, or severe cases (see table 89).

Contingency table analysis and Chi-square test produce Chi-square = 278.06 at 12 degrees of freedom has 4,098 cases in the analysis. The contingency coefficient = .2521, an indication of moderate level association, at level of significancy $p < .001$.

The decision to seek care is also influenced by the clinical onset of the disease. Acute cases are more likely

TABLE 89

DISTRIBUTION OF PATIENT WHO SEEKS CARE BY TYPE OF HEALTH CARE PROVIDER AND CLINICAL SEVERITY OF ILLNESS

CLINICAL SEVERITY	SOURCES OF CARE						
	Self Care	Medic. Man	S.H.C.	A.M.P.	H.C.	Hospit.	Priv. Doctor
Mild							
Obs.	694	72	163	200	223	83	215
Exp.	508	126	179	245	254	121	217
row%	42.1	4.4	9.9	12.1	13.5	5.0	13.0
col%	55.0	23.0	36.7	39.2	35.3	27.6	39.9
Moderate							
Obs.	402	102	168	239	262	110	215
Exp.	461	114	162	222	231	110	197
row%	26.8	6.8	11.2	16.0	17.5	7.3	14.4
col%	31.9	32.6	37.8	39.3	41.5	36.5	39.9
Severe							
Obs.	166	139	113	169	146	108	109
Exp.	293	73	103	141	146	70	125
row%	17.5	14.6	11.9	17.8	15.4	11.4	11.5
col%	13.2	44.4	25.5	27.8	23.1	35.9	20.2

D.F. = 12; Number of Cases = 4,098; χ^2 = 278.06; Significancy = 0.000; Contingency coefficient = .2521
Obs = number of observed cases; Exp = number of expected cases)

to be treated through self care, but subacute and chronic cases are more likely to be treated by health care providers. The proportion of acute, subacute, and chronic cases are more or less the same for medicine men, subhealth centers, AMP private offices and health centers. Physicians in private practice attend more acute cases, less subacute cases, and almost the same load of chronic cases in relative proportion to other health care providers, except the hospital. The hospital has more chronic cases, and less

TABLE 90

DISTRIBUTION OF PATIENT'S TYPE OF HEALTH CARE PROVIDER AND CLINICAL ONSET OF ILLNESS

CLINICAL ONSET	SOURCES OF CARE						
	Self Care	Medic. Man	S.H.C.	A.M.P.	H.C.	Hospit.	Pr. v. Doctor
Acute							
Obs.	943	140	216	294	278	96	278
Exp.	689	172	244	334	346	164	296
row%	42.0	6.2	9.6	13.1	12.4	4.3	12.4
col%	74.3	44.3	48.1	47.7	43.6	31.7	51.0
Subacute							
Obs.	167	68	80	129	141	40	77
Exp.	216	54	76	105	108	51	93
row%	23.8	9.7	11.4	18.4	20.1	5.7	11.0
col%	13.1	21.5	17.8	20.9	22.1	13.2	14.1
Chronic							
Obs	160	108	153	193	218	167	190
Exp.	365	91	129	177	183	87	157
row%	13.5	9.1	12.9	16.2	18.3	14.0	16.0
col%	12.6	34.2	34.1	31.3	34.2	55.1	34.9

D.F. = 12 Number of Cases = 4,136 χ^2 = 397.16
significancy = 0.000 Contingency coefficient = .2960

acute and subacute cases. This occurs because of the greater proportion of inpatients in the hospital, relative to other types of health care providers (see table 90).

The contingency table analysis and Chi-square test produce Chi-square = 397.16 with 12 degrees of freedom and 4,136 cases in the analysis. The contingency coefficient = .2960, an indication of moderate association between utilization and type of onset, and the significancy level < 0.001.

Similar to the approach in tables 89 and 90, contingency table analysis and χ^2-test are employed on the

cross tabulation between diagnosis of illness and type of health care provider. The conclusion obtained is that different illnesses tend to have different types of health care providers, or, at least, there are some differences in case mix in different types of health care providers. The contingency table analysis and χ^2-test on the cross tabulation of type of health care provider and diagnosis of illness produce χ^2 = 5,240.49 with 114 degrees of freedom and 3,261 cases in the analysis. The contingency coefficient = .3710. This indicates a rather high association between diagnosis of illness and place of treatment, at level of significancy $p < .001$.

One-way analysis of variance of utilization by type of health care provider discloses the significant difference in the utilization of at least two strata. Table 91 shows the utilization of self care ($e^{.2966}$ or 1.35 times) is significantly less than the utilization of the medicine man ($e^{.6834}$ or 1.98 times), subhealth center ($e^{.6252}$ or 1.87 times), and A.M.P. private office ($e^{.6147}$ or 1.85 times), health center ($e^{.6920}$ or 2.00 times), hospital ($e^{.9758}$ or 2.65 times) or physician private office ($e^{.6652}$ or 1.94 times). Utilization of medicine men is significantly less than utilization of the hospital. Utilization of subhealth centers and A.M.P. private offices is significantly less than utilization of the hospital. Utilization of health centers is significantly less than utilization of the hospital and physicians' private offices (see table 91).

TABLE 91

ONE-WAY ANALYSIS OF VARIANCE OF UTILIZATION ACROSS DIFFERENT STRATA OF HEALTH CARE PROVIDERS

ANALYSIS OF VARIANCE:

SOURCES	D.F.	SUM OF SQR	MEAN SQR	F	p
Between	6	40.520	6.7533	13.079	.0000
Within	2,674	1,380.7	.51635		
Total	2,680	1,421.2			

Eta = .1689 Eta² = .0285 Var-Comp = .0168 %Var-Among = 3.16

SOURCE OF CARE	MULTI-STRATA COMPARISON		
	DIFFERENCE	F-Stat.	p
Self Care			
Med. man	-.38648	21.024	.0000
S.H.C.	-.32828	16.779	.0000
A.M.P.	-.31773	16.561	.0000
H.C.	-.39508	25.848	.0000
Hospital	-.67884	64.037	.0000
Physician	-.36826	21.937	.0000
Med. man			
S.H.C.	.05820	1.0584	.3037
A.M.P.	.06875	1.6453	.1997
H.C.	-.00860	.02625	.8713
Hospital	-.29236	21.509	.0000
Physician	.01822	.11222	.7377
S.H.C.			
A.M.P.	.01055	.05082	.8217
H.C.	-.06680	2.0905	.1483
Hospital	-.35056	37.328	.0000
Physician	-.03998	.70163	.4023
A.M.P.			
H.C.	-.07735	3.3109	.0689
Hospital	-.36112	43.983	.0000
Physician	-.05053	1.3091	.2527
H.C.			
Hospital	-.28376	27.689	.0000
Physician	.02682	.37994	.5377
Hospital			
Physician	.31059	31.614	.0000

All utilization scales are in natural logarithm.

In general, we may conclude that the intensity of utilization of self care is less than the utilization of any

other health care provider per episode of illness. On the other hand, utilization of the hospital per episode of illness is significantly greater than utilization of any other type of health care delivery. Medicine men, subhealth centers, A.M.P., health centers and physicians' private offices are utilized at approximately the same intensity.

4. Diagnoses of Illness

As has been mentioned earlier, the diagnosis of illness has a weak association with utilization and type of health care sought. Using SEARCH analysis it has been found that diagnosis of illness has a weak explanatory power (2.14%) in explaining the variation of utilization if several explanatory variables are used simultaneously. The reason for the weakening of the explanatory power of diagnosis of illness is the fact that a certain proportion of the variation in utilization is jointly explained by the diagnosis of illness with several other variables.

One-way analysis of variance, however, is able to indicate the overall explanatory power of the diagnosis of illness. There is a difference in the utilization, at least between two diagnoses. In fact, using one-way analysis of variance, the diagnosis of illness can explain 26.52% of the variation in utilization (see table 92).

The difference between the explanatory power of SEARCH (2.14%) and the explanatory power of ANOVA (26.52%) is

TABLE 92

ONE-WAY ANALYSIS OF VARIANCE OF UTILIZATION ACROSS DIFFERENT STRATA OF DIAGNOSIS OF ILLNESS

ANALYSIS OF VARIANCE:

SOURCES	D.F.	SUM OF SQR	MEAN SQR	F	p
Between	19	266.33	14.017	35.415	.000
Within	2,042	808.23	.39580		
Total	2,061	1,074.6			

Eta = .4978 Eta² = .2478 Var-Comp = .14282
%Var-Among = 26.52

DIAGNOSIS OF ILLNESS	Number of Cases	(natural logarithm) Mean	Std. Dev.
Typhoid Fever	36	.80633	.75229
Dysentery	46	.42051	.53664
Enteritis	102	.51488	.61284
Respiratory Tuberculosis	208	1.3409	.81547
Malaria	55	.67396	.65559
Avitaminosis	33	.78988	.76752
Anemia	46	.83870	.68855
Eye Infection	71	.50844	.68444
Cataract	15	.49721	.80448
Ear & Mastoid	32	.39638	.52571
Heart & Vascular	78	1.2248	.72975
Hypertension	90	1.0305	.77283
U.R.I.	148	.24297	.45197
Flu/Common Cold	588	.28296	.46181
Pneumonia	16	.58449	.62534
Bronchitis/Asthma/Emph	198	.83948	.74847
Peptic Ulcer	58	.79153	.59679
Dermatitis	105	.43680	.56715
Dermatosis	87	.53604	.67852
Accident	50	.76593	.74379
All Cases	2062	.62107	.72206

occurring due to the elimination of redundant explanatory power by SEARCH analysis. In one-way analysis of variance, there is only one explanatory variable. Therefore, all variation is explained by only one variable. In comparing

utilization of health services across different types of diagnoses, the influence of other explanatory variables should be taken into account and controlled.

5. Latrine Availability and Its Type

Latrine availability and its type serves as a proxy variable in explaining the utilization of health services. Latrine availability has a moderate degree of correlation with variables representing physical amenities in the household such as the quality of drinking water, the physical condition of the drinking water, the general impression about the quality of housing, and the household space. Latrine availability also has a moderate degree of correlation with the regular sources of treatment when ill, which represents positive household attitudes toward modern health services (see table 93).

Therefore, the importance of the variable of latrine availability and type, in explaining the variation in utilization of the health services, actually represents the importance of the physical amenities and regular sources of health service.

Latrine availability, however, has weak correlations with education and occupation of the head of the household, and the estimated value of the family assets.

One-way analysis of variance of health service utilization by strata of latrine availability and type

TABLE 93

TABLE OF CORRELATION ANALYSIS BETWEEN LATRINE AVAILABILITY AND TYPES WITH VARIABLES OF HOUSEHOLD AMENITIES AND A REGULAR HEALTH CARE SOURCE

(Latrine code: 1=n.a./pollute the water; 2=n.a./bush; 3=n.a./buried; 4=n.a./public 5=n.a./neighborhood; 6=available/pit; 7=available/septic tank)

VARIABLE NAME	Number of Cases	G-K γ	Spearman's ρ	p
Household space (in M^2)	4,058	.1040	.1004	.0000
House building physical impression	4,058	.2152	.1568	.0000
Drinking water quality	2,770	.1952	.1457	.0000
Drinking water physical condition	2,770	.4119	.2693	.0000
Distance between: latrine - water source	2,770	.4588	.3041	.0000
Regular source of treatment when ill	4,058	.2164	.1795	.0000

reveals the difference in the utilization of the health services, at least between two strata. The intensity of the utilization across strata is as follows (see table 94).

1. If members of the household defecate in the stream, sewer canal, river, pond, or any means that will pollute the water, the average utilization of health services among the members of that household per episode of illness is e'''' or 1.95 times.
2. If members of the household defecate in the bush, then

the average number of utilizations of the health services is $e^{.91128}$ or 2.49 times per episode of illness.

3. If members of the household defecate in the neighborhood latrine, the average utilization of the health services is $e^{.60684}$ or 1.83 times per episode of illness.
4. If members of the household defecate in their own pit latrine, the average utilization of the health services is $e^{1.00062}$ or 2.74 times per episode of illness.
5. If members of the household defecate in their own water-sealed latrine, equipped with septic tank, the average utilization of the health services is $e^{.77028}$ or 2.16 times per episode of illness.

Table 94 reveals that improvement in the quality of latrine does not always reflect an increase in utilization of health services. Availability of the latrine represents not only the availability of physical amenities and regular access to health care services, but is also the product of complex phenomena. The availability of the latrine in the household explains 2.85% of the variation in utilization of the health services. When combined simultaneously with other predictor variables, such as in SEARCH analysis, the availability and type of latrine explains only .63% of all variation (see table 37 and figure 8).

Tests of significance of difference among the mean

TABLE 94

ONE-WAY ANALYSIS OF VARIANCE OF UTILIZATION OF HEALTH SERVICES ACROSS DIFFERENT STRATA OF LATRINE AVAILABILITY AND TYPE
(There are 1,860 valid cases in the analysis)

ANALYSIS OF VARIANCE:

SOURCES	D.F.	SUM OF SQR	MEAN SQR	F	p
Between	6	29.061	4.8436	9.0484	0.
Within	1,853	991.90	.53529		
Total	1,859	1,021.00			

Eta = .1687 Eta² = .0285 Var-Comp = .02431
%Var-Among = 4.35

LATRINE Availability/Type	Number of Cases	(natural logarithm) Mean	Std. Dev
No/Pollute water	1,155	.66600	.70614
No/Bush	337	.91128	.77371
No/Buried	43	.76018	.78626
No/Public	18	.48375	.62112
No/Neighborhood	69	.60684	.75955
Yes/Pit latrine	146	1.0062	.76741
Yes/Septic tank	92	.77028	.79966

All scales are in natural logarithm

values of health service utilization, across strata of latrine availability and type, only concludes significant difference among several pairs.

Intensity of utilization of the health services, per episode of illness among those who defecate by polluting the water, is significantly greater than those who defecate in the bush or in their own pit latrine. The intensity of the

TABLE 95

TEST OF SIGNIFICANT DIFFERENCE IN UTILIZATION OF THE HEALTH SERVICES ACROSS DIFFERENT STRATA OF LATRINE AVAILABILITY AND TYPE
(There are 1,860 valid cases in the analysis)

PAIRWISE STRATA	MULTI-STRATA COMPARISON		
	DIFFERENCE	F	p
Pollute water			
Bush	-.24527	29.319	.0000
Buried	-.09418	.68695	.4073
Public	.18225	1.0998	.2944
Neighborhood	.05916	.42569	.5142
Pit latrine	-.34017	28.020	.0000
Septic tank	-.10428	1.7310	.1884
Bush			
Buried	.15109	1.6264	.2024
Public	.42753	5.8346	.0158
Neighborhood	.30443	9.9162	.0017
Pit latrine	-.09490	1.7139	.1906
Septic tank	.14100	2.6840	.1015
Buried			
Public	27643	1.8113	.1785
Neighborhood	.15334	1.1636	.2809
Pit latrine	-.24599	3.7551	.0528
Septic tank	-.01010	.00558	.9405
Public			
Neighborhood	-.12309	.40409	.5251
Pit latrine	-.52243	8.1704	.0043
Septic tank	-.28653	2.3090	.1288
Neighborhood			
Pit latrine	-.39933	13.959	.0002
Septic tank	-.16344	1.9675	.1609
Pit Latrine			
Septic tank	.23590	5.8670	.0155

The scales of difference are in natural logarithm.

utilization of the health services, per episode of illness among those who defecate in the bush, is significantly greater than those who use the public or neighborhood latrine. Those who buried their feces after defecation have significantly lower intensity of utilization of the health

services per episode of illness than those who defecate in a pit in their own houses. Those who use a public latrine have a significantly lower intensity of utilization of the health services per episode of illness than those who use their own household pit latrine. Those who use the neighborhood latrine have a significantly higher intensity of utilization of the health services per episode of illness than those who use their own pit latrine. Those who use their own pit latrine have a significantly higher intensity of utilization of the health services per episode of illness than those who use their own household septic tank (see table 95).

It is clear, that the relationship between availability of latrine and utilization of health services per episode of illness is not simple, but very complex.

APPENDIX B

BIVARIATE ANALYSIS OF INCAPACITATION

The explanatory variables of incapacitation days due to illness may have redundancy among themselves. The basic bivariate techniques, such as one-way analysis of variance, and regression analysis, have been used to reveal the direction, strength and significance of the association between incapacitation variable and all its explanatory variables. Their relationships are presented below.

1. Severity of Illness

The coefficient of correlation between the severity of illness and incapacitation days due to illness is the highest, with the Goodman-Kruskal γ = .6747, Spearman's ρ = .5093, and the level of significancy of these correlation coefficients = .0000. One-way analysis of variance of incapacitation across different strata of severity of illness confirms the significance of difference in at least two strata of severity, with $F_{2,5751}$= 1,051.9 and level of significancy = .0000.

On the average, mild cases are incapacitated for

TABLE 96

ONE-WAY ANALYSIS OF VARIANCE OF INCAPACITATION ACROSS DIFFERENT STRATA OF SEVERITY OF ILLNESS

ANALYSIS OF VARIANCE:

SOURCES	D.F.	SUM OF SQR	MEAN SQR	F	p
Between	2	3,806.9	1,903.5	1,051.9	0.
Within	5,751	10,407.	1.8096		
Total	5,753	14,214.			

Eta = .5175 Eta² = .2678 Var-Comp = 1.0332
%Var-Among = 36.34

Severity of Illness	Number of Cases	Mean of $e^{\text{Log of Incapacitation}}$	Variance	Std. Dev.
Mild	2,477	.21091	.46950	.68520
Moderate	2,098	.83349	1.7881	1.3110
Severe	1,179	2.3915	4.7881	2.1882
All Cases	5,754	.88472	2.4707	1.5718

The difference between strata means are significant at a level of significance for rejecting the null hypotheses = .000

$e^{.6852}$ or 1.98 days; moderate cases for $e^{1.3110}$ or 3.71 days; and severe cases for $e^{2.1882}$ or 8.92 days per episode of illness (see table 96).

In line with increasing severity of illness, incapacitation days increase substantially. On the average, mild cases are only incapacitated for 1.98 days per episode of illness; moderate cases for 3.71 days; and severe cases for 8.92 days. The difference across strata of severity of illness is very meaningful since the strength of the correlation between incapacitation and severity is moderate

at eta² = .2678.

Multi-strata comparison among the strata of severity of illness confirms that the difference across strata is statistically significant (see table 97).

TABLE 97

MULTI-STRATA COMPARISON OF INCAPACITATION DAYS ACROSS STRATA OF SEVERITY OF ILLNESS

PAIRWISE STRATA	MULTIPLE COMPARISON		
	Difference	F	p
Mild Moderate	-.66258	243.31	.0000
Severe	-2.1806	2,009.0	.0000
Moderate Severe	-1.5580	1,012.5	.0000

2. Duration of Illness

Duration of illness is the second most important explanatory variable of incapacitation days. In expressing the bivariate relationship between duration of illness and incapacitation days, Simple Regression is used. The coefficient of correlation between incapacitation days and duration of illness is $r^2 = .3347$ and level of significancy is <.01.

The general model of incapacitation days with duration of illness as the independent variable is shown in table 98.

TABLE 98

THE LEAST SQUARE REGRESSION OF NATURAL LOG OF INCAPACITATION DAYS DUE TO ILLNESS ON NATURAL LOG OF DURATION OF ILLNESS

ANALYSIS OF VARIANCE:

SOURCES	D.F.	SUM OF SQR	MEAN SQR	F	p
Regression	1	1,070.1	1,070.1	464.96	0.
Error	5,798	13,334.	2.3014		
Total	5,799	14,414.			

Multiple-r = .27247 r^2 = .0742 S.E.= 1.5170

VARIABLE	Partial R	Regression Coefficient	Std. Error	t	p
Constant		.27599	.03475	7.9425	.0000
Duration	.27247	.20355	.09440	21.562	.0000

The linear model does not provide a good fit in this case, since the r^2 = .0742, which means that the duration of illness only explains 7.42% of all variation in incapacitation. The regression slope of duration is = .20355, which means incapacitation days will be longer if the disease onset progresses to chronicity. The intercept = .27599, which is equal to 1.32 days, indicates the presence of incapacitation once a sick person perceives his illness.

The scatter-gram of the residual of incapacitation days on duration of illness indicates heteroscedasticity. Therefore, the explanation of incapacitation days in linear regression, without further treatment, is not very useful. Apart from the direction of the slope of the least square line, other conclusions are very weak. In order to produce a good fit, the variation of

incapacitation should be explained simultaneously by duration of illness and other explanatory variables. Only among the severe cases does the least square regression of incapacitation days on duration of illness indicate greater fit, but still weak with $r^2 = .16231$. The results of the regression are presented in table 99.

TABLE 99

THE LEAST SQUARE REGRESSION OF NATURAL LOG OF INCAPACITATION DAYS DUE TO ILLNESS ON NATURAL LOG OF DURATION OF ILLNESS AMONG SEVERE CASES

ANALYSIS OF VARIANCE:

SOURCES	D.F.	SUM OF SQR	MEAN SQR	F	p
Regression	1	909.40	909.40	227.28	.0000
Error	1,173	4,693.4	4.0012		
Total	1,174	5,602.8			

Multiple-r = .40288 r^2 = .16231 S.E.= 2.0003

VARIABLE	Partial R	Regression Coefficient	Std. Error	t	p
Constant		.77555	.12218	6.3478	.0000
Duration	.40288	.40646	.02696	15.076	.0000

The scatter-gram of the residual of incapacitation days on duration of illness among these severe cases shows heteroscedasticity. The fitness of the model will be very much improved if the transformation of the dependent variable of incapacitation days, is made to control the effect of heteroscedasticity, which makes the model not easy to handle from the practical point of view, though mathematically conceivable. One thing that should be kept in

mind is the fact that the linear model has better precision in explaining variation of incapacitation days with duration of illness as an independent variable and only severe cases to compare.

The linear model of these severe cases is:

$$^{e}\text{Log INCAPACITATION} = .77555 + .40646\,^{e}\text{Log DURATION} + \varepsilon$$

where; $r^2 = .16231$
$F_{2,1173} = 227.28$
$p < .0001$
$E(\varepsilon) = 0$

According to this linear model, every severe case has at least 2.17 days of incapacitation. If the duration of illness is 8 days, then the projected incapacitation is 5.06 days. If the duration of illness is 20 days, then the incapacitation is 7.34 days (see table 100).

TABLE 100

THE LEAST SQUARE LINE RELATIONSHIP BETWEEN INCAPACITATION DAYS DUE TO ILLNESS AND DURATION OF ILLNESS AMONG SEVERE CASES

DURATION OF ILLNESS	INCAPACITATION DAYS DUE TO ILLNESS	DURATION OF ILLNESS	INCAPACITATION DAYS DUE TO ILLNESS
1 day	2.17 days	25 days	8.04 days
2 days	2.88 days	50 days	10.65 days
3 days	3.39 days	100 days	14.12 days
4 days	3.82 days	200 days	18.17 days
5 days	4.18 days	400 days	24.80 days
10 days	5.54 days	700 days	31.13 days
15 days	6.53 days	997 days	35.95 days

The scatter gram of the residual shows non-constant variance (heteroscedasticity). Therefore, the interpretation of incapacitation days in this model should be limited to cases with the value of the dependent variable of duration of illness closer to the mean. The range of duration of illness with 90% confidence interval is $e^{3.0172+1.96X_{2.1107}}$ or from 2.58 days to 161.69 days.

3. Quality of Care

Quality of care in different types of health care providers is rescaled into five levels of the ordinal scale. The interval-scaled quality of care is recoded: 0-1 = ONE, >1-2 = TWO, >3-5 = THREE, -6 = FOUR, -7=FIVE. The correlation between rescaled quality of care and incapacitation days produces Goodman-Kruskall γ = .2161, Spearman's ρ = .1368; the level of significancy of these two coefficients of correlation is = .0000.

In ordinal ranking of importance, based on the correlation ratio (beta) in SEARCH analysis, the variable of quality of care is the third most important explanatory variable of incapacitation days. One-way analysis of variance of incapacitation days by strata of quality of care indicates significant difference in incapacitation days between at least two strata of quality of care, as presented in table 101.

One-way analysis of variance of incapacitation days by

TABLE 101

ONE-WAY ANALYSIS OF VARIANCE OF NATURAL LOG OF INCAPACITATION DAYS ACROSS DIFFERENT STRATA OF QUALITY OF CARE

ANALYSIS OF VARIANCE:

SOURCES	D.F.	SUM OF SQR	MEAN SQR	F	p
Between	4	525.14	131.28	54.689	.0000
Within	5,806	13,938.	2.4006		
Total	5,810	14,463.			

Eta = .1906 Eta² = .0365 Var-Comp = .11607 %Var-Among = 4.61

QUALITY	NUMBER	MEAN	VARIANCE	STD. DEV
ONE	1,667	.51418	1.5973	1.2638
TWO	326	.86120	2.8855	1.6987
THREE	1,128	.85735	2.1450	1.4646
FOUR	1,044	1.4027	4.4864	2.1181
FIVE	1,636	.97688	1.9731	1.4047
ALL	5,811	.89016	2.4893	1.5778

QUALITY OF CARE	MULTI-STRATA COMPARISON		
	DIFFERENCE	F	p
One		13.692	
Two	-.34702	33.084	.0002
Three	-.34317	211.62	.0000
Four	-.88855	73.854	.0000
Five	-.46270		.0000
Two			
Three	.00385	.00156	.9685
Four	-.54153	30.348	.0000
Five	-.11568	1.5153	.2184
Three			
Four	-.54538	67.179	.0000
Five	-.11953	3.9735	.0463
Four			
Five	.42585	48.145	.0000

All incapacitation scales are in natural logarithm.

strata of quality of care only explains 3.63% of the variation of incapacitation, and the incapacitation days can be regrouped into three significant groups. The lowest

incapacitation days due to illness is found among the cases which have received treatment with the lowest quality of care (level ONE), where the incapacitation days is = $e^{.51418}$ or 1.67 days. The middle group consists of cases which have received treatment with a quality of care rating of class TWO with incapacitation equal to $e^{.86112}$ or 2.37 days, class THREE with incapacitation equal to $e^{.85753}$ or 2.36 days, and class FIVE with incapacitation equal to $e^{.97688}$ or 2.66 days. The highest incapacitation days is within the group which has received treatment with quality of care level FOUR, where incapacitation is equal to $e^{1.40327}$ or 4.07 days.

The positive coefficient of correlation and higher incapacitation days within the group with higher quality of care reveals that the users of health care services select more sophisticated types of care when they have contracted a disease with higher virulence. Users seem to be aware about which type of care is appropriate for a particular condition. The $eta^2 = .0363$ indicates low fitness of the one-way analysis of variance model when quality of care is the only explanatory variable. Therefore, quality of care should be used simultaneously with other explanatory variables.

4. Type of Health Care Provider

The fourth most important explanatory variable of incapacitation days produced by SEARCH analysis is the

variable of "Type of Health Care Provider." The correlation between the type of health care provider and incapacitation days is low. Goodman-Kruskal γ is = .0714, Spearman's ρ = .0621 and the level of significancy is = .0003. The positive coefficient of correlation indicates a tendency for increasing incapacitation days among patients treated by a more sophisticated health care providers. This does not mean that the patients are worse off if they are treated by more capable medical personnel in a more sophisticated facility, but it is, rather, the result of the non-random selection of patients at any type of health care facility. As has been mentioned earlier, it is the patients who make the decision to select the type of treatment they need. For instance, in what type of facility do they want their treatment, and attended by what type of health care personnel? Patients with severe diseases tend to use a more sophisticated facility, while patients with mild diseases are willing to settle down with self care or other less sophisticated medical intervention.

One-way analysis of variance of incapacitation days due to illness by type of health care provider discloses the significance of difference across different strata of health care providers, at least between two strata. Table 59 shows that incapacitation days in self care is the lowest; on the average, it is equal to $e^{.61158}$ or 1.84 days. Incapacitation days among cases who receive treatment at the medicine man is the highest; on the average, it is equal to

TABLE 102

ONE-WAY ANALYSIS OF VARIANCE OF NATURAL LOG OF INCAPACITATION DAYS ACROSS DIFFERENT STRATA OF HEALTH CARE PROVIDERS

ANALYSIS OF VARIANCE:

SOURCE	D.F.	SUM OF SQR	MEAN SQR	F	p
Between	6	500.69	83.448	31.563	.0000
Within	4,129	10,916.	2.6438		
Total	4,135	11,417.			

Eta = .0294 Eta² = .0439 Var-Comp = .14304 %Var-Among = 5.13

PROVIDER	NUMBER	MEAN	VARIANCE	STD. DEV
SELF	1,270	.61158	1.0649	1.0319
MED. MAN	317	1.6791	4.3950	2.0964
S.H.C.	448	1.1112	2.9054	1.7045
A.M.P.	616	1.3013	3.1745	1.7817
H.C.	637	1.0664	2.8028	1.6742
HOSPITAL	303	1.5891	4.8998	2.2135
PHYSICIAN	545	.97993	3.0567	1.7483
ALL	4,136	1.0404	3.0567	1.7483

TYPE OF HEALTH CARE PROVIDER	MULTI-STRATA COMPARISON		
	DIFFERENCE	F	p
Self care			
Med. man	-1.0675	109.35	.0000
S.H.C.	-.49963	31.270	.0000
A.M.P.	-.68975	74.644	.0000
H.C.	-.45480	33.190	.0000
Hospital	-.97750	88.412	.0000
Physician	-.36835	19.571	.0000
Med. man			
S.H.C.	.56791	22.647	.0000
A.M.P.	.37779	11.299	.0000
H.C.	.61274	30.059	.0000
Hospital	.09005	.47517	.4907
Physician	.69919	37.060	.0000
S.H.C.			
A.M.P.			
S.H.C.	-.19012	3.5461	.0598
H.C.	.04483	.19993	.6548
Hospital	-.47786	15.612	.0001
Physician	.13128	1.6028	.2056

All incapacitation scales are in natural logarithm.

e'''''' or 5.36 days, or about the same as the

TABLE 102 (continued)

TYPE OF HEALTH CARE PROVIDER	MULTI-STRATA COMPARISON		
	DIFFERENCE	F	p
A.M.P.	.23495		
H.C.	-.28774	6.5387	.0106
Hospital	.32140	6.3603	.0117
Physician		11.298	.0008
H.C.			
Hospital	-.52269	21.218	.0000
Physician	.08645	.83026	.3622
Hospital			
Physician	.60914	27.331	.0000

All incapacitation scales are in natural logarithm.

incapacitation days among those who receive treatment at the hospital ($e^{1.5890}$ or 4.90 days). The incapacitation days between those who seek care at the hospital and those who receive care at the medicine man does not have significant difference.

Incapacitation days in subhealth centers, health centers, and physicians' private offices are approximately the same, and the differences among them are not significant. The incapacitation in subhealth centers is equal to $e^{1.1112}$ or 3.04 days, in health centers is equal to $e^{1.0664}$ or 2.90 days, and in physicians' private offices is equal to $e^{.9793}$ or 2.66 days. The cases treated at subhealth centers, health centers, and physicians' private offices are mostly outpatient cases and the severity of their illness is probably about the same.

Incapacitation days among cases who receive treatment at A.M.P.'s private offices is somewhere between the level of incapacitation days among those who receive treatment at subhealth centers - health centers - physicians' private offices, and medicine man - hospital. Incapacitation days among the users of A.M.P.'s private offices is $e^{1.3013}$ or 3.67 days.

Regrouping of health care providers based on the level of incapacitation found among cases who seek care from them, from low to high, forms four groups:

1) Self care,
2) Subhealth center - health center - physician's private office,
3) A.M.P. private office, and
4) medicine man - hospital.

Eta^2 = .0439 means that 4.39% of the variation of incapacitation days is explained by the type of health care provider.

5. Age Group of the Sick

The fifth most important explanatory variable of incapacitation days due to illness is the age group of the sick. Correlation analysis of age group of the sick and incapacitation days due to illness, in Spearman's ρ is =.0885, and in Goodman-Kruskal γ is = .1159. The level of significancy for these two coefficients is = .0000. Such

small positive correlation coefficients indicate increasing incapacitation days due to illness with increasing age of the sick.

Relation between incapacitation days due to illness and age group, in one-way analysis of variance, shows that there is a significant difference in incapacitation days between at least two age groups (see table 103).

Incapacitation days due to illness among different strata of age groups is significantly different, at least between two strata, where the level of significancy is = .0000, and the percentage variation of incapacitation days explained by the age group is 3.19% (eta^2 = .0319). Surprisingly enough, the incapacitation days among small children (age 1-4 years) is the lowest with incapacitation equal to $e^{.53926}$ or 1.71 days. The next lowest is the incapacitation days among infant (age 0-1 year) which is equal to $e^{.62669}$ or 1.87 days. The third lowest incapacitation days is among big children (age 5-14 years) which is equal to $e^{.68891}$ or 1.99 days. The incapacitation days between small children and infants is not significantly different ($F_{2,580}$=.64890 and significancy = .4205); between infant and big children age 5-14 years old is also not significant ($F_{2,580}$= .32804 and significancy = .5668). The difference in incapacitation days between small children age 1-4 years old and big children age 5-14 years old, however, is significantly different ($F_{2,580}$= 4.7243 and significancy =.0298). The incapacitation days among adults (age 15-44

TABLE 103

ONE-WAY ANALYSIS OF VARIANCE OF INCAPACITATION DAYS ACROSS DIFFERENT STRATA OF AGE GROUP

ANALYSIS OF VARIANCE:

SOURCE	D.F.	SUM OF SQR	MEAN SQR	F	p
Between	4	460.95	115.24	47.785	.0000
Within	5,806	14,002.	2.4116		
Total	5,810	14,463.			

Eta = .1785 Eta² = .0319 Var-Comp = .10325 %Var-Among = 4.11

AGE GROUP	NUMBER	MEAN	VARIANCE	STD. DEV
- 1 YR	256	.69669	1.2155	1.1025
1 - 4 YRS	1,022	.53926	1.0932	1.0456
5 - 14 YRS	1,013	.68891	1.1335	1.0647
15 - 44 YRS	1,895	.86951	2.1409	1.4632
≥ 45 YRS	1,625	1.3019	4.5404	2.1308
ALL	5,811	.89016	2.4893	1.5778

AGE GROUP	MULTI-STRATA COMPARISON		
	DIFFERENCE	F	p
0 - 1 yr			
1 - 4yrs	.08743	.64890	.4205
5 - 14 yrs	-.06222	.32804	.5668
15 - 44 yrs	-.24282	5.5139	.0189
≥ 45 yrs	-.67522	41.811	.0000
1 - 4 yrs			
5 - 14 yrs	-.14965	4.7243	.0298
15 - 44 yrs	-.33025	30.026	.0000
≥ 45 yrs	-.76265	151.32	.0000
5 - 14 yrs			
15 - 44 yrs	-18060	8.9278	.0028
≥ 45yrs	-.61301	97.232	.0000
15 -44 yrs			
≥ 45yrs	-.43241	67.826	.0000

All incapacitation scales are in natural logarithm.

years old) and old people (age ≥ 45 years old) are distinct from each other and from the other three age groups. Incapacitation among the adults is equal to $e^{.86951}$ or 2.3 days and among the old people is equal to $e^{1.3019}$ or

3.68 days (see table 103).

6. Treatment Result

As has been mentioned in the description of the variable, treatment result has been divided into six ordinal levels:

1. *Death*
2. *Permanent Impairment*
3. *Worse*
4. *More or Less the Same*
5. *Better*
6. *Complete Cure*

The variable of treatment result has a positive correlation with incapacitation days due to illness, where the Goodman-Kruskal γ = .0320 and Spearman's ρ = .0203, and the level of significancy = .1988. This means incapacitation days are fewer among the cases which have been terminated by death. *SEARCH* analysis indicates that treatment result is the sixth best explanatory variable of incapacitation days.

One-way analysis of variation of incapacitation days by strata of treatment result is presented in table 104.

Incapacitation among the cases terminated by death is = $e^{2.3203}$ or 10.18 days, by permanent impairment is $e^{4.7896}$ or 120.25 days, by worse condition is $e^{3.1830}$ or 24.12 days, by more or less the same condition is = $e^{1.3366}$ or 3.81

TABLE 104

ONE-WAY ANALYSIS OF VARIANCE OF INCAPACITATION DAYS
ACROSS DIFFERENT STRATA OF TREATMENT RESULT

ANALYSIS OF VARIANCE:

SOURCE	D.F.	SUM OF SQR	MEAN SQR	F	p
Between	5	651.51	130.30	49.896	.0000
Within	4,116	10,749.	2.6115		
Total	5,810	11,400.			

Eta = .2391 Eta² = .0571 Var-Comp = .23791 %Var-Among = 8.

RESULT	NUMBER	MEAN	VARIANCE	STD. DEV
DEATH	4	2.3203	1.9726	1.4045
HANDICAP	18	4.7896	6.5194	2.5533
WORSE	47	3.1830	6.9675	2.6396
THE SAME	976	1.3366	4.6282	2.1513
BETTER	1,885	.82329	2.2013	1.4837
CURED	1,192	1.0025	1.3870	1.1777
ALL	4,122	1.0423	2.7664	1.6633

TREATMENT RESULT	MULTI-STRATA COMPARISON		
	DIFFERENCE	F	p
Death			
Handicap	-2.4693	7.6411	.0057
Worse	-.86263	1.0504	.3055
Same	.98373	1.4762	.2244
Better	1.4971	3.4255	.0643
Cured	1.3178	2.6511	.1036
Handicap			
Worse	1.6066	12.865	.0003
Same	3.4530	80.694	.0000
Better	3.9663	107.41	.0000
Cured	3.7871	97.383	.0000
Worse			
Same	1.8464	58.535	.0000
Better	2.3597	97.774	.0000
Cured	2.1804	82.320	.0000
Same			
Better	.51333	64.885	.0000
Cured	.33408	22.934	.0000
Better			
Cured	-.17925	8.9843	.0027

All incapacitation scales are in natural logarithm.

days, by better condition after treatment is = $e^{.82329}$ or 2.28 days, and by complete cure is $e^{1.00025}$ or 2.73 days. There are four cases which have been terminated by death. The average incapacitation among them is 10.18 days. This figure is not significantly different from incapacitation among cases who become worse, or are the same or cured after treatment (significancy level >0.1). This conclusion is not very convincing since only four cases of death are found after treatment. Among the death cases alone, it seems that death occurred after an acute onset illness. The incapacitation among other categories of outcome is significantly different from each other, with the most incapacitating illness suffered by 18 cases terminated as permanent impairment.

7. Diagnosis of Illness

Diagnosis of illness is the seventh most important explanatory variable of incapacitation days due to illness. It is also the last explanatory variable selected by the SEARCH analysis. Bivariate analysis using one-way analysis of variance of incapacitation days, by strata of diagnosis of illness, produces $eta^2 = .1058$, which is greater than the product of other variables such as type of health care provider ($eta^2 = .0439$), outcome of treatment ($eta^2 = .0571$), quality of care ($eta^2 = .0363$), and age group ($eta^2 = .0319$). It is also greater than the measure

of fitness of the regression line of incapacitation days on duration of illness (r^2 = SSR/SST = .07424), but less than the severity of illness (eta^2 = .2678) (see table 105).

T A B L E 105

TABLE OF EXPLANATORY POWER OF THE EXPLANATORY VARIABLE OF INCAPACITATION DAYS DUE TO ILLNESS

EXPLANATORY VARIABLES	SSB/SST or SSR/SST (eta^2 or r^2)	Var Comp	Var Among
Severity of Illness	.2678	1.03320	.3634
Diagnosis of Illness	.1058	.26537	.1148
Outcome of Treatment	.0571	.23791	.0835
Type of Provider	.0439	.14304	.0513
Quality of Care	0363	.11607	.0461
Age Group	.0319	.10325	.0411
Duration of Illness	.07424+		

+The measure of fitness of the explanatory variable for "Duration of Illness" is r^2 = Sum of Square Regression/Sum of Square Total, while for the other explanatory variables it is eta^2 = Sum of Square Between Group/Sum of Square Total.
Var Comp = Estimate of among group variance component
Var Among = Interclass correlation coefficient.

Therefore, even though SEARCH analysis places diagnosis of illness at the seventh rank, it is actually one of the most important explanatory variable of incapacitations. It explains more variation of incapacitation days in bivariate analysis using one-way analysis of variance than most of the explanatory variables

selected by SEARCH analysis. There is a significant difference of incapacitation days between at least two types of diagnoses of illness (see table 106). The

TABLE 106

ONE-WAY ANALYSIS OF VARIANCE OF INCAPACITATION ACROSS DIFFERENT DIAGNOSIS OF ILLNESS

ANALYSIS OF VARIANCE:

SOURCE	D.F.	SUM OF SQR	MEAN SQR	F	p
Between	19	1,095.0	57.629	28.157	0.
Within	4,523	9,257.1	2.0467		
Total	4,542	10,352.0			

Eta = .3252 Eta² = .1058 Var-Comp.= .26537
%Var-Among = 11.48

DIAGNOSIS OF ILLNESS	Number of Cases	(natural logarithm) Mean	Variance	Std. Dev.
Typhoid	58	2.0429	1.2854	1.1338
Dysentery	112	.7047	.9202	.9593
Enteritis	219	.7388	.8168	.9038
Respiratory-Tuberculosis	327	1.6223	5.7662	2.4013
Malaria	142	1.7800	1.6785	1.2956
Avitaminosis	59	1.8574	6.5244	2.5543
Anemia	116	.5124	1.8592	1.3635
Eye Infection	207	.5093	2.0314	1.4253
Cataract	35	2.2529	9.1881	3.0312
Ear & Mastoid	57	.3391	1.0754	1.0370
Heart & Vascular	126	2.1931	7.0962	2.6639
Hypertension	180	.8593	3.2385	1.7996
U.R.I.	421	.5725	.7968	.8927
Flu	1,331	.6298	.8928	.9449
Pneumonia	48	.9595	1.6223	1.2737
Bronchitis-Asthma-Emphysema	405	1.1324	3.4507	1.8576
Peptic Ulcer	152	.7432	1.9703	1.4037
Dermatitis	267	.4316	1.2637	1.1242
Dermatosis	201	.2057	.5708	.7555
Accident	80	1.3502	2.4927	1.5788
All Cases	4,543	.8601	2.2792	1.5097

All incapacitation scales are in natural logarithm.

difference and similarity among the diagnoses are observable. For instance, typhoid-malaria-avitaminosis-cataract-disease of the heart and vascular systems do not have significantly different average incapacitation days among each other. Similarly, there is no significant difference among the average incapacitation days among cases of respiratory tuberculosis-malaria-avitaminosis and accident. However, there is a significant difference between incapacitation days due to typhoid and respiratory tuberculosis, even though incapacitation days due to both typhoid and respiratory tuberculosis are not significantly different from incapacitation days due to malaria.

The significance of difference of the mean incapacitation days is tested based on the value of the mean and standard deviation, where the standard deviation is very much influenced by the sample size and the variation of the raw score. Major diagnosis with a large number of observations tends to have a less spread-out standard deviation, therefore tending to have more exclusive incapacitation days. Minor diagnosis is just the opposite; with a smaller number of observations they tend to have more spread-out standard deviation, therefore tending to have insignificant difference in their incapacitation days from other diseases.

The importance of diagnosis of illness as an explanatory variable of incapacitation days due to illness makes separate analysis based on diagnosis of illness

necessary, after controlling for the effect of other explanatory variables. Even though severity of illness is a stronger explanatory variable of incapacitation days than age group or diagnosis of illness, the presentation of morbidity data is in age specific morbidity rates. Moreover, the conventional presentation of morbidity figures is mostly based on the age-specific morbidity rate, not in age-specific severity rate.

APPENDIX C

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1      C REGENCY HEALTH PLANNING PROFILE MODEL FOR INDONESIA
1.5    C THIS PROGRAM ALSO CALCULATES COST OF SEEKING CARE
2      C WRITTEN BY BERLIAN SIAGIAN, STARTED FEB 3, 1982
3            DIMENSION POP(6),RATE(20,6),PSC(20,6,7),VE(20,7),DL(20,6,7),
4           1 XDL(7),TDLC(7),TDL(20),TXD(7),DLAX(6),
5           2 DLNRX(20,6),XY(20,6),DIAGN(20,10),AGNAM(6,2),RGNAM(8),
6           3     DATE(4),COSTSC(7),TCOST(7)
6.2          DATA TCOST/7*0./
7      C MEMBACA NAMA KABUPATEN DARI INPUT DEVICE 5
8            READ(5,12)(RGNAM(K2),K2=1,8)
9       12   FORMAT(8A4)
10     C MEMBACA TANGGAL PEKERJAAN DARI INPUT DEVICE 5
11           READ(5,13)(DATE(K3),K3=1,4)
12      13   FORMAT(4A4)
13     C MEMBACA JUMLAH DIAGNOSIS PENYAKIT YANG AKAN DIPAKAI MAX 20
14           READ(5,1)NDIS
15        1  FORMAT(I2)
16     C MEMBACA JUMLAH GOLONGAN UMUR YANG AKAN DIPAKAI MAX 6
17           READ(5,4)NAGE
18      4    FORMAT(I1)
19     C MEMBACA JUMLAH SARANA PENGOBATAN YANG AKAN DIPAKAI MAX 7
20     C PERIKSA BAHWA JUMLAH SARANA DISESUAIKAN DENGAN FORMAT
21     C PADA SAAT MEMBACA DAN MENULIS DATA . DARI INPUT DEVICE 5
22           READ(5,4)LCR
23           READ(5,17)(COSTSC(L),L=1,LCR)
24       17 FORMAT(7F7.2)
25           POPT=0
26           DO 5 J=1,NAGE
27     C MEMBACA JUMLAH PENDUDUK KABUPATEN DISETIAP GOLONGAN UMUR
28     C DARI INPUT DEVICE 5
29     C DISUSUL DENGAN LABEL MASING MASING GOLONGAN UMUR TERSEBUT
30           READ(5,7)POP(J)
31      7    FORMAT(F8.0)
32           POPT=POPT+POP(J)
33      5    READ(5,6)(AGNAM(J,K1),K1=1,2)
34      6    FORMAT(2A4)
35           DO 10 I = 1, NDIS
36     C MEMBACA DIAGNOSIS PENYAKIT KEMUDIAN INSIDENSI/PREVALENSI PENYAKIT
37     C MELALUI INPUT DEVICE 5
38           READ(5,3)(DIAGN(I,K),K=1,10)
39        3  FORMAT(10A4)
40     C MEMBACA JUMLAH PEMAKAIAN SARANA PENGOBATAN MENURUT JENIS SARANA,
41     C UNTUK SATU EPISODE PENYAKIT DARI INPUT DEVICE 7
42           READ(7,2)(VE(I,L),L=1,LCR)
43         2 FORMAT(7F5.2)
44             DO 10 J = 1, NAGE
```

```
45          READ (5,20) RATE(I,J),(PSC(I,J,L),L=1,LCR)
46       20 FORMAT(F7.0,7F6.2)
47    C MEMBACA JUMLAH HARI TIDAK DAPAT BEKERJA SEPERTI BIASA KARENA SAKIT
48    C MENURUT JENIS PENYAKIT, GOLONGAN UMUR DAN JENIS SARANA PENGOBATAN
49    C YANG DIPAKAI DARI INPUT DEVICE 9
50       10 READ(9,21)DLNRX(I,J),(DL(I,J,L),L=1,LCR)
51       21 FORMAT(8F6.2)
52    C MENULISKAN NAMA KABUPATEN, JUMLAH PENDUDUK DAN TANGGAL PEKERJAAN
53    C MELALUI OUTPUT FILE 6
54          WRITE (6,50) (RGNAM(K2),K2=1,8),POPT,(DATE(K3),K3=1,4)
55       50 FORMAT ('1',/,'-',34X,63('*'),/,35X,'*',5X,
56         +'DISEASE PROFILE FOR ',8A4,4X,'*',/,35X,'*',15X,F10.0,1X,
57         +'PEOPLE',29X,'*',/,35X,'*',18X,4A4,27X,'*',/,35X,63('*'))
58          WRITE (6,55)
59       55 FORMAT(35X,'*',19X,'POPULATION DISTRIBUTION',19X,'*')
60          DO 25 J=1,NAGE
61       25 WRITE (6,56) (AGNAM(J,K1),K1=1,2),POP(J)
62       56 FORMAT (35X,'*',19X,2A4,10X,F8.0,16X,'*')
63          WRITE (6,57)
64       57 FORMAT (35X,63('*'))
65          TDAYS = 0
66          TVISIT = 0
67          TCASE = 0
68          XDAY = 0
69          YDAY = 0
70          TCARE = 0
71    C MENULISKAN JUDUL TABEL DAN JUDUL KOLOM MELALUI OUTPUT DEVICE 6
72          CALL HEAD1
73          CALL COLIST
74          DO 460 I = 1, NDIS
75    C DO LOOP BERIKUT INI MENGHITUNG TABEL DASAR PERTAMA
76          WRITE(6,9)(DIAGN(I,K),K=1,10)
77     9    FORMAT('0',10A4)
78          TCAS = 0
79          DO 8 L=1,LCR
80        8 TDLC(L) = 0
81          TSC = 0
82          TVIS = 0
83          TDLY = 0
84          TDLX = 0
85            DO 450 J = 1, NAGE
86              TOSC = 0
87              TDVT = 0
88              X = 0
89              CASE = POP(J) * RATE(I,J)/1000.
```

```
90              DO 451 L=1,LCR
91                XNSC = CASE * PSC(I,J,L)/100.
92                XVE = XNSC * VE(I,L)
93                XDL(L) = XNSC * DL(I,J,L)
94                X = X + XDL(L)
95                TOSC = TOSC + XNSC
96                TOVT = TOVT + XVE
97                TXD(L) = TXD(L) + XDL(L)
98              TDLC(L) = TDLC(L) + XDL(L)
98.5            TCOST(L) = TCOST(L) + (XNSC*COSTSC(L)/1000.)
99        451 CONTINUE
100               TNSC = CASE - TOSC
101               Y = TNSC*DLNRX(I,J)
102               IF(Y.LT.0.)Y=0
103               XY(I,J) = X + Y
104               TSC = TSC + TOSC
105               TVIS = TVIS + TDVT
106               TDLX = TDLX + X
107               TDLY = TDLY + Y
108               TCAS = TCAS + CASE
109               TDL(I) = TDL(I) + XY(I,J)
110               DLAX(J) = DLAX(J) + XY(I,J)
111       450 WRITE (6,390) (AGNAM(J,K1),K1=1,2),RATE(I,J),CASE,
112          1    TOSC,TOVT,Y,(XDL(L),L=1,LCR),X,XY(I,J)
113       390 FORMAT (5X,2A4, 1X, F5.0,3(1X,F8.0),2X,3F8.0,1X,F8.0,1X,
114          1 4F8.0,1X,F8.0,1X, F9.0)
115               TCASE = TCASE + TCAS
116               XDAY = XDAY + TDLX
117               YDAY = YDAY + TDLY
118               TDAYS = TDAYS + TDL(I)
119               TCARE = TCARE + TSC
120               TVISIT = TVISIT + TVIS
121
121           WRITE(6,470)TCAS,TSC,TVIS,TDLY,(TDLC(L),L=1,LCR),TDLX,TDL(I)
122           CHECK=I/5.0
123           ICH=CHECK
124           CHECK=CHECK-ICH
125           IF(CHECK.EQ.0.0) CALL CDLIST
126       470 FORMAT('0',4X,'ALL AGE',7X,3(1X,F8.0),2X,3F8.0,1X,F8.0,1X,
127          +4F8.0,1X,F8.0,1X,F9.0)
128       460 CONTINUE
129           WRITE (6,471)TCASE,TCARE,TVISIT,YDAY,(TXD(L),L=1,LCR),
130          +XDAY,TDAYS
131       471 FORMAT('0',2X,'ALL DISEASES',4X,3(1X,F8.0),1X,F9.0,
132          +F9.0,2(F8.0,1X),4F8.0,F9.0,F10.0)
132.05        WRITE(6,472)
132.1     472 FORMAT('0',57X,'SELF MED.',48x,'PRIVATE',/58x,'CARE',
```

```
132.15        +7X,'MAN',8X,'SHC',8X,'AMP',8X,'H.C.  HOSPITAL  PHYSICIAN',/
132.2         +51X,7('        COST'))
132.25         WRITE(6,473)(TCOST(L),L=1,LCR)
132.3      473 FORMAT('O',21X,'ALL DISEASES (IN THOUSAND RP.)    ',7(1X,F10.2))
132.35         SOCST=0
132.4          DO 91 L=1,LCR
132.45      91 SOCST=SOCST + (TCOST(L)/1000.)
132.5          WRITE(6,474)SOCST
132.55     474 FORMAT('-','   SOCIAL COSTS = RP.',F16.5,' MILLION')
133      C KEPALA TABEL DASAR KEDUA
134            CALL HEAD2
135      C DO LOOP BERIKUT INI MENGHITUNG TABEL DASAR KEDUA
136            DO 500 I = 1, NDIS
137       500 WRITE(6,520)(DIAGN(I,K),K=1,10),(XY(I,J),J=1,NAGE),TOL(I)
138            WRITE(6,510)(DLAX(J),J=1,NAGE),TDAYS
139       520  FORMAT ('O',3X,10A4,6('|',1X,F9.0,1X),1X,F9.0)
140       510  FORMAT ('O',15X,'ALL DISEASES',16X,6('|',1X ,F9.0,1X))
141      C DO LOOP BERIKUT INI MENGHITUNG JUMLAH PEMAKAIAN SARANA PENGOBATAN
142      C RATA RATA UNTUK SATU EPISODE PENYAKIT, MENURUT GOLONGAN UMUR
143            WRITE(6,521)
144       521  FORMAT('1',33X,'AGGREGATE RATES')
145            WRITE(6,522)
146       522  FORMAT(' ',78('-'),/,' ','+',76X,'+',/,' ','+ AGE GROUP',
147           +2X,' D.I.I. PER PERSON PER YEAR',37X,'+',/,' ','+',76X,
148           +'+',/,' ',78('-'))
149            DO 149 J=1,NAGE
150            SMR = DLAX(J)/POP(J)
151       149  WRITE (6,540) (AGNAM(J,K2),K2=1,2),SMR
152       540  FORMAT(' ','|',76X,'|',/,'|',2A4,13X,F8.3,47X,'|')
153            XMR =TDAYS/POPT
154            WRITE(6,660) XMR
155       660  FORMAT(79('-'),/,'|',76X,'|',/,'|','ALL AGE GROUP',8X,
156           +F8.3,47X,'|',/,'|',76X,'|',/,79('-'))
157            VPY = TVISIT / POPT
158            WRITE(6,530) TVISIT,VPY
159       530  FORMAT(' ','|',76X,'|',/,'|','TOTAL VISIT PER YEAR = ',F9.0,
160           +5X,'VISIT PER PERSON PER YEAR = ',F6.4,5X,'|',/,' ','|',
161           +76X,'|',/,' ',78('-'),
162             FSC=TCARE/TCASE
163            WRITE(6,455) TCARE,FSC
164       455  FORMAT(1X,'|',76X,'|',/,'|','NUMBER SEEKING CARE PER YEAR =',
165           +F9.0,3X,' FRACTION SEEKING CARE',F7.3,5X,'|',/,'|',76X,'|',
166           +/,78('-'))
167            STOP
```

```
168          END
169          SUBROUTINE HEAD1
170          WRITE (6,65)
171       65 FORMAT (//////////////////////,' ',57('+'),/,'  + TABLE 1',47X,'+',/
172         +'  +',55X,'+',/,'  + AGE SPECIFIC-DISEASE SPECIFIC MORBIDITY,',
173         +  TOTAL NUMBER +',/,'  +',' OF CASES, NUMBER OF VISITS, AND',
174         +' DAYS LOST BY TYPE OF  +',/,' +',1X,'HEALTH ',
175         +'CARE PROVIDER',34X,'+',/,'  ',57('+'))
176          RETURN
177          END
178          SUBROUTINE COLIST
179          WRITE (6,70)
180       70 FORMAT ('1',2X,'DIAGNOSIS',3X, 'RATE', 4X, 'TOTAL', 3X,'TOTAL',5X,
181         1 'NUMBER',3(4X,'DAYS'),2(5X,'DAYS'),3(4X,'DAYS'),5X,
182         1'DAYS',6X,'TOTAL',/,6X,'AND',6X, 'PER', 6X, '#OF', 4X,
183 2'SEEKING',4X,'#OF',2X,3(4X,'LOST'),2(5X,'LOST'),3(4X,'LOST'),
184         35X,'DAYS',6X,'DAYS',/,3X,'AGE GROUP',3X,'1000',4X,'CASES',3X,
185 4'CARE',6X,'VISIT',5X,'NRX',5X,'SELF',3X,'MEDMAN',4X,'SHC',7X,
186 5'AMP',5X,'HC',4X,'HOSPIT',2X,'DOCTOR',5X,'RX',7X,'LOST')
187          RETURN
188          END
189          SUBROUTINE HEAD2
190          WRITE(6,475)
191      475 FORMAT('1',42('+'),/,' ','+','  TABLE 2',31X,'+',/ ,
192         +' ','+',2X,'DISABILITY BY AGE GROUP AND DIAGNOSIS',1X,'+',/
193         +' ',42('+'),///)
194          WRITE (6,480)
195      480 FORMAT (133('-'),/,' ',15X,'DIAGNOSIS',19X,'|  0-1 YR   ',
196         +'|  1-4 YR   |','  5-14 YR  |',
197         +' 15-44  YR |','  45 + YR  |','   TOTAL ',
198         +/,44X, 6('|  D.I.I.   '),/,' ',132('-'))
199          RETURN
200          END
```

DISEASE PROFILE FOR Bogor, West Java, Indonesia.
2945202. PEOPLE
5/20/82

POPULATION DISTRIBUTION

0 - 1	96701.
1 - 4	325636.
5 - 14	811986.
15 - 44	1272952.
45 + yrs	437927.

(INCLUDING COMPUTATION OF GOVERNMENT COST)

TABLE 107

AGE SPECIFIC-DISEASE SPECIFIC MORBIDITY, TOTAL NUMBER OF CASES, NUMBER OF VISITS, AND DAYS LOST BY TYPE OF HEALTH CARE PROVIDER

DIAGNOSIS AND AGE GROUP	RATE PER 1000	TOTAL #OF CASES	TOTAL SEEKING CARE	NUMBER #OF VISIT	DAYS LOST NRX	DAYS LOST SELF	DAYS LOST MEDMAN	DAYS LOST SHC	DAYS LOST AMP	DAYS LOST HC	DAYS LOST HOSPIT	DAYS LOST DOCTOR	DAYS DAYS RX	TOTAL DAYS LOST
1. TYPHOID FEVER														
0 - 1	31.	2998.	0.	0.	13700.	0.	0.	0.	0.	0.	0.	0.	0.	13700.
1 - 4	32.	10420.	7443.	17670.	12802.	0.	14350.	0.	15272.	0.	0.	5956.	35578.	48380.
5 - 14	41.	33291.	24609.	55066.	42457.	38565.	31726.	0.	0.	6314.	17986.	26342.	120932.	163389.
15 - 44	18.	22913.	16708.	39050.	29225.	8532.	19829.	15208.	16792.	8372.	5960.	8731.	83425.	112650.
45 + yrs	6.	2628.	2628.	6206.	0.	0.	8973.	0.	3184.	2383.	0.	2484.	17024.	17024.
ALL AGE		72250.	51388.	117992.	98183.	47097.	74877.	15208.	35249.	17069.	23947.	43513.	256959.	355143.
2. DYSENTERY (AMEBIC & BACILLARY)														
0 - 1	257.	24852.	11044.	17643.	38938.	14137.	0.	0.	0.	6930.	0.	7234.	38301.	67239.
1 - 4	306.	99645.	66423.	107438.	88369.	62894.	28174.	13613.	22553.	33747.	0.	11715.	172696.	261065.
5 - 14	6.	4872.	3045.	4939.	5517.	3337.	0.	993.	2192.	1638.	0.	856.	9016.	14534.
15 - 44	27.	34370.	21869.	38157.	36376.	10997.	10185.	16350.	14455.	5394.	0.	8435.	63817.	102192.
45 + yrs	6.	2628.	1414.	2421.	4574.	1382.	0.	822.	1814.	679.	966.	0.	5664.	10237.
ALL AGE		166366.	103796.	170597.	173774.	92747.	38359.	31778.	41015.	48389.	966.	28240.	281493.	455267.
3. ENTERITIS - G.E.D.														
0 - 1	81.	7833.	4629.	10879.	6952.	2805.	0.	834.	2756.	0.	2938.	1431.	10765.	17717.
1 - 4	694.	225991.	161787.	351542.	130977.	137759.	5874.	28240.	37453.	42076.	33246.	39031.	323678.	454656.
5 - 14	54.	43847.	29229.	61054.	33915.	30836.	8448.	0.	17988.	6726.	4770.	0.	68767.	102682.
15 - 44	22.	28005.	22048.	50194.	13283.	10887.	4467.	7181.	19018.	4743.	3376.	2481.	52153.	65436.
45 + yrs	330.	144516.	106479.	234592.	109926.	109614.	0.	23717.	78726.	29418.	13949.	51159.	306582.	416508.
ALL AGE		450192.	324172.	708262.	295054.	291901.	18788.	59972.	155941.	82963.	58279.	94103.	761945.	1056998.
4. RESPIRATORY TUBERCULOSIS														
0 - 1	34.	3288.	3288.	8767.	1.	0.	0.	3003.	0.	2477.	3529.	0.	9008.	9009.
1 - 4	5.	1628.	862.	2176.	1832.	415.	257.	0.	0.	0.	290.	1063.	2025.	3857.
5 - 14	2.	1624.	928.	2505.	1894.	0.	235.	0.	0.	752.	1334.	391.	2712.	4606.
15 - 44	5.	6365.	4733.	12264.	4276.	647.	957.	924.	2037.	2788.	3973.	1859.	13185.	17460.
45 + yrs	26.	11386.	7591.	18697.	12865.	3037.	1873.	3067.	6573.	5804.	3178.	3106.	26639.	39504.
ALL AGE		24291.	17401.	44408.	20867.	4099.	3322.	6994.	8611.	11821.	12303.	6419.	53568.	74435.
5. MALARIA														
0 - 1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1 - 4	21.	6838.	4558.	7669.	9484.	10771.	2654.	2563.	0.	2113.	0.	0.	18102.	27587.
5 - 14	59.	47907.	36630.	60761.	53455.	103000.	14930.	0.	31831.	11887.	0.	6197.	167846.	221301.
15 - 44	12.	15275.	11783.	21544.	15923.	18972.	7790.	6441.	9498.	7089.	5041.	0.	54832.	70755.
45 + yrs	14.	6131.	5709.	10322.	2492.	13573.	5588.	1347.	2978.	4447.	3169.	2318.	33421.	35913.
ALL AGE		76152.	58680.	100296.	81355.	146317.	30963.	10352.	44308.	25537.	8210.	8516.	274201.	355556.

DIAGNOSIS AND AGE GROUP	RATE PER 1000	TOTAL #OF CASES	TOTAL SEEKING CARE	NUMBER #OF VISIT	DAYS LOST NRX	DAYS LOST SELF	DAYS LOST MEDMAN	DAYS LOST SHC	DAYS LOST AMP	DAYS LOST HC	DAYS LOST HOSPIT	DAYS LOST DOCTOR	DAYS DAYS RX	TOTAL DAYS LOST
6. A-HYPO-VITAMINOSIS & MALNOURISHMENT														
0 - 1	24.	2321.	0.	0.	12416.	0.	0.	0.	0.	0.	0.	0.	0.	12416.
1 - 4	16.	5210.	1520.	2780.	18599.	495.	1225.	1182.	3914.	487.	0.	1017.	8320.	26920.
5 - 14	10.	8120.	738.	1260.	42297.	1279.	0.	1523.	1680.	0.	0.	0.	4483.	46780.
15 - 44	2.	2546.	1000.	1760.	8533.	911.	562.	1625.	598.	1790.	0.	0.	5485.	14019.
45 + yrs	4.	1752.	331.	637.	10141.	0.	0.	1095.	403.	604.	429.	0.	2530.	12671.
ALL AGE		19948.	3589.	6437.	91987.	2685.	1787.	5425.	6596.	2880.	429.	1017.	20819.	112806.
7. ANEMIA														
0 - 1	6.	580.	290.	406.	499.	453.	0.	0.	0.	0.	0.	0.	453.	952.
1 - 4	7.	2279.	285.	596.	3231.	0.	0.	0.	0.	0.	0.	430.	430.	3661.
5 - 14	2.	1624.	0.	0.	2988.	0.	0.	0.	0.	0.	0.	0.	0.	2988.
15 - 44	11.	14002.	4464.	8097.	16978.	1797.	808.	973.	1722.	1122.	457.	1171.	8050.	25028.
45 + yrs	8.	3503.	1219.	2276.	5255.	531.	0.	252.	973.	417.	742.	109.	3023.	8278.
ALL AGE		21990.	6258.	11375.	28951.	2780.	808.	1225.	2695.	1538.	1199.	1710.	11956.	40907.
8. EYE INFECTION														
0 - 1	260.	25142.	9428.	16782.	35199.	6380.	0.	0.	16782.	0.	0.	0.	23162.	58361.
1 - 4	111.	36146.	15159.	26980.	44281.	13359.	5502.	3989.	2930.	2195.	3129.	1141.	32245.	76525.
5 - 14	56.	45471.	17734.	30952.	66570.	20817.	3670.	5889.	5202.	1946.	5529.	0.	43052.	109622.
15 - 44	70.	39107.	39323.	68516.	115001.	43824.	6231.	14000.	8822.	6608.	7049.	3448.	89983.	204984.
45 + yrs	20.	8759.	2671.	5017.	18201.	2606.	0.	345.	1522.	853.	1620.	1188.	8134.	26334.
ALL AGE		204624.	84316.	148247.	279251.	86986.	15403.	24223.	35258.	11602.	17327.	5777.	196576.	475827.
9. CATARACT														
0 - 1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1 - 4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5 - 14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15 - 44	1.	1273.	489.	498.	5610.	0.	0.	0.	0.	1249.	1778.	651.	3678.	9288.
45 + yrs	11.	4817.	688.	633.	38237.	1240.	2038.	0.	1086.	406.	1732.	423.	6925.	45162.
ALL AGE		6090.	1177.	1132.	43847.	1240.	2038.	0.	1086.	1655.	3510.	1074.	10602.	54450.
10. DISEASE OF EAR AND MASTOID														
0 - 1	12.	1160.	232.	339.	1049.	0.	299.	0.	0.	0.	0.	0.	299.	1348.
1 - 4	13.	4233.	1343.	1849.	3093.	307.	126.	244.	269.	501.	0.	0.	1446.	4539.
5 - 14	3.	2436.	985.	1360.	1755.	348.	144	139.	154.	228.	81.	119.	1214.	2969.
15 - 44	1.	1273.	796.	1275.	559.	0.	213.	205	226.	0.	481.	0.	1125.	1683.
45 + yrs	4.	1752.	1051.	1787.	1058.	0.	0.	585.	0.	0.	1373.	0.	1958	3016.
		[illegible]	[illegible]	[illegible]	7514	655	783.	1173	648.	729.	1935.	119.	6043.	13557.

DIAGNOSIS AND AGE GROUP	RATE PER 1000	TOTAL #OF CASES	TOTAL SEEKING CARE	NUMBER #OF VISIT	DAYS LOST NRX	DAYS LOST SELF	DAYS LOST MEDMAN	DAYS LOST SHC	DAYS LOST AMP	DAYS LOST HC	DAYS LOST HOSPIT	DAYS LOST DOCTOR	DAYS DAYS RX	TOTAL DAYS LOST
11. DISEASE OF HEART AND VASCULAR SYSTEM														
0 - 1	6.	580.	0.	0.	2634.	0.	0.	0.	0.	0.	0.	0.	0.	2634.
1 - 4	1.	326.	163.	437.	697.	0.	0.	0.	415.	0.	442.	0.	857.	1554.
5 - 14	1.	812.	710.	1676.	494.	449.	0.	0.	590.	1762.	0.	460.	3260.	3754.
15 - 44	3.	3819.	1872.	4685.	9133.	636.	786.	1515.	1255.	2192.	1336.	1305.	9025.	18158.
45 + yrs	10.	4379.	3176.	8007.	7305.	1590.	3268.	947.	3833.	1822.	2222.	6241.	19923.	27228.
ALL AGE		9916.	5921.	14805.	20263.	2675.	4054.	2462.	6093.	5776.	4000.	8007.	33066.	53329.
12. HYPERTENSION														
0 - 1	1.	97.	97.	235.	0.	0.	0.	0.	0.	0.	0.	175.	175.	175.
1 - 4	1.	326.	0.	0.	596.	0.	0.	0.	0.	0.	0.	0.	0.	596.
5 - 14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15 - 44	5.	6365.	3114.	6771.	6533.	1109.	305.	1322.	975.	849.	346.	1393.	6297.	12830.
45 + yrs	20.	8759.	3413.	7582.	13898.	1401.	143.	972.	766.	1837.	1633.	2156.	8908.	22805.
ALL AGE		15546.	6624.	14588.	21027.	2510.	448.	2294.	1740.	2686.	1979.	3723.	15380.	36407.
13. UPPER RESPIRATORY TRACT INFECTION														
0 - 1	318.	30751.	20440.	33203.	29180.	13174.	0.	4225.	13607.	7749.	3676.	13482.	55913.	85093.
1 - 4	1619.	527205.	227858.	341987.	796263.	262056.	67870.	57394.	72425.	47429.	28868.	63543.	599585.	1395847.
5 - 14	765.	621169.	277103.	412037.	1042519.	386057.	83178.	80233.	63236.	66248.	13392.	118765.	811109.	1853628.
15 - 44	142.	180759.	92133.	135343.	258789.	129812.	0.	22035.	48688.	24251.	4347.	31596.	260729.	519518.
45 + yrs	117.	51237.	23651.	34888.	104276.	44411.	4768.	4599.	12658.	5698.	8099.	7913.	88146.	192422.
ALL AGE		1411120.	641185.	957458.	2231026.	835510.	155816.	168487.	210614.	151375.	58383.	235299.	1815481.	4046506.
14. FLU / COMMON COLD														
0 - 1	3905.	377617.	200326.	358618.	501735.	132082.	16280.	125719.	86791.	51767.	36874.	121559.	571072.	1072806.
1 - 4	5577.	1816071.	623638.	1073268.	3183793.	553317.	81451.	219672.	251217.	136151.	82867.	324277.	1648950.	4832743.
5 - 14	1231.	999555.	421812.	698488.	1750560.	511272.	84962.	193434.	155229.	159229.	20781.	125998.	1250902.	3001462.
15 - 44	450.	572828.	372395.	618968.	585264.	411224.	54883.	93946.	238415.	134489.	14451.	126673.	1074081.	1659345.
45 + yrs	414.	181302.	116740.	194432.	244044.	156275.	24081.	30994.	119871.	67147.	13663.	29973.	442003.	686047.
ALL AGE		3947371.	1734909.	2943772.	6265394.	1764168.	261657.	663765.	851523.	548782.	168636.	728480.	4987007.	11252402.
15. PNEUMONIA														
0 - 1	63.	6092.	3046.	6800.	7889.	0.	2208.	0.	2345.	0.	2498.	1828.	8879.	16769.
1 - 4	200.	65127.	29307.	55521.	87401.	28786.	0.	8564.	9443.	7066.	0.	14719.	68579.	155980.
5 - 14	33.	26796.	10718.	21651.	44534.	6726.	0.	8012.	0.	6618.	0.	6913.	28269.	72803.
15 - 44	3.	3819.	1637.	3684.	5825.	0.	0.	1572.	0.	1299.	1845.	0.	4715.	10540.
45 + yrs	13.	5693.	2441.	4572.	11221.	2546.	0.	0.	3352.	2506.	0.	0.	8404.	19625.
ALL AGE		107527.	47149.	92228.	156870.	38058.	2208.	18148.	15141.	17489.	4342.	23460.	118846.	275717.

DIAGNOSIS AND AGE GROUP	RATE PER 1000	TOTAL #OF CASES	TOTAL SEEKING CARE	NUMBER #OF VISIT	DAYS LOST NRX	DAYS LOST SELF	DAYS LOST MEDMAN	DAYS LOST SHC	DAYS LOST AMP	DAYS LOST HC	DAYS LOST HOSPIT	DAYS LOST DOCTOR	DAYS DAYS RX	TOTAL DAYS LOST
16. BRONCHITIS-ASTHMA-EMPHYSEMA														
0 - 1	44.	4255.	1418.	2841.	5617.	0.	1045.	0.	0.	832.	1187.	0.	3063.	8680.
1 - 4	31.	10095.	5255.	9130.	9001.	3272.	0.	556.	1842.	2525.	653.	718.	9566.	18567.
5 - 14	7.	5684.	3389.	5923.	4865.	2519.	259.	501.	1383.	1896.	882.	431.	7871.	12735.
15 - 44	6.	7638.	4831.	9055.	5726.	1570.	1191.	1005.	2539.	1544.	1691.	868.	10408.	16134.
45 + yrs	28.	12262.	7469.	13684.	12654.	4117.	896.	3163.	3816.	4389.	2198.	1484.	20062.	32717.
ALL AGE		39933.	22362.	40633.	37863.	11478.	3391.	5225.	9581.	11186.	6610.	3501.	50971.	88833.
17. PEPTIC ULCER & GASTRITIS														
0 - 1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1 - 4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5 - 14	7.	5684.	2842.	4917.	6480.	3921.	0.	0.	2577.	0.	0.	0.	6499.	12978.
15 - 44	8.	10184.	5646.	11043.	9938.	4414.	248.	478.	2641.	988.	841.	2674.	12284.	22221.
45 + yrs	6.	2628.	2112.	4450.	1464.	1064.	0.	949.	1048.	782.	927.	1360.	6129.	7593.
ALL AGE		18495.	10600.	20409.	17882.	9399.	248.	1427.	6266.	1770.	1768.	4034.	24911.	42793.
18. DERMATITIS														
0 - 1	439.	42452.	14918.	21848.	49562.	13172.	4639.	4478.	0.	1845.	2625.	0.	26760.	76322.
1 - 4	226.	73594.	23388.	36183.	85350.	11039.	3580.	5522.	11488.	4556.	0.	4174.	40359.	125709.
5 - 14	50.	40599.	12537.	19228.	54441.	8583.	3534.	1137.	3763.	2346.	2666.	2455.	24484.	78925.
15 - 44	13.	16548.	6513.	10310.	18665.	3211.	564.	3273.	1205.	2253.	1281.	470.	12256.	30921.
45 + yrs	13.	5693.	2846.	4361.	6862.	2550.	349.	1345.	1485.	278.	793.	289.	7089.	13951.
ALL AGE		178886.	60202.	91931.	214878.	38554.	12666.	15756.	17942.	11278.	7364.	7389.	110949.	325827.
19. DERMATOSIS														
0 - 1	45.	4352.	1741.	2590.	3029.	369.	0.	658.	242.	362.	0.	376.	2007.	5036.
1 - 4	39.	12700.	4527.	6693.	8990.	1022.	359.	862.	1531.	573.	1015.	0.	5361.	14351.
5 - 14	8.	6496.	2970.	4283.	4407.	839.	519.	251.	691.	824.	294.	323.	3741.	8149.
15 - 44	6.	7638.	1875.	2765.	6915.	438.	359.	261.	574.	215.	203.	300.	2351.	9266.
45 + yrs	10.	4379.	1571.	2309.	4353.	537.	83.	399.	440.	463.	281.	274.	2478.	6832.
ALL AGE		35564.	12684.	18640.	27694.	3205.	1321.	2431.	3478.	2437.	1793.	1274.	15939.	43633.
20. ACCIDENT & TRAUMA														
0 - 1	189.	18276.	0.	0.	62871.	0.	0.	0.	0.	0.	0.	0.	0.	62871.
1 - 4	11.	3582.	2116.	4500.	4751.	2980.	1000.	0.	0.	1592.	1132.	0.	6704.	11456.
5 - 14	69.	56027.	17693.	40250.	141068.	19705.	0.	0.	0.	19351.	13763.	10079.	62897.	203965.
15 - 44	13.	16548.	12315.	28883.	15027.	8675.	4586.	2947.	3255.	10945.	10388.	3812.	44608.	59635.
45 + yrs	9.	3941.	2237.	5119.	7822.	1704.	127.	1096.	1058.	2331.	435.	619.	7370.	15192.
ALL AGE		98375.	34361.	78751.	231540.	33064.	5712.	4043.	4313.	34218.	25718.	14510.	121579.	353719.
ALL DISEASES		6915487.	3231178.	5588561.	10345215.	3415112.	634648.	1040383.	1458083.	991178.	408695.	1220151.	9168283.	19513456.

TABLE 2
DISABILITY BY AGE GROUP AND DIAGNOSIS

DIAGNOSIS	0-1 YR D.I.I.	1-4 YR D.I.I.	5-14 YR D.I.I.	15-44 YR D.I.I.	45 + YR D.I.I.	TOTAL D.I.I.
1. TYPHOID FEVER	13700.	48380.	163389.	112650.	17024.	355143.
2. DYSENTERY (AMEBIC & BACILLARY)	67239.	261065.	14534.	102192.	10237.	455267.
3. ENTERITIS - G.E.D.	17717.	454656.	102682.	65436.	416508.	1056998.
4. RESPIRATORY TUBERCULOSIS	9009.	3857.	4606.	17460.	39504.	74435.
5. MALARIA	0.	27587.	221301.	70755.	35913.	355556.
6. A-HYPO-VITAMINOSIS & MALNOURISHMENT	12416.	26920.	46780.	14019.	12671.	112806.
7. ANEMIA	952.	3661.	2988.	25028.	8278.	40907.
8. EYE INFECTION	58361.	76525.	109622.	204984.	26334.	475827.
9. CATARACT	0.	0.	0.	9288.	45162.	54450.
10. DISEASE OF EAR AND MASTOID	1348.	4539.	2969.	1683.	3016.	13557
11. DISEASE OF HEART AND VASCULAR SYSTEM	2634.	1554.	3754.	18158.	27228.	53329.
12. HYPERTENSION	175.	596.	0.	12830.	22805.	36407.
13. UPPER RESPIRATORY TRACT INFECTION	85093.	1395847.	1853628.	519518.	192422.	4046506.
14. FLU / COMMON COLD	1072806.	4832743.	3001462.	1659345.	686047.	11252402.
15. PNEUMONIA	16769.	155980.	72803.	10540.	19625.	275717.
16. BRONCHITIS-ASTHMA-EMPHYSEMA	8680.	18567.	12735.	16134.	32717.	88833.
17. PEPTIC ULCER & GASTRITIS	0.	0.	12978.	22221.	7593.	42793.
18. DERMATITIS	76322.	125709.	78925.	30921.	13951.	325827.
19. DERMATOSIS	5036.	14351.	8149.	9266.	6832.	43633.
20. ACCIDENT & TRAUMA	62871.	11456.	203965.	59635.	15192.	353119.
ALL DISEASES	1511123.	7463987.	5917269.	2982063.	1639055.	19513456.

AGGREGATE RATES

AGE GROUP	D.I.I. PER PERSON PER YEAR
0 - 1 yr	15.627
1 - 4 yrs	22.921
5 - 14 yrs	7.287
15 - 44 yrs	2.343
45 + yrs	3.743
ALL AGE GROUP	6.626

TOTAL VISIT PER YEAR = 5588561. VISIT PER PERSON PER YEAR = 1.8975

NUMBER SEEKING CARE PER YEAR = 3231178. FRACTION SEEKING CARE 0.467

	SELF CARE COST	MED. MAN COST	SHC COST	AMP COST	H.C. COST	HOSPITAL COST	PRIVATE PHYSICIAN COST
ALL DISEASES (IN THOUSAND RP.)	0.0	0.0	52364.95	0.0	149515.63	192970.19	0.00

TOTAL GOVERNMENT COSTS = RP. 394.85059 MILLIONS

APPENDIX D

```
C RESOURCE ALLOCATION SUBOPTIMIZATION MODEL
C FOR THE INDONESIAN REGIONAL HEALTH PLANNING
C THE SHORT VERSION OF RGALLOC (COMPILER RGALLSHCOM)
C MODIFIED APRIL 1, 1982
      COMMON CDLA,CPSA,CPSC,CDL,NDIS,NAGE,LCR,PSC,DL
      DIMENSION POP(5),RATE(20,5),PSC(8,8,20,5,7),VE(20,7),
     + DL(8,8,20,5,7),DLNRX(20,5),CPSC(3,20),TCASE(8,8),
     + TSC(8,8),COSTV(8,8),TVIS(8,8),COSTF(8,8),ATDAY(5),
     + ASDIR(8,8,5),DIR(8,8),COST(8,8),COV(8,8),CDL(3,20),
     + EXBUD(8,8),XMORBT(8,8),XMORB(8,8,5),COSTSC(7),ND(2),
     + AGNAM(5,2),DIAGN(20,10),INTNAM(4,10),RGNAM(7),
     + DATE(3),BUDG(10),XCOV(8,8),CDLA(3),CPSA(3),INDEX(3,20)
      DATA TCASE,TVIS,TSC,COSTV/64*0.,64*0.,64*0.,64*0./
C MEMBACA DATA DASAR DENGAN INPUT DEVICE 5
C MEMBACA NAMA KABUPATEN
   77 READ(5,10)(RGNAM(K2),K2=1,7)
 10   FORMAT(7A4)
C MEMBACA TANGGAL PEKERJAAN DARI INPUT DEVICE 5
      READ(5,10)(DATE(K3),K3=1,3)
C MEMBACA JUMLAH JENIS PENYAKIT DALAM PERHITUNGAN.
C JUMLAH MAX 20 PENYAKIT
      READ(5,11)NDIS
 11   FORMAT(I2)
C MEMBACA JUMLAH GOLONGAN UMUR
      READ(5,12)NAGE
 12   FORMAT(I1)
C MEMBACA JUMLAH SARANA PENGOBATAN YANG AKAN DIPAKAI.
C MAX 7 JENIS SARANA, DARI INPUT DEVICE 5
      READ(5,12)LCR
C MEMBACA BIAYA TANGGUNGAN LANGSUNG PEMERINTAH UNTUK
C SATU KONSULTASI MENURUT JENIS SARANA PELAYANAN
   78 READ(5,21)(COSTSC(L),L=1,LCR)
      POPT=0
      DO 5 J=1,NAGE
C MEMBACA JUMLAH PENDUDUK MERURUT GOLONGAN UMUR
C PADA PERTENGAHAN MASA PERENCANAAN
      READ(5,13)POP(J)
 13   FORMAT(F8.0)
      POPT=POPT+POP(J)
C MEMBACA NAMA GOLONGAN UMUR
 5    READ(5,14)(AGNAM(J,K1),K1=1,2)
 14   FORMAT(2A4)
C MEMBACA LAMA MASA PERENCANAAN
      READ(5,11)LPP
      DO 100 I=1,NDIS
```

```
46          READ (5,15)(DIAGN(I,K4),K4=1,10)
47          READ(1,21)(VE(I,L),L=1,LCR)
48     15   FORMAT(10A4)
49          DO 100 J=1,NAGE
50       79 READ(5,20)RATE(I,J),(PSC(1,1,I,J,L),L=1,LCR)
51          READ(3,22)DLNRX(I,J),(DL(1,1,I,J,L),L=1,LCR)
52     21   FORMAT(7F8.3)
53     22   FORMAT(8F8.3)
54     20   FORMAT(F6.0,7F6.2)
55    100   CONTINUE
56    C  MEMBACA JUMLAH VARIABLE YANG MUNGKIN DIPAKAI SEBAGAI ALAT
57    C  PENGEMBANGAN KEBIJAKSANAAN UMUM KESEHATAN, DALAM RANGKA
58    C  PENINGKATAN JUMLAH KUNJUNGAN DAN PENGURANGAN JUMLAH HARI SAKIT
59          READ (7,12) NINT
60          NCOMB=2**NINT
61    C  MANFAAT ANEKA KEBIJAKSANAAN KESEHATAN
63          DO 500 N=1,NINT
64          READ(7,15) (INTNAM(N,K4),K4=1,10)
65    C MEMBACA JUMLAH PENYAKIT YANG DIPENGARUHI OLEH
66    C PERUBAHAN KEBIJAKSANAAN
67          READ(7,11) ND(N)
68          N1=ND(N)
69          DO 500 NN=1,N1
70          READ (7,11) INDEX(N,NN)
71          I=INDEX(N,NN)
72    C  MEMBACA PERUBAHAN RELATIP PEMAKAIAN SARANA/ HARI TIDAK DAPAT
73    C BEKERJA KARENA SAKIT DARI BEBERAPA PILIHAN MELALUI INPUT FILE 7
74    500 READ(7,28)CPSC(N,I),CDL(N,I)
75     28 FORMAT(2F8.3)
76        READ(7,12) NALT
77     62 READ(7,21)(CPSA(LA),LA=1,NALT),(CDLA(LA),LA=1,NALT)
78        LL=2**NALT
79        DO 37 LT=1,LL
80        DO 37 K=1,NCOMB
81        DO 37 I=1,NDIS
82        DO 37 J=1,NAGE
83        DO 37 L=1,LCR
84        PSC(LT,K,I,J,L)=PSC(1,1,I,J,L)
85     37 DL(LT,K,I,J,L)=DL(1,1,I,J,L)
86        DO 360 K=1,NCOMB
87        DO 360 I=1,NDIS
88        DO 360 J=1,NAGE
89        NA=1
90        DO 365 LA4=1,2
91        DO 365 LA3=1,2
92        DO 365 LA2=1,2
93        DO 365 LA1=1,2
94        LT=NA
95        IF(LA1.EQ.2)CALL ALTER(1,LT,K,I,J)
```

```
      IF(LA2.EQ.2)CALL ALTER(2,LT,K,I,J)
      IF(LA3.EQ.2)CALL ALTER(3,LT,K,I,J)
      IF(LA4.EQ.2)CALL ALTER(4,LT,K,I,J)
   63 IF(NA.EQ.LL)GO TO 370
  365 NA=NA+1
  370 CONTINUE
  360 CONTINUE
      DO 375 LT=1,LL
      DO 375 J=1,NAGE
      NC=1
      DO 376 L4=1,2
      DO 376 L3=1,2
      DO 376 L2=1,2
      DO 376 L1=1,2
      K=NC
      IF(L1.EQ.2)CALL INTER(1,LT,K,J,ND,INDEX)
      IF(L2.EQ.2)CALL INTER(2,LT,K,J,ND,INDEX)
      IF(L3.EQ.2)CALL INTER(3,LT,K,J,ND,INDEX)
      IF(L4.EQ.2)CALL INTER(4,LT,K,J,ND,INDEX)
   64 IF(NC.EQ.NCOMB)GO TO 377
  376 NC=NC+1
  377 CONTINUE
  375 CONTINUE
      DO 650 LT=1,LL
      DO 650 K=1,NCOMB
      CTDAY=0
      DO 656 J=1,NAGE
  656 ATDAY(J)=0
      DO 651 I=1,NDIS
      DO 651 J=1,NAGE
      PSCI=0
      DO 653 L=1,LCR
  653 PSCI=PSCI+PSC(LT,K,I,J,L)
      DO 657 L=1,LCR
  657 IF(PSCI.GE.100)PSC(LT,K,I,J,L)=PSC(LT,K,I,J,L)*100/PSCI
      TNSC=0
      TDAYX=0
      CASE=RATE(I,J)*POP(J)/1000.
      DO 652 L=1,LCR
      XNSC=CASE*PSC(LT,K,I,J,L)/100.
      TNSC=TNSC+XNSC
      DAYX=XNSC*DL(LT,K,I,J,L)
      TSC(LT,K)=TSC(LT,K)+XNSC
      IF(K.EQ.1)COSTV(LT,K)=COSTV(LT,K) + (XNSC*COSTSC(L))
      IF(K.EQ.3)COSTV(LT,K)=COSTV(LT,K) + (XNSC*COSTSC(L))
      IF(K.EQ.5)COSTV(LT,K)=COSTV(LT,K) + (XNSC*COSTSC(L))
      IF(K.EQ.7)COSTV(LT,K)=COSTV(LT,K) + (XNSC*COSTSC(L))
      TVIS(LT,K)=TVIS(LT,K)+(XNSC*VE(I,L))
  652 TDAYX=TDAYX+DAYX
```

```
145          YNRX=CASE-TNSC
146          DAYNRX=YNRX*DLNRX(I,J)
147          ATDAY(J)=ATDAY(J)+DAYNRX+TDAYX
148          TCASE(LT,K)=TCASE(LT,K)+CASE
149      651 CTDAY=CTDAY+DAYNRX+TDAYX
150          DO 654 J=1,NAGE
151      654 ASDIR(LT,K,J)=ATDAY(J)/POP(J)
152      650 DIR(LT,K)=CTDAY/POPT
153    C PEMBAHASAN COST EFFECTIVENESS DARI ANEKA PRDGRAM
155    C BACAKAN BIAYA PENYELENGGARAAN MASING MASING PROGRAM
156          DO 610 LT=1,LL
157     610  READ(9,41)(COSTF(LT,K),K=1,NCDMB)
158     41   FORMAT(8F15.3)
159          DO 611 LT=1,LL
160          DO 611 K=1,NCOMB
161          COSTVC=LPP*COSTV(LT,K)/TSC(LT,K)
162          COSTFC=COSTF(LT,K)/POPT
163      611 COST(LT,K)=COSTVC+COSTFC
164    C MEMBACA BEBERAPA KEMUNGKINAN TINGKATAN PEMBIAYAAN
165       81 READ(9,12)NLEVEL
166          DO 620 M=1,NLEVEL
167     620  READ(9,43) BUDG(M)
168     43   FORMAT(F8.2)
169          DO 625 M=1,NLEVEL
170    C MENULISKAN TABEL UNTUK BERBAGAI TINGKATAN PEMBIAYAAN
171          WRITE (6,82)M,(RGNAM(K2),K2=1,7),(DATE(K3),K3=1,3),POPT,
172             +TCASE(1,1),LPP,BUDG(M),((AGNAM(J,K1),K1=1,2),J=1,NAGE)
173       82 FORMAT('1',48('*'),/'* TABLE',I2,' - ',7A4,7X,'*',59X,'DATE ',3A4,
174         +/'*',46X,'*',/'* COST EFFECTIVENESS ANALYSIS OF VARIOUS       *',
175         +19X,'POPULATION IN MID PLANNING PERIOD IS',F9.0,' PEOPLE',/
176         +'* HEALTH PROGRAMS MEASURED IN DAYS OF',10X,'*',/
177         +'* INCAPACITATION DUE TO ILLNESS BY AGE-GROUPS  *',19X,
178         +'AVERAGE ANNUAL EPISODE OF ILLNESS IS',F9.0,' CASES',/
179         +'* IF TOTAL DEVELOPMENT BUDGET FOR THE ',I2,' YEARS *',/
180         +'* PLANNING PERIOD IS RP.',F9.2,' PER CAPITA   *',/48('*'),/'-'/
181         +2('ALTER. '),'  ADD.    ADD.    TOTAL NUMBER OF INCAPACIT',
182         +'ATION DAYS/PERSON/YEAR   AV. ANN. PERCENT AV. ANN.',/'FACIL.',
183         +' POLICY COST PER PROGRAM SURPLUS',16('_'),'AGE_____GROUPS',
184         +17('_'),2(' SEEKING '),'  # OF',/'EXPAN. INTER.  CAPITA  COVER',
185         +'AGE BUDGET',10A4,' ALL AGE ',2(' CARE '),' VISITS',/'-'/)
186          DO 630 LT=1,LL
187          DO 630 K=1,NCOMB
188          IF (COST(LT,K).GT.0.0) GO TO 635
189           COV(LT,K)=1.
190           XCOV(LT,K)=100.
191           EXBUD(LT,K)=BUDG(M)
192           XMORBT(LT,K)=DIR(1,1)
193          DO 640 J=1,NAGE
194      640 XMORB(LT,K,J)=ASDIR(1,1,J)
195          GO TO 636
```

```
635   COV(LT,K)=BUDG(M)/COST(LT,K)
      IF(COV(LT,K).GT.1.)COV(LT,K)=1.
      IF(COV(LT,K).EQ.1.)EXBUD(LT,K)=BUDG(M)-COST(LT,K)
      IF(COV(LT,K).LT.1.)EXBUD(LT,K)=0.0
      XCOV(LT,K)=COV(LT,K)*100.
      XMORBT(LT,K)=(DIR(LT,K)*COV(LT,K))+((1-COV(LT,K))*DIR(1,1))
      DO  655 J=1,NAGE
 655  XMORB(LT,K,J)=(ASDIR(LT,K,J)*COV(LT,K))+((1-COV(LT,K))
     +*ASDIR(1,1,J))
 636  XTSC=(TSC(LT,K)*COV(LT,K))+((1-COV(LT,K))*TSC(1,1))
      XTVIS=(TVIS(LT,K)*COV(LT,K))+((1-COV(LT,K))*TVIS(1,1))
      XPSC=XTSC*100/TCASE(LT,K)
630   WRITE(6,110)LT,K,COST(LT,K),XCOV(LT,K),EXBUD(LT,K),
     +(XMORB(LT,K,J),J=1,5),XMORBT(LT,K),XTSC,XPSC,XTVIS
 110  FORMAT(2(1X,I2,4X),F8.2,3X,F4.0,'%',1X,F8.2,6(1X,F5.2,2X),
     +F9.0,2X,F4.0,'%',2X,F10.0)
625   CONTINUE
      STOP
      END
      SUBROUTINE INTER(N,LT,K,J,ND,INDEX)
      COMMON CDLA,CPSA,CPSC,CDL,NDIS,NAGE,LCR,PSC,DL
      DIMENSION PSC(8,8,20,5,7),DL(8,8,20,5,7),CPSC(3,20),CDL(3,20)
     + CPSA(3),CDLA(3),ND(2),INDEX(3,20)
      N1=ND(N)
      DO 1 NN=1,N1
      I=INDEX(NN,N)
      AI=0
      DO 2 L=1,LCR
          PSC(LT,K,I,J,L)= (PSC(LT,K,I,J,L) * (1+(CPSC(N,I)/100)))
      DL(LT,K,I,J,L)=(DL(LT,K,I,J,L)*(1-(CDL(N,I)/100)))
    2 AI=AI+PSC(LT,K,I,J,L)
      DO 3 L=1,LCR
    3 IF(AI.GE.100)PSC(LT,K,I,J,L)=PSC(LT,K,I,J,L)*100/AI
    1 CONTINUE
      RETURN
      END
      SUBROUTINE ALTER(LA,LT,K,I,J)
      COMMON CDLA,CPSA,CPSC,CDL,NDIS,NAGE,LCR,PSC,DL
      DIMENSION PSC(8,8,20,5,7),DL(8,8,20,5,7),CPSA(3),CDLA(3),
     +          CPSC(3,20),CDL(3,20)
      A=0
      DO 33 L=1,LCR
      PSC(LT,K,I,J,L)=(PSC(LT,K,I,J,L) * (1+(CPSA(LA)/100)))
      DL(LT,K,I,J,L)=(DL(LT,K,I,J,L)*(1-(CDLA(LA)/100)))
   33 A=A+PSC(LT,K,I,J,L)
      DO 34 L=1,LCR
   34 IF(A.GE.100)PSC(LT,K,I,J,L)=PSC(LT,K,I,J,L)*100/A
      RETURN
      END
```

TABLE 108 - BOGOR, WEST JAVA, INDONESIA.

COST EFFECTIVENESS ANALYSIS OF VARIOUS HEALTH PROGRAMS MEASURED IN DAYS OF INCAPACITATION DUE TO ILLNESS BY AGE-GROUPS IF TOTAL DEVELOPMENT BUDGET FOR THE 21 YEARS PLANNING PERIOD IS RP. 1250.00 PER CAPITA

GOVERNMENT COST EFFECTIVENESS

POPULATION IN MID PLANNING PERIOD IS 3871046. PEOPLE

AVERAGE ANNUAL EPISODE OF ILLNESS IS 9089399. CASES

LTER. ACIL. XPAN.	ALTER. POLICY INTER.	ADD. COST PER CAPITA	ADD. PROGRAM COVERAGE	TOTAL SURPLUS BUDGET	NUMBER OF INCAPACITATION DAYS/PERSON/YEAR AGE GROUPS 0 - 1	1 - 4	5 - 14	15 - 44	45 + YRS	ALL AGE	AV. ANN. SEEKING CARE	PERCENT SEEKING CARE	AV. ANN. # OF VISITS
1	1	2566.22	49.%	0.0	15.63	22.92	7.29	2.34	3.74	6.63	4246827.	47.%	7345171.
1	2	0.0	100.%	1250.00	15.63	22.92	7.29	2.34	3.74	6.63	4194796.	46.%	7238418.
1	3	4614.96	27.%	0.0	15.53	22.73	7.25	2.32	3.65	6.57	4356423.	48.%	7556102.
1	4	1996.64	63.%	0.0	15.41	22.52	7.21	2.29	3.55	6.50	4496106.	49.%	7823940.
1	5	3272.08	38.%	0.0	15.62	22.90	7.28	2.34	3.73	6.62	4264264.	47.%	7381012.
1	6	697.10	100.%	552.90	15.63	22.93	7.29	2.34	3.74	6.63	4238082.	47.%	7327385.
1	7	5314.98	24.%	0.0	15.54	22.75	7.25	2.32	3.66	6.57	4346064.	48.%	7535506.
1	8	2693.75	46.%	0.0	15.46	22.60	7.22	2.30	3.59	6.52	4439612.	49.%	7714174.
2	1	2748.53	45.%	0.0	15.04	22.21	7.03	2.23	3.56	6.38	4568452.	50.%	7900940.
2	2	184.25	100.%	1065.75	14.35	21.42	6.75	2.11	3.38	6.11	4893443.	54.%	8442946.
2	3	5454.68	23.%	0.0	15.24	22.40	7.13	2.26	3.58	6.45	4481108.	49.%	7760914.
2	4	2852.33	44.%	0.0	14.89	21.96	6.99	2.20	3.44	6.30	4691711.	52.%	8133351.
2	5	3660.95	34.%	0.0	15.18	22.36	7.09	2.26	3.59	6.44	4506261.	50.%	7799424.
2	6	1088.04	100.%	161.96	14.34	21.37	6.73	2.10	3.34	6.09	4943867.	54.%	8546556.
2	7	6359.85	20.%	0.0	15.29	22.47	7.15	2.27	3.60	6.47	4449780.	49.%	7705311.
2	8	3756.12	33.%	0.0	15.06	22.17	7.05	2.23	3.51	6.37	4588349.	50.%	7950233.
3	1	3212.53	39.%	0.0	15.42	22.67	7.20	2.30	3.68	6.54	4325662.	48.%	7481417.
3	2	646.85	100.%	603.15	15.10	22.32	7.07	2.25	3.60	6.42	4394941.	48.%	7583532.
3	3	6825.75	18.%	0.0	15.46	22.67	7.22	2.31	3.65	6.54	4353325.	48.%	7542100.
3	4	4212.25	30.%	0.0	15.36	22.53	7.18	2.29	3.60	6.50	4417419.	49.%	7659973.
3	5	4085.17	31.%	0.0	15.46	22.70	7.21	2.31	3.68	6.55	4323346.	48.%	7482191.
3	6	1510.83	83.%	0.0	15.18	22.39	7.10	2.26	3.60	6.44	4406885.	48.%	7619472.
3	7	7692.40	16.%	0.0	15.47	22.69	7.22	2.31	3.66	6.55	4344240.	48.%	7525048.
3	8	5076.23	25.%	0.0	15.40	22.59	7.19	2.29	3.62	6.52	4392825.	48.%	7614224.
4	1	3394.80	37.%	0.0	14.93	22.08	6.99	2.21	3.53	6.34	4594107.	51.%	7945266.
4	2	831.10	100.%	418.90	13.75	20.70	6.49	2.00	3.20	5.87	5126582.	56.%	8844846.
4	3	7664.91	16.%	0.0	15.25	22.44	7.13	2.27	3.60	6.46	4446207.	49.%	7695693.
4	4	5067.94	25.%	0.0	15.06	22.20	7.05	2.23	3.53	6.38	4546740.	50.%	7871659.
4	5	4473.92	28.%	0.0	15.09	22.26	7.05	2.24	3.57	6.40	4525362.	50.%	7831399.
4	6	1901.77	66.%	0.0	14.38	21.42	6.75	2.11	3.36	6.11	4859768.	53.%	8402190.
4	7	8736.50	14.%	0.0	15.29	22.49	7.15	2.28	3.61	6.48	4422860.	49.%	7654655.
4	8	6138.61	20.%	0.0	15.15	22.32	7.09	2.25	3.56	6.42	4496041.	49.%	7782674.

ATER. FCIL. EPAN.	ALTER. POLICY INTER.	ADD. COST PER CAPITA	ADD. PROGRAM COVERAGE	TOTAL SURPLUS BUDGET	NUMBER OF INCAPACITATION DAYS/PERSON/YEAR AGE GROUPS 0 - 1	1 - 4	5 - 14	15 - 44	45 + yrs	ALL AGE	AV. ANN. SEEKING CARE	PERCENT SEEKING CARE	AV. ANN. # OF VISITS
5	1	3120.71	40.%	0.0	15.29	22.51	7.14	2.28	3.64	6.49	4326795.	48.%	7483373.
5	2	555.03	100.%	694.97	14.79	21.96	6.94	2.19	3.51	6.30	4392016.	48.%	7578486.
5	3	7125.57	18.%	0.0	15.41	22.62	7.20	2.30	3.64	6.53	4348390.	48.%	7533053.
5	4	4512.00	28.%	0.0	15.29	22.46	7.15	2.27	3.59	6.47	4405371.	48.%	7637859.
5	5	4985.64	25.%	0.0	15.41	22.65	7.19	2.30	3.67	6.53	4308777.	47.%	7456144.
5	6	2411.30	52.%	0.0	15.19	22.40	7.10	2.26	3.61	6.45	4345581.	48.%	7514391.
5	7	8984.50	14.%	0.0	15.45	22.67	7.21	2.31	3.66	6.54	4329870.	48.%	7498575.
5	8	6368.27	20.%	0.0	15.38	22.58	7.19	2.29	3.63	6.51	4362695.	48.%	7558783.
6	1	3302.99	38.%	0.0	14.79	21.91	6.93	2.19	3.49	6.28	4602451.	51.%	7959691.
6	2	739.28	100.%	510.72	13.45	20.34	6.36	1.94	3.11	5.74	5123163.	56.%	8838964.
6	3	7964.73	16.%	0.0	15.21	22.40	7.12	2.26	3.59	6.45	4438243.	49.%	7681730.
6	4	5367.69	23.%	0.0	15.02	22.16	7.04	2.22	3.52	6.37	4529309.	50.%	7841115.
6	5	5374.39	23.%	0.0	15.11	22.29	7.06	2.24	3.58	6.41	4477899.	49.%	7748563.
6	6	2802.24	45.%	0.0	14.65	21.74	6.87	2.16	3.44	6.22	4661267.	51.%	8059868.
6	7	10028.62	12.%	0.0	15.29	22.50	7.15	2.28	3.62	6.48	4399818.	48.%	7614177.
6	8	7430.64	17.%	0.0	15.18	22.36	7.10	2.26	3.58	6.44	4452220.	49.%	7705787.
7	1	3766.98	33.%	0.0	15.16	22.36	7.09	2.26	3.60	6.43	4383422.	48.%	7581221.
7	2	1201.88	100.%	48.12	14.25	21.30	6.71	2.09	3.35	6.07	4601443.	51.%	7939555.
7	3	9336.33	13.%	0.0	15.38	22.60	7.19	2.29	3.64	6.52	4349129.	48.%	7530116.
7	4	6727.61	19.%	0.0	15.29	22.49	7.15	2.28	3.61	6.48	4387521.	48.%	7599050.
7	5	5798.73	22.%	0.0	15.32	22.55	7.15	2.28	3.64	6.50	4346232.	48.%	7520473.
7	6	3225.03	39.%	0.0	15.09	22.27	7.06	2.24	3.58	6.40	4402667.	48.%	7613345.
7	7	11362.02	11.%	0.0	15.42	22.65	7.20	2.30	3.66	6.54	4332906.	48.%	7500396.
7	8	8750.76	14.%	0.0	15.37	22.58	7.18	2.29	3.64	6.51	4357628.	48.%	7544996.
8	1	3949.18	32.%	0.0	14.74	21.84	6.90	2.18	3.47	6.26	4622343.	51.%	7993996.
8	2	1386.13	90.%	0.0	13.12	19.93	6.22	1.88	3.01	5.61	5256908.	58.%	9071017.
8	3	10174.63	12.%	0.0	15.23	22.43	7.12	2.27	3.60	6.46	4422125.	49.%	7651204.
8	4	7583.30	16.%	0.0	15.09	22.27	7.07	2.24	3.56	6.40	4480895.	49.%	7753248.
8	5	6187.89	20.%	0.0	15.05	22.22	7.04	2.23	3.56	6.39	4496364.	49.%	7779701.
8	6	3615.96	35.%	0.0	14.66	21.75	6.87	2.16	3.45	6.23	4653105.	51.%	8045975.
8	7	12404.76	10.%	0.0	15.30	22.51	7.15	2.28	3.63	6.49	4391152.	48.%	7597144.
8	8	9813.14	13.%	0.0	15.21	22.41	7.12	2.26	3.60	6.45	4428446.	49.%	7661832.

TABLE 109 - BOGOR, WEST JAVA, INDONESIA.

COST EFFECTIVENESS ANALYSIS OF VARIOUS HEALTH PROGRAMS MEASURED IN DAYS OF INCAPACITATION DUE TO ILLNESS BY AGE-GROUPS IF TOTAL DEVELOPMENT BUDGET FOR THE 21 YEARS PLANNING PERIOD IS RP. 1870.00 PER CAPITA

GOVERNMENT COST EFFECTIVENESS

POPULATION IN MID PLANNING PERIOD IS 3871046. PEOPLE

AVERAGE ANNUAL EPISODE OF ILLNESS IS 9089399. CASES

LTER. ACIL. XPAN.	ALTER. POLICY INTER.	ADD. COST PER CAPITA	ADD. PROGRAM COVERAGE	TOTAL SURPLUS BUDGET	NUMBER OF INCAPACITATION DAYS/PERSON/YEAR AGE GROUPS 0 - 1	1 - 4	5 - 14	15 - 44	45 + YRS	ALL AGE	AV. ANN. SEEKING CARE	PERCENT SEEKING CARE	AV. ANN. # OF VISITS
1	1	2566.22	73.%	0.0	15.63	22.92	7.29	2.34	3.74	6.63	4246827.	47.%	7345171.
1	2	0.0	100.%	1870.00	15.63	22.92	7.29	2.34	3.74	6.63	4194796.	46.%	7238418.
1	3	4614.96	41.%	0.0	15.48	22.64	7.23	2.31	3.61	6.54	4410783.	49.%	7660724.
1	4	1996.64	94.%	0.0	15.31	22.32	7.17	2.27	3.46	6.44	4619748.	51.%	8061409.
1	5	3272.08	57.%	0.0	15.62	22.89	7.28	2.34	3.72	6.62	4272913.	47.%	7398789.
1	6	697.10	100.%	1172.90	15.63	22.93	7.29	2.34	3.74	6.63	4238082.	47.%	7327385.
1	7	5314.98	35.%	0.0	15.49	22.66	7.23	2.31	3.62	6.54	4395285.	48.%	7629913.
1	8	2693.75	69.%	0.0	15.37	22.44	7.19	2.28	3.51	6.47	4535234.	50.%	7897198.
2	1	2748.53	68.%	0.0	14.75	21.85	6.91	2.18	3.47	6.26	4727978.	52.%	8176602.
2	2	184.25	100.%	1685.75	14.35	21.42	6.75	2.11	3.38	6.11	4893443.	54.%	8442946.
2	3	5454.68	34.%	0.0	15.04	22.15	7.05	2.23	3.50	6.37	4597311.	51.%	7967123.
2	4	2852.33	66.%	0.0	14.52	21.48	6.84	2.12	3.29	6.14	4912373.	54.%	8524289.
2	5	3660.95	51.%	0.0	14.96	22.09	6.99	2.21	3.52	6.34	4634940.	51.%	8024733.
2	6	1088.04	100.%	781.96	14.34	21.37	6.73	2.10	3.34	6.09	4943867.	54.%	8546556.
2	7	6359.85	29.%	0.0	15.12	22.25	7.08	2.24	3.53	6.40	4550444.	50.%	7883940.
2	8	3756.12	50.%	0.0	14.77	21.80	6.94	2.17	3.39	6.25	4757744.	52.%	8250344.
3	1	3212.53	58.%	0.0	15.31	22.54	7.15	2.28	3.65	6.50	4364764.	48.%	7548995.
3	2	646.85	100.%	1223.15	15.10	22.32	7.07	2.25	3.60	6.42	4394941.	48.%	7583532.
3	3	6825.75	27.%	0.0	15.37	22.55	7.18	2.29	3.61	6.50	4406148.	48.%	7639777.
3	4	4212.25	44.%	0.0	15.22	22.34	7.13	2.26	3.53	6.44	4502032.	50.%	7816115.
3	5	4085.17	46.%	0.0	15.37	22.60	7.17	2.29	3.65	6.51	4361300.	48.%	7550154.
3	6	1510.83	100.%	359.17	15.09	22.28	7.06	2.24	3.57	6.40	4440284.	49.%	7676710.
3	7	7692.40	24.%	0.0	15.39	22.58	7.19	2.29	3.62	6.51	4392558.	48.%	7614268.
3	8	5076.23	37.%	0.0	15.28	22.42	7.15	2.27	3.56	6.46	4465240.	49.%	7747673.
4	1	3394.80	55.%	0.0	14.58	21.66	6.84	2.15	3.42	6.19	4766357.	52.%	8242913.
4	2	831.10	100.%	1038.90	13.75	20.70	6.49	2.00	3.20	5.87	5126582.	56.%	8844846.
4	3	7664.91	24.%	0.0	15.06	22.20	7.05	2.23	3.53	6.38	4545100.	50.%	7869552.
4	4	5067.94	37.%	0.0	14.78	21.85	6.94	2.18	3.43	6.26	4695498.	52.%	8132797.
4	5	4473.92	42.%	0.0	14.83	21.93	6.94	2.19	3.48	6.29	4663516.	51.%	8072568.
4	6	1901.77	98.%	0.0	13.77	20.68	6.48	1.99	3.17	5.86	5163788.	57.%	8926471.
4	7	8736.50	21.%	0.0	15.12	22.28	7.08	2.24	3.55	6.41	4510173.	50.%	7808160.
4	8	6138.61	30.%	0.0	14.92	22.02	7.00	2.20	3.47	6.32	4619651.	51.%	7999676.

ATER. FCIL. EPAN.	ALTER. POLICY INTER.	ADD. COST PER CAPITA	ADD. PROGRAM COVERAGE	TOTAL SURPLUS BUDGET	NUMBER OF INCAPACITATION DAYS/PERSON/YEAR AGE GROUPS 0 - 1	1 - 4	5 - 14	15 - 44	45 + yrs	ALL AGE	AV. ANN. SEEKING CARE	PERCENT SEEKING CARE	AV. ANN. # OF VISITS
5	1	3120.71	60.%	0.0	15.12	22.31	7.07	2.25	3.59	6.42	4366459.	48.%	7551922.
5	2	555.03	100.%	1314.97	14.79	21.96	6.94	2.19	3.51	6.30	4392016.	48.%	7578486.
5	3	7125.57	26.%	0.0	15.30	22.47	7.15	2.28	3.59	6.48	4398766.	48.%	7626243.
5	4	4512.00	41.%	0.0	15.12	22.23	7.08	2.24	3.51	6.40	4484008.	49.%	7783033.
5	5	4985.64	38.%	0.0	15.30	22.52	7.15	2.28	3.63	6.49	4339504.	48.%	7511186.
5	6	2411.30	78.%	0.0	14.97	22.14	7.01	2.22	3.54	6.36	4394563.	48.%	7598324.
5	7	8984.50	21.%	0.0	15.36	22.55	7.18	2.29	3.61	6.50	4371060.	48.%	7574663.
5	8	6368.27	29.%	0.0	15.26	22.41	7.14	2.27	3.57	6.46	4420166.	49.%	7664734.
6	1	3302.99	57.%	0.0	14.38	21.41	6.75	2.11	3.36	6.11	4778840.	53.%	8264492.
6	2	739.28	100.%	1130.72	13.45	20.34	6.36	1.94	3.11	5.74	5123163.	56.%	8838964.
6	3	7964.73	23.%	0.0	15.01	22.14	7.03	2.22	3.52	6.36	4533184.	50.%	7848664.
6	4	5367.69	35.%	0.0	14.71	21.78	6.91	2.17	3.41	6.24	4669419.	51.%	8087104.
6	5	5374.39	35.%	0.0	14.85	21.97	6.95	2.20	3.49	6.30	4592511.	51.%	7948644.
6	6	2802.24	67.%	0.0	14.16	21.16	6.66	2.07	3.29	6.02	4866828.	54.%	8414359.
6	7	10028.62	19.%	0.0	15.13	22.30	7.08	2.25	3.56	6.41	4475702.	49.%	7747604.
6	8	7430.64	25.%	0.0	14.96	22.09	7.01	2.21	3.50	6.34	4554095.	50.%	7884653.
7	1	3766.98	50.%	0.0	14.93	22.08	6.99	2.21	3.53	6.34	4451172.	49.%	7698302.
7	2	1201.88	100.%	668.12	14.25	21.30	6.71	2.09	3.35	6.07	4601443.	51.%	7939555.
7	3	9336.33	20.%	0.0	15.26	22.44	7.14	2.27	3.59	6.47	4399870.	48.%	7621849.
7	4	6727.61	28.%	0.0	15.13	22.27	7.08	2.24	3.54	6.41	4457306.	49.%	7724973.
7	5	5798.73	32.%	0.0	15.17	22.36	7.09	2.26	3.59	6.43	4395536.	48.%	7607423.
7	6	3225.03	58.%	0.0	14.82	21.95	6.94	2.19	3.49	6.29	4479963.	49.%	7746358.
7	7	11362.02	16.%	0.0	15.32	22.52	7.16	2.28	3.62	6.49	4375601.	48.%	7577837.
7	8	8750.76	21.%	0.0	15.24	22.41	7.13	2.26	3.58	6.45	4412586.	49.%	7644109.
8	1	3949.18	47.%	0.0	14.30	21.31	6.71	2.09	3.34	6.08	4808600.	53.%	8315814.
8	2	1386.13	100.%	483.87	12.84	19.61	6.10	1.82	2.93	5.50	5366907.	59.%	9258963.
8	3	10174.63	18.%	0.0	15.03	22.18	7.04	2.23	3.54	6.38	4509072.	50.%	7802997.
8	4	7583.30	25.%	0.0	14.83	21.94	6.96	2.19	3.47	6.29	4596992.	51.%	7955654.
8	5	6187.89	30.%	0.0	14.77	21.87	6.92	2.18	3.47	6.27	4620135.	51.%	7995229.
8	6	3615.96	52.%	0.0	14.18	21.17	6.66	2.07	3.30	6.03	4854619.	53.%	8393573.
8	7	12404.76	15.%	0.0	15.13	22.31	7.08	2.25	3.57	6.42	4462737.	49.%	7722123.
8	8	9813.14	19.%	0.0	15.00	22.16	7.03	2.22	3.53	6.37	4518530.	50.%	7818896.

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 TABLE 110 - BOGOR, WEST JAVA, INDONESIA.     *
                                              *
 COST EFFECTIVENESS ANALYSIS OF VARIOUS       *
 HEALTH PROGRAMS MEASUREO IN DAYS OF          *
 INCAPACITATION DUE TO ILLNESS BY AGE-GROUPS  *
 IF TOTAL DEVELOPMENT BUDGET FOR THE 21 YEARS *
 PLANNING PERIOD IS RP.  2500.00 PER CAPITA   *
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GOVERNMENT COST EFFECTIVENESS

POPULATION IN MID PLANNING PERIOD IS 3871046. PEOPLE

AVERAGE ANNUAL EPISODE OF ILLNESS IS 9089390. CASES

LTER. ACIL. XPAN.	ALTER. POLICY INTER.	ADD. COST PER CAPITA	ADD. PROGRAM COVERAGE	TOTAL SURPLUS BUDGET	NUMBER OF INCAPACITATION DAYS/PERSON/YEAR AGE GROUPS 0 - 1	1 - 4	5 - 14	15 - 44	45 + YRS	ALL AGE	AV. ANN. SEEKING CARE	PERCENT SEEKING CARE	AV. ANN. # OF VISITS
1	1	2566.22	97.%	0.0	15.63	22.92	7.29	2.34	3.74	6.63	4246827.	47.%	7345171.
1	2	0.0	100.%	2500.00	15.63	22.92	7.29	2.34	3.74	6.63	4194796.	46.%	7238418.
1	3	4614.96	54.%	0.0	15.43	22.54	7.21	2.29	3.56	6.51	4466019.	49.%	7767033.
1	4	1996.64	100.%	503.36	15.28	22.28	7.16	2.26	3.44	6.43	4645004.	51.%	8109915.
1	5	3272.08	76.%	0.0	15.62	22.89	7.28	2.34	3.72	6.61	4281701.	47.%	7416853.
1	6	697.10	100.%	1802.90	15.63	22.93	7.29	2.34	3.74	6.63	4238082.	47.%	7327385.
1	7	5314.98	47.%	0.0	15.44	22.57	7.21	2.30	3.57	6.52	4445300.	49.%	7725842.
1	8	2693.75	93.%	0.0	15.28	22.28	7.16	2.26	3.43	6.42	4632397.	51.%	8083176.
2	1	2748.53	91.%	0.0	14.45	21.49	6.76	2.12	3.38	6.14	4890078.	54.%	8456709.
2	2	184.25	100.%	2315.75	14.35	21.42	6.75	2.11	3.38	6.11	4893443.	54.%	8442946.
2	3	5454.68	46.%	0.0	14.65	21.89	6.97	2.19	3.42	6.28	4715388.	52.%	8176658.
2	4	2852.33	88.%	0.0	14.15	20.99	6.68	2.05	3.14	5.98	5136594.	57.%	8921532.
2	5	3660.95	68.%	0.0	14.73	21.81	6.89	2.17	3.44	6.25	4765695.	52.%	8253676.
2	6	1088.04	100.%	1411.96	14.34	21.37	6.73	2.10	3.34	6.09	4943867.	54.%	8546556.
2	7	6359.85	39.%	0.0	14.95	22.02	7.01	2.20	3.45	6.32	4652732.	51.%	8065451.
2	8	3756.12	67.%	0.0	14.48	21.42	6.82	2.11	3.27	6.12	4929871.	54.%	8555295.
3	1	3212.53	78.%	0.0	15.20	22.41	7.11	2.26	3.61	6.45	4404497.	48.%	7617662.
3	2	646.85	100.%	1853.15	15.10	22.32	7.07	2.25	3.60	6.42	4394941.	48.%	7583532.
3	3	6825.75	37.%	0.0	15.29	22.42	7.15	2.27	3.56	6.46	4459823.	49.%	7739030.
3	4	4212.25	59.%	0.0	15.09	22.15	7.07	2.23	3.46	6.37	4588009.	50.%	7974776.
3	5	4085.17	61.%	0.0	15.28	22.49	7.14	2.28	3.62	6.48	4399865.	48.%	7619212.
3	6	1510.83	100.%	989.17	15.09	22.28	7.06	2.24	3.57	6.40	4440284.	49.%	7676710.
3	7	7692.40	32.%	0.0	15.32	22.46	7.16	2.28	3.57	6.48	4441654.	49.%	7704926.
3	8	5076.23	49.%	0.0	15.17	22.25	7.10	2.24	3.50	6.41	4538823.	50.%	7883275.
4	1	3394.80	74.%	0.0	14.23	21.23	6.68	2.08	3.32	6.05	4941387.	54.%	8545362.
4	2	831.10	100.%	1668.90	13.75	20.70	6.49	2.00	3.20	5.87	5126582.	56.%	8844846.
4	3	7664.91	33.%	0.0	14.87	21.96	6.97	2.19	3.46	6.30	4645588.	51.%	8046216.
4	4	5067.94	49.%	0.0	14.49	21.48	6.82	2.12	3.32	6.14	4846654.	53.%	8398147.
4	5	4473.92	56.%	0.0	14.56	21.60	6.82	2.14	3.39	6.17	4803897.	53.%	8317628.
4	6	1901.77	100.%	598.23	13.74	20.64	6.47	1.99	3.16	5.85	5179365.	57.%	8953334.
4	7	8736.50	29.%	0.0	14.95	22.06	7.01	2.21	3.48	6.34	4598894.	51.%	7964140.
4	8	6138.61	41.%	0.0	14.68	21.72	6.90	2.16	3.38	6.22	4745254.	52.%	8220177.

ATER. FCIL. EPAN.	ALTER. POLICY INTER.	ADD. COST PER CAPITA	ADD. PROGRAM COVERAGE	TOTAL SURPLUS BUDGET	NUMBER OF INCAPACITATION DAYS/PERSON/YEAR AGE GROUPS 0 - 1	1 - 4	5 - 14	15 - 44	45 + yrs	ALL AGE	AV. ANN. SEEKING CARE	PERCENT SEEKING CARE	AV. ANN. # OF VISITS
5	1	3120.71	80.%	0.0	14.94	22.10	7.00	2.22	3.53	6.35	4406763.	48.%	7621575.
5	2	555.03	100.%	1944.97	14.79	21.96	6.94	2.19	3.51	6.30	4392016.	48.%	7578486.
5	3	7125.57	35.%	0.0	15.19	22.32	7.11	2.25	3.54	6.43	4449954.	49.%	7720936.
5	4	4512.00	55.%	0.0	14.94	21.99	7.01	2.21	3.43	6.32	4563915.	50.%	7930548.
5	5	4985.64	50.%	0.0	15.19	22.38	7.10	2.26	3.59	6.44	4370726.	48.%	7567117.
5	6	2411.30	100.%	88.70	14.78	21.91	6.93	2.18	3.48	6.28	4437329.	49.%	7671604.
5	7	8984.50	28.%	0.0	15.27	22.43	7.14	2.27	3.57	6.46	4412914.	49.%	7651977.
5	8	6368.27	39.%	0.0	15.13	22.24	7.09	2.24	3.51	6.40	4478564.	49.%	7772395.
6	1	3302.99	76.%	0.0	13.96	20.91	6.57	2.03	3.24	5.94	4958075.	55.%	8574210.
6	2	739.28	100.%	1760.72	13.45	20.34	6.36	1.94	3.11	5.74	5123163.	56.%	8838964.
6	3	7964.73	31.%	0.0	14.80	21.88	6.95	2.18	3.44	6.27	4629658.	51.%	8018289.
6	4	5367.69	47.%	0.0	14.41	21.40	6.79	2.11	3.30	6.11	4811790.	53.%	8337060.
6	5	5374.39	47.%	0.0	14.59	21.65	6.84	2.15	3.41	6.19	4708972.	52.%	8151953.
6	6	2802.24	89.%	0.0	13.67	20.56	6.44	1.97	3.14	5.82	5075706.	56.%	8774566.
6	7	10028.62	25.%	0.0	14.96	22.08	7.01	2.21	3.50	6.34	4552810.	50.%	7883182.
6	8	7430.64	34.%	0.0	14.73	21.81	6.92	2.17	3.42	6.25	4657612.	51.%	8066403.
7	1	3766.98	66.%	0.0	14.70	21.80	6.89	2.17	3.46	6.24	4520016.	50.%	7817271.
7	2	1201.88	100.%	1298.12	14.25	21.30	6.71	2.09	3.35	6.07	4601443.	51.%	7939555.
7	3	9336.33	27.%	0.0	15.14	22.28	7.09	2.25	3.54	6.41	4451430.	49.%	7715061.
7	4	6727.61	37.%	0.0	14.96	22.05	7.02	2.21	3.47	6.34	4528216.	50.%	7852929.
7	5	5798.73	43.%	0.0	15.02	22.17	7.02	2.23	3.54	6.37	4445636.	49.%	7695776.
7	6	3225.03	78.%	0.0	14.54	21.63	6.82	2.14	3.41	6.18	4558505.	50.%	7881517.
7	7	11362.02	22.%	0.0	15.22	22.39	7.12	2.26	3.57	6.45	4418986.	49.%	7656220.
7	8	8750.76	29.%	0.0	15.10	22.24	7.08	2.24	3.53	6.40	4468429.	49.%	7744822.
8	1	3949.18	63.%	0.0	13.85	20.77	6.52	2.01	3.20	5.89	4997860.	55.%	8642822.
8	2	1386.13	100.%	1113.87	12.84	19.61	6.10	1.82	2.93	5.50	5366907.	59.%	9258963.
8	3	10174.63	25.%	0.0	14.83	21.93	6.96	2.19	3.47	6.29	4597422.	51.%	7957237.
8	4	7583.30	33.%	0.0	14.56	21.61	6.85	2.14	3.38	6.18	4714962.	52.%	8161325.
8	5	6187.89	40.%	0.0	14.48	21.52	6.79	2.13	3.38	6.15	4745901.	52.%	8214232.
8	6	3615.96	69.%	0.0	13.69	20.58	6.45	1.98	3.15	5.83	5059383.	56.%	8746778.
8	7	12404.76	20.%	0.0	14.96	22.10	7.01	2.22	3.51	6.35	4535477.	50.%	7849118.
8	8	9813.14	25.%	0.0	14.79	21.90	6.95	2.18	3.45	6.28	4610066.	51.%	7978493.

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 TABLE 111 - BOGOR, WEST JAVA, INDONESIA.     *
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 COST EFFECTIVENESS ANALYSIS OF VARIOUS       *
 HEALTH PROGRAMS MEASURED IN DAYS OF          *
 INCAPACITATION DUE TO ILLNESS BY AGE-GROUPS  *
 IF TOTAL DEVELOPMENT BUDGET FOR THE 21 YEARS *
 PLANNING PERIDD IS RP.  3125.00 PER CAPITA   *
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GOVERNMENT COST EFFECTIVENESS

POPULATION IN MID PLANNING PERIOD IS 3871046. PEOPLE

AVERAGE ANNUAL EPISODE OF ILLNESS IS 9089399. CASES

LTER. ACIL. XPAN.	ALTER. POLICY INTER.	ADD. COST PER CAPITA	ADD. PROGRAM COVERAGE	TOTAL SURPLUS BUDGET	NUMBER OF INCAPACITATION DAYS/PERSON/YEAR AGE GROUPS 0 - 1	1 - 4	5 - 14	15 - 44	45 + YRS	ALL AGE	AV. ANN. SEEKING CARE	PERCENT SEEKING CARE	AV. ANN. # OF VISITS
1	1	2566.22	100.%	558.78	15.63	22.92	7.29	2.34	3.74	6.63	4246828.	47.%	7345172.
1	2	0.0	100.%	3125.00	15.63	22.92	7.29	2.34	3.74	6.63	4194796.	46.%	7238418.
1	3	4614.96	68.%	0.0	15.38	22.45	7.19	2.28	3.52	6.48	4520818.	50.%	7872498.
1	4	1996.64	100.%	1128.36	15 28	22.28	7.16	2.26	3.44	6.43	4645004.	51.%	8109915.
1	5	3272.08	96.%	0.0	15.61	22.88	7.27	2.34	3.71	6.61	4290419.	47.%	7434774.
1	6	697.10	100.%	2427.90	15.63	22.93	7.29	2.34	3.74	6.63	4238082.	47.%	7327385.
1	7	5314.98	59.%	0.0	15.40	22.48	7.20	2.28	3.53	6.49	4494917.	49.%	7821009.
1	8	2693.75	100.%	431.25	15.26	22.23	7.14	2.25	3.41	6.41	4662279.	51.%	8140371.
2	1	2748.53	100.%	376.47	14.33	21.35	6.73	2.10	3.35	6.09	4954026.	55.%	8567212.
2	2	184.25	100.%	2940.75	14.35	21.42	6.75	2.11	3.38	6.11	4893443.	54.%	8442946.
2	3	5454.68	57.%	0.0	14.65	21.63	6.89	2.15	3.34	6.19	4832529.	53.%	8384530.
2	4	2852.33	100.%	272.67	13.94	20.72	6.60	2.01	3.06	5.89	5261991.	58.%	9143691.
2	5	3660.95	85.%	0.0	14.51	21.53	6.79	2.13	3.37	6.15	4895412.	54.%	8480802.
2	6	1088.04	100.%	2036.96	14.34	21.37	6.73	2.10	3.34	6.09	4943867.	54.%	8546556.
2	7	6359.85	49.%	0.0	14.78	21.79	6.93	2.17	3.38	6 25	4754209.	52.%	8245521.
2	8	3756.12	83.%	0.0	14.20	21.05	6.70	2.06	3.15	6.00	5100632.	56.%	8857825.
3	1	3212.53	97.%	0.0	15.10	22.28	7.06	2.24	3.58	6 41	4443914.	49.%	7685786.
3	2	646.85	100.%	2478.15	15.10	22.32	7.07	2.25	3.60	6.42	4394941.	48.%	7583532.
3	3	6825.75	46.%	0.0	15.20	22.30	7.12	2.25	3.52	6.42	4513072.	50.%	7837494.
3	4	4212.25	74.%	0.0	14.95	21.95	7.02	2.20	3.39	6.31	4673306.	51.%	8132177.
3	5	4085.17	76.%	0.0	15.20	22.38	7.10	2.26	3.59	6.44	4438125.	49.%	7687722.
3	6	1510.83	100.%	1614.17	15.09	22.28	7.06	2.24	3.57	6.40	4440284.	49.%	7676710.
3	7	7692.40	41.%	0.0	15.24	22.35	7.13	2.26	3.53	6 44	4490360.	49.%	7794865.
3	8	5076.23	62.%	0.0	15.05	22.09	7.05	2.22	3.43	6 35	4611822.	51.%	8017802.
4	1	3394.80	92.%	0.0	13.88	20.81	6.53	2.01	3.21	5.91	5115027.	56.%	8845410.
4	2	831.10	100.%	2293.90	13.75	20.70	6.49	2.00	3.20	5.87	5126582.	56.%	8844846.
4	3	7664.91	41.%	0.0	14.68	21.71	6.90	2.16	3.39	6.22	4745278.	52.%	8221477.
4	4	5067.94	62.%	0.0	14.21	21.13	6.71	2.07	3.22	6.02	4996611.	55.%	8661391.
4	5	4473.92	70.%	0.0	14.29	21.27	6.70	2.09	3.31	6 06	4943165.	54.%	8560741.
4	6	1901.77	100.%	1223.23	13.74	20.64	6.47	1.99	3.16	5.85	5179365.	57.%	8953334.
4	7	8736.50	36.%	0.0	14.79	21.85	6.94	2.18	3.42	6.26	4686911.	52.%	8118883.
4	8	6138.61	51.%	0.0	14.44	21.42	6.80	2.11	3.29	6.12	4869861.	54.%	8438929.

ATER. FCIL. EPAN.	ALTER. POLICY INTER.	ADD. COST PER CAPITA	ADD. PROGRAM COVERAGE	TOTAL SURPLUS BUDGET	NUMBER OF INCAPACITATION DAYS/PERSON/YEAR AGE GROUPS 0 - 1	1 - 4	5 - 14	15 - 44	45 + yrs	ALL AGE	AV. ANN. SEEKING CARE	PERCENT SEEKING CARE	AV. ANN. # OF VISITS
5	1	3120.71	100.%	4.29	14.78	21.90	6.92	2.18	3.48	6.28	4446474.	49.%	7690204.
5	2	555.03	100.%	2569.97	14.79	21.96	6.94	2.19	3.51	6.30	4392016.	48.%	7578486.
5	3	7125.57	44.%	0.0	15.08	22.16	7.07	2.23	3.49	6.38	4500736.	50.%	7814877.
5	4	4512.00	69.%	0.0	14.77	21.76	6.95	2.17	3.35	6.24	4643187.	51.%	8076893.
5	5	4985.64	63.%	0.0	15.08	22.25	7.05	2.24	3.56	6.39	4401701.	48.%	7622604.
5	6	2411.30	100.%	713.70	14.78	21.91	6.93	2.18	3.48	6.28	4437329.	49.%	7671604.
5	7	8984.50	35.%	0.0	15.18	22.30	7.11	2.25	3.53	6.42	4454435.	49.%	7728679.
5	8	6368.27	49.%	0.0	15.01	22.07	7.04	2.22	3.45	6.34	4536498.	50.%	7879201.
6	1	3302.99	95.%	0.0	13.55	20.40	6.39	1.95	3.11	5.77	5135888.	57.%	8881469.
6	2	739.28	100.%	2385.72	13.45	20.34	6.36	1.94	3.11	5.74	5123163.	56.%	8838964.
6	3	7964.73	39.%	0.0	14.59	21.62	6.86	2.14	3.36	6.19	4725365.	52.%	8186569.
6	4	5367.69	58.%	0.0	14.10	21.02	6.66	2.05	3.19	5.98	4953030.	54.%	8585031.
6	5	5374.39	58.%	0.0	14.34	21.33	6.72	2.10	3.33	6.08	4824508.	53.%	8353649.
6	6	2802.24	100.%	322.76	13.43	20.28	6.34	1.93	3.07	5.72	5175913.	57.%	8947374.
6	7	10028.62	31.%	0.0	14.80	21.88	6.94	2.18	3.43	6.27	4629305.	51.%	8017685.
6	8	7430.64	42.%	0.0	14.51	21.53	6.83	2.13	3.34	6.15	4760309.	52.%	8246711.
7	1	3766.98	83.%	0.0	14.47	21.52	6.79	2.13	3.39	6.15	4588313.	50.%	7935296.
7	2	1201.88	100.%	1923.12	14.25	21.30	6.71	2.09	3.35	6.07	4601443.	51.%	7939555.
7	3	9336.33	33.%	0.0	15.02	22.12	7.04	2.22	3.49	6.36	4502581.	50.%	7807535.
7	4	6727.61	46.%	0.0	14.79	21.84	6.95	2.18	3.41	6.26	4598564.	51.%	7979868.
7	5	5798.73	54.%	0.0	14.86	21.98	6.96	2.20	3.49	6.30	4495338.	49.%	7783427.
7	6	3225.03	97.%	0.0	14.27	21.30	6.71	2.09	3.32	6.07	4636426.	51.%	8015605.
7	7	11362.02	28.%	0.0	15.12	22.25	7.08	2.24	3.53	6.40	4462025.	49.%	7733984.
7	8	8750.76	36.%	0.0	14.97	22.07	7.02	2.21	3.47	6.34	4523829.	50.%	7844734.
8	1	3949.18	79.%	0.0	13.40	20.23	6.33	1.92	3.07	5.71	5185617.	57.%	8967234.
8	2	1386.13	100.%	1738.87	12.84	19.61	6.10	1.82	2.93	5.50	5366907.	59.%	9258963.
8	3	10174.63	31.%	0.0	14.63	21.69	6.87	2.15	3.40	6.21	4685071.	52.%	8110254.
8	4	7583.30	41.%	0.0	14.29	21.28	6.74	2.09	3.29	6.07	4831996.	53.%	8365363.
8	5	6187.89	51.%	0.0	14.20	21.17	6.67	2.07	3.29	6.03	4870670.	54.%	8431497.
8	6	3615.96	86.%	0.0	13.20	20.00	6.24	1.89	3.00	5.63	5262522.	58.%	9097180.
8	7	12404.76	25.%	0.0	14.80	21.90	6.95	2.18	3.45	6.28	4607639.	51.%	7975106.
8	8	9813.14	32.%	0.0	14.58	21.64	6.86	2.14	3.38	6.19	4700876.	52.%	8136823.

TABLE 112 - BOGOR, WEST JAVA, INDONESIA.

COST EFFECTIVENESS ANALYSIS OF VARIOUS HEALTH PROGRAMS MEASURED IN DAYS OF INCAPACITATION DUE TO ILLNESS BY AGE-GROUPS IF TOTAL DEVELOPMENT BUDGET FOR THE 21 YEARS PLANNING PERIDD IS RP. 3750.00 PER CAPITA

GOVERNMENT COST EFFECTIVENESS

POPULATION IN MID PLANNING PERIOD IS 3871046. PEOPLE

AVERAGE ANNUAL EPISODE OF ILLNESS IS 9089399. CASES

LTER. ACIL. XPAN.	ALTER. POLICY INTER.	ADD. COST PER CAPITA	ADD. PROGRAM COVERAGE	TOTAL SURPLUS BUDGET	NUMBER OF INCAPACITATION DAYS/PERSON/YEAR AGE GROUPS 0 - 1	1 - 4	5 - 14	15 - 44	45 + YRS	ALL AGE	AV. ANN. SEEKING CARE	PERCENT SEEKING CARE	AV. ANN. # OF VISITS
1	1	2566.22	100.%	1183.78	15.63	22.92	7.29	2.34	3.74	6.63	4246828.	47.%	7345172.
1	2	0.0	100.%	3750.00	15.63	22.92	7.29	2.34	3.74	6.63	4194796.	46.%	7238418.
1	3	4614.96	81.%	0.0	15.33	22.36	7.17	2.27	3.47	6.45	4575616.	50.%	7977964.
1	4	1996.64	100.%	1753.36	15.28	22.28	7.16	2.26	3.44	6.43	4615004.	51.%	8109915.
1	5	3272.08	100.%	477.92	15.61	22.87	7.27	2.34	3.71	6.61	4292472.	47.%	7438992.
1	6	697.10	100.%	3052.90	15.63	22.93	7.29	2.34	3.74	6.63	4238082.	47.%	7327385.
1	7	5314.98	71.%	0.0	15.35	22.40	7.18	2.27	3.49	6.46	4544536.	50.%	7916176.
1	8	2693.75	100.%	1056.25	15.26	22.23	7.14	2.25	3.41	6.41	4662279.	51.%	8140371.
2	1	2748.53	100.%	1001.47	14.33	21.35	6.73	2.10	3.35	6.09	4954026.	55.%	8567212.
2	2	184.25	100.%	3565.75	14.35	21.42	6.75	2.11	3.38	6.11	4893443.	54.%	8442946.
2	3	5454.68	69.%	0.0	14.46	21.37	6.80	2.11	3.26	6.11	4949669.	54.%	8592402.
2	4	2852.33	100.%	897.67	13.94	20.72	6.60	2.01	3.06	5.89	5261991.	58.%	9143691.
2	5	3660.95	100.%	89.05	14.32	21.29	6.71	2.09	3.31	6.07	5006648.	55.%	8675569.
2	6	1088.04	100.%	2661.96	14.34	21.37	6.73	2.10	3.34	6.09	4943867.	54.%	8546556.
2	7	6359.85	59.%	0.0	14.60	21.57	6.86	2.14	3.31	6.17	4855684.	53.%	8425591.
2	8	3756.12	100.%	0.0	13.91	20.67	6.58	2.00	3.03	5.87	5271393.	58.%	9160357.
3	1	3212.53	100.%	537.47	15.08	22.27	7.05	2.24	3.58	6.40	4449435.	49.%	7695327.
3	2	646.85	100.%	3103.15	15.10	22.32	7.07	2.25	3.60	6.42	4394941.	48.%	7583532.
3	3	6825.75	55.%	0.0	15.12	22.18	7.08	2.24	3.47	6.38	4566320.	50.%	7935958.
3	4	4212.25	89.%	0.0	14.82	21.76	6.97	2.17	3.33	6.25	4758601.	52.%	8289578.
3	5	4085.17	92.%	0.0	15.11	22.27	7.06	2.24	3.56	6.40	4476385.	49.%	7756232.
3	6	1510.83	100.%	2239.17	15.09	22.28	7.06	2.24	3.57	6.40	4440284.	49.%	7676710.
3	7	7692.40	49.%	0.0	15.16	22.24	7.10	2.24	3.49	6.40	4539067.	50.%	7884805.
3	8	5076.23	74.%	0.0	14.93	21.92	7.01	2.20	3.37	6.30	4684821.	52.%	8152327.
4	1	3394.80	100.%	355.20	13.73	20.62	6.47	1.99	3.16	5.84	5189984.	57.%	8974935.
4	2	831.10	100.%	2918.90	13.75	20.70	6.49	2.00	3.20	5.87	5126582.	56.%	8844846.
4	3	7664.91	49.%	0.0	14.49	21.47	6.82	2.12	3.31	6.14	4844969.	53.%	8396738.
4	4	5067.94	74.%	0.0	13.92	20.77	6.59	2.01	3.11	5.90	5146567.	57.%	8924635.
4	5	4473.92	84.%	0.0	14.02	20.94	6.58	2.04	3.22	5.95	5082433.	56.%	8803856.
4	6	1901.77	100.%	1848.23	13.74	20.64	6.47	1.99	3.16	5.85	5179365.	57.%	8953334.
4	7	8736.50	43.%	0.0	14.62	21.63	6.87	2.14	3.36	6.19	4774928.	53.%	8273624.
4	8	6138.61	61.%	0.0	14.20	21.12	6.70	2.06	3.20	6.02	4994469.	55.%	8657680.

ATER. FCIL. EPAN.	ALTER. POLICY INTER.	ADD. COST PER CAPITA	ADD. PROGRAM COVERAGE	TOTAL SURPLUS BUDGET	NUMBER OF INCAPACITATION DAYS/PERSON/YEAR AGE GROUPS 0 - 1	1 - 4	5 - 14	15 - 44	45 + yrs	ALL AGE	AV. ANN. SEEKING CARE	PERCENT SEEKING CARE	AV. ANN. # OF VISITS
5	1	3120.71	100.%	629.29	14.78	21.90	6.92	2.18	3.48	6.28	4446474.	49.%	7690204.
5	2	555.03	100.%	3194.97	14.79	21.96	6.94	2.19	3.51	6.30	4392016.	48.%	7578486.
5	3	7125.57	53.%	0.0	14.97	22.01	7.02	2.21	3.43	6.33	4551518.	50.%	7908818.
5	4	4512.00	83.%	0.0	14.60	21.53	6.88	2.14	3.28	6.17	4722459.	52.%	8223237.
5	5	4985.64	75.%	0.0	14.97	22.11	7.00	2.22	3.52	6.35	4432677.	49.%	7678090.
5	6	2411.30	100.%	1338.70	14.78	21.91	6.93	2.18	3.48	6.28	4437329.	49.%	7671604.
5	7	8984.50	42.%	0.0	15.09	22.18	7.07	2.23	3.49	6.38	4495957.	49.%	7805381.
5	8	6368.27	59.%	0.0	14.89	21.90	6.99	2.19	3.39	6.29	4594432.	51.%	7986006.
6	1	3302.99	100.%	447.01	13.43	20.26	6.34	1.93	3.07	5.72	5186525.	57.%	8968971.
6	2	739.28	100.%	3010.72	13.45	20.34	6.36	1.94	3.11	5.74	5123163.	56.%	8838964.
6	3	7964.73	47.%	0.0	14.39	21.36	6.78	2.10	3.29	6.10	4821073.	53.%	8354848.
6	4	5367.69	70.%	0.0	13.80	20.63	6.54	1.99	3.08	5.85	5094271.	56.%	8833004.
6	5	5374.39	70.%	0.0	14.08	21.02	6.61	2.05	3.24	5.98	4940043.	54.%	8555344.
6	6	2802.24	100.%	947.76	13.43	20.28	6.34	1.93	3.07	5.72	5175913.	57.%	8947374.
6	7	10028.62	37.%	0.0	14.63	21.67	6.88	2.15	3.37	6.20	4705801.	52.%	8152188.
6	8	7430.64	50.%	0.0	14.29	21.25	6.74	2.08	3.25	6.06	4863005.	54.%	8427019.
7	1	3766.98	100.%	0.0	14.23	21.24	6.69	2.08	3.32	6.05	4656610.	51.%	8053322.
7	2	1201.88	100.%	2548.12	14.25	21.30	6.71	2.09	3.35	6.07	4601443.	51.%	7939555.
7	3	9336.33	40.%	0.0	14.90	21.96	6.99	2.20	3.44	6.31	4553731.	50.%	7900007.
7	4	6727.61	56.%	0.0	14.62	21.62	6.88	2.15	3.34	6.19	4668911.	51.%	8106808.
7	5	5798.73	65.%	0.0	14.71	21.79	6.89	2.17	3.44	6.24	4545041.	50.%	7871078.
7	6	3225.03	100.%	524.97	14.23	21.25	6.69	2.08	3.31	6.05	4648897.	51.%	8037065.
7	7	11362.02	33.%	0.0	15.02	22.12	7.04	2.22	3.49	6.36	4505065.	50.%	7811746.
7	8	8750.76	43.%	0.0	14.84	21.90	6.97	2.19	3.42	6.28	4579230.	50.%	7944647.
8	1	3949.18	95.%	0.0	12.96	19.69	6.14	1.84	2.93	5.53	5373376.	59.%	9291646.
8	2	1386.13	100.%	2363.87	12.84	19.61	6.10	1.82	2.93	5.50	5366907.	59.%	9258963.
8	3	10174.63	37.%	0.0	14.43	21.44	6.79	2.11	3.33	6.12	4772720.	53.%	8263271.
8	4	7583.30	49.%	0.0	14.02	20.95	6.63	2.04	3.20	5.96	4949029.	54.%	8569402.
8	5	6187.89	61.%	0.0	13.91	20.81	6.54	2.02	3.20	5.91	4995439.	55.%	8648762.
8	6	3615.96	100.%	134.04	12.82	19.54	6.08	1.81	2.88	5.47	5422097.	60.%	9372436.
8	7	12404.76	30.%	0.0	14.63	21.70	6.88	2.15	3.39	6.21	4679801.	51.%	8101093.
8	8	9813.14	38.%	0.0	14.38	21.39	6.77	2.10	3.31	6.11	4791686.	53.%	8295154.

APPENDIX E

SURVEY QUESTIONNAIRES

HEALTH HOUSEHOLD QUESTIONNAIRE

(The text below only presents the content of the original questionnaire. The format has been altered and the language has been translated from Bahasa Indonesia into English.)

Sections A and B contain instructions for administering the questionnaire.

H 1. HOUSEHOLD CHARACTERISTICS

C. FAMILY REGISTER

(in tabular form in the original questionnaire)

1. Ordinal number in the household ___|___
2. Name _____

3. Status in the household : 1. Head of the household

   2. Spouse

   3. Child

   4. Relative

   5. Other

4. Sex: 1. Male

   2. Female

5. Age: _____ years _____ months _____ days

   (ask age in months, and days if the individual is ≤ 1 year old, otherwise only years and months)

6. Marital status: 1. Married

2. Single

3. Divorced, not re-married

7. Religion: 1. Moslem

2. Christian

3. Hindu

4. Buddhism

5. Other

8. Literacy: 1. Illiterate

2. Literate

9. If literate, level of education:

1. Never attended school

2. Have not completed Elementary School

3. Completed Elementary School

4. Completed Secondary School

5. Completed High School

6. With College Degree or Higher

10. Main occupation: 1. Not/not yet working at the moment

2. White Collar

3. Retailer, Commerce

4. Blue Collar, Daily Laborer

5. Peasant

6. Other

11. Smoking habit: 1. Not a smoker

2. Sometimes smoke

3. Usually smoke

D. HEALTH AWARENESS AND HEALTH BEHAVIOR

1. Are there any health care facilities in this village or nearby, such as:

1. Hospital	1. Yes / 2. No
2. Health Center	1. Yes / 2. No
3. Maternal and Child Health Clinic	1. Yes / 2. No
4. General Polyclinic	1. Yes / 2. No
5. Maternity Clinic	1. Yes / 2. No
6. Private Physician	1. Yes / 2. No
7. Private Allied Medical Personnel	1. Yes / 2. No
7. Private Midwife	1. Yes / 2. No

2. What is the regular source of care for members of your household when ill?

1. Hospital
2. Health Center
3. Maternal and Child Health Clinic
4. General Polyclinic
5. Maternity Clinic
6. Private Physician
7. Private Allied Medical Personnel
8. Private Midwife
9. Traditional Healer
10. Self Care / Care by member of the household
11. Other (explain _____)

3. 1. Do you keep a regular stock of modern medicine in your home that could be used for:

- Headache / fever / muscle pain 1. Yes / 2. No
- Diarrhea 1. Yes / 2. No
- Cough / Common Cold 1. Yes / 2. No
- Vitamin / Roborantia 1. Yes / 2. No
- Skin diseases 1. Yes / 2. No
- Eye diseases 1. Yes / 2. No
- Balm / rubbing balm 1. Yes / 2. No
- Other 1. Yes / 2. No

3. 2. Do you keep a regular stock of traditional medicine in your home that could be used for:

- Head ache / fever / muscle pain 1. Yes / 2. No
- Diarrhea 1. Yes / 2. No
- Cough / Common Cold 1. Yes / 2. No
- Vitamin / Roborantia 1. Yes / 2. No
- Skin diseases 1. Yes / 2. No
- Eye diseases 1. Yes / 2. No
- Balm / rubbing balm 1. Yes / 2. No
- Other 1. Yes / 2. No

E. SANITATION

1a. How large is this house:

_____ x _____ m or = _____ m^2

b. How many bedrooms do you have in this house?

_____ bedrooms.

2. How do you dispose of your garbage?

1. Just throw it away recklessly
2. Buried / Land fill / Fertilizer
3. Burned
3. Sold it
5. Use it as animal food
6. Others (specify _____)

3. Do this house has private latrine?

1. Yes
2. No

4. If this house does not have a private latrine, where do members of your household defecate most of the time?

1. Public latrine
2. Communal latrine shared with another house
3. Bury the feces after defecation
4. Defecate in the river / stream
5. Defecate in the sewer
6. Defecate in the bushes
7. Defecate into the pond
8. Other (specify _____)

5. What is the source for drinking water during the rainy season?

1. Tap / running water
2. Deep-pumping well
3. Shallow-pumping well
4. Protected well
5. Unprotected / open well

6. Artesian well
7. Rain
8. River / stream
9. Pond
10. Other (specify _____)

6. What is the source for drinking water for your household during the dry season?

1. Tap / running water
2. Deep pumping well
3. Shallow pumping well
4. Protected well
5. Unprotected / open well
6. Artesian well
7. Rain
8. River / stream
9. Pond
10. Other (specify _____)

7. Do you boil your drinking water before you drink it?

1. Boil it
2. Do not boil it

8. Do you boil plain water that you usually drink?

1. Boil it
2. Do not boil it

9. Do you have the same water for drinking and for washing?

1. Yes, the same ---> GO TO Q. E-11.
2. No, it is different

10. If washing water does not have the same source as drinking water, what is the source of your washing water?

1. Tap / running water
2. Deep-pumping well
3. Shallow-pumping well
4. Protected well
5. Unprotected / open well
6. Artesian well
7. Rain
8. River / stream
9. Pond
10. Other (specify _____)

11. Do you mind if we take a look at the condition of your house?

(If permitted, please check !)

A. VENTILATION	1. BAD / 2. FAIR / 3. GOOD
B. ILLUMINATION	1. BAD / 2. FAIR / 3. GOOD
C. WALL	1. BAD / 2. FAIR / 3. GOOD
D. FLOOR	1. BAD / 2. FAIR / 3. GOOD
E. ROOF	1. BAD / 2. FAIR / 3. GOOD

BUILDING MATERIAL FOR:

F. FLOOR MADE OUT OF: 1. BARE GROUND
2. WOOD / BAMBOO FLOOR
3. CONCRETE / TILE

G. WALL MADE OUT OF: 1. BAMBOO MAT / WALL
2. WOOD
3. HALF CONCRETE

4. CONCRETE

H. ROOF MADE OUT OF: 1. GRASS/THATCHED ROOF/TASSEL

2. CORRUGATED IRON

3. ASBESTOS/BRICK ROOF

4. WOOD TILE / TILE ROOF

I. BUILDING FRAME MADE OUT OF:

1. BAMBOO

2. WOOD

3. MIXED

4. STEEL-REINFORCED CONCRETE

OTHER CHARACTERISTICS OF THE HOUSEHOLD:

J. PHYSICAL CONDITION OF DRINKING WATER: 1. BAD / 2. FAIR / 3. GOOD

K. SEWER 1. BAD / 2. FAIR / 3. GOOD

L. STORAGE OF PREPARED FOOD 1. BAD / 2. FAIR / 3. GOOD

M. YARD CLEANLINESS 1. BAD / 2. FAIR / 3. GOOD

N. IMPRESSION ABOUT THE WHOLE BUILDING 1. BAD / 2. FAIR / 3. GOOD

O. TYPE OF LATRINE: 1. WITH SEPTIC TANK

2. OPEN PIT

P. DISTANCE FROM LATRINE TO SOURCE OF DRINKING WATER?

± _____ Meters

12. In your house do you have:

- T.V 1. Yes / 2. No
- Radio / Receiver 1. Yes / 2. No
- Refrigerator 1. Yes / 2. No
- Furniture 1. Yes / 2. No
- Motorcycle 1. Yes / 2. No

- Car 1. Yes / 2. No
- Bicycle 1. Yes / 2. No

13. How many of these animals do you have?

1. Water buffalo / Cattle _____
2. Goat _____
3. Chicken / Duck _____
4. Pig _____
5. Horse _____

To the nearest	Distance in km 0.0-0.5=0 0.6-1.5=1 1.6-2.5=2 . . >97.6=97	Reached by: 1. Walking 2. Bicycle 3. Motorcycle 4. Bus 5. Paid motor-cycle ride 6. Coach/Tricycles 7. Other	Average travel time in minutes
14. Market			
15. Health Center			
16. Hospital			
17. Post Office			
18. Bank			
19. Subdistrict Office			
20. Recreation Park			
21. Place of Worship			
22. Secondary School			

H2. MORBIDITY INFORMATION

Numbers 1 to 7 contain instructions and information about location of the household

FOR THIS PERSON, FORM NO.___

8. Patient ordinal number in the family register

9. Patient age ___|___ ___|___ ___|___
DAYS MONTHS YEARS

1. ILLNESS PERCEIVED

2. ILLNESS NOT-PERCEIVED

10. What do you call this disease?

_____

11. What is the duration of illness so far?

____ DAYS ____ WEEKS ____ MONTHS

TRANSLATE INTO

_____ DAYS

12. How do you judge the condition of the illness?

1. Severe

2. Moderate

3. Mild

13. Is there any incapacitation associated with this illness?

If yes, for how long?

____ DAYS ____ WEEKS ____ MONTHS

= _____ DAYS

14. How long have other members of your household, if any, been unable to conduct their normal activity/work because of this illness?

____ DAYS ____ WEEKS ____ MONTHS

= _____ DAYS

15. Have you sought treatment for this illness?

1. Yes

2. Not yet ---> GO TO Q. 41

16. If yes, where have you been treated for this illness? Please state in order of occurrence!

First _____

Second _____

Third _____

Fourth _____

Fourth _____

Fifth _____

USE THIS CODE:
1. Hospital
2. Health Center
3. Maternal and Child Health Clinic
4. General Polyclinic
5. Maternity Clinic
6. Private Physician
7. Private Allied Medical Personnel
8. Private Midwife
9. Traditional Healer/ Medicine Man
10. Self Care
11. Other (explain _____)

17. Again, where were you treated the last time?

1. Hospital

2. Health Center

3. Maternal and Child Health Clinic
4. General Polyclinic
5. Maternity Clinic
6. Private Physician
7. Private Allied Medical Personnel
8. Private Midwife
9. Traditional Healer/ Medicine Man

10. Self Care ---> GO TO Q. 30

11. Other (explain _____)

19. What do you think about the cost of treatment? Is it gratis, cheap, rather expensive, expensive, or very expensive?

1. Gratis
2. Cheap
3. Rather expensive
4. Expensive
5. Very expensive

20. How do you rate the treatment process--not satisfactory, rather satisfactory, satisfactory, or very satisfactory?

1. Not satisfactory
2. Rather satisfactory
3. Satisfactory
4. Very satisfactory

21. How did you make your decision to select that facility? Did somebody tell you, or send you, or force you to use that treatment facility?

1. I am forced to go

2. I have no choice

3. It was suggested by friend/relative to go there

4. I was referred by doctor/paramedic/midwife to go there

5. Self referral

22. How many times did you have an outpatient consultation in those places?

_____ times

23. What is the total cost of those outpatient treatments?

Rp. _____

24. Was hospitalization / inpatient care suggested to you by any who cared for you?

1. Yes

2. No ---> GO TO Q. 40

25. WAS the patient hospitalized?

1. Yes ---> GO TO Q. 27

2. No / Not yet

26. Why was the patient not hospitalized?

1. No bed available

2. We have no money

3. The place is far

4. We do not want it / Family disagreed / Afraid

5. Others

SKIP THE QUESTIONS BELOW AND CONTINUE WITH Q. 40

27. Where was the patient finally hospitalized?

1. In government hospital

2. In government health center / polyclinic / health post

3. In private hospital

4. In private health center / polyclinic / health post

5. In other places (specify _____)

28. Was the patient discharged from hospital?

1. Yes

2. Not yet ---> GO TO Q. 40

29. Can you estimate, approximately, the total cost of hospitalization?

Rp. _____

30. If the patient was self treated, was modern (patented) medicine used?

1. Yes

2. No ---> GO TO Q. 33

31. Can you tell us the names of those medicines?

_____

_____

_____

32. From whom or from where did you receive instruction/ advice to use those medicines?

1. From dispensary

2. Copy of previous prescription

3. From drug store / medicine store

4. From friend / relative

5. My own knowledge / discovery from advertisement

6. Others

33. Were traditional herbs or traditional medicines also used?

1. Yes

2. No ---> GO TO Q. 36

34. Can you tell us the names of those traditional herbs or medicines?

_____

_____

_____

35. From whom or from where do you receive instruction / advice to use those herbs/medicines?

1. From drug store / medicine store
2. From friend / relative
3. My own knowledge / discovery from advertisement
4. Others

36. Was the patient ever treated by other means?

(modern medicine, and traditional medicine and herbs are not included)

1. Yes
2. No --->RECHECK ANSWERS OF Q. 30,33, AND 36. IF THE RESPONDENT SAYS NO TO ALL OF THEM REPEAT THE QUESTIONS AGAIN STARTING FROM Q. 17; IF THE RESPONSE IS YES TO EITHER ONE OR BOTH Q. 30 AND Q. 33, BUT NO FOR Q. 36, THEN CONTINUE WITH Q. 39.

37. Can you tell us what hose treatment are?

_____

38. From whom or from where did you receive instruction / advice to use those treatments?

1. From friend / relative
2. My own knowledge
3. Others

39. Can you tell us the total cost of this self treatment?

Rp. _____

40. What was the outcome of all those treatments?

1. Complete cure
2. Improvement
3. More or less the same
4. Getting worse
5. Caused permanent impairment
6. Terminated by death

CONTINUE WITH PHYSICAL EXAMINATION

41. If the patient has not been treated, or will not be treated, could you tell us what is the main reason for it?

1. Cost
2. Distance
3. Past experience showed treatment was not very good
4. Wait until further development shows it to be necessary
5. No place of treatment to go to
6. We will go later on
7. Other (specify _____)

CONTINUE WITH PHYSICAL EXAMINATION

PHYSICAL EXAMINATION

1. Main complaint: _____

2. Additional complaints: _____

_____

3. History of the disease:

Physical examination in general

5. Pulse rate : _____/minute

6. Respiratory rate: _____/minute

7. Blood pressure : _____/mm mercury

8. Eye : Anemic/Normal/Hyperemic

9. Ear/Nose/Throat :

10. Heart :

11. Lung :

12. Abdomen :

13. Extremity :

14. Other Organs :

15. Working Diagnosis :

16. Differential Diagnosis:

17. Treatment :

H3. PREGNANCY FOUND DURING INTERVIEW

Numbers 1 to 7 contain instructions and information about location of the household

8. NAME AND ORDER OF THIS WOMAN IN THE FAMILY REGISTER

_____ __|__

9. This is pregnancy number _____

   Number of childbirths _____ times

   Number of abortions _____ times

10. Length of current pregnancy?

CONFIRM WITH PHYSICAL EXAMINATION BY PALPATION OF THE FUNDUS OF UTERUS

_____ weeks

11. Are you aware that in this area or nearby there is a government-owned facility that provides maternity care?

    1. Yes
    2. No ---> GO TO Q. 17

12. Do you receive prenatal care in that facility?

    1. Yes
    2. No ---> GO TO Q. 16

13. What type of facility is it?

    1. Hospital
    2. Health Center
    3. Maternal and Child Health Clinic
    4. Maternity Clinic
    5. Other

14. How many prenatal visits have you made to that

government facility?

_____

15. What is the average cost of one prenatal visit in that government facility?

Rp. _____

CONTINUE WITH Q. 20

16. If you know about the presence of a government-owned facility offering maternity care in this area, but have never had a prenatal check-up there, would you tell us what your reasons are for not using it?

	1. Yes	2. No
1. Not necessary	_____	_____
2. Too expensive	_____	_____
3. Too far from home	_____	_____
4. The service is not good	_____	_____
5. Other	_____	_____

17. Even if you are aware of the availability of a government-owned facility that offers maternity care in this area, where do you have your prenatal check-ups?

1. No prenatal check up so far ---> GO TO Q. 20
2. At the traditional birth attendant
3. At private midwife
4. At private physician
5. Other

18. How many times have you had a prenatal check-ups at the private practitioner mentioned above (response for Q. 17)?

_____ times

19. How much did you pay, on the average, for one prenatal check-up at that private practitioner?

Rp. _____

20. Do you have any symptoms or complaints related to your pregnancy, such as:

	1. Yes	2. No
1. Swollen leg	_____	_____
2. Bleeding from vagina	_____	_____
3. Convulsion / Seizure	_____	_____
4. Sudden abdominal pain	_____	_____
5. Excessive vomiting	_____	_____
6. Others	_____	_____

H4. CHILDBIRTH IN THE PREVIOUS ONE YEAR

Numbers 1 to 7 contain instructions and information about location of the household

8. NAME AND ORDER OF THIS WOMAN IN THE FAMILY REGISTER

_____ __|__

9. Date of delivery

__|__ __|__ __|__
DAYS MONTH YEAR

10. How many times have you been pregnant? _____ times

How many times have you given childbirth? _____ times

How many times have you had an abortion? _____ times

11. Length of pregnancy of your last childbirth?

_____ weeks

12. Are you aware of the availability of a government-owned childbirth facility in this area?

1. Yes
2. No ---> GO TO Q. 19

13. Did you have your childbirth there, or were you attended by health personnel from that facility?

1. Yes
2. No ---> GO TO Q. 18

14. If yes, what is the name of that facility?

1. Hospital
2. Health Center
3. Maternal and Child Health Clinic
4. Maternity Clinic

5. At home

6. Others

15. How many prenatal visits did you have at that facility (response for Q. 14)?

_____ visits

16. How many days were you incapacitated or unable to perform your normal activities after that childbirth?

____ days ____ weeks ____ months

IF THE INCAPACITATION ≥ 97 DAYS CODE 97 DAYS

CALCULATE !!! = _____ DAYS

17. What was the overall cost to you of childbirth in that government facility?

Rp. _____

CONTINUE WITH Q. 23

18. If you know about the presence of a government-owned facility offering child delivery care in this area, but did not have your childbirth there, then would you tell us what are your reasons for not using it?

	1. Yes	2. No
1. Not necessary	_____	_____
2. Too expensive	_____	_____
3. Too far from home	_____	_____
4. The service is not good	_____	_____
5. Other	_____	_____

19. Even if you are aware of the availability of a government-owned facility that offers child delivery care in this area, but did not have your childbirth there, who did

attend your childbirth?

1. Private physician
2. Private midwife
3. Traditional birth attendant
4. Self care / member of the household
5. Others

20. How many prenatal visits did you have before this last childbirth?

_____ visits

21. How many days were you incapacitated or unable to perform your normal activities after that childbirth?

____ days ____ weeks ____ months

IF THE INCAPACITATION ≥ 97 DAYS CODE 97 DAYS

CALCULATE !!! = _____ DAYS

22. What was the overall cost of childbirth to you in that private place?

Rp. _____

23. How was the outcome of the childbirth?

CHECK (✓) IN THE APPROPRIATE COLUMN

	1. NORMAL AND HEALTHY	2. WITH COMPLICATION	3. DEATH
A. Mother	_____	_____	_____
B. 1st Child	_____	_____	_____
C. 2nd Child	_____ GO TO Q. 26	_____ GO TO Q. 24	_____ GO TO H5

24. If you had any complications during childbirth, what were they?

1. Yes 2. No

1. Bleeding from vagina _____ _____
2. Convulsion w/ or w/o swollen leg _____ _____
3. Prolonged labor _____ _____
4. High fever _____ _____
5. Others (specify _____) _____ _____

25. If the baby died during childbirth, would you say that the baby cried or breathed immediately after childbirth?

    1. Yes
    2. No ---> GO TO H5

25. Is the child alive now?

    1. Yes
    2. No ---> GO TO H5

H5. DEATH REPORTING WITHIN ONE YEAR PRIOR TO SURVEY

Numbers 1 to 7 contain instructions and information about location of the household

8. NAME AND ORDER OF THIS WOMAN IN THE FAMILY REGISTER

_____ ___|___

9. Date of death _____

Death occurred in ≤ one month or between one month to one year, check appropriate box

1. LT 1 MO	2. 1 MO - 1 YR

10. Age when died? ___|___ ___|___ ___|___
DAYS MONTHS YEARS

11. Sex: 1. Male
2. Female

12. What is the cause of death?
1. Illness
2. Accident
3. Suicide
4. Homicide
5. Childbirth
6. Stillbirth
7. Others (specify _____)

13. Symptoms found before death:

CHECK APPROPRIATE CODE ACCORDING TO THE DURATION OF THE SYMPTOMS

0 = NONE 3 = 1 - 3 WEEKS

1 = ACUTE 4 = 1 - 11 MONTHS

2 = 1-6 DAYS 5 = 1 YEAR OR MORE

PLEASE CHECK (✓)

(1). HEADACHE ( ) _____

(2). FEVER ( ) _____

(3). CONVULSION ( ) _____

(4). STIFF NECK ( ) _____

(5). COUGHING ( ) _____

(6). RESPIRATORY DISTRESS ( ) _____

(7). EYE / SKIN TURN YELLOW ( ) _____

(8). STOMACH ACHE ( ) _____

(9). DIARRHEA ( ) _____

(10). SWOLLEN LEG ( ) _____

(11). BLEEDING ( ) _____

(12). VOMITING ( ) _____

(13). OTHERS (SPECIFY_____) ( ) _____

14. Diagnosis of death _____

F2. HEALTH FACILITY PERFORMANCE STUDY OF BOGOR 1980

PATIENT'S RECORD SUMMARY

1. Place of recording: 1. Hospital OPD
   2. Hospital Inpatient Care
   3. Health Center
   4. Subhealth Center

   If hospital care, what department?
   1. Internal Medicine
   2. Pediatrics
   3. Obstetrics and Gynecology
   4. Surgery
   5. Ear, Nose and Throat
   6. Neurology
   7. Opthalmology
   8. Orthopedics
   9. Dentistry

2. Place of health care facility?
   1. Subdistrict of East Bogor
   2. Subdistrict of Central Bogor
   3. Subdistrict of South Bogor
   4. Subdistrict of Cigudeg
   5. Subdistrict of Gunung Putri
   6. Subdistrict of Cibinong

7. Subdistrict of Jonggol

8. Subdistrict of Sawangan

TAKE NOTES FROM PATIENT'S RECORD WHICH HAVE BEEN RANDOMLY SELECTED BY YOUR SUPERVISOR AND SUMMARIZE ALL ACTIVITIES IN NOVEMBER - DECEMBER 1979. IF THE FORM CANNOT BE COMPLETED DUE TO INCOMPLETE RECORDING, ATTACH THE FORM ON TO THE RECORDS, TOGETHER WITH A NOTE TO FUTURE EXAMINER, WHENEVER HE SEES THIS FAMILY ATTENDING THE FACILITY

3. Name of patient: _____

4. Patient address is in:

   1. This subdistrict

   2. Other subdistrict, but still within Regency of Bogor

   3. Other subdistrict outside of Regency of Bogor

5. Age group of patient: - 1 year

   - 5 years

   - 15 years

   - 45 years

   45+ years

6. Sex of patient: 1. Male

   2. Female

7. Main complaint and symptoms of illness:

   _____

   _____

   _____

8. Duration of illness before seeking care:

   ____ months ____ weeks ____ days

   COMPUTE INTO = _____ days

9. Diagnosis of Illness: _____

   ITS C-LIST CODE FROM ICD IS: __|__

10. Treatment with: _____ _____

_____

_____

11. This illness is the ____ illness suffered by the patient in November and December 1979.

12. Number of visits made for this diseases (response for Q. 9) is _____ times

13. Is there any referral made for this illness to higher level health care facilities?

1. Yes
2. No

14. Result of treatment for this illness:

1. Cured
2. Not cured, or forced discharge
3. Death

15. Duration of illness after treatment:

____ months ____ weeks ____ days

COMPUTE INTO = _____ days

16. Duration of absence from work/school/normal activities due to this illness is

____ months ____ weeks ____ days

COMPUTE INTO = _____ days

QUESTION 17 ONLY FOR THOSE WHO HAD BEEN TREATED AS INPATIENT IN NOVEMBER AND DECEMBER 1979

17. Length of hospital stay: ___months ___weeks ___days

COMPUTE INTO = _____ days

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