REFERRAL SYSTEMS AND HEALTH-CARE-SEEKING BEHAVIOUR OF PATIENTS: AN ECONOMIC ANALYSIS

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WORKING PAPER No. 446

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June, 1987

IDS/WP 446

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Abstract

The paper studies medical referral systems of developing countries in relation to patients' health-care-seeking behaviour. It is shown that the vertical referral structures are consistent with patients' cost-minimizing behaviour in their search of medical treatments. This consistency is a consequence of a common desire among patients and health planners, to minimize costs of treating illnesses so as to get the most from their limited resources. The conditions under which the medical referral system reflects treatment seeking behaviour of patients are specified. Since these conditions do not hold exactly in the real world, the referral system has some major weaknesses as a model of how national health service delivery systems actually function. Reforms that can be undertaken to rectify these weaknesses are suggested.

1 Introduction

The hierarchical referral health care system is a key component of national health care systems of virtually all developing countries. A pervasive characteristic of national health care systems of these countries, is a pyramid-like structure of health institutions, through which basic and tertiary health services are provided (in principle) to everyone. Typically, the apex of this structure consists of a national hospital and medical research institutions, while its base comprises small scale health facilities - the dispensaries and health centres. In-between the apex and the base, are the district and regional hospitals.

The most striking aspect of the organizational structure of the health system just described, is its referral system. This system, the hierarchical referral structure, permits movement of patients or their problems, from the base of the national health care system to its apex and the vice-versa. The movement of patients (or their problems), in the referral system is intended to be initiated by the health professionals who manage the national health care system. But in actual practice, patients or their relatives, do move themselves up or down this system.

This paper has three main aims. Firstly, it demonstrates that the referral health care system, as characterized by a hierarchical structure of health facilities, is simply an organizational image of the cost minimizing behaviour of patients in their attempts to cure illnesses. Unless this is so, the referral system cannot work as intended on a voluntary basis, i.e., without a force external to it that would compel patients to move step-by-step through its hierarchical levels. Secondly, the paper illustrates with empirical data from Kenya that even though the public referral system mimics the cost-minimizing behaviour of patients in their search of cure, it does not function as desired for two main reasons:

(a) The public referral system is typically erected under the false premise that patients do not have alternative sources of medical care; this assumption often leads to under-utilization of the referral facilities.
(b) Patients have considerable consumer sovereignity in deciding the level of the national health care system from which to seek treatment.

That is, they can ignore the advice of the health professionals regarding referrals[1]. Patients' autonomy in choice of source of treatment often leads to over-utilization of referral facilities.

Lastly, the paper suggests ways of altering the public referral systems of the developing countries to improve their performance.

11 Historical Origins of Referral Health Care systems in Developing Countries

The referral health care systems in many developing countries are creatures of the British colonial administration. The idea of dispensaries and health centres, as a line of first contact of a national health care system with patients, was conceived by Lord Dawson in the 1920s. In 1940s, the organizational structure of dispensaries and health centres was introduced in India, Egypt, Tunisia and the Sudan.

Rex Fendall, the former Director of Medical services in Kenya during colonial administration, was instrumental in implementing the referral health care system in Kenya in the late 1940s and early 1950s. According to Fendall (1963: 980), in a resource poor country, the "referral system is the only way to supply health service at a modest level to all the people and yet to provide, at the same time, the highest standard of care to those in urgent need." Fendall's claim will be examined at great length in this paper.

111 Referral System as a model of Patients' Behaviour

Health planners, as suppliers of medical and health services, are faced with a problem of resource scarcity. That is, they have insufficient manpower, medical supplies, equipment and other inputs to provide basic health care to everyone. This problem is particularly acute in the developing countries. Faced with this problem, the health planner, whose purpose will be assumed to be miximization of coverage of population with basic health services, must use the scarce resources available to him wisely. Resource use is "wise" when it is in accordance with economic rules of allocative and operational efficiency which ensure provision of a good or a service in the most cost-effective manner, i.e. in the least costly way.

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1. This is in sharp contrast to their lack of autonomy in deciding the form of treatment to get once they are at the source of medical care.

It is important at this point to bear in mind that cost-effectiveness in the delivery of basic health services is achieved within a particular organizational structure of health institutions. Different organizational structures (or delivery systems), entail different (minimum) costs of delivering the same package of basic health services. The delivery system with the lowest cost (i.e. with the minimum of the minimum costs) is the cost-effective health service delivery system. That is, it is the organizational structure that would maximize the proportion of the population covered with basic health services under certain resource constraints.[1]

The preceding discussion indicates that in a resource poor country, health planners would design a health care delivery system that minimizes the cost of treating illnesses (or of providing basic health services). Under certain conditions (to be spelt out later), the hierarchical referral system minimizes the cost of treating or preventing common illnesss of a population. This is because under a vertical referral system, illnesses are first seen at dispensaries and health centres, which, due to their simple technology of medical care, are very cheap facilities for treating illnesses.[2] Only when illnesses cannot be treated at dispensaries or health centres, are they referred to hospitals for more expensive treatment. Since most of the illnesses that afflict the majority of the population in the developing countries are preventable (and can be treated by paramedics), the vertical referral system is a cost-effective way of providing basic health services in those countries. It should be emphasized that the system assumes that patients will first visit health units before they progressively move up to the more sophisticated and expensive units for follow-up care.

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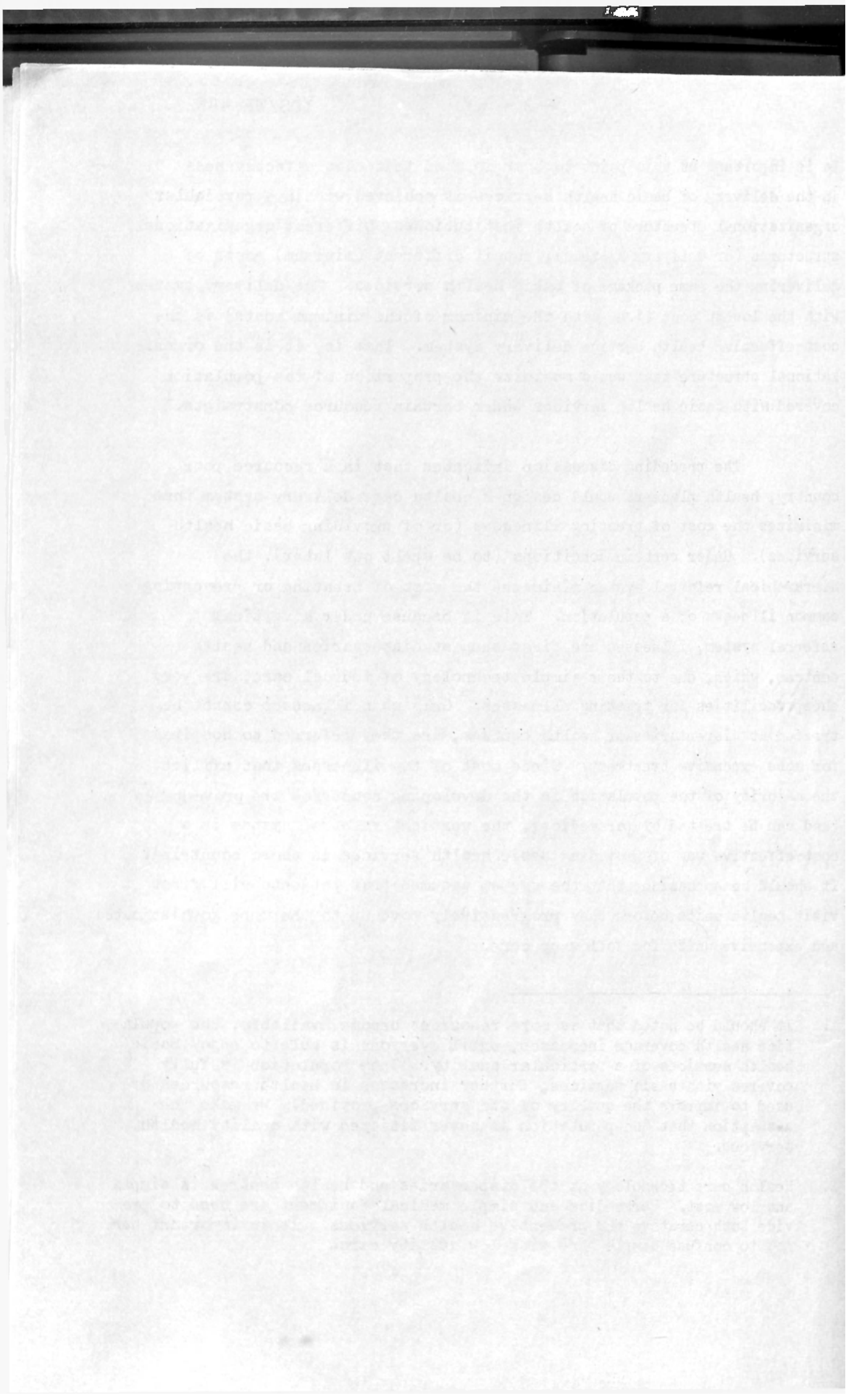
1. It should be noted that as more resources become available, the population health coverage increases, until everyone is able to enjoy basic health services of a particular quality. Once population is fully covered with basic services, further increases in health resources are used to improve the quality of the services provided. We make the assumption that the population is never satiated with quality health services.

2. Health care technology at the dispensaries and health centres is simple and low cost. Paramedics and simple medical equipment are used to provide both curative and preventive health services. It is important here not to confuse simple care with low quality care.



The question now is whether patients believe (as health planners/professionals do) that in the event of illness, they should first seek medical attention from the facilities that form the base of the referral system, and only move up that system, when adviced to do so by medical personnel. To see whether in seeking treatment, patients actually behave as health planners expect them to do, we need to examine their economic behaviour as consumers of medical services.

Recall that in providing health services to a population, the planner acts under conditions of resource scarcity. Similarly, in using the public health services provided by the planner, the patient or his relative, must face the problem of resource scarcity. The time and financial resources that can be used to obtain medical services from public or private health facilities can also be used to acquire other goods and services which, like medical care, also yield utility to the patient. Such goods or services include clothing, food, housing and so forth. If the patient (or his relative) can save part of the health budget, then he can buy more of other things which he also needs in addition to medical care. Thus, like the planner, the patient can be assumed to act so as to minimize the cost of treating a given illness. It follows therefore, that cost minimizing patients will first seek treatment frpm health facilities at the base of the referral system, i.e., from dispensaries and health centres. This is because the cost of treatment there is lower than in referral facilities. Hence, as the referral model suggests, cost minimizing patients would seek medical care from referral facilities (hospitals) only if they cannot get acceptable treatment from non-referral facilities (dispensaries or health centres).

The result of our analysis so far is important enough to warrant emphasis: the assumption that both health planners and patients attempt to minimize the cost of curing or preventing illnesses, leads them (without consulting each other) to prefer a common mode of health services delivery, i.e. the referral system. It is as if, in erecting the hierarchical referral facilities (as a service delivery system), the health planner transforms patients' unrevealed ideas of how best to seek medical treatments into an organizational structure of health institutions.

Alternatively, since patients' actual responses to illnesses are governed by their perceptions of how best to deal with illnesses, the referral system can also be viewed as a transformation of health-care-seeking behaviour of cost minimizing patients into a vertically ordered organizational structure of health facilities.

It should now be noted that the referral system as a model of patients' health-care-seeking behaviour rests on some very stringent assumptions, namely:

1. Patients, like health planners, are cost minimizers, that is, they minimize the cost of achieving a certain level of benefit derivable from consumption of health services.

2. The health facilities at different levels of the referral systems are substitutes in the treatment of common illnesses. For example, a malaria case can either be treated in an outpatient department of a National Hospital, or in an outpatient department of a rural health centre or dispensary.

3. Costs of treatment are higher for everyone at referral facilities.

4. The quality of service at non-referral facilities is acceptable to patients.

5. Patients are well informed about types of health services available at different levels of the referral system.

6. Health professionals have power to create demand for their own services; or equivalently, patients cannot bypass one level of a referral system to the next, without consent of the health personnel at the level that they are bypassing.

7. The public health care system is the only source of medical care available to the patient.

If the above assumptions were to hold, the referral system would fit in a strikingly remarkable way, the actual health-care-seeking behaviour of patients. Unfortunately, these assumptions rarely hold. Implicit in assumption 1, is the condition that patients, as consumers of medical services, maximize a non-probabilistic utility function. If, however, patients maximize an expected utility function, a two-parameter utility function a la Tobin (1958), then the possibility of them wishing to use different levels of the referral system for a given illness arises. In that case, the referral system would be an incorrect model of how patients seek treatment in the event of sickness. It would not capture patients' tendency to want to use referral facilities in conjunction with non-referral ones.

For some illnesses, assumption 2 would not hold, and hence patients would not visit only the cheapest source of treatment. Failure of assumptions 3 - 6 to hold would lead to bypass of health facilities by patients. Assumption 7 ensures that patients wishing to seek follow-up care after initial visits in public clinics will do so in the public referral system. This however may not be so if other sources of medical care exist.

The next section discusses empirical evidence that is used to examine the proposition that the referral system is a good model of how patients actually seek treatment in the event of illness. The proposition holds if patients first visit the closest health facilities, and only move to distant ones when fail to get cured by their initial treatments.

IV Empirical Evidence

a) Introduction

Field research on health facility utilization in developing countries shows that patients tend to seek treatment from closest health facilities. See for example, Akin et al (1985), Conly (1975), Mbithi and Rasmussen (1977) and Mwabu (1984). In their initial attempts to cure illnesses, most patients visit dispensaries and health centres - precisely the health institutions that form the base of the referral health system. In the majority of developing countries, money prices of medical services in these facilities are either totally or heavily subsidized by revenue from general taxation.

Furhter, in comparison with other sources of modern health care, dispensaries and health centres are relatively closer to peoples' homes, and hence the time cost of travelling to these facilities is not as great as to alternative modes of medical treatments. Thus the total cost (in terms of; money and time considerations) of receiving medical care from dispensaries and health centres is generally lower than the cost of treatment in the competing health institutions such as the hospitals and private clinics. See Mwabu (1985) for an illustration of differences in medical care costs in rural health facilities in Kenya.

In brief, patients' tendency to visit the closest (cheapest) health facilities fro medical attention, provides strong justification for the hypothesis that patients act so as to minimize the cost of treating a given illness. Hence, the referral model, according to which patients should seek initial medical care from the simplest (cheapest) health units of a national health care system, is a good description of patients' health-care-seeking behaviour. Nonetheless, the available empirical evidence, also indicates that patients' bypass of the simple units of the hierarchical national systems of health care is quite common.

b) Patients' bypass of health facilities

Patients' bypass of the closest health facilities has been documented in considerable detail in one of the Rural Health Units (Divisions in Kenya (see Mwabu 1984), pp. 56-67). The set of tables that follow display various aspects of health facility bypass by patients.

In the particular case illustrated by table 1, it can be seen that patients did not necessarily visit the closest health facility. For example, of the patients who sought treatment in government clinics in the first round of visits, 37 of them, or 27 percent, did not visit the closest government clinic. As can be seen from table 1, the percentage of the patients bypassing the closest government clinic got larger as the illness period became longer.

Table 1: Bypassing of closest facility of a given class for other facilities in that class

Type of facility or Provider bypassed	Per cent of Patients		
	First Visit	Second Visit	Third Visit
Govt. Health Centre or Dispensary	27 (37)	18.5 (12)	36 (9)
Mission Clinic	24.0 (33)	43.6 (44)	42.6 (20)
Private Clinic	26 (2)	43.8 (4)	56.3 (9)
Govt. Hospital	14.3 (2)	25.0 (4)	30.8 ( )
Pharmacy/shop	23.8 (30)	20.0 (7)	22.2 (4)
Traditional Healer	51.6 (16)	50.0 (9)	41.7 (5)

NOTE: The figures in parentheses are numbers of patients who bypassed the closest provider in a given class of providers.

Source: Mwabu (1984), p. 56

This is also the case in non-government health facilities. However, the actual number of patients who bypassed the closest facility became progressively smaller as the period of illness increased. This is because in each period, patients recovered and exited the health care system. In general, as the number of visits (number of attempts to cure illness) increases, the bypass rate first rises and them declines. It should be noted that the results displayed in table 1 generally lack statistical reliability because the sample sizes involved are quite small. Nonetheless, the results are important because they illustrate the phenomenon of patients' bypass of health units in a health care system characterized by referral facilities.

Table 2: A comparison of the total number of patients bypassing the closest facility in a given class of facilities and the number of patients attending the closest facilities in other classes after the bypass

Class of facility bypassed	Number bypassing (out of 422)	No. going to closest clinic in other classes	Per cent
Government clinics	122	118	96.7
Mission clinics	45	42	93.3
Private clinics	128	125	97.6
Government Hospitals	-	-	-
Pharmacies/shops	166	162	97.6
Traditional Healers	280	168	95.6

Source: Mwabu (1984), p. 58

Table 2 is interesting because it emphasizes patients' tendency to seek treatment from the closest facilities. As can be seen from the table, after bypassing a particular class of clinics, e.g. government clinics, patients generally sought treatment from the clinic of other classes of health facilities that was closest to them. Expectation of better quality of service from the next health facility, or lack of drugs from the closest clinic, were the two most commonly mentioned reasons for bypassing the nearest health unit.

The data in tables 1 and 2 show two conflicting behavioural tendencies of patients in their search of cure: a strong tendency to seek treatment from the nearest health facility and a rather weak but persistent countervailing tendency to bypass the nearest clinic. As already mentioned, patients bypass a health facility when they consider its services to be of insufficient quality. Thus, the health facilities bypass can be attributed to perceived inadequacies in health services.

It is this phenomenon, the health facility bypass, that weakens the predictive power of the vertical referral model regarding patients' health-care-seeking behaviour.

V Reffrral System as a normative model of a National Health Care Delivery System

In the previous section, it was demonstrated that in the absence of the bypass phenomenon, the hierarchical referral system, fits quite well, the actual health-care-seeking behaviour of patients. In other words, the referral system is a positive model of patients' economic behaviour in their search for medical treatments. Further, the data presented in the previous section, indicates that the bypass phenomenon only weakens the predictive power of the referral system (as a model of patients' behaviour), but does not make it invalid.

The normative question posed in this section is: should a national health care delivery system of a developing country be organized according to the structure of health institutions implied by the vertical referral system? Or equivaltntly, does the referral health care system describe the organizational structure of health institutions which ought to exist in a developing country such as Kenya?

In a resource poor country, a vertical organizational structure of health institutions provides the health planner with an opportunity to achieve two important health care goals. First, such a structure makes it possible to cover a large number of people with some medical care. This is because simple health institutions (e.g. dispensaries) are easy to afford since they use local resources intensively), and can therefore be built in large numbers. Second, through the referral system, it is possible to provide high quality care both to those who can afford to pay for it, and to those who cannot afford such care, but are deemed to be in great need for it. Poor patients, once identified, can be referral to high quality health facilities for free treatment. Thus, under a referral health care delivery system, it is possible to charge market prices for medical services without excluding anyone from medical care. Since user fees tend to discourage internal inefficiency in health care delivery (Carl Stevens, 1984 and others) a referral system would be conducive to both efficiency and equity in medical care.

From a theoretical perspective, a referral system provides a very convincing description of an organizational arrangement of health institutions that ought to exist in resource poor countries. That is, it is an appropriate model of how health delivery systems in such countries ought to be organized.

We will now match this theoretical perspective with empirical evidence. Specifically, we will match it with the evidence regarding the known effects of referral systems on efficiency and equity.

VI Empirical Evidence once again

The key question to be answered in this section is deceptively simple: Are the referral health care delivery systems in developing countries efficient and/or equitable?

There is much anecdotal evidence regarding the performance of referral health care systems in developing countries. These systems are known to be characterized by considerable internal inefficiencies. The symptoms of this inefficiency include over-loaded referral facilities; unmaintained medical equipment; unmotivated health personnel; misuse or shortages of drugs; mismanagement of transport facilities, among others. As a result of these inefficiency problems, the quality and quantity of health services delivered by health care systems of the developing countries, is believed to be far below what is possible with the available health resources. As already stated, hard data on the issues just raised are rare. However, in the case of Kenya, there is considerable amount of data on utilization of referral facilities (e.g. district and provincial hospitals). Table 3 below shows numbers of re-attendances to health facilities in Kenya, and the numberrs of re-attendances referred to higher levels of the referral system.

In interprating table 3, we make the following three assumptions. First, since the data are for districts, all the referrals are to district hospitals. Second, there are no horizontal referrals, i.e. there are no referrals from one district hospital to another; all referrals are vertical, that is, from health centres or dispensaries to district hospitals. Third, the majority of the re-attendance cases are from health centres and dispensaries, and when necessary, these are referred to district hospitals.

Table 3: Re-attendances and referrals to Government health facilities in selected Districts in Kenya, January - March 1987

District	Re-attendances or Re-visits	Referrals	Referrals as per cent of Re-attendances
Embu	102493	1543	1.5
Machakos	97429	10861	11.1
Kitui	60033	916	1.5
Meru	151495	2029	1.4
Isiolo	11697	216	1.8
Marsabit	7295	46	0.6
Kiambu	75274	2683	3.6
Kirinyaga	105397	4306	4.1
Murang'a	84181	3234	3.8
Nyandarua	88132	2399	2.1
Nyeri	288290	6046	2.1

Source: Health Information System, Ministry of Health, Kenya.

Given the above assumptions, it can be seen from table 3, that only a very small proportion of patients who re-attend health centres or dispensaries is referred by health professionals to district hospitals. This result is consistent with that obtained by Mwabu (1984) in a study of patients' treatment strategies in a rural district in Kenya. In that study, it was found that the probability of a patient visiting a Government hospital after re-attending a Government health centre or dispensary was quite small (about 0.055. See Mwabu, 1984 p.62). In other words only about 5.5 per cent of the patients who re-attended Government health centres or dispensaries visited Government hospitals for follow-up care. The remaining 94.5 per cent sought referral or follow-up care from non-government facilities. The same was true of patients who sought initial treatment in a Government hospital after self-diagnosis of their health problems. These are patients who bypassed health centres and dispensaries and sought treatment from the closest Government hospital. Only about 9.3 per cent of such patients, sought treatment from a referral government health facility. The rest - 90.7 per cent - sought treatment from non-government facilities.

The data on utilization of referral facilities suggest that these facilities are used predominantly by non-referral patients. The congestion of patients at the hospitals is due, to a large extent, to the presence pf patients there who can be treated successfully at lower level facilities. In short, the problem of over-utilization of hospital services is due to the fact that the referral system is not functioning as desired. This is partly due to the phenomenon of patients' bypass of health facilities, and partly a result of under-pricing of hospital services. Since hospital service is of better quality than dispensary service, a patient will choose to use a hospital if its service costs the same as that of the dispensary; for example, if both of the services are free. In brief, the referral health care delivery systems of the developing countries do not function efficiently because, among other things, they are overcrowded by patients who do not need referral medical care. They (the referral systems of developing countries) are also inequitable because they tend to be urban-biased. By design, the referral facilities are located in the urban areas, where also, 60-80 per cent of the most qualified medical personnel (the doctors, dentists, pharmacists etc.) work. Thus, the referral

facilities end up benefiting urban residents disproportionately more than the rural populations. To summarize, the referral systems of the developing countries fall short of expectations regarding their efficiency and equity in health services delivery.

VII Synthesis and Discussion

This paper has examined the hierarchical referral health care system, both as a positive model of patients' health-care-seeking behaviour, and also as a normative model of a national health care delivery system in a resource poor country. The novelty of the paper is in demonstrating that the organizational structure of a referral health care system is a physical model of how cost-minimizing patients would seek treatment under certain conditions (see assumptions 1-7, pp 6-7). When these conditions hold, the referral system also turns out to be a good description of how a national health care delivery system ought to be organized to achieve goals of efficiency and equity in the provision of health services.

In democratic countries where governments respect consumer (patients') preferences, the effectiveness of a referral health care system depends on how well it reflects patients' behaviour in their search of cure.

It has been shown in the paper that referral health care systems are appropriate organizations of health services delivery in developing countries. However, the systems need to be reformed to make them more equitable, and to increase their efficiency. The needed reforms are as follows:

1. An increase in costs of using services of referral facilities.
2. Abolition of outpatient departments in referral facilities - leaving only the inpatient and specialized departments.
3. An increase in the amount of health budget allocated to health centres and dispensaries.
4. Provision of incentives for doctors at referral facilities (hospitals), to visit health centres regularly to deal with difficult cases there.

5. Strenghening the diagnostic capabilities of health centres.

6. Introduction of models of drug supply (such as the kit system in Kenya) that would ensure availability of essential drugs in health centres and sispensaries.

Due to the fact that in addition to government health facilities, other sources of treatment are available to the population, it is important for health planners to know the proportion of patients who need referral services that seeks treatment from non-government facilities. This information is useful in planning the level of service to provide at government health facilities.

VIII Summary and Conlusion

Government health services in developing countries are provided predominantly through organizational structures with vertical referral systems. An important phenomenon of these structures is the movement of patients (or their problems) up or down a hierarchy of referral facilities. The referral system can be viewed as a physical, organizational construction of how patients actually seek treatment for their illnesses. A referral system would not work at all if it were not consistent with patients' health-care-seeking behaviour either by chance or by design.

The vertical referral systems are appropriate organizational forms for health services delivery in resource poor countries, not only because they are largely consistent with economic behaviour of patients in their search of treatments, but also because they are cost-effective. Nonetheless, the referral systems do not function as desired because of certain inefficiencies and inequities that characterize them. Reforms that would improve their performance include re-structuring government hospitals so that most of their outpatient services can be provided at the health centres; making the specialized medical care at referral facilities equally expensive for everyone without hurting the poor; and strengthening the management, and financial positions of health centres and dispensaries.

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APPENDIX I: THE PROBLEM OF HEALTH SERVICES PLANNING AS THE PATIENTS' (HOUSEHOLDS') PROBLEM

This appendix provides a rigorous treatment for the idea that health planners and patients, have a common desire to minimize costs of medical care; and that this desire leads them to prefer a referral system of health services delivery.

Planner's Problem-Cum-Patients' Problem

Assume health planner's budget consists of the time resource, T, and other resources, R. With this resource bundle, the planner is able to provide two units of health services, namely, curative services, X_1, and preventive services, X_2. Since the planner's budget is limited, he is cost conscious. Specifically, in providing X_1 and X_2, it is as if the planner is solving the following linear programming problem:

$$\text{Min } C = vR + wT \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

s.t

$$vr_1 + wt_1 \geq U_1$$

$$vr_2 + wt_2 \geq U_2$$

$$v, w \geq 0$$

where

C = Total cost of providing X_1 and X_2

v = Price of one unit of resource, R

w = Price of one unit of resource, T.

r_1, r_2 = Units of R required to produce a unit of X_1 and a unit of X_2 respectively.

t_1, t_2 = Units of T required to produce a unit of X_1 and X_2 respectively.

U_1, U_2 = Social benefits attached respectively, to utilization of X_1, and X_2 by a given population of households.

Like the planner, the households are endowed with time and other resources (T* and R* respectively) that they use to acquire X_1 and X_2. Since the planner spends his scarce resources to provide X_1 and X_2, he cannot give them free of charge to the households. There is no such thing as "free lunch" in the world of the planner. However, households (patients) can advance the planner, in form of taxes, some of their resources which he can use to provide them with health services. Under such arrangement, patients pay only part of the cost of medical services. Assuming R* = R, and the patients advance this much to the planner, they would be able to exchange their time resource, T* for medical services when they need them. For simplicity assume T* = T. Some households and a number of their representatives in their own government, regard this arrangement as a "situation of free services". needless to say their view is incorrect. When the planner and the households are not engaged in health care activity, they both work in non-health sectors, where they are paid an hourly wage rate of w. It is this wage rate, w, which they sacrifice every time they engage in the health care activity.

In order to work in the health sector as a provider of health services, the planner must receive a compensation of not less w from the households. Also, in order for the households to compensate the planner at the rate of w, they must derive benefits (utility) equal at least to w from the consumption of medical services. If the households find the planner's services (X_1 and X_2) worthwhile, they spend their limited resources, T and R, to get as much as possible from these services. It should be recalled here that with regard to household's spending behaviour, it matters not at all whether part of their health budget, R, is in the hands of the planner, or in their own possession. Given their resource constraint, the households can be assumed to spend their health budget on X_1 and X_2 as if they are maximizing the following linear programming problem:

$$\text{Max } W = U_1X_1 + U_2X_2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

s.t

$$r_1X_1 + r_2X_2 \leq R$$

$$t_1X_1 + t_2X_2 \leq T$$

$$X_1, X_2 \geq 0$$

where

W = Utility (Welfare that households derive from consumption of X_1 and X_2.

U_1, U_2 = Marginal utility of consuming a unit of X_1 and X_2 respectively. All the other variables, r_1, r_2, t_1, t_2, X_1, X_2, R, and T are defined as in problem (1).

Inspection of expressions (1) and (2) reveals that the planner and the households are solving an identical problem. Specifically, the planner is solving the Primal version of an optimization problem, while the households are solving its Dual or the vice-versa. By Duality Theorem optimal C is equal to optimal W; a result that confirms indeed that both the planner and the households are engaged in the same problem*.

Proposition: Given the nature fof their problem, both the planner and the households will arrive at a referral system, as the optimal system of health services delivery.

Proof: Let S be an set of numbers characterizing various sizes of health institutions. Costs of health care in large institutions are higher than in small institutions.

Let β be the proportion of serious illnesses in the population, and α be the proportion of minor illnesses. Assume, as is always the case, that $\alpha > \beta$, and that, minor illnesses are treated in small institutions.

It follows from behavioural tendencies sketched in problems (1) and (2) that the number of small institutions in S would exceed that of the large ones. Moreover, due to structure of health care costs in S, illnesses would be treated in larger institutions only if they cannot be treated in smaller ones. Thus, the set, S, would represent an ordered hierarchy of health institutions, which, at an abstract level, bears the shape of a pyramid.

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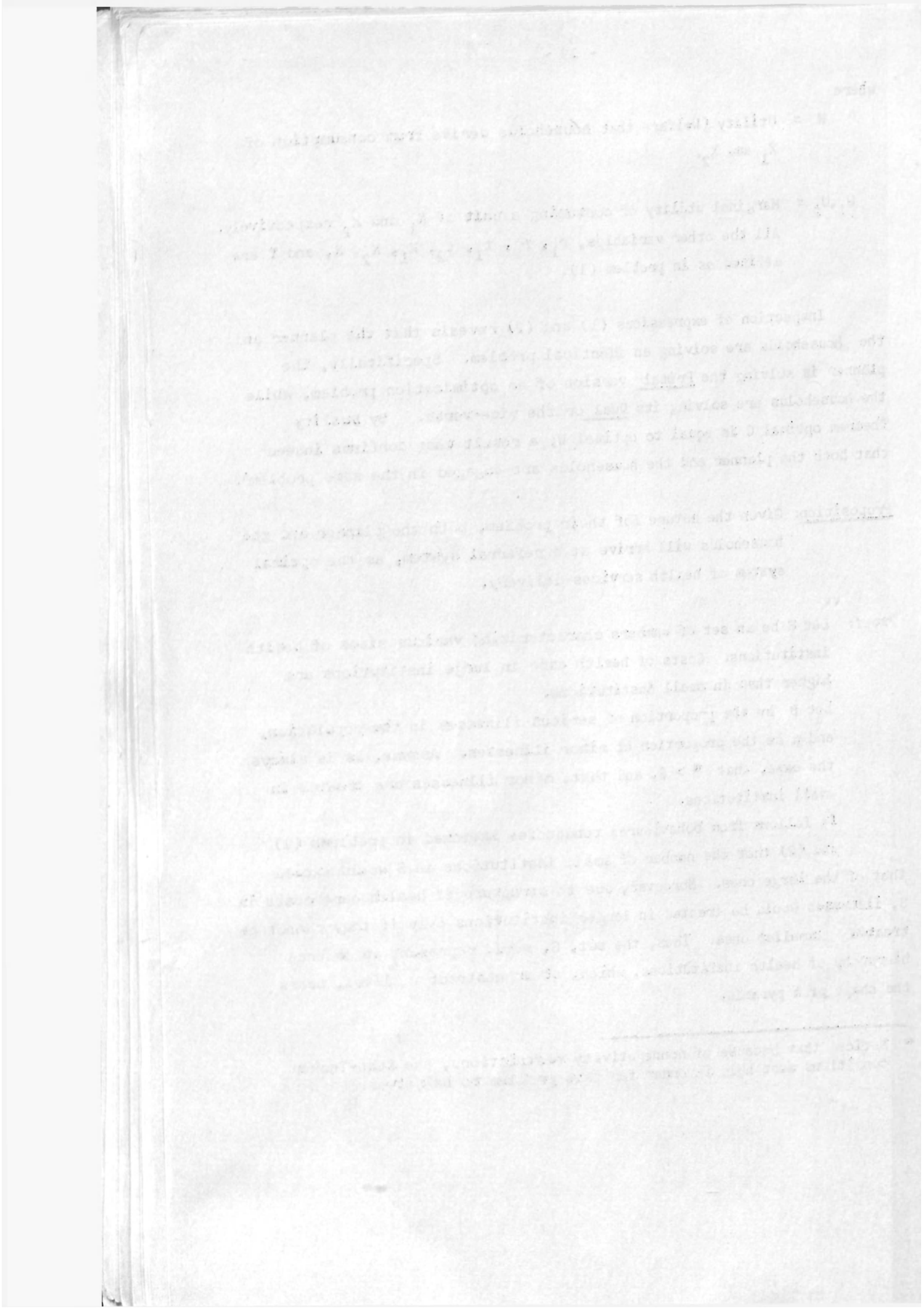
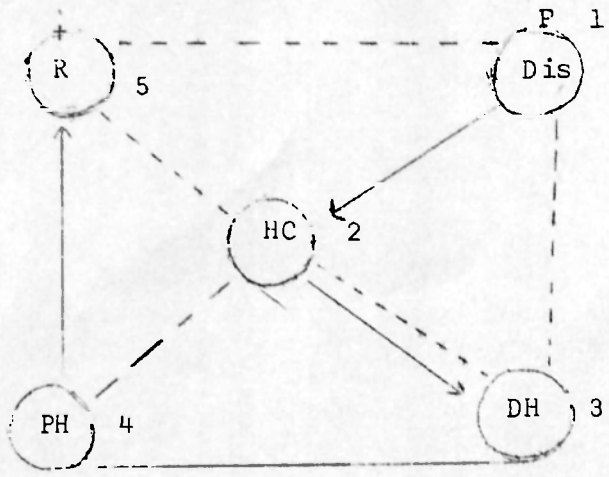
* Notice that because of nonnegativity restrictions, the Kuhn-Tucker conditions must hold in order for this problem to be solved.



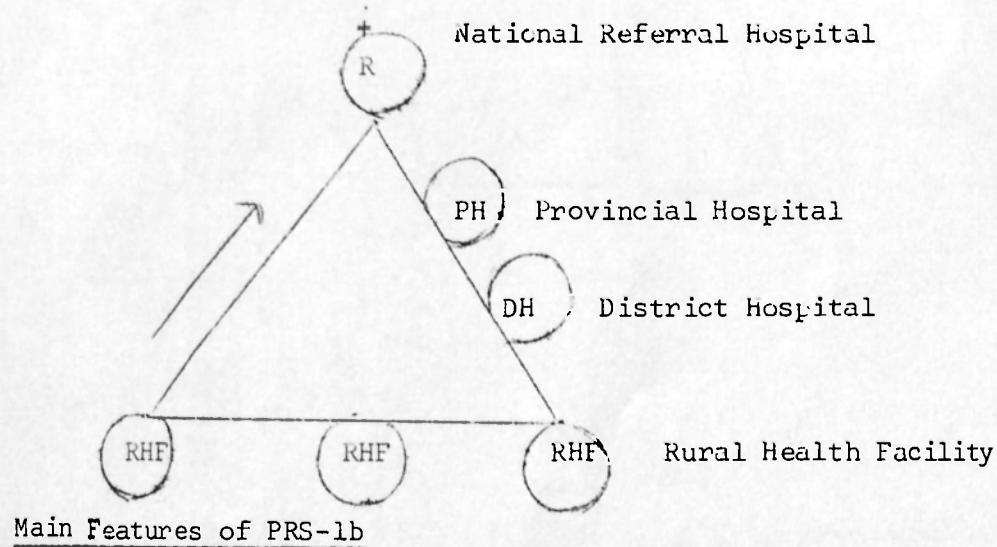
APPENDIX II: GLOSSARY OF POSSIBLE REFERRAL SYSTEMS (PRS)

1. Figure 1a: PRS-1a



legend:
1 = Dispensary or Health Post
2 = Health Centre
3 = District Hospital
4 = Provincial/Regional Hospital
5 = National Referral Hospital
→ = Direction of formal referrals
---- = Possible channels of informal or self referrals

Figure 1b: PRS-1b



Main Features of PRS-1b

a) Figure 1a, represents possible geographical locations of health health facilities that comprise a health care system in a typical LDC.

b) Figure 1b, represents an abstract view of this system. a pyramid-like structure of health institutions.

c) The system consists of one national referral hospital; many Rural Health facilities; and a number of District and Provincial hospitals.

Positive remarks about PRS-1

a) It corresponds to households pattern of medical responses to illnesses.

b) It is a common referral system in LDCs

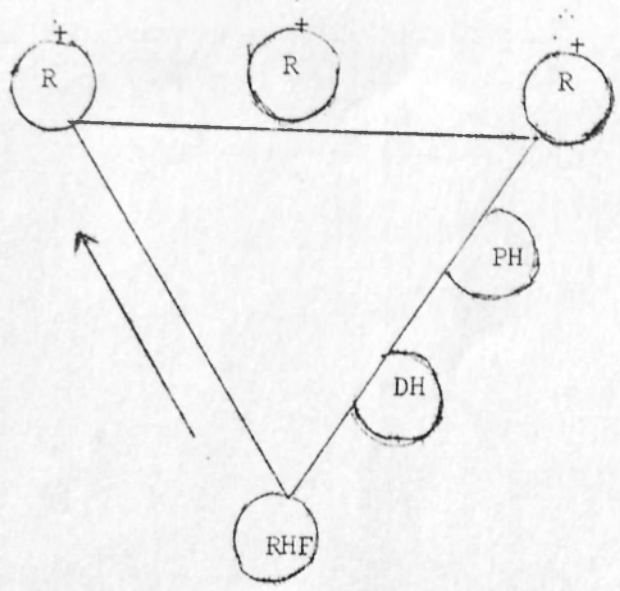
c) In its present form, it is inequitable and inefficient.

Normative remarks about PRS-1

a) All resource poor countries ought to have some version of this y·tem

b) For most illnesses, households ought to seek medical treatments according to its predictions.

2) Figure 2: PRS-II



Main Features of the System

a) An inverted pyramid of a hierarchy of health institutions.

b) Many National Referral Hospitals

c) One or very few Rural Health Facilities

d) Quite a number of provincial and District hospitals.

4) Positive Remarks about PRS-II

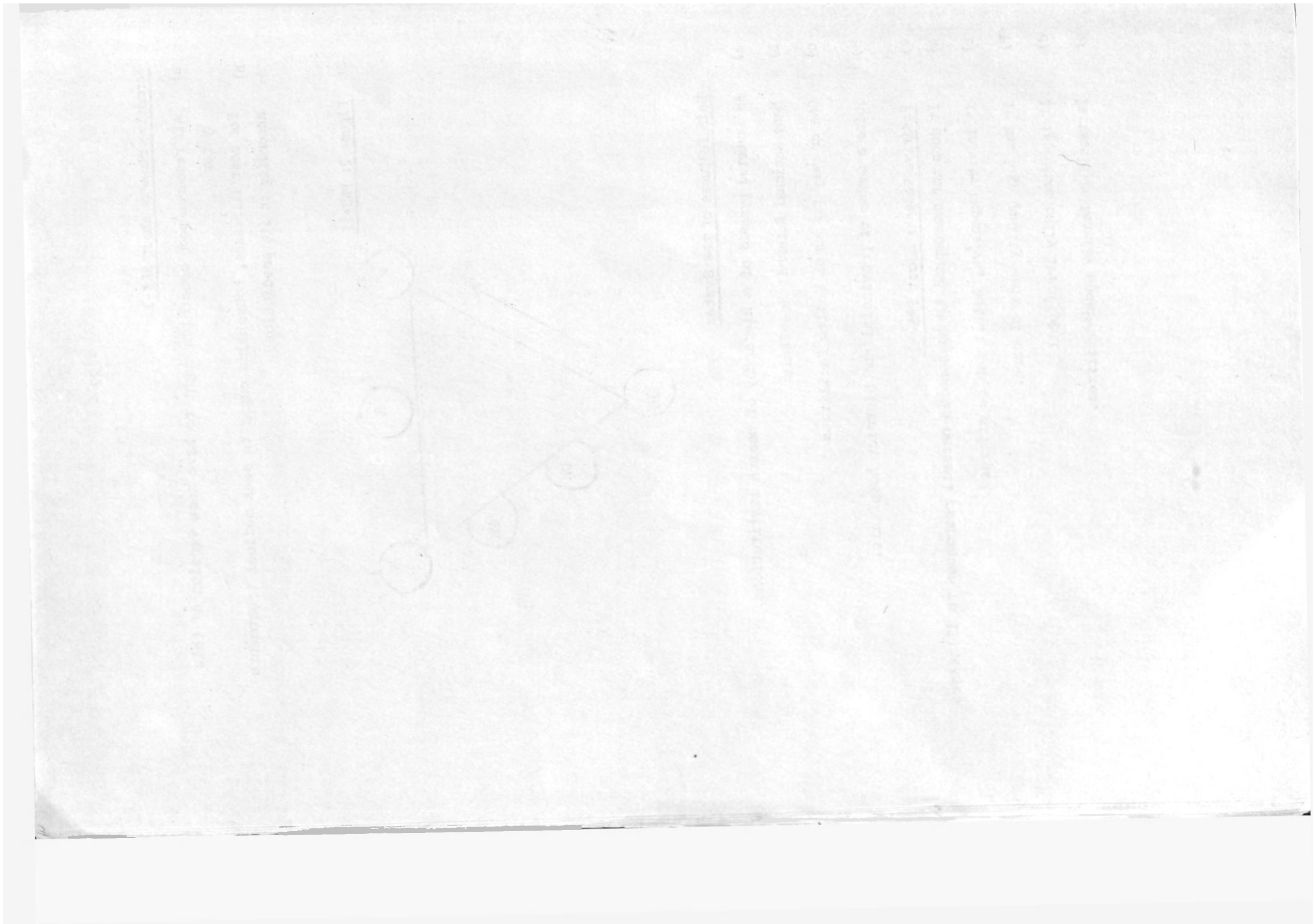
a) It does not correspond to households natural responses to illnesses

b) I⁺ is very expensive, but it can be afforded.

c) It has high quality medical care.

d) It is economically irrational

e) It would be heavily under-utilized.

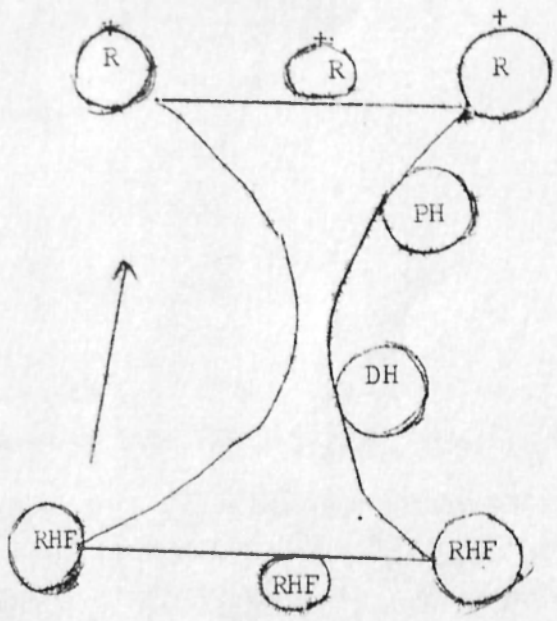


Normative statements about PRS-II

a) Countries, especially LDCs, ought not to have this system, even when they can afford it.

b) Given the nature of most medical problems, and medical care technology, households ought to avoid seeking treatments according to the predictions of this system. Notice that according to PRS-II, households would start seeking treatment, (even for minor illnesses) from very expensive facilities.

5) Figure 3: PRS-III



Main features of PRS-III

a) It consists of a hierarchy of health institutions, with an abstract shape of sand-glass.

b) It has many national referral hospitals; many Rural Health Facilities; one or very few District hospitals; and quite a large number of provincial hospitals.

Positive Remarks about PRS-III

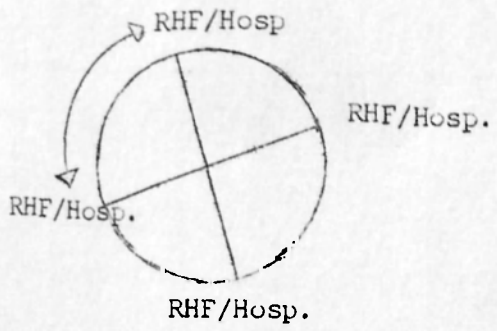
a) It corresponds to households' economic behaviour in their medical responses to illness.

b) It is very expensive; disease patterns in LDCs do not justify this system.

Normative remark about PRS-III

Given the generally accepted principles of Primary Health care including Community-Based Health Care, low income LDCs ought not to have PRS-III.

4) Figure 4: PRS-IV



Main Features of PRS-IV

a) It has homogeneous Health Facilities, e.g., facilites consisting of identical hospitals or of identical dispensaries.

b) Referral system in this case is trivial, because patients would bbe moving between identical facilities. The radii of the circle in figure 4 represent probabilities of cure after referral. As can be seen, these probabilities remain the same after referral; hence referral becomes pointless.

c) There are either many or few health facilities of uniform sizes.

Positive remarks about PRS-IV

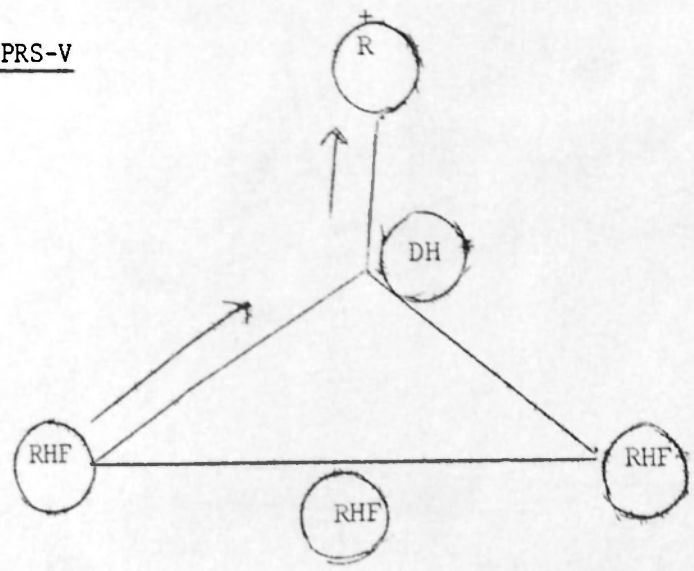
a) It does not correspond to households' medical responses to illnesses.

b) It cannot be justified on the basis of disease patterns.

Normative remark about PRS-IV

It should not to be installed in any country.

5) Figure 5: PRS-V



Main Features of PRS-V

a) There are no provincial hospitals

b) District hospital is the key referral facility in any given community in a district.

c) There is one National Referral hospital (NRH). The NRH deals only with special cases which DH cannot handle. . Self referrals to NRH are extremely expensive; those trhough DH are free or highly subsidized.

d) Referrals are strictly vertical.

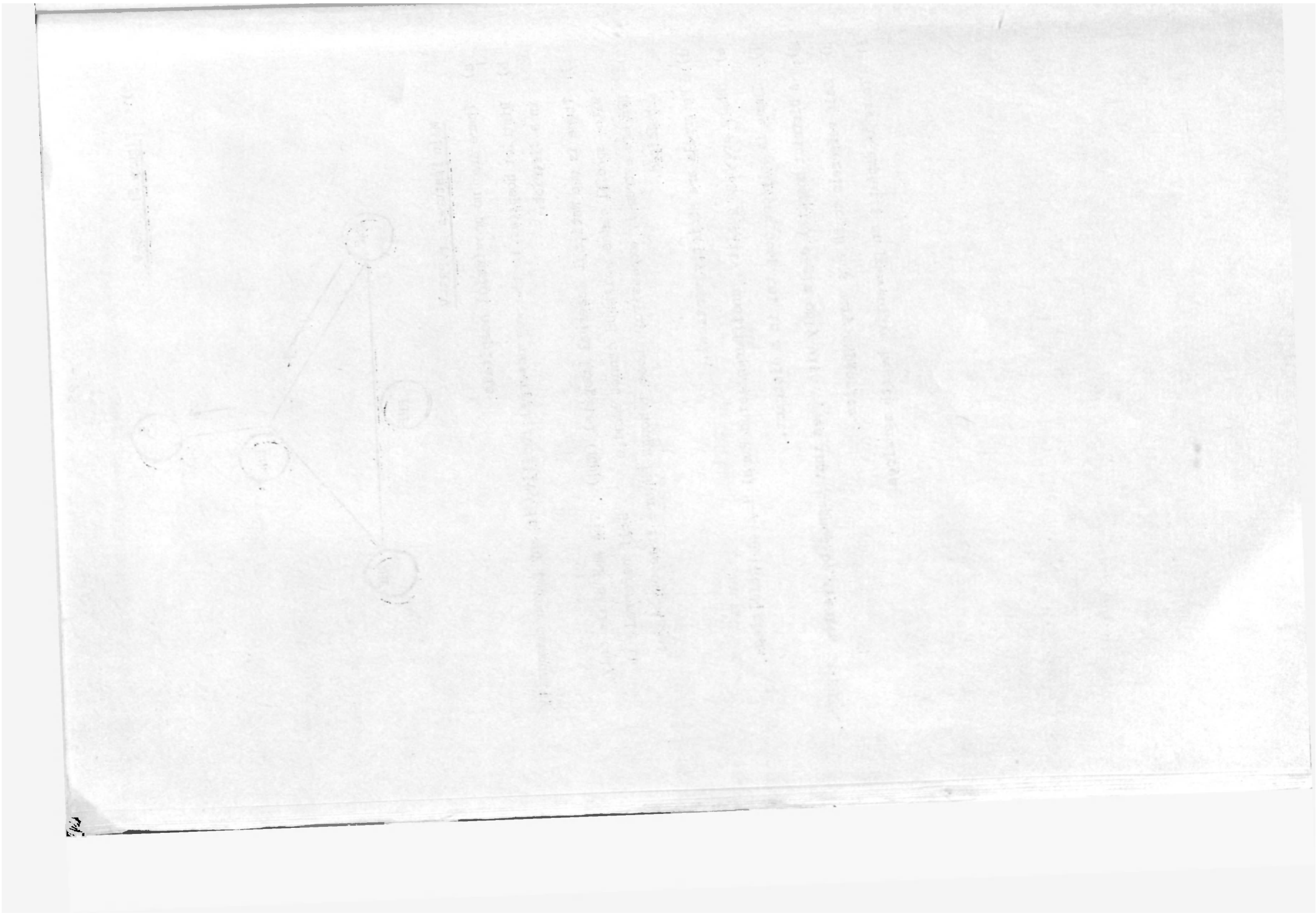
e) There are high quality, undifferentiated Rural Health Facilities.

f) There is only one hospital in a district.

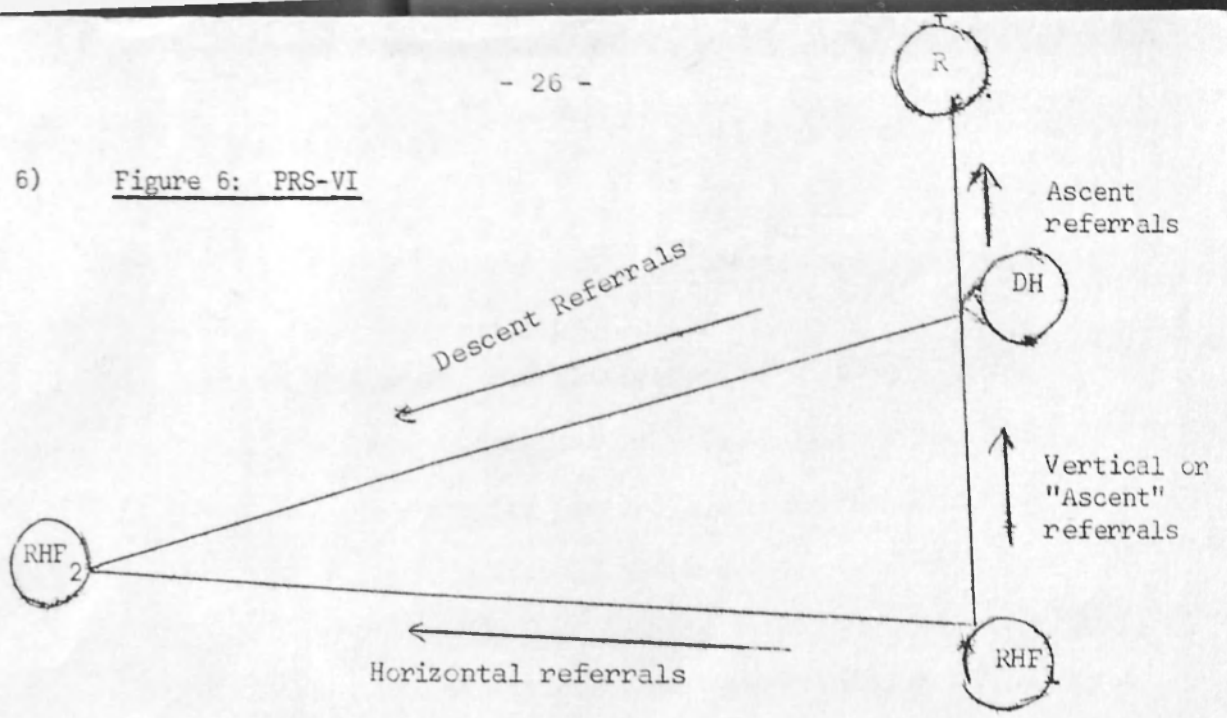
g) A District hospital deals only with cases that cannot be treated at RHFs.

h) Self referrals to DH are very expensive.

i) There is emphasis on preventive health services.



6) Figure 6: PRS-VI



Main Features of PRS-VI

a) There are high quality Rural Health Facilities. Some of these however, specialize in certain diseases, e.g., RHF_2 might have a greater capabilityo of treating leprosy cases than other rural facilities. Hence other rural facilites would be referring leprosy cases to RHF_2. District hospital would also refer cases to RHF_2.

b) There is one National Referral Hospital for all districts, and one Referral hospital in every district.

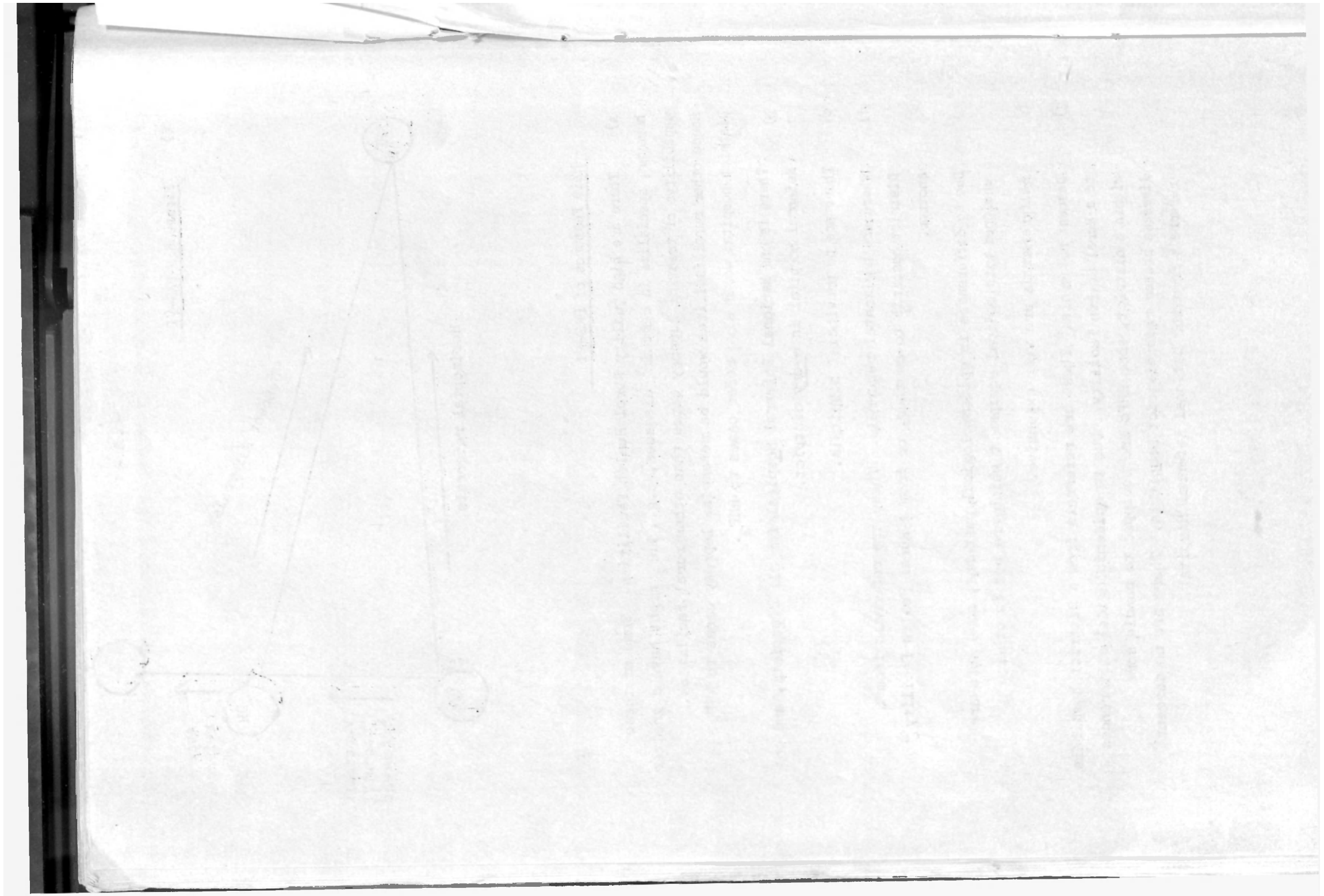
c) There are no provincial hospitals.

d) There are horizontal referrals. These are referrals from a District hospital to another, or from a Rural Health Facility to another.

e) Due to differences in epidemiological patterns, some RHFs are equipped with medical equipment which are not in others.

f) Self-referrals are very expensive.

g) Descent referrals. These are referrals from a District hospitals to a Rural Health Facility. Due to epidemiological differences within a district, some RHFs are equipped to handle some diseases better than district hospitals. There are no descent referrals from the National Referral Hospital.



Pcsitive remarks abcut PRS-VI

a) It corresponds to households' rational responses to illnesses f

b) It is the optimal system fcr LDCs since it has the potential to serve well the goals of equity and efficiency.

c) It is consistent with principles of Primary Health Care.

d) It is conducive to community participation in cost recovery.

e) It is consistent with policy of "District Focus" and related decentralization policies.

f) It permits referral facilities to be used mainly by patients who need them most.
It avoids large crowds of sick people in hospitals most of whom are probably lured there by"mirages of cure" at the hospitals.
Probabilities of infections at the hospitals would also decline.

g) It frees doctors' time from unnecessary referrals, and hence gives them an opportunity to engage in- research, without which the referral system would remain static.

Normative Remark about PRS-VI

LDCs ought to explore seriously, ways of adopting some version of PRS-VI, taking into account their own specific circumstances.