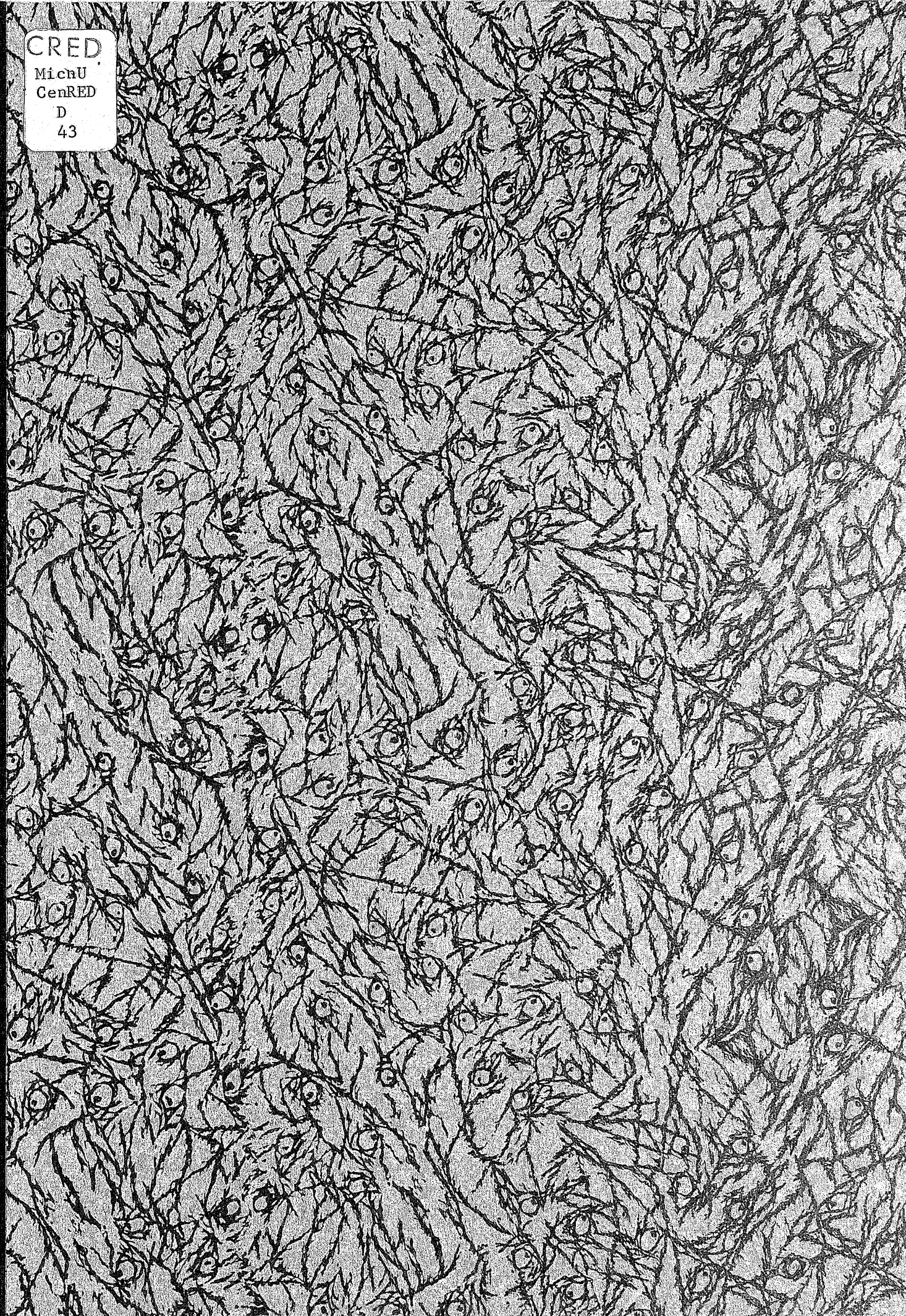

AN ANALYSIS OF THE STRUCTURE, EQUITY AND EFFECTIVENESS OF PUBLIC SECTOR HEALTH SYSTEMS IN DEVELOPING COUNTRIES: THE CASE OF TUNISIA 1960 - 1972

Peter S. Heller

CENTER FOR RESEARCH ON ECONOMIC DEVELOPMENT
The University of Michigan
Ann Arbor, Michigan 48108

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This paper presents an economic analysis of the health and medical sector in Tunisia. After reviewing the structure of investment and recurrent expenditure policy over the first planning decade, it analyzes the effectiveness with which resources are allocated in the health system. It provides a theoretical framework for the analysis of medical referral systems as well as an analysis of (1) the pattern of demand for medical services, (2) the operating characteristics of Tunisia's medical referral system, (3) the causes of capacity underutilization in hospitals and (4) the incidence of government medical expenditure. Finally, the paper evaluates Tunisia's medical manpower strategy.

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I

Introduction

At the time of its independence, Tunisia inherited a health and medical system totally inadequate to respond to the medical needs of its population or to attack the underlying causes of disease. Medical resources--infrastructure and manpower--were in scarce supply and maldistributed between the urban and rural areas. Between 1962 and 1971, Tunisia's government pursued policies to quantitatively and qualitatively expand the capacity of its medical and health system. This required substantial increases in the level of recurrent and investment expenditure, and measures to improve the allocative efficiency of the medical system. Many of these policies appeared highly innovative. The medical profession was "socialized." A network for rural dispensaries, staffed by physicians, was established. Fees for medical services were virtually eliminated.

The problems Tunisia faced are not uncommon among other developing countries. Since its policies are similar to those urged on the health planners of other LDCs, it is useful to evaluate their impact and efficacy. Did Tunisia's expanded health efforts remedy the perceived structural inadequacies? Does the "referral pyramid" of medical and health institutions represent an efficient allocation of Tunisia's scarce medical and financial resources? In this paper we shall examine the structure of Tunisia's policies and of its medical and health system, and attempt to appraise whether they have been allocatively efficient and distributionally equitable. This requires two types of analysis. First, Tunisia's health policies over the decade must be described and examined for their impact on the structure of the medical and health system.

Secondly, an analysis must be made of the market for the medical services of the public sector. Is there efficiency in the production of medical services? Does the medical system effectively address the medical problems of the society?

In section II, we shall examine the rationale and consequences of Tunisia's first decade of planning and investment in the health and medical sector. In part A, we shall describe the health sector priorities that emerged during the course of the decade in order to have a benchmark for evaluating the success of Tunisia's policies. In parts B and C, we shall analyze the functional, institutional and geographic distribution of the government's investment and recurrent expenditure in the health sector.

Our analysis reveals that the government's expenditure programs have solidified Tunisia's medical system into a system of "referral" institutions. The bulk of the decade's investment has developed the inpatient capacity of the large urban-based regional and general hospitals and institutions, and these institutions absorb a large share of the Ministry of Health's recurrent financial and manpower resources. In principle, such a referral system may be theoretically optimal in terms of efficiency. Although the more expensive, medically complex facilities are located in the urban centers of any region, they are theoretically available to the entire regional population, with access rationed only on the basis of the degree of medical need. In principle, the network of rural dispensaries and urban hospitals is sufficiently dense to ensure easy access to primary diagnostic and treatment services. Referral linkages between institutions allow for prompt movement of serious cases from any outpatient clinic to an urban hospital, so that immediate physical proximity is not a critical determinant of access.

The obvious weakness of a descriptive analysis is that it allows only a limited number of inferences as to the actual effectiveness with which resources are used. This is particularly the case for a "referral" system, where the incidence of beds and medical skills between the urban and rural areas raises the alternative possibility of regional and socioeconomic inequities in effective access to medical care. Thus, it becomes crucially necessary to evaluate the characteristics of the technology and demand for medical services. Does the referral system filter

patients to institutions with the appropriate level of care? Is there equality of access to medical care?

Section III will attempt to answer these questions by examining the characteristics of the demand and supply of medical services in Tunisia, with primary focus on public sector institutions. Part A shall focus on the theoretical issues underlying the choice and evaluation of a referral structure. Part B will describe Tunisia's referral system and appraise whether the use of the more complex hospital units conforms to our theoretical criteria of effectiveness. The optimality of a medical delivery system is not only a problem in medical technology and economic optimization, but is constrained by the way in which the demand for medical services is manifested. Part C will examine the microeconomic factors which underlie the demand for medical care in the light of the current medical delivery system. The effectiveness of the institutional system is also influenced by the way in which medical treatment capacity is utilized. Part D developes a model to explain the structure of inpatient capacity utilization in Tunisia's hospital system. Part E examines the fundamental issue of income distributional incidence in the consumption of medical services.

A final aspect of the technology of any medical delivery system is the way in which medical and paramedical manpower are used to provide medical care. In many developing countries, the shortage of physicians has constrained government efforts to obtain an equitable regional distribution of physicians. This has led to policies ranging from nationalization of the medical profession to increased reliance on medical auxiliaries. Two policy options have been chosen in Tunisia. The "socialization" of the medical profession was an option applied in the early 1960s but abandoned by the end of the decade. The problems with this policy are explored in section IV, part A. In part B, an appraisal is made of the current policy of reliance on free market forces and expanded medical training programs.

Two caveats to the reader should be noted. It is likely that section II will primarily be of interest to students of Tunisia and it may be skimmed by the general reader. Sections III and IV focus on issues of broader interest to economists analyzing the effectiveness of health and medical systems in the public sector of developing countries.

Also, this paper will not attempt an analysis of the relationship of health and development in Tunisia. Although this would be extremely useful for development planning, it is not an easy task, particularly with Tunisia's limited data base. However, the role of such analyses must be put in perspective. It is unlikely that the priority attached to health and medical sector investment in most developing countries will be influenced to any significant degree by any empirical result that health investment is unrelated to development. Given this premise and the magnitude of society's resources allocated to the health sector, it is crucial that these resources be used as effectively as possible. It is our hope that our understanding of the characteristics of an efficient medical system will be enriched by a detailed analysis of the way in which resources are allocated and used in a country such as Tunisia.

II

The Structure of Health Sector Policy in the 1960s

A. The Rationale of Health Policy in Tunisia: 1960-1972

At the end of the 1950s Tunisia's health system was inadequate to provide a minimal level of medical services to its population or to attack the underlying causes of disease. Only physicians were allowed to make diagnostic and treatment decisions, yet they were in short and dwindling supply, owing to the return of many to France upon Independence. Those that remained were in private medical practice in the major urban centers of Tunis, Sousse and Sfax. Hospital bed capacity was regionally maldistributed with a large share of total bed capacity in Tunis. In many districts, there was negligible hospital bed capacity. Although many dispensaries had been constructed after Independence, shortages of staff, equipment and supplies precluded any thing more than a façade of service, particularly in the rural areas.

Planning strategy was shaped by these inadequacies and by an implicit technological perspective on how they could be redressed. Three technological premises can be recognized. First, the physician should continue to play the key role in the diagnostic and treatment process. This ruled out partial substitution of auxiliary and paramedical personnel for many tasks. Secondly, specific disease control programs in such areas as tuberculosis, nutrition, and infant and maternal health should

be managed, and to some extent implemented, through independent agencies or institutes. Thirdly, the network of medical institutions should be organized as a referral structure, which may be described as follows.

Most of the inpatient and outpatient demand for medical services should be fully satisfied by readily accessible, nonspecialized, base-level institutions, such as urban outpatient clinics, rural dispensaries and district hospitals. Such units were envisioned as diagnosing and treating most of the recurrent health programs of the community. Patients requiring more sophisticated medical attention would be referred to successively higher tiers of the institutional pyramid. These would include the regional and general hospitals, and the institutes. These would be better staffed and equipped for specialty medical care. The cost per case is these latter institutions would be more expensive because of the greater quantity and quality of inputs. The pyramid shape derives from the smaller number of institutions as one moves to higher tiers.

In principle, an efficient referral system would refer a patient to the lowest tier possessing the skills and supplies necessary for adequate diagnosis and treatment. With egalitarian goals, the level of treatment depends on the medical severity of the case rather than income or social position. Although this rationale was not explictly developed in the Plan documents, it is clear that the structure of the hospital system was to take a pyramid form.

Organizationally, the country was divided into health regions, which closely correspond to the country's administrative regional structure. Each region is divided into health districts, each of which contains either a regional or district hospital. In most health regions, the highest institutional tier of the pyramid reached is the regional hospital. The regional hospital provides specialized inpatient and outpatient services and serves as the seat of administration for <u>all</u> health institutions within the region. The district hospital provides nonspecialized inpatient and outpatient services, and is also medically responsible for the *Centres de Protection Maternelle et Infantile* (Maternal-Child Health [MCH] Centers) and rural dispensaries within the district.

At the top of the pyramid are six general hospitals, located in four regions. The general hospitals provide the widest range of medical

specialty services and thus serve as the ultimate referral points for cases from many regions. For example, the Sousse General Hospital will receive cases that the regional hospitals in Kasserine and Kairouan cannot treat. Finally, the institutes serve as the ultimate treatment facility for complex cases of specific medical services (pediatrics, tuberculosis, etc.).

Given the organizational structure, the technological premises and the perceived inadequacies, the "gaps" in the existing capacity were obvious. The following objectives ring like a clarion call throughout the Plan Documents of the period:[1] (1) "qualitative" improvement of the capacity of medical institutions through the modernization of antiquated hospital plants and the purchase of new surgical, radiological and laboratory equipment; (2) "quantitative" expansion in the number of hospital beds and outpatient clinics at a faster rate than the growth of the population; (3) rectification of regional imbalances in the quality and density of medical services; (4) creation of a national treatment capacity for complex disease problems; and (5) development of a network of maternal-child health centers as an integrated source of ante-natal and well-baby care and of family planning. A sixth goal that emerged in the mid-1960s was an expanded training program for paramedical and medical personnel.

These goals were unexceptionable in the world of health development plans. The ultimate objectives of health policy were not clearly expressed. Excepting the specific attention to infant-mortality reduction, leprosy and tuberculosis, health policy was motivated by an unweighted amalgam of humanitarian, economic and social welfare goals. The inherent right to adequate medical services appeared as important as the contribution health investments could make to the realization of economic goals. Lacking a well articulated objective function, there appeared to be no cost to pursuing one set of objectives at the expense of others. As a result, the ensuing pattern of investment in the health sector did not reflect a unified perspective of which critical deficiencies in the health system required the most rapid amelioration.

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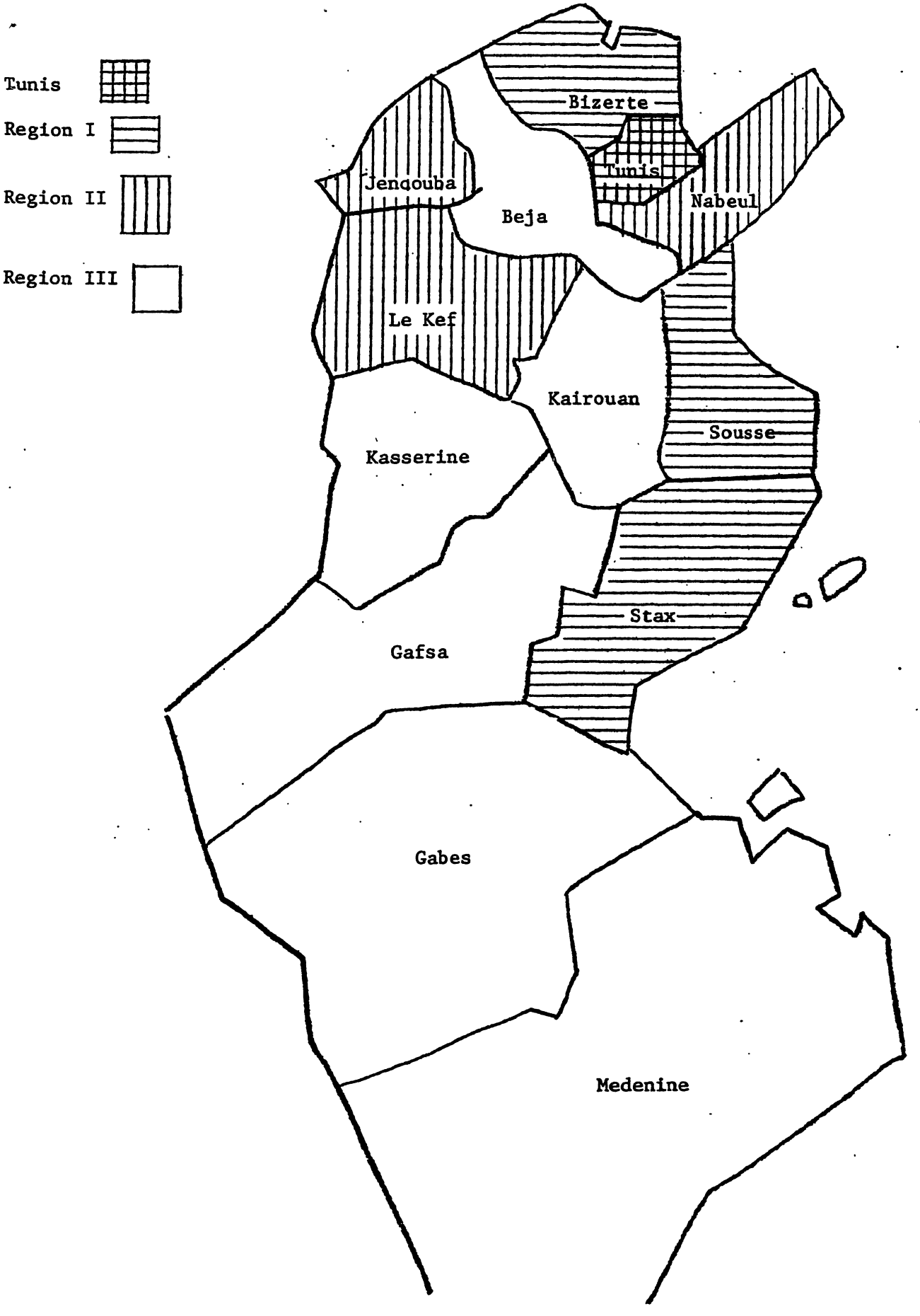
[1] These were culled from the *Plan Trienn al* (1962-1964), the *Plan Quadrienn al* (1965-1968), and the *Plan Quadrienn al* (1967-1972).

MAP 1

REGIONS OF TUNISIA



B. Investment Policy in the Health Sector

In the light of these objectives, an initial appraisal can be made of Tunisia's health sector investment policy. Has there been a reduction in the imbalance of medical capacity across regions? In terms of the referral pyramid, which levels of the referral pyramid received the greatest emphasis in the investment program, and how was this emphasis realized? Did expansion take the form of expanded bed and clinic capacity or through modernization of existing facilities? The structure of the investment strategy can be jointly measured by the magnitude of investment expenditure and by the identifiable changes in the capacity of the health system.

For analytical purposes, we have divided the administrative regions of Tunisia into four groups, which reflect our sense of the relative political and economic importance of the different regions (map 1). The capital region of Tunis is the country's dominant region. Second in importance, region I includes the major urban regions of Sousse, Sfax and Bizerte; third, region II consists of the northern coastal regions of Nabeul, Le Kef and Jandouba. Lowest in political priority are the remaining regions of Beja, Kasserine, Medenine, Gabes, Kairouan and Gafsa, which are included in region III. Obviously, the classification is subject to both dispute and change. The recent development of a petrochemical complex in Gabes and Medenine will raise their status in future years.

We may also distinguish between the following areas of medical intervention. Primary outpatient care relates to the initial diagnosis and treatment of patients for common medical problems. In general, it is the first type of medical assistance given to anyone who seeks medical care at a government outpatient clinic. A patient requiring further assistance from a medical specialist is referred to the secondary outpatient clinic for that particular specialty (surgery, gynecology, opthamology, and so forth), which are found at higher level referral institutions. Similarly, primary inpatient care is defined to include the medical services of general medicine, pediatrics, and obstetrics and gynecology. Primary inpatient bed capacity is available to some extent at most of the base-level district and regional hospitals. Secondary inpatient care includes inpatient capacity for all other medical specialties, such as surgery, dermatology, opthalmology, orthopedics, otolaryn-

gology, cardiology, and neurosurgery. Most of these specialties are found at the regional hospital, general hospital or institute levels of the referral pyramid. Access to these services is normally obtained by an initial referral from primary care physicians. A final category of activity is preventive health programs.

Expenditures: Several conclusions emerge from an analysis of the pattern of investment presented in tables 1 to 4. First, in terms of expenditure, the health sector received only a small, though rising, share of total government capital expenditure. Its share in the capital budget is far less than in the recurrent budget. Thus, its low priority in the government's investment program would seem to have precluded radical changes in the capacity of the health and medical sector.

Secondly, the distribution of capital expenditure appears to emphasize Tunis and region I. From table 2, the institutes and hospitals in the Tunis region absorbed more than 65 per cent of the decade's health investment budget whereas major hospitals in the other three regions received only 17 per cent of the budget. Of the investments that may be allocated to regions (8.96 million dinars [MD]), 81 and 9.36 per cent went to Tunis and region I, respectively. (Table 3) Since the Tunis region and region I account for no more than 22 and 27 per cent of the population, respectively, investment expenditure in and of itself clearly did not reduce regional imbalances in health sector capacity.

Thirdly, the allocation of investment is weighted toward secondary referral services and institutions. Of the 6.9 MD spent in Tunis institutions, two-thirds were directly attributable to secondary inpatient services. Another .7 MD was spent on the Institute of Pediatrics, which primarily treats complex pediatric cases. Only 1.04 MD may be directly tied to primary inpatient or outpatient services.

For the entire country, only 24.4 per cent (2.5 MD) of the decade's health sector investment was allocated to an expansion in primary care services. Of this latter amount, 40 per cent was expended on the elaboration of a maternal-child health center and dispensary network throughout the country. Primary inpatient expenditure outside the Tunis region was only .41 MD, and this was primarily realized by the construction and expansion of the regional hospitals in Nabeul, Gafsa and Kairouan. Although there was much discussion concerning the qualitative inadequacy

TABLE 1

HEALTH EXPENDITURES, CAPITAL AND RECURRENT FOR SELECTED YEARS - 1962-1971

(in thousand Tunisian dinars)

		1962	1965	1967	1968	1969	1971 (Estimates)
(1)	Total Recurrent Health Expenditures (Title 1)	5,367[a/]	8,050	9,584	11,767	12,438	14,572
(2)	Total Government Recurrent Expenditures	56,800	84,255	105,200	122,779	131,505	158,757
	[(1) / (2)] x 100	9.4%	9.5%	9.1%	9.6%	9.4%	9.2%
(3)	Total Capital Health Expenditures (Title II)	285	355	564	1,154	1,337	1,640
(4)	Total Government Capital Expenditures	n.a.	45,537	38,840	55,978	56,467	n.a.
	[(3) / (4)] x 100		.78%	1.45%	2.06%	2.36%	

[a/] This was estimated, since in 1962 the Health Ministry was merged with the Ministry of Social Affairs.

Source: Annuaire Statistique, 1962-1971.

TABLE 2

AN INSTITUTIONAL AND REGIONAL BREAKDOWN OF GOVERNMENT CAPITAL EXPENDITURES IN HEALTH FOR SELECTED YEARS -- 1962-1969 [a]

(in Tunisian Dinars)

Institution and Region [a]	1962 Total Capital Expenditures	1962 Percentage of Total	1965 Total Capital Expenditures	1965 Percentage of Total	1967 Total Capital Expenditures	1967 Percentage of Total	1968 Total Capital Expenditures	1968 Percengage of Total	1969 Total Capital Expenditures	1969 Percentage of Total
Institutes	55,496	19.4	8,000	2.3	194,889	34.5	322,277	27.9	410,192	30.6
Miscellaneous Curative	40,689	14.2	197,000	55.5	182,541	32.4	270,252	23.4	113,597	8.5
General Hospitals: Tunis	43,467	15.2	13,000	3.7	7,973	1.4	143,596	12.4	261,060	19.5
General Hospitals: I	----	----	----	----	-----	----	-----	----	52,248	3.9
Regional Hospitals: I	66,176	23.2	1,000	0.3	11,195	2.0	-----	----	-----	----
Regional Hospitals: II	18,856	6.6	78,000	22.0	28,027	5.0	89,084	7.7	36,516	2.7
Regional Hospitals: III	20,668	7.2	1,000	0.3	3,086	.5	67,791	5.9	82,683	6.2
Auxiliary Hospitals: I	12,563	4.4	4,000	1.1	-----	----	-----	----	-----	----
Auxiliary Hospitals: II	1,751	0.6	----	----	-----	----	-----	----	-----	----
Auxiliary Hospitals: III	5,925	2.1	3,000	0.8	-----	----	218	0.02	-----	----
Auxiliary Hospitals: Others	100	.03	----	----	-----	----	-----	----	-----	----
Training Institutions: I and Tunis	----	----	----	----	-----	----	81,021	7.0	72,057	5.4
Training Institutions: II	----	----	----	----	92,973	16.5	-----	----	-----	----
Maternal Child Health Centers (PMI)	17,500	6.1	46,000	13.0	34,378	6.1	9,581	0.8	-----	----
Pharmacies	2,553	0.9	----	----	-----	----	-----	-----	13,980	1.0
Mental Health	----	----	4,000	1.1	8,997	1.6	8,442	0.7	206	0.02
Miscellaneous Preventive	----	----	----		-----	----	161,901	14.0	294,659	22.0
TOTAL	285,746	100.0%	355,000	100.0%	564,059	100.0%	1,154,163	100.0%	1,337,250	100.0%

[a] Region I includes Sousse, Sfax and Bizerte.
Region II includes Nabeul, Le Kef and Jendouba.
Region III includes Kairouan, Kasserine, Gabes, Medenine, Gafsa and Beja.

Source: Unpublished Financial Statistics, Ministry of Finance.
Retrospectives 1962-1971: La Santé, Ministère de la Santé Publique, 1972.

TABLE 3

TOTAL INVESTMENT EXPENDITURE IN THE HEALTH SECTOR BETWEEN 1962-1971, BY INSTITUTION, REGION AND TYPE OF INVESTMENT

(in dinars)

Institution and Region \ Type of investment	Primary & Secondary Outpatient [a]	Primary Inpatient [a]	Secondary Inpatient [a]	Unspecified General Curative Improvements	Miscellaneous Preventive	Total
GENERAL HOSPITALS [b]						
E. Conseil (Tunis)	27,000	255,000	1,016,000	167,000		1465
C. Nicolle (Tunis)	270,000	442,000	845,000	329,000		1886
H. Thameur (Tunis)	32,000	20,000		114,000		166
Aziza Othmana (Tunis)			36,000	58,000		94
Cancer Institute (Tunis)			969,000			969
Nutrition Institute (Tunis)					300,000	300
Pediatrics Institute (Tunis)		675,000				675
Sousse (I)			600,000	77,000		677
Sfax (I)				34,000		34
Centre D'orthopédie (Tunis)			1,548,000			1548
Menzel Bourgiba (I)				88,000		88
Cite Welwert						207
• General Hospitals: Total (excld. Menzel Bourgiba)	330,000	717,000	250,700	867,000	300,000	
• Institutes	207,000	675,000	250,000			
REGIONAL HOSPITALS						
Gabes (III)				23,000		23
Kairouan (III)		65,000	195,000		20,000	270
Monastir (I)					40,000	40
Kasserine (III)				10,000		10
Nabeul (II)		160,000				160
Jendouba (II)				37,000		37
Gafsa (III)		120,000		8,000		128
Beja (III)				27,000		27
Medenine (III)				54,000		54
• Regional Hospitals: Total		358,000	195,000	149,000	60,000	
AUXILIARY HOSPITALS						
Grombalia (II)		23,000				23
Tatouine (III)		20,000				20
Maktar (II)		10,000				10
• Auxiliary Hospitals: Total		53,000				53
SUMMARY STATISTICS						
PMI's	400,000	50,000				
Dispensaries	600,000					
Auxiliary Hosp.		53,000				
Regional Hosp.		358,000	355,000	149,000	60,000	
General Hosp.	330,000	717,000	2507,000	867,000		
Institutes		675,000	2500,000		300,000	
TOTAL	1330,000	1213,000	5402,000	1017,000	360,000	

[a] Terminology: Primary outpatient: General Medicine, Pediatrics, Obstetrics-Gynecology
Secondary outpatient: All other specialties
Primary inpatient: Pediatrics, Obstetrics-Gynecology, General Medicine
Secondary inpatient: All other specialties

[b] Region indicated in parentheses

Source: Unpublished Financial Statistics, Ministère de la Finance, Ministère de la Santé Publique: Retrospectives 1962-1971; Santé.
Secretariat d'état au Plan et aux Finances:
Plan Quadrennal 1965-1968:
Plan Triennal: 1962-1964
Plan de Developpement Economique et Sociale , 1969-1972

of the existing capacity in the auxiliary hospital system (see section III E), only a negligible amount was expended to upgrade these facilities.

Fourthly, only a small share of total capital expenditure, less than 10 per cent, was allocated to the expansion of training institutions for paramedical manpower and preventive health programs. The small amount for training is surprising, given the shortage of paramedical manpower. The small share for prevention is partly explained by its largely recurrent character. Moreover, if one includes the expenditure of other Ministries for such purposes as the provision of clean drinking water, housing, and sewage networks, the amount spent on prevention, broadly defined, would be considerably enlarged. From table 4, gross fixed capital formation on urban water supplies rose substantially throughout the period, and was generally in excess of the investment budget of the Ministry of Health. Unfortunately, it is not possible to allocate these investments by region.

Finally, a measure of the relative priority given to each medical objective may be obtained by comparing the capital expenditures proposed, as outlined in Plan documents, with those actually carried out (table 5). For primary inpatient care, only 12 per cent of planned capital outlays on auxiliary hospitals and 27 to 34 per cent of those on regional and general hospitals were actually implemented. This contrasts with an implementation rate of 71 to 100 per cent for secondary inpatient services (including the institutes). Planned expenditure on primary and secondary outpatient services was fully realized. Preventive activities received only 25.7 per cent of planned spending.[1]

Thus, given the organizational and budgetary constraints on the level of project activity feasible within the decade, there is a clear priority in investment expenditure toward the development of the higher level institutions of the referral pyramid, particularly in the Tunis region. The relative rates of project implementation further accentuate

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[1] A possible explanation for the failure to undertake many projects was an underestimation of the cost of many projects. There was a clear tendency for projects initially appearing in an early Plan period to remain uncompleted at the end of that period, and to reappear and be implemented at a significantly higher level of expenditure in a subsequent Plan period. For many projects, the initial underestimation of actual project cost was from 50 to 65 per cent. Also, many projects were implemented without ever appearing in the Plan, obviously emerging between Plan periods and gaining administrative support for priority implementation.

TABLE 4

CAPITAL EXPENDITURE ON URBAN WATER SUPPLIES: 1968-1972

(in millions of dinars)

	1968	1969	1970	1971	1972
I. Health		1.58	1.57	1.87	3.08
II. Urban Water Supplies	2.67	2.82	3.94	2.42	2.72
a. Gov't. Capital Budget	1.36	.81	1.72	.98	1.19
b. Outside Gov't. Budget	1.30	.51	.57	.32	.12
c. Local Authorities		1.30	1.30	.96	1.26
d. Fonds de Concours		.20	.35	.16	.15

Source: Statistics on the Réalization du Plan: 1968 through 1972, Tableau V-13.

TABLE 5

THE IMPLEMENTATION RATE OF HEALTH INVESTMENT: BY FUNCTION: 1962-1971

(in thousands of dinars)

Function	Expenditures Planned b/ c/		Actual Expenditures		Implementation
	Amount	Percentage	Amount	Percentage	Rate (%)
Primary outpatient care	1499	9.55%	1330	13.13%	88.73%
Prevention	1400	8.93%	360	3.55%	25.71%
Primary inpatient services a/	4705	30.00%	1338	13.21%	28.44%
Secondary inpatient services	6880	43.87%	6077	60.00%	88.33%
General qualitative expansion (unattributable)	1196	7.62%	1017	10.00%	85.03%
TOTAL	15680	100.00%	10122	100.00%	64.55%

a/ Pediatrics Institute included in Secondary inpatient services (D 657,000).

b/ Excludes expenditure on training programs.

c/ This includes the sum of expenditures that were in the Plan Documents or which were implemented without previous inclusion in the Plan.

Source: Unpublished Financial Statistics, Ministère de la Finance. Ministére de la Santé Publique, Retrospectives 1962-1971: Santé

Secretariat d'État au Plan et aux Finances
Plan Quadrennal: 1965-1968
Plan Triennal: 1962-1964
Plan de Developpement Economique et Sociale, 1969-1972.

this preference, particularly relative to primary inpatient services and preventive care programs. However, one cannot immediately assert that the regional imbalance in medical services was accentuated. If these institutions actually served as national and regional referral centers, then their location is immaterial to the incidence of the benefits from this investment. Similarly, some basic level of delivery capacity in secondary inpatient services is critical to the viability of any referral system. To make stronger value judgments, further analysis of the operating characteristics of the system in section III is required.

What effect did this investment program have on the capacity of the medical system to provide inpatient and outpatient services? Capital expenditures may facilitate an increase in outpatient services through an increase in the number of clinics. Capital expenditures primarily affect the level of inpatient capacity through increments to the stock of hospital beds and by qualitative improvements brought about by the purchase of new equipment. The latter may be used to provide for increased quality of care or to increase the inpatient absorption potential for a given stock of beds (through a reduction in the duration of inpatient stays, improved ambulance capacity, etc.). Without a procedure for adjustment for changes in the quality level of a given stock of hospital beds, intertemporal comparisons of the bed-stock are not very meaningful. Nevertheless, a minimal analysis of the change in hospital bed capacity over the period is revealing.

New investment expenditure provided approximately 1550 additional beds over the decade. Another 550 beds were obtained by the absorption of the French naval hospital in Bizerte (Menzel Bourguiba General Hospital) into the public hospital system.[1] If one includes the absorption of

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[1]The estimate of 1550 cannot easily be derived from the published estimates of total bed stock. This is because of inconsistencies in the definition of a hospital bed, the types of institutions included and inexplicable movements in the number of beds attributed to a given region. Therefore, this estimate was derived from an examination of those hospital beds which could be directly allocated to investment expenditure within the Plan period, or to cases of absorption of private units into the public system. In cases where a given institution had a decrease in the number of beds (for example, the number of beds in the Tuberculosis Institute in Nabeul decreased by a third), it is presumed that the more recent estimate is the more accurate measure of the effective number of beds that existed. One is forced to make such inferences because data on the number of beds by institutions exists, if at all, for only a small set of institutions for the years 1961-1963 and post-1969.

Menzel Bourguiba, the investment program just kept pace with the rate of population growth, and the population-bed ratio remained constant at 400.

The regional variance in the population-bed ratio fell. Major additions to some regional hospitals and small changes in the stock of beds in the more densely served areas (Sousse, Sfax and Tunis) narrowed the gap between regions. (Columns 1 and 2, table 6) Signifcant regional differentials persist, but this stems primarily from the presence of the major institutes and general hospitals in Tunis and Bizerte.

Once changes in quality are introduced, the results become more ambiguous. From table 3, it is clear that a substantial investment was made within the Sousse and Tunis regions (at least 60 per cent of the health capital budget). Forty per cent of this went into the general hospitals of these regions, and yet the increase in their bed capacity was small, accounting for no more than 8 per cent of the 1550 additional beds for which investment outlays were made. Thus the quality of the existing stock of general hospital beds must have been substantially upgraded. Weighting for quality would increase the regional variance in quality standardized beds per capita, assuming that an increase in quality allows for a more rapid turnover in inpatients.[1]

In addition, although 58 per cent of the expansion in total beds occurred outside of Tunis and region I, this change in capacity required only 8 per cent of the total capital budget. This would suggest that these were not high quality inpatient units.

In terms of specific medical services, only the bed capacity in general medicine and pediatrics clearly expanded relative to the growth in population. By implication, bed capacity per capita fell for all other services (including surgery and obstetrics-gynecology). The regional variance in pediatric and general medicine beds per capita has also fallen, implying a more equal regional distribution of primary inpatient capacity. This is ironic when one considers the small shares of total capital expenditures allocated to this type of capacity expansion.

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[1]It would also increase the differential in the subsidy to those in the population receiving medical services within the higher quality urban hospitals.

Table 6

The Distribution of Hospital Beds by Region: 1962, 1971[a/]

Region	Total Population Per Bed (1)		Total Population Per General Medicine and Pediatric Bed (3)		Total Population Per Surgical Bed (5)		Total Population Per Obstetrics-Gynecology Bed (7)		Total Beds (#) (9)	
	(2)		(4)		(6)		(8)		(10)	
	1962	1971	1962	1971	1962	1971	1962	1971	1962	1971
Tunis	150	226	1090	1143	1301	2220	1630	2860	3254	4982
Bizerte	665	295	1395	860	3055	1620	4640	2871	404	1071
Beja	706	602	1460	1138	3810	3050	4210	2766	399	492
Jendouba	548	639	1080	1480	4035	4760	3065	3450	419	432
Le Kef	492	525	1191	1329	3160	3170	4410	6647	609	646
Kasserine	1340	1396	1440	1551	*	10360	*	28500	144	164
Gafsa	813	661	2035	1384	4040	3140	11790	4089	348	504
Medenine	1334	696	3110	1274	3775	5410	25730	6463	212	382
Gabes	507	541	1260	1186	2050	2975	5650	7964	412	414
Sfax	427	508	1785	1785	1965	2885	3930	5670	919	949
Kairouan	763	625	2160	1312	5465	3280	13665	9145	322	483
Sousse	387	437	1030	1006	1400	2810	2760	3286	1353	1340
Nabeul	610	462	3490	1265	2935	3460	4045	2491	257	712
Total Beds (#)	10471	12571	2814	4210	1687	1840	1122	1334		
Total Pop/Total Beds	398	400	1475	1176	2472	2738	3699	3776		
Regional Mean: Pop/Bed	672	585	1732	784	3082	3780	7127	6630		
Regional Standard Dev: Population/Bed	342	280	1285	238	1237	2199	6877	6925		

a/ Designates population per bed per region for each category

*Signifies that there were no beds of this category in the region

Source: Annuaire Statistique 1961-1971
Ministère de le Santé Publique, Retrospective 1962-1971 La Santé
Ministère de le Santé Publique, Statistiques 1971, Fascicule 2

There remain significant differentials (by a factor of 6) in the availability of surgical and maternity beds per capita across regions, and the differentials have widened over time. Specialty beds remain heavily concentrated in Tunis and region 1, which is consistent with their role in the national hospital referral system.

Finally, the regional statistics also mask intra-regional variations in the number of beds per capita. From table 7 it is clear that substantial differentials persist across districts. This is true even when one excludes the capital district of any region (since their bed per capita ratio includes the specialty bed capacity serving the entire region). This measure is one reflection on the availability of inpatient services to an individual, since all citizens are required to initially seek inpatient or outpatient care in the district of their residence in order to obtain free medical care.

C. The Pattern of Recurrent Expenditure: 1962-1971

From table 1, it is quite clear that the brunt of Tunisia's efforts in the health sector are borne by the recurrent side of the budget. The annual recurrent budget for health is quite substantial, being 14.57 million dinars (MD) in 1971, or fifty per cent larger than total investment in health over the entire decade. Consequently, the pattern of resource allocation implied from the recurrent budget is the most accurate mirror of the government's actual priorities in the health sector and of the resource consequences of its health sector strategy. The budget also reveals the magnitude of the particular medical and health services available in different parts of the country. Analysis of this expenditure allows for a comparison of the relative cost of providing alternative medical services, and thus of the tradeoffs implicit in the choice of health sector strategies.

In table 8, the recurrent budget has been broken down by institutional accounting units and by our regional classification, for selected years of the decade. Total recurrent expenditure has risen from 7.2 MD in 1962 to 14.2 MD in 1971. In real terms, the increase is smaller but still substantial, rising to 10.1 MD in 1971 in terms of 1962 dinars. Real national expenditure per bed has risen from 488 dinars to 550 dinars over this period, reflecting the increase in the services provided at

Table 7

The Density of Hospital Beds by District and Urban Area : 1964--1970

City	1964 Total Pop[b]	1964 Urban Pop	1964 Beds/ Pop[b]	1964 Beds/ Urban Pop	1971 Total Pop	1971 Urban Pop	1971 Beds/ Pop	1971 Beds/ Urban Pop
Gafsa[a]	64	27	2.70	6.41	58.9	41.4	3.03	4.35
Redeyef	12	--	5.00	--	40.9	26.0	2.09	3.26
Tozeur	29	18	2.76	4.44	18.8	18.8	4.79	4.79
Sousse	99	86	7.81	9.01	97.6	95.9	7.94	8.13
Enfidaville	23	9	1.04	4.80	47.6	35.5	1.25	8.95
Msaken	45	29	.71	1.10	51.4	35.1	0.0	0.0
Monastir	38	16	5.26	12.50	54.3	53.5	3.77	3.82
Moknine-ksar Hellal	42	33	2.02	2.57	57.3	42.4	.52	.71
Mahdia	43	25	3.48	6.00	31.8	28.5	4.72	5.26
Djemmal	49	19	.41	1.05	52.7	37.7	.57	7.91
Souassi	48	--	.67	--	60.9	0.0	.53	0.0
Nabeul	44	28	1.82	2.85	56.1	52.1	4.63	4.99
Grombalia	28	10	1.29	3.60	30.9	8.5	1.17	6.49
M. Bou Zelfa	30	13	2.36	5.46	32.6	13.2	.98	2.40
M. Temine	40	15	1.30	3.46	49.7	16.9	1.81	5.35
Kasserine	28	3	2.14	20.00	42.8	10.7	1.40	5.62
Sbeitla	41	4	.73	7.50	57.4	6.4	.79	8.82
Feriana	25	4	.96	6.00	33.1	7.3	.40	2.38
Thala	53	5	.57	6.00	64.6	7.9	.45	3.74
Sfax	205	86	4.08	9.71	290.8	255.6	2.99	3.40
Kerkenneh	14	--	1.43	6.67	14.5	3.2	.97	4.39
Menzel Charey	22	--	0.0	--	21.9	0.0	0.0	--
Mahares	30	6	1.07	5.33	38.3	8.5	.78	3.56
Djebeniana	60	15	.53	2.13	86.8	14.6	.88	2.40
Bir Ah Benkhelr	15	--	0.0	--	22.9	0.0	0.0	--
Mezzoune	10	--	0.0	--	16.1	0.0	0.0	--
Gabes	48	26	7.30	13.46	83.9	71.5	4.24	4.98
Mareth	13	4	0.0	--	18.5	0.0	0.0	--
Hamma de Gabes	30	7	.40	1.71	35.9	12.1	.50	1.49
Kebili	32	7	1.09	5.00	37.1	9.3	1.11	4.42
Le Kef	54	17	8.62	27.30	71.2	25.6	6.80	18.96
Sakiet Sidi Youssef	13	3	2.46	10.67	16.9	3.2	1.77	9.38
Ebba Ksour	31	6	.97	5.00	40.7	9.8	.74	3.07
Makthar	11	--	n.a.	n.a.	59.1	8.4	.68	4.76
Siliana	30	4	1.07	8.00	53.1	5.9	.57	5.14
Tadjerouine	40	4	.40	4.00	49.0	12.2	.61	2.45
Kbaat Senan	14	4	0.0	0.0	0.0	18.0	0.0	0.0
Le Sers	30	0	0.0	0.0	34.3	12.8	0.0	0.0
Jendouba	55	9	2.73	16.60	73.1	19.7	2.22	8.23
Souk el Khamis	48	3	2.12	34.00	64.0	9.0	1.88	13.33
Ghardimaou	45	5	.71	6.40	57.8	6.0	.54	5.36
Ain Draham	37	1	2.84	105.00	55.1	4.6	1.72	21.55
Tabarka	20	1	.60	12.00	28.5	4.4	.84	5.61
Bizerte	71	60	3.17	3.75	107.6	82.4	.95	2.54
Menzel Bourguibe	53	39	12.05	16.41	56.4	39.0	13.51	19.64
Ras Djebel	35	19	1.34	2.47	38.5	23.0	1.22	2.04
Mateur	56	16	2.45	8.56	65.1	18.9	.77	2.65
Sajerane	42	--	0.0	--	54.1	0.0	0.0	--
Medenine	40	7	.88	5.00	43.5	8.7	2.14	10.69
Ben Gardane	29	3	.76	7.33	27.5	5.8	1.27	6.06
Zarzis	32	12	1.09	2.92	39.1	25.4	1.41	2.17
Tataouine	45	2	.67	15.00	37.5	5.2	2.80	20.00
Djerba	68	13	1.03	5.38	75.0	10.6	.80	4.67
Beja	62	25	4.53	11.20	80.2	33.8	4.15	9.89
Medjez El Bab	31	5	1.94	12.00	37.6	8.2	1.46	6.67
Bou Hrada	23	8	.61	1.75	27.7	3.9	.65	4.65
Gafour	46	14	.98	3.21	20.4	5.3	1.72	6.62
Kairouan	68	37	3.27	6.00	92.5	51.5	4.13	7.39
Hadjeb	14	2	1.43	10.00	19.3	3.1	.48	2.20
Haffouz	37	5	1.08	8.00	45.9	2.3	1.04	6.49

[a] Districts with Regional Hospitals have been underlined.

[b] All population statistics are in thousands.

Source: Ministère de le Santé Publique: Profils Demographiques SocioEconomiques et

Table 8

Recurrent Expenditure for Selected Years of Decade, 1962-1971: By Region and Institution

Tunisian (in Dinars)

Institution and Region	1962 Total Recurrent Expenditure	1962 As Percentage of Total	1965 Total Recurrent Expenditure	1965 As Percentage of Total	1970E* Total Recurrent Expenditure	1970E* As Percentage of Total	1971E* Total Recurrent Expenditure	1971E* As Percentage of Total Institutional Expenditure	1971E* As Percentage of Total Expenditure
Institutes	941,720	15.7	1,216,380	18.0	2,254,000	19.3	2,559,300	19.3	17.6
General Hospitals: Tunis	1,781,626	29.6	1,807,070	27.0	2,919,000	25.0	3,197,110	24.1	22.0
General Hospitals: I	881,050	14.7	1,079,040	16.0	1,949,000	16.7	2,233,500	16.8	15.4
Regional Hospitals: I	153,000	2.6	185,490	2.8	573,000	4.9	701,000	5.2	4.8
Regional Hospitals: II	380,000	6.3	402,000	6.0	737,000	6.3	926,000	6.9	6.4
Regional Hospitals; III	661,040	11.0	898,740	13.0	1,311,000	11.2	1,644,000	12.4	11.3
Auxiliary: Tunis	114,849	1.9	90,700	1.0	155,274	1.3	162,367	1.2	1.0
Auxiliary Hospitals: I	323,733	5.4	255,396	3.8	282,784	2.4	304,081	2.3	2.2
Auxiliary Hospitals: II	206,578	3.4	184,431	2.0	389,988	3.3	405,100	3.1	2.8
Auxiliary Hospitals: III	310,117	5.1	270,367	4.0	583,119	5.0	668,758	5.0	4.6
Training	171,240	2.8	235,160	3.0	500,400	4.3	457,000	3.4	3.1
Kindergartens	87,840	1.5							
Total Institutional Expenditures	6,013,073	100.0%	6,623,600	100.0%	11,654,214	100.0 %	13,256,216	100.0 %	
Administrative Costs:					864,000		1,114,800		7.7
Foreign MD's					931.000		188,000		1.3
Subvention to Faculty of Medicine					194,000		161,700		1.1
TOTAL	7,204,000		8,050,000		13,678,214		14,531,016		100.0 %

Source: Unpublished financial statistics, Ministère de la Finance.

dispensaries, maternal-child health centers and outpatient clinics as well as an improved quality of services within the hospital system (table 9).

The expenditure pattern has not changed dramatically over the period. Since recurrent expenditure is principally allocated to hospital institutions, this is not surprising. There has not been a major change in the structure of institutional bed or clinic capacity over the period.

Approximately 90 per cent of the Ministry of Health's budget was allocated to hospital or paramedical training institutions managed by the Ministry, for the purpose of preventive and curative care and for training programs. The residual was allocated for administration costs, for the payment of foreign physicians working for the Tunisian government and for the medical school at the University of Tunis.

Of the resources allocated directly to medical and health institutions, approximately 16 to 19 per cent was spent through the institutes, 41 to 44 per cent on the general hospitals, 20 to 22 per cent on the regional hospitals, and 11 to 14 per cent on the auxiliary hospitals. The share of the institutes, and of the region I general hospitals have risen at the expense of the general hospitals in Tunis. The share of the auxiliary hospitals actually fell, while the share of the regional hospitals rose. However, the upper two levels of the pyramid clearly dominate the recurrent budget, absorbing 60 per cent throughout the period (table 8).

The recurrent budget is not structured to allow us to delineate expenditure by specific curative, preventive or training program activities. Thus, it is virtually impossible to allocate the decade's recurrent budget on this basis. A few tentative inferences may be drawn for more recent years. The training budget for paramedical and medical manpower absorbed 4.4 per cent of the 1971 budget, and since the medical school only began in the latter part of the decade, it is likely that the share of training expenditure was lower in earlier years. Most preventive expenditures are difficult to identify since they are financed out of the budgets of individual hospitals and thus are not specifically delineated by any budget category. However, some budget categories are clearly associated with preventive activities, and these absorb approximately 3.6 per cent of total expenditure. From discussions with health officials, it is likely that no more than 15 per cent of the total

TABLE 9

TOTAL RECURRENT EXPENDITURE PER HOSPITAL BED, BY REGION: 1962,1971

	1962			1971			1971	
	Total Recurrent Expenditure b/	Recurrent expenditure per bed (1962 dinars)	Recurrent expenditure per bed (1971 dinars)	Total Recurrent Expenditures b/ (1971 dinars)	Total per bed	Recurrent expenditure per capita	Recurrent Expenditure Per Non-Auxiliary Hospital Bed a/	Recurrent Expenditure Per Hospital Bed--Auxiliary
Tunis	2521.0	775	906	5041.0	1012	4.56	1026	706
Bizerte	170.8	422	460	738.0	689	2.21	693	595
Beja	207.5	520	507	374.6	761	.82	827	591
Jendouba	166.6	397	490	317.6	735	1.12	1073	572
Le Kef	206.9	339	433	420.2	650	1.204	662	614
Kasserine	50.2	348	584	143.7	876	.58	1375	557
Gafsa	163.5	469	470	388.0	705	1.026	894	582
Medenine	139.5	658	482	276.3	723	1.01	951	583
Gabes	192.7	467	546	339.1	819	1.44	853	611
Sfax	443.4	482	548	781.0	823	1.61	827	769
Kairouan	164.6	511	504	365.0	756	1.12	770	700
Sousse	645.8	477	701	1410.3	1052	2.39	1107	716
Cap Bon	313.5	685	495	529.6	743	1.58	778	669
Regional Mean		488	530	855.72	795	1.59	910	635
Reg. Standard Deviation		105	80	1298.4	120	1.02	195	67

a/ Non-Auxiliary Hospitals include Regional and General Hospitals and Institutes.

b/ in 1,000 D.

Source: Unpublished financial statistics, Ministry of Finance.

recurrent health budget is directed toward preventive health activities, narrowly defined. In addition, the budget of the Ministry of Public Works and Housing includes funds for sewage and water supplies, which also influences the quality of the community's environment. Administrative expenses absorb 7 to 8 per cent of the budget. This would leave 70 to 75 per cent of total recurrent health expenditure for curative purposes; of this latter amount, a quarter is allocated to primary and secondary outpatient services, with the residual going to inpatient services.

The regional allocation of recurrent expenditure (table 9) mirrors the regional distribution of hospital capacity. Institutions in the Tunis region absorbed 45 to 47 per cent of recurrent resources throughout the decade, and another 23 to 26 per cent went to region I. The share of regions II and III remained fairly constant at 12 and 17 per cent respectively. This regional disparity obviously reflects the presence of the higher level referral institutions in Tunis and region I, rather than the quantitative importance of the population of these two regions. From columns 6 and 7 of table 9, the expenditure per bed on auxiliary hospitals is considerably lower than that for the higher tier hospitals. Thus the greater the proportion of auxiliary hospital beds in a region, its regional share of the total budget will be disproportionally lower.[1]

For analytical purposes, the regional and institutional breakdowns in tables 8 and 9 remain far too aggregative for an accurate understanding of the pattern of recurrent resource allocation. Table 10 has broken down the recurrent budget in the health sector on a more disaggregated regional, institutional and programmatic basis. Specifically, it

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[1]It is interesting to note that the differences in expenditure per bed across regions, for auxiliary and nonauxiliary hospital beds, do not seem to exacerbate in an obvious way the inequalities in regional expenditure shares due to the distribution of beds. Auxiliary hospitals in regions I and Tunis clearly receive a larger allocation per bed, but expenditure per nonauxiliary hospital bed is also quite high in some of the poorer regions (for example, Kasserine and Mederine). It is possible that these differences are spurious, and reflect the higher share of activities within the poorer regions that are oriented to outpatients and preventive activities. By dividing the regional hospital budget by the number of beds, we overestimate the amount spent on inpatient activities for those regions with a relatively low ratio of inpatient to total activities (inpatient care, preventive health activities, outpatient clinics, dispensaries).

TABLE 10

A BREAKDOWN OF RECURRENT HEALTH EXPENDITURE BY ACTIVITY AND REGION: 1970

	TUNIS REGION				REGION I			
	Measure of Activity, Number of Outpatients, Inpatient Days or Units	Total expenditure	Actual Average Cost	Percentage of total Tunis expenditures	Measure of Activity, Number of Outpatients, Inpatient Days or Units	Total expenditure	Actual Average Cost	Percentage of total Region I expenditures
GENERAL HOSPITAL DISTRICTS								
Outpatients	549,445	241,565	0.44	4.6	380,358	120,252	0.32	4.3
Inpatients	707,476	2,182,883	3.09	41.3	708,185	1,555,331	2.20	55.5
General Medicine	102,946	221,866	2.16	4.2	100,798	156,228	1.55	5.6
Pediatrics	45,054	135,939	3.02	2.6	68,683	149,033	2.17	5.3
Obstetrics - Gynecology - Maternity	102,249	356,990	3.49	6.8	59,604	149,657	2.51	5.3
Surgery	130,995	395,122	3.02	7.5	133,879	290,500	2.17	10.4
Dermatology	33,401	106,537	3.19	2.0				
Otolaryngology	28,796	124,121	4.31	2.3	22,404	69,448	3.10	2.5
Opthalmology	18,591	59,298	3.19	1.1	28,947	66,440	2.30	2.4
Other	245,484	783,009	3.19	14.8	293,870	674,097	2.30	24.1
PMI	17	255,000	15000	4.8	7	105,000	15000	3.7
REGIONAL HOSPITAL DISTRICTS								
Outpatient Costs					250,729	91,455	.36	3.3
Inpatient Costs					167,432	427,934	2.55	15.3
General Medicine					61,146	91,719	1.5	3.3
Pediatrics					25,839	90,436	3.5	3.2
Obst.-Gyn. Maternity					23,857	47,714	2.0	1.7
Surgery					56,590	198,065	3.5	7.1
Dermatology								
Otolaryngology								
Opthalmology								
Others								
Dispensaries: Urban	11	209,000	19000	4.0	1	19,000	19000	0.7
Dispensaries: Rural	7	9,100	1300	0.2	16	20,800	1300	0.7
PMI					2	10,000	5000	0.4
AUXILIARY HOSPITAL DISTRICTS								
Outpatient Costs	76,187	13,271	0.17	0.3	112,403	25,496	.22	0.9
Inpatient Costs	47,752	58,257	1.22	1.1	78,998	125,484	1.59	4.5
Dispensaries: Urban	5	25,000	5000	0.5	5	25,000	5000	0.9
Dispensaries: Rural	18	23,400	1300	0.4	59	76,700	1300	2.7
Maternal-Child Health Centers	5	25,000	5000	0.5	6	30,000	5000	1.1
INSTITUTES AND HOSPITAL SPECIALTIES								
Pediatrics Institute	94,532	422,438	4.46	8.0				
Carcinology Institute	43,152	210,978	4.89	4.0				
Orthopedics Institute	28,431	234,006	8.23	4.4				
L. Pasteur Institute		181,700	n.a.	3.4				
Blood Transfusion Center	7,052	58,547	8.31	1.1				
Tuberculosis Institutes:								
-- Nabeul								
-- Ariana	170,023	309,863	1.82	5.9				
-- Bardo	80,776	170,730	2.11	3.2				
Razi Manouba Psychiatric Institute	375,829	468,312	1.25	8.9				
Opthamological Institute	26,320	185,279	7.04	3.5				
TOTAL		5,284,329		100.0		2,801,852		100.0

Source: Ministere de la Santé Publique: Statisques 1970
Ministere de la Finance: Unpublished financial records.

REGION II				REGION III					
Measure of Activity, Number of Outpatients, Inpatient Days or Units	Total expenditure	Actual Average Cost	Percentage of total Region II expenditures	Measure of Activity, Number of Outpatients, Inpatient Days or Units	Total expenditure	Annual Average Cost	Percentage of total Region III expenditures	Total Expenditure All Regions	Percentage of Total
								366,817	3.2
								3,738,214	33.28
								378,094	3.4
								284,972	2.5
								506,647	4.5
								685,622	6.1
								106,532	0.9
								193,569	1.7
								125,698	1.1
								1,457,106	12.9
								360,000	3.2
254,709	68,820	0.27	5.5	339,214	111,550	0.33	5.9	271,825	2.4
259,655	502,530	1.94	40.2	380,489	870,068	2.31	46.3	1,807,532	16.0
53,926	59,918	1.11	4.8	102,999	139,289	1.35	7.3	290,926	2.6
17,720	45,941	2.60	3.7	52,746	166,436	3.16	8.8	302,813	2.7
34,048	50,441	1.48	4.0	64,912	117,043	1.80	6.2	215,198	1.9
82,509	213,912	2.60	17.1	104,096	328,470	3.16	17.3	740,447	6.6
				234	738	3.16		738	
16,496	30,548	1.85	2.4	15,400	34,935	2.25	1.8	65,483	0.6
54,956	101,770	1.85	8.2	40,001	90,157	2.25	4.7	791,927	1.7
5	95,000	19000	7.6	12	228,000	19000	12.0	551,000	4.9
21	27,300	1300	2.2	38	49,400	1300	2.6	106,600	0.9
9	45,000	5000	3.6	9	45,000	5000	2.4	100,000	0.9
342,379	59,668	0.17	4.8	466,710	95,813	0.20	5.0	194,248	1.7
159,051	194,042	1.22	15.5	201.291	289,287	1.44	15.3	672,070	5.9
2	10,000	2500	0.4	4	20,000	5000	1.1	75,000	0.7
47	61,100	1300	4.9	80	104,000	1300	5.5	265,200	2.3
15	75,000	5000	6.0	15	75,000	5000	4.0	205,000	1.8
								422,438	3.7
								210,978	1.9
								234,006	2.1
								181,700	1.6
								58,547	0.5
								114,904	1.0
40,708	114,904		9.2					309,863	2.7
								170,730	1.5
								468,312	4.1
								185,279	1.6
	1,248,364		100.0		1,895,118		100.0	11,234,689	100.0

presents an estimate of expenditure on the institutions at each tier of the referral pyramid. In addition to the expenditure on institutes, general hospitals, regional hospitals, and auxiliary hospitals, estimates of the expenditure on the maternal-child health centers and rural and urban dispensaries under the jurisdiction of each type of hospital are also provided. Expenditure within hospitals has been allocated as between outpatient clinics and the principal inpatient specialities. Among the latter are included general medicine, obstetrics-gynecology, pediatrics, surgery, dermatology, otolaryngology, and opthalmology. The volume of outpatients or inpatients served in each type of ward or clinic for the different institutional units is also presented. This allows us to determine the unit cost of inpatient and outpatient services at different levels of the pyramid (table 11).[1]

The accuracy of these estimates is subject to the following qualifications. First, our statistical estimation procedure did not allow us to calculate expenditure for the preventive activities financed by the regional or general hospitals. Since expenditure on inpatient services was estimated as a residual, obtained by subtracting our estimates of outpatient expenditure from total hospital expenditure, it is likely that

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[1]These estimates were derived from Ministry of Finance and Ministry of Health statistics on the 1) expenditure and 2) volume of services delivered by each micro-institution. The specific allocation of expenditure between activities was based on a statistical estimation of cost functions for the different hospital units. Estimates were obtained of the marginal cost of rural and urban dispensaries, of maternal-child health centers, and of outpatient clinics. By subtracting out the total cost of these activities, one can estimate the total cost of inpatient services. Since our estimates of the marginal cost of an outpatient visit appeared to be excessive, we have used the estimate of Durand that an outpatient visit in a hospital unit is one-seventh of the inpatient day cost in that unit. Using the percentage of total inpatient days consumed by each medical service in the hospital, regressions were estimated to discern the relative cost of an inpatient day across different medical services. Hence, using the average cost C_i per inpatient day in any service i, one can obtain the total cost of service i by multiplying C_i by the total number of inpatient days in service i [equalling (Average Length of Stay in i) x (Admissions in i)]. Where the estimated cost of total inpatient and outpatient care derived from these micro-estimates yielded a total expenditure in excess of actual spending, inpatient and outpatient expenditures per unit of output were scaled down, maintaining the same relationships between the different output units. See Durand reference.

Table 11

The Average Cost per Outpatient Consultation and Inpatient Day in Tunisia's Medical System 1971

Institutional Level \ Region	Tunis	I	II	III
Regional and General Hospitals				
Cost per Outpatient Consultation	.44	.34	.27	.33
Cost per Inpatient Day in Service of:				
General Medicine	2.16	1.50	1.11	1.35
Pediatrics	3.02	2.10-3.50	2.60	3.16
Obstetrics-Gynecology	3.49	2.00-2.50	1.48	1.80
Surgery	3.02	2.17-3.50	2.60	3.16
Auxiliary Hospitals				
Outpatient Consultation	.17	.22	.17	.20
Inpatient Day	1.22	1.59	1.22	1.44
Institutes				
Inpatient Day	1.10-8.90	n. applicable	9.20	n. applicable

inpatient spending has been overestimated. We would need to deduct the cost of administration and preventive activities to correct for this bias. Secondly, these are strictly recurrent cost estimates. No attempt has been made to amortize the capital expenditure on each medical service, nor to impute the cost of foregone capital.[1] Thirdly, the cost of general administrative services should logically be prorated across different activities in order not to underestimate their true cost. Finally, our estimates also exclude user fee receipts collected by the hospitals. Since these revenues are not more than 5 per cent of expenditure in any hospital, this imparts a negligible bias.

Several additional characteristics of the expenditure pattern can be noted. First, the high share of total recurrent expenditure absorbed by the hospital institutions at the higher tiers of the referral pyramid is reconfirmed. After separating out the share of resources allocated to dispensaries, the general hospitals and institutes still absorb 56.2 per cent of the institutional recurrent budget (35.5 and 20.7 per cent respectively). The regional and auxiliary hospitals receive 18.4 and 7.6 per cent, respectively. At the base of the pyramid, the urban and rural dispensaries receive 10.3 per cent (6.8 and 3.5 per cent, respectively) and the maternal-child health centers 5.9 per cent.

Secondly, the structural differences in the role of outpatient services at different tiers of the pyramid clearly emerges. Outpatient activities decline in their share of total expenditure as one moves up the pyramid; their share falling from 25 to 33 per cent in the auxiliary hospitals to 10 per cent in the general hospitals. This reflects no more than the extensive range of inpatient services found at the higher tiers. Conversely, the complexity of the outpatient services provided at the referral institutions is indicated by the higher unit cost per patient. In the Tunis-based general hospitals, the cost per outpatient consultation is .44 dinars, as contrasted with .27 to .36 dinars at the regional hospitals and .17 to .20 dinars in the auxiliary hospitals (table 11).

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[1] For a more careful attempt to precisely estimate the unit cost of medical services, the reader is referred to an article by the author, "The Cost and Distribution of Health Services in Peninsular Malaysia," I.B.R.D. Staff Working Paper (forthcoming).

The higher level institutions have a wider range of secondary outpatient clinics, which are better equipped and better staffed with medical specialists.

Thirdly, the average cost of an inpatient day and per admission sharply declines as one moves down the institutional pyramid. For those specialties where comparisons are possible (pediatrics and opthalmology) the cost per day in an institute dominates the cost in any other institution. With the exception of the high cost specialty inpatient services in the general hospitals of Tunis, there is a reasonable uniformity in the cost of specialty inpatient services at the other regional and general hospitals. The small amount of specialty care offered at the auxiliary hospitals clearly explains their lower cost per inpatient day. An obvious consequence of these differences is the disproportionate share of total expenditure at the higher tier institutions relative to their case load. Although a fifth of inpatients are treated at auxiliary hospitals, the latter receive only 7.94 per cent of all inpatient expenditure.

Fourthly, although two-thirds of all inpatients are hospitalized in primary inpatient services (pediatrics, obstetrics and general medicine), only a third of total hospital inpatient expenditure is allocated to these services. Again, this reflects the higher per patient cost of specialty care.

Fifthly, there is a striking disparity in the budget allocations to alternative types of primary outpatient clinics. From tables 11 and 12, the cost per outpatient visit in the urban dispensaries is nearly four times that in the rural dispensaries and approximately seven times that in the auxiliary hospitals. These differentials are not significantly reduced if one considers the other services provided in these outpatient clinics, such as injections, bandaging, drug dispensing, first-aid, and x-rays.[1]

Presumably, the function of the outpatient clinic is identical at the different primary health units--the rural and urban dispensaries,

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[1] If one incorporates the ratio of the volume of these outpatient-related activities to the volume of outpatient consultations (3.27 at auxiliary hospitals, 3.22 at urban dispensaries, 3.44 at rural dispensaries), the basic differential remains.

TABLE 12

DISTRIBUTION OF RECURRENT HEALTH EXPENDITURE: BY FUNCTION: 1970

Institution and Type of Output	(1) Percent of total Expenditures	Percent of (1) in: Tunis	Region I	(2) Total Consultants or Admissions	Percent of (2) in: Tunis	Region I
Outpatient Services	23.5	29.9	21.7	5,578,603	22.6	26.8
Hospital Outpatient Services	7.3	31.1	29.3	2,772,134		
at General Hosp. 359,350	3.2			930,000		
at Regional Hosp. 269,512	2.4			843,500		
at Auxiliary Hosp. 190,904	1.7			998,039		
Urban Dispensaries 763,618	6.8	35.3	18.5	735,659	35.9	46.9
Rural Dispensaries 393,039	3.5	8.3	34.0	1,231,122	7.0	37.5
Maternal-Child Health 662,551	5.9	42.0	22.1	839,688	41.9	23.4
Total Inpatient Services At:	74.3			301.417		
General Hospital	33.3			121,704		
Institute (Inpatient Service)	19.1			22,027		
Regional Hospital	16.0			89,011		
Auxiliary	5.9			68,675		
Specialty Inpatient Services in [a] General & Regional Hosp. & Inst.						
General Medicine	6.0	32.8	36.8	36,947	15.2	39.8
Maternity	6.4	49.7	27.4	72,859	35.1	35.2
Pediatrics	5.2	23.2	40.0	19,429	9.5	58.5
Auxiliary Hospitals	5.9	7.2	18.9	68,675	11.4	18.0
Total Inpatient Services in General Medicine, Pediatrics, Maternity (including Pediatrics Institute)	23.5 (27.2)	29.3	30.7	197,910 202,740	20.6	32.3
of Inpatient Expenditure on a General Medicine, Pediatrics and Maternity Care, share spent in:						
General Hospitals	10.3			69,000		
Regional Hospitals	7.2			60,200		
Auxiliary Hospitals	5.9			68,675		
of Inpatient Expenditure on General Medicine, share spent in:						
General Hospitals	3.4			14,300		
Regional Hospitals	2.6			22,500		
Auxiliary Hospitals	5.9			68,675		
Total Inpatient Specialty Services	50.8	69.4	24.6	103,507	43.5	32.3
(Excluding Pediatric Institutes)	(47.1)			98,677		
TOTAL	100%					
TOTAL EXPENDITURE (dinars)	11,229,689					

[a] Share of total expenditure spent on specialty inpatient services.

SOURCE: Unpublished financial statistics, Ministère de la Finance, Ministère de la Santé Publique, Statistiques 1970.

and the primary outpatient clinics of the hospitals. A primary outpatient consultation ("consultation externe") is simply defined as a basic diagnosis and treatment by a physician. These estimates suggest significant differences in the quality of the initial diagnosis received by a consultant in rural and urban outpatient clinics--differences not easily explained by recourse to the rationale of a referral system.

The expenditure per outpatient in the general and regional hospitals is comparable to that in the rural dispensaries. Yet if one also considers that the latter outpatient clinics also provide a larger amount of other services, it is likely that the cost per clinic visit in the rural dispensary is actually much lower. This is less surprising since the regional and general hospitals also provide specialized outpatient services, and these are likely to be more expensive.[1]

Sixthly, at the inpatient level, the expenditure per inpatient in the primary inpatient services of general medicine, pediatrics and obstetrics-gynecology is markedly higher at the upper levels of the pyramid. The treatment cost per inpatient in the general hospital is 1.24 and 1.73 times higher than in the regional and auxiliary hospitals, respectively. More than twice as much is spent per general medicine case in the general hospitals than in the regional hospitals. This differential increases to 2.7 as between general and auxiliary hospitals (table 12). As with outpatient care, a clear quality differential emerges between the care received in the urban and rural areas.

There are two explanations. The quality of primary inpatient care received by a random patient may differ depending on the type of hospital closest to his residence. Alternatively, these differences arise simply because the general and regional hospitals also treat complex as well as simple medical cases in the services of internal medicine, pediatrics and obstetrics-gynecology. Only the latter fits within the rationale of the referral structure.

Finally, we have noted that the regional imbalance in expenditure is partly caused by the presence of the general hospitals within the Tunis

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[1]The ratio of outpatient-related activities to outpatient consultations is far lower for the regional and general hospitals: .66 and 1.6, respectively.

and region I area. Thus, although Tunis hospitals have only 15.2, 35.1 and 9.5 per cent of the national inpatient case load for general medicine, obstetrics-gynecology and pediatrics, respectively, these services receive 32.8, 50 and 23.2 per cent of total public expenditure on each service, respectively. More striking is the relative share of the stock of maternal-child health centers and of the MCH budget in these regions (42 per cent for Tunis, 22 per cent for region I).

A priori, many of these structural features cannot be dismissed as inefficient or suboptimal, given the goals and technological premises of the health system. Clearly, the cost of an outpatient visit will be less than a day in an inpatient service. The higher capital costs and longer periods of hospitalization associated with treatment in specialized medical services will inevitably raise the cost per inpatient day in a specialty ward relative to that for a general medicine ward. Since general hospitals and institutes are better equipped and staffed to treat more complex cases, one would expect that their cost of treatment per case will exceed that of an auxiliary hospital. Given the distribution of the hospital system's bed capacity across levels of the referral pyramid, these aspects of the expenditure distribution are virtually assured. In other words, the choice of a referral system will inevitably lead to this basic structure, although the precise characteristics of the structure may differ across referral systems.

Whether Tunisia's particular referral system is efficient cannot be evaluated without further analysis of the pattern of demand and supply in the health and medical system. It is obviously relevant to ask whether there is a greater marginal payoff to higher quality primary outpatient care than to more specialized inpatient services. What is the tradeoff between improvements in inpatient services at the auxiliary relative to the general hospital ?

Table 12 also raises questions concerning the income distributional implications of Tunisia's health expenditure. Nearly 7.7 MD are spent on inpatient services in nonauxiliary hospital units (or 33 D per case).[1] The specialty medical services consume nearly half of the total

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[1]Only 662,000 dinars are spent on inpatient services in auxiliary hospitals, or 9.65 dinars per case.

institutional budget--5.7 MD--or 55.1 D per case. The institutes alone spend almost one-fifth of the budget, or 97.3 D per case. In a country where the per capita income is approximately 180 D this represents a significant subsidy to the recipients. Who are the recipients of these benefits? It is important to ask whether the existing system ensures that the receipt of the higher cost, complex medical service is determined by the degree of medical need rather than socio-economic status.

III

Issues in the Allocative Efficiency and Distributional Equity of the Tunisian Medical System

Introduction

Our analysis indicates that Tunisia's health system has evolved over the past decade along the lines of a medical referral system typical in basic form to that in many less developed countries. At first glance, the distribution of capacity and expenditure in such a system suggests strong regional and urban-rural differentials in the access to medical services. The ratios of hospital beds and physicians to population are considerably higher in the dominant regions and major urban centers. A large share of the decade's recurrent and investment expenditure in the health sector have been allocated to the general hospitals and institutes at the highest tiers of the pyramid. Yet it would be totally misleading to generalize from the expenditure and resource distribution to a judgment on the distribution of medical care to all parts of the population. Some form of referral system is undoubtedly the optimal means of providing the highest quality medical services for a given level of resources. If the referral system is operating efficiently and optimally, the distribution of medical care will be based on degree of medical need rather than residential location. It is crucial for the appraisal of any country's medical system to go beyond expenditure analysis and toward evaluation of the nature of the market for medical services.

In this section, we shall offer a partly impressionistic, partly quantitative analysis of different aspects of the market for medical services in Tunisia. We rely heavily on the data collected during a

two-month period of 1973 in four health regions of Tunisia. Besides assembling data from inpatient and outpatient records, lengthy discussions were held with a wide range of personnel at all levels of the medical system in these regions.

In part A we shall provide a theoretical framework for our analysis of the efficiency of the Tunisian medical system. The principal structural features of a medical referral system will be examined, and we shall heuristically develop some of the basic requirements that an optimal referral structure must satisfy. In parts B through D, the market for medical services at different tiers of the referral system is examined. In part B, we describe the institutional referral options in the Tunisian system, and follow with an analysis of the referral process to the higher tier units. What can be inferred about equity in access to these institutions? Do the case-mixes suggest disease problems for which complex treatment is required? What is the marginal cost of the higher quality units? In part C we examine the factors influencing the demand for medical services at the outpatient level. The primary outpatient clinic plays a crucial role in the referral system, since initial diagnostic and treatment decisions are made which will determine which patients are referred for further care at the higher levels. In part D we examine the efficiency with which resources are used within the specific medical units providing inpatient services. The distribution of bed capacity is only a partial measure of the effective capacity available; the way in which this capacity is used will also determine the quality and quantity of inpatient services available. In part E, we evaluate the incidence of Tunisia's medical system. Do the poor utilize the system and are they adequately represented at each tier of the referral pyramid?

A. A Conceptual Framework for the Analysis of Medical Referral Systems

The choice of a medical referral structure rests on both technological and political premises. The underlying political premise is the unacceptability of having a significant number of medical problems which cannot be domestically treated on an acceptable medical basis. This overrides the alternative economic question of whether, given scarce resources,

society's welfare might be better served either by having some patients treated abroad or treated domestically at a lower level of medical effectiveness. Imposition of this type of political constraint will narrow the range of policy options available.

The basic technological premise is that the overhead cost of the diagnostic and treatment process is high for many disease problems, while the percentage of the country's population requiring such treatment is small. Consequently, economies of scale dictate against the proliferation of complex treatment facilities for such disease problems to many hospital institutions. This suggests that the client population for any complex medical specialty service be drawn from a wide area. Conversely, since most medical problems require far less medical skills and equipment one may satisfy a large fraction of the demand for medical services through an abundant network of more limited, primary care hospitals and clinics. Patients with medical problems beyond the capacity of the latter institutions could then be referred to the smaller set of complex treatment institutions. We shall theoretically characterize the essential features of a referral system, and examine some of the basic requirements that an optimal referral structure must satisfy.

Characteristics of a Referral System

Let us define the following characteristics of the typical referral structure. 1) Any referral pyramid has a set of n discrete levels, $i=1,\ldots,n$, where at any level i, there are a set of j institutions. 2) At any level i, the set of j institutions are all of comparable quality, in the sense that their equipment and staff allow them to treat a given set of medical problems at an equal standard of care s (defined in (5) below). 3) Each institution will have a defined capacity $C_{ij}(s)$ for treatment at a standard s. This may relate to the maximum number of inpatients that can be hospitalized, for an assumed mix of medical problems, or the maximum number of outpatients that may be diagnosed and treated, at standard s. 4) As one rises from any level i to another higher level i+m, the quality of care rises, in the sense that for a given medical problem, the standard of medical care provided (s^*) at the $(i+m)^{th}$ level, would exceed that providable at the i^{th} level, $(\bar{s})(s^* > \bar{s})$.

5) The standard of care, s, may be defined as the relationship

of a given treatment for a disease problem to the optimal treatment. Conceptually, for any medical problem there exists some optimal form of treatment which is associated with a mean probability of the sick individual bearing the minimum cost of the illness. If we assigned a norm of one for the optimal form of treatment,[1] s will delineate the proximity of the actual treatment to the optimal.[2] Clearly, the medical resources required to achieve a given standard, s, will be greater for a serious illness than for a common malady. We would also expect that there is a positive marginal productivity to medical resources for most disease problems, such that the greater the medical resources expended on an individual, the higher the level of s achieved for a given disease problem (although the second derivative is probably negative over most regions).

6) The standard of care, s, is a policy variable to be chosen for the referral system. In principle one possible policy would be for an equal level of s at all institutions. This would imply that the more complex the medical problems, the higher the pyramid level at which it would be treated in order to receive the fixed standard of care s.[3] 7) At any level i, there must be (a) a screening capacity to diagnose those medical problems that cannot be dealt with, at standard s, at level i, and (b) a referral capacity to refer them to some higher level i+m. Conversely, no patient should be treated at a higher level if treatment at the required standard s is possible at a lower level. 8) Finally, any referral structure may be described by the number n of levels, the treatment capacity, $\Sigma C_{ij}(s)$ at any level i and institution j, and the standard of care s which the system provides. Given these parameters, one should

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[1] For the optimal treatment norm of 1, this may correspond to a mean probability of less than 1 of the individual bearing the minimum cost of illness.

[2] For a smaller level of s, the mean probability of the individual bearing the minimum cost of illness would be lower. At s=1, the optimal level of treatment is provided.

[3] One institution theoretically may actually embody several levels. A general hospital in an urban area services both the general urban population for common disease problems and a larger regional or national population for complex specialty problems. There may be a primary care outpatient clinic and separate secondary specialist clinics.

know the way in which medical and financial resources are allocated as between the different levels of the pyramid. Obviously, the Tunisian referral pattern (reflected in the expenditure pattern of table 10) is only one among many possibilities.

Evaluation of Referral Systems

As an economic policy issue, it is important to evaluate the social profitability of a given medical referral structure by its efficiency in allocating scarce medical resources to solve the perceived medical problems of the country. For such an appraisal, one would need a glimpse of the country's objective function. Our reading of the Tunisian plans suggests the egalitarian premise that access to medical facilities, particularly complex medical facilities, ought to be based on medical need; income or district of residence ought not be the principal criterion of access. Given that premise, one would want to minimize the cost of illness, where the definition of what are the components of this cost is itself an important policy problem. An alternative growth-oriented objective function may impose social welfare weights attaching greater importance to those individuals with high relative marginal products. The choice of objective function quite clearly matters, since the latter function could yield a completely different referral system structure.

There are two levels at which such an evaluation may occur. There is the obvious first-best problem of determining the optimal distribution of resources across different levels of the pyramid. Given that there are limited resources available, are they allocated across the i levels in such a way as to minimize the weighted cost of illness across individuals of a given population? Empirically, our research did not allow solution of this optimization problem. For any country, such an optimization would necessitate the estimation of a production function for the "health status" in individuals and social groups, as well as information on the cost of providing different combinations of medical inputs. Data on the incidence of disease, the characteristics of the demand function for health services, and the population density would also be necessary.

At a second-best level, one may ask whether a given referral is operating effectively? Are there obvious points of pressure or inefficiency which suggest directions in which the referral system could move with obvious gain? Should more resources be allocated to one level at

the expense of another? In what follows, we shall try to outline alternative measures and points of analysis which would allow us to identify such disequilibria and thus perhaps answer some of these problems of the second best.

1. One obvious measure of whether a referral system is operating equitably (according to our egalitarian type of objective function) is a test of whether patients appear to be representative of the client population. Do the patients in a high cost medical facility reasonably mirror the client population of that facility? In general, as one moves up the pyramid, one would expect that the size of the client population would be larger, under the following assumptions. 1) The severity of a disease, in terms of the complexity of its treatment process, is inversely related to the incidence of that illness in the population. 2) For reasons of scale economy, the quantitative capacity of any medical specialty unit is likely to be centered in a small set of higher referral institutions. 3) The probability of illness from a given disease does not differ significantly for populations of different regions.

These assumptions would imply that the size of the client population from which patients of higher level units in the pyramid are drawn should be successively larger. It would also suggest that the share of patients drawn from a given region within the client population should directly vary with the share of the total population from that region. In part B, we shall examine whether the inpatient population of higher level hospitals satisfies this criterion.[1]

2. Two additional requirements for a referral system to be optimal are that the number of patients that <u>should</u> be referred to higher level institutions is equal both to 1) the number that <u>can</u> be referred in terms of the capacity of receiving institutions, and 2) the number of patients <u>actually</u> being referred. This may be specified more clearly.

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[1]As will be discussed further in part B, this is a critical assumption. If the health status of the urban population is far better than the rural population, it is quite possible that the urban groups are afflicted with disease problems (for example, heart disease, cancer, maladies of old age) which require more complex treatment facilities. This would logically explain an incidence of urban patients greater than the share of the urban population.

Let $\beta_{ij}^{i+m}(s)$ equal the minimum percentage of patients seen at level i in institution j that should be referred to an institution at some higher level i+m, in order to obtain a given standard of care s. We have indexed β in terms of s to indicate that this is not a technologically rigid parameter, but is critically influenced by the standard of care desired for the medical system. In fact, $\beta_{ij}^{i+m}(s)$ is functionally determined as:

(1) $\beta_{ij}^{i+m} = B[s, C_{ij}(s), (x_1^{ij}, \ldots, x_r^{ij}), (d_1^{ij}, \ldots, d_v^{ij}), P_{ij}]$

where $[x^{ij}]$ is a set of input variables, and $[d_t^{ij}]$ is the proportion of each type of disease problem t confronting institution j at level i (with $(\sum_{t=1}^{v} d_t^{ij}=1)$). We would expect that at any time, all variables other than s are set and not easily changed. Let us assume a standard ŝ is set at some arbitrary level for all i.

Presumably, an increase in the level of the inputs (staff, equipment) for a given capacity would allow a lower referral percentage; the disease mix confronted will determine the adequacy of the inputs in relation to the given standard s. Similarly, ceterus paribus, an increase in absorptive capacity [1] would allow a larger case load at the quality standard set by the other variables. Implicit is the assumption that institutions will not opt to cram facilities with patients at the expense of lowering the policy-chosen level of s. Thus, an increase in patient demand, P_{ij}, will necessitate referring patients to preclude the dilution of the standard of care. Obviously, one way of resolving any disequilibria that may emerge at an institution is to lower s, but more on this shortly.[3] Finally, the implication of $\beta_{ij}^{i+m}(s) > 0$ in a referral system is that is that there are discrete jumps in the quality of medical care provided at higher pyramid levels.[2] A high level of [βi] for low levels of i implies the necessity

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[1] The absorptive capacity $C_{ij}(s)$ is also a function of $[x^{ij}]$.

[2] Obviously, if we exclude referral outside the country, $\beta_{ij}^{N}=0$ for the highest level N of the pyramid.

[3] symbolically,

$$\frac{\partial \beta_{ij}^{i+m}}{\partial s} > 0, \quad \frac{\partial \beta_{ij}^{i=M}}{\partial x^{ij}} \leq 0; \quad \frac{\partial \beta_{ij}^{i+m}}{\partial c^{ij}} < 0 \text{ and } \frac{\partial \beta_{ij}^{i+m}}{\partial P_{ij}}$$

of frequent referral, and probably a large share of system resources allocated to the higher pyramid levels.

Let $\alpha_{ij}^{i+m}(s)$ equal the maximum percentage of patients of institution j at level i that can be referred to a higher level i+m in order to obtain standard of care s. The variable

$$(2) \qquad \alpha_{ij}^{i+m} = A\left\{s,\ C_{i+m}(s),\ \sum_{\substack{u=1 \\ u\neq j}}^{I} p_{iu},\ [D_{ij},\ i+m],\ P_{ij},\ [\hat{d}_1^i,\ \ldots,\ \hat{d}_v^i],\ (x_1^{i+m},\ \ldots,\ x_r^{i+m})\right\}$$

where D_{ij},i+m is the distance from institution j to a referral unit of level i+m, p_{iu} is the normal patient load of the u^{th} institution of level i and $\hat{d}_t^i$ is the share of the t^{th} disease problem in the patient load of all i-level institutions. In effect, the α is influenced by the receiving capacity of the higher level referral institutions. The higher their capacity C_{i+m}, the higher α_{ij}^{i+m}. Ceterus paribus, the greater the likely competition for this capacity, proxied by the pool of potential referrents $\sum_{u=1}^{I} p_{iu}$,(influenced by their disease mix), the lower the share of patients from any one i^{th} level institution that can be referred. The greater the distance to the higher referral unit, the higher the cost of any referral. The higher the standard of care s that must be provided at any unit in the system, the lower its own absorptive capacity for referrals, so that α_{ij}^{i+m}, would fall.

On the other hand, holding s constant, an increase in the input set $[x^{i+m}]$ of the $i+m^{th}$ level institution would raise the set of problems which could be treated at the $i+m^{th}$ level if there is sufficient physical absorptive capacity.[1] The absorptive capacity is not completely fixed. Any inpatient unit has some flexibility to increase the flow of admissions by lowering the average duration of stay and substituting ambulatory treatment. However, there is a limit to this flexibility, in that the length of stay for any patient is largely medically determined.[2]

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[1]One clear identity which must hold in such a system is that the number of patients referred be less than the physical absorption capacity of the receiving institutions, or

$$\sum_{i} < i+m \sum_{j} (\alpha_{ij}^{i+m})(P_{ij}) \leq \sum_{j} C\ i+m,\ j.$$

[2]This is borne out by our analysis in part E of section III.

Finally, let γ_{ij}^{i+m} be the percentage of patients that are actually referred from institution j at level i to a referral unit at a higher level i+m.

Some examples of these levels institutionally may be useful. If i=1 refers to the primary outpatient clinic of a hospital or dispensary, and i=2 refers to the primary inpatient facilities (of the same or different institutions as the clinic), then $\beta_{1j}^{2}(\hat{s})$ is the percentage of outpatients seen at the j^{th} primary clinic that should be hospitalized at level 2 in order to receive a standard of care s (holding qualitative and quantitative capacity, and case-mix constant). Similarly, there are clear limits to the percentage of outpatients, α_{1j}^{2}, that any clinic can refer for hospitalization. These are limits clearly perceived by the staff at the j^{th} clinic level.

At a first-best level of analysis, one would want to choose the optimal matrix of $[\beta_{ij}^{i+m}]$, which optimizes s for a given budgetary cost.[1] A suboptimal set of $[\beta_{ij}^{i+m}]$ would imply a lower level of s than is possible for a given budgetary effort; the burden of illness in a society would be higher than was necessary. There is also a cost tradeoff implied by a change in the $[\beta_{ij}^{i+m}]$ set, assuming a rigid budget constraint. A decrease in the β_{i}^{i+m} for any level i would require an increase in expenditure on the input set $[x^{i}]$ at that level, and this would necessitate a reduction in the inputs available at the other levels. The latter expenditure reduction would either raise the level of referrals required by other levels or lead to a lower level of s for the overall system. A measure of this tradeoff will be provided in part B.

In a first-best solution, a necessary though not sufficient condition of optimality would be that $\beta_{ij}^{i+m} = \alpha_{ij}^{i+m}$. It would be inefficient to design a system to "medically" require hospitalization of β_{ij}^{i+m} per cent of patients, with only $\alpha_{ij}^{i+m} < \beta_{ij}^{i+m}$ per cent of them able to be absorbed at the $i+m^{th}$ level. One measure of whether a <u>given</u> (though not necessarily optimal) referral structure is likely to operate effectively would be the equality of β_{ij}^{i+m} and α_{ij}^{i+m}. Similarly, one would expect that even if this equality holds, the actual effectiveness of a system would require that γ_{ij}^{i+m} equal β_{ij}^{i+m} and α_{ij}^{i+m}. The absence of these equalities

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[1] Alternatively, for a given s, one could find that expenditure distribution across the i levels which minimizes cost.

at different levels of the system imply disequilibria which clearly reduce the operating efficiency of the system. It is truly a problem of the second-best to determine whether a disequilibrium in a sub-optimal referral system increases the welfare provided by the system. The identification of these disequilibria will provide a framework for our subsequent analysis on the operating characteristics of the system in parts B through E.

(1) If $\beta_{ij}^{i+m} > \alpha_{ij}^{i+m}$, it may reflect three possible disequilibria in the referral structure. In each of these there is a quantitative inadequacy in the absorption capacity of the higher level i+m in a nominal sense, but in only one case would a policy of increasing C_{i+m} be called for. The first possibility is a qualitative inadequacy at level i. Specifically the i-level institutions are deficient in the medical skills or medical equipment required to treat a higher fraction $(1-\alpha_{ij}^{i+m}) > (1-\beta_{ij}^{i+m})$ per cent of their cases. This problem may ironically lead to an excess capacity phenomenon. As we shall see in part E, it has been argued that excess capacity in the Tunisian auxiliary hospitals is explicable by a deficiency in resources, coupled with the unwillingness to lower care below $\hat{s}$. Thus the physicians hospitalize only the number of patients that can be adequately treated given available resources. Whether this disequilibrium is resolved by referring all other patients to higher level units or treating them at a lower s ($< \hat{s}$) on an ambulatory basis is not clear. The latter possibility is more likely.

The disequilibrium may also imply a quantitative inadequacy at either level i or level i+m. The volume of patients requiring the standard of services $\hat{s}$ that are provided at an institution j of level i may exceed its physical absorption capacity. Referrals to other institutions would be required in excess of what can be absorbed at the higher level. Even if they could be absorbed, and $\beta_{ij}^{i+m} = \alpha_{ij}^{i+m}$, it would imply an inefficiency to the extent that the higher cost institutions at i+j would be treating patients that could receive the required standard of care at lower cost. This is one reason why equality is not a sufficient condition. Alternatively, it may lead to patients not being treated, or having the treatment deferred. In many outpatient clinics, the physician will arbitrarily limit the number of outpatients to be seen during a clinic. Once the limit is reached, all other patients must return on

another clinic day.

Finally, the i level institutions may have sufficient capacity, qualitative and quantitative, and the disequilibria is fundamentally caused by insufficient capacity at level i+m. For example, the other side of the excess capacity problem in the auxiliary hospitals is that the proportion of outpatients that should be admitted is more than can be hospitalized, because of capacity limitations in the inpatient wards.

(2) The alternative disequilibrium, $\beta_{ij}^{i+m} < \alpha_{ij}^{i+m}$, is more serious, but in a different way. It implies excess capacity at the higher level units; the percentage of patients that can be referred is higher than the percentage in medical need of referral, in terms of the quantitative and qualitative capacity of the lower level units. As a result, capacity at the higher level units is maintained by a reduction in the average severity of the illnesses treated. Illnesses that could be treated at lower cost inpatient institutions or on an ambulatory basis, with same effect, receive higher quality treatment than necessary, yielding a higher level of s at one level of the system than at another. Case-mix differences between the patients in the higher and lower level units may not be as sharp as would be necessary to warrant the differential in cost per patient. A cutback in the higher capacity units would be warranted.

Although such a disequilibrium is unlikely in most LDCs, a similar result may arise, even with $\beta_{ij}^{i+m} > \alpha_{ij}^{i+m}$. Where there exist bottlenecks in the linkage between different levels of the pyramid, the actual percentage of patients referred, γ_{ij}^{i+m}, may be less than both α_{ij}^{i+m} and β_{ij}^{i+m}. As a consequence, the low severity level of cases at the $i+m^{th}$ level does not reflect the absence of complex medical illnesses at lower levels of the system, but rather the obstacles to their referral. Specifically, such factors as inadequate communication facilities, high patient-borne transportation costs to higher level institutions, negligible public ambulance capacity, negative socio-psychological attitudes of patients to hospitalization in another region, etc., may block an adequate number of referrals from occurring.

Alternatively, $\gamma_{ij}^{i+m} < \alpha_{ij}^{i+m}$ may occur if there are large differences in the perceptions of the sending and receiving institutions. If higher level units perceive a different role for their institutions, obviously they can refuse referrals for residents of other regions or other

units. For example, a general hospital may attach a higher weight to serving the urban population than to serving as a regional or national referral unit. If the lower level units are incapable of adequately diagnosing patients due to medical incompetence, and refer patients excessively or needlessly, this may engender resistance at the receiving level institutions. Each of these factors may occur and would enter into any explanation of the operating characteristics of the referral system.

A final example of $\beta_{ij}^{i+m} > \gamma_{ij}^{i+m}$ may arise at the initial point of demand for services. One could posit β_{oj}^{1} as a morbidity index, where β_{oj}^{1} would equal the fraction of the population of an area j that ought to appear at an outpatient clinic on the basis of morbidity. If γ_{oj}^{1} equalled the percentage of people who actually go to the outpatient clinic, then if $\gamma_{oj}^{1} < \beta_{oj}^{1}$, the difference would equal the fraction of the population who do not reach the initial entry point of the medical system. This residual only partly relates to the medico-cultural perceptions of the population. The quality of medical care provided and the cost of obtaining that care will also be influential. The equality of $\beta_{oj}^{1} = \gamma_{oj}^{1} = \alpha_{oj}^{1}$ is obviously necessary for optimality, though it is less amenable to strictly technological interventions (see part C of this section).

B. The Referral Structure in Tunisia in Practice: Referrals to Higher Levels of the Pyramid

The linkage between levels of our theoretical referral pyramid may be readily associated with a set of specific referral options available in the Tunisian medical system. In this part, we shall examine the efficiency with which referral occurs to the higher levels of Tunisia's pyramid of medical institutions: the regional and general hospitals and the specialty institutes. Since they absorb a large fraction of the government's health sector budget, it is of considerable importance that they in fact perform their intended role with the system. Analysis of the operational effectiveness of other links in the referral chain will be made in the remainder of section III. We shall begin by describing the referral options in the Tunisian system and the quantitative probability of each as one moves up the pyramid. Quantitative measures of the adequacy of referral to higher level institutions will be developed,

as well as an overall estimate of the cost burden of this particular referral system.

In Tunisia, initial diagnostic and treatment decisions are made by physicians at the level of the primary outpatient clinic. In the urban areas, there may be clinics five or six times a week, either at the clinic of a hospital or in separate urban dispensaries. In the rural areas, weekly clinics are held by physicians from nearby hospitals at rural dispensaries. For most patients, no subsequent referral is necessary. A diagnosis is made and a course of treatment prescribed. For the remaining patients, subsequent referral actions are required. This may include: (1) further diagnostic tests, (2) examination by a more specialized physician at a secondary outpatient clinic and/or (2) hospitalization. Depending on the point of entry into the medical system and the particular medical problem, referral may necessitate the patient going to the same or to another hospital unit.

In the first instance, the phsician may suggest further tests--radiological examinations, urine samples, blood tests, etc. If these cannot be performed or analyzed at the outpatient clinic, the patient is referred to the nearest hospital for these tests. For tests that are not significantly complex, referral is necessary only to the nearest auxiliary hospital unit; more complex tests may necessitate referral to a regional or even a general hospital. Similarly, any patient referred to a specialists' outpatient clinic will necessarily have to go to the nearest regional or general hospital, since these are the only sources of specialty care. As a consequence, the cost of referral for even outpatient services will differ to a significant extent for patients in the rural and urban areas. In the latter areas, the cost of referral is negligible, whereas for the former, it may necessitate significant financial and time costs to the patient.

In general, the decision to hospitalize will only be made at the primary outpatient level for obvious emergencies, medical problems in general medicine and for simple cases in the other primary inpatient services. Each hospital, whether auxiliary or general, is theoretically staffed and equipped to treat patients in the latter two categories. An ambulance capacity presumably exists to provide referral of patients from the rural dispensary clinic to the hospital institution. For all

other medical problems where hospitalization is a significant possibility, the patient will be referred to a specialist's outpatient clinic. Any decision to hospitalize will be made by the specialist.

In cases where referral requires the patient to be sent outside the region, each auxiliary and regional hospital has a limited budget to finance the transportation costs of the patient and a member of his family. Prior arrangements are made to ensure that the patient is referred to a hospital for which there is potentially available inpatient capacity. Usually the referral process is sequential, with the patient referred initially to the regional hospital and then, if necessary, to the general hospital. Similarly, the referral sequence is well-defined. For certain types of medical problems, the regional hospital will usually refer to a specific general hospital or institute.

The decision to refer for hospitalization is obviously influenced by the capacity constraint imposed by the higher units (α_{ij}^{i+m}) and the physicians at the clinic have an expectation of the number of patients that can (or will) be absorbed at the higher level units. Although patients can be referred simply for a more accurate diagnosis, the decision to refer for hospitalization is not taken lightly.

The Capacity for Referrals (α_{ij}^{i+m})

One measure of the absorptive capacity of higher level referral units relative to the pool of potential demand is the ratio of patients at a given level i+1 relative to the number of patients at level i. For example, in table 13, the ratio of hospital admissions in a given specialty relative to the number of outpatient visits for that specialty has been calculated for the three hospital levels of the pyramid. This gives a measure of γ_{ij}^{i+1} for each specialty, where i is the specialty outpatient clinic and i+1 the inpatient service at the same institutional level. Specifically, this measures the probability that a random outpatient at a given clinic will be hospitalized, and offers some measure of the constraint as perceived by the clinic physician. A finer breakdown for the ratio of primary inpatients to primary outpatient consultations has been made on a district basis.

The results at this aggregative level are not very revealing. In part A of table 13, the ratios relate inpatients and outpatients at the

Table 13

MEASURES OF THE ABSORPTIVE CAPACITY OF THE TUNISIAN MEDICAL REFERRAL SYSTEM:
THE RELATIONSHIP BETWEEN OUTPATIENTS AND INPATIENTS IN HOSPITALS OF SELECTED REGIONS: 1971

PART A

TOTAL ADMISSIONS PER OUTPATIENT VISIT 1971, IN SERVICE OF:

TYPE OF HOSPITAL	General Medicine	Gynecology	Pediatrics	Surgery	Opthamology	ORL	Other
General Hospitals	.086	1.0	.631	.21	.026	.064	.037
Regional Hospitals	.049	2.05	.189	.195	.062	.017	
Auxiliary Hospitals	.041	4.21	.126				

PART B

The Ratio of: / District	(1) Outpatient Consultations to Paramedical Outpatient Acts[a]	(2) Total Hospital Admissions to Total Hospital Outpatient Consultations[b]	(3) Total Hospital Admissions to Total Outpatient Consultations at Hospitals and Dispensaries[c]	(4) Total General Medicine Admissions to General Medicine Outpatient Consultations[d]
Kairouan[e]				
Haffouz	.178	.116	.087	.041
Ouseltia	.385	.175	.077	.077
Sidi Amor	.533	.061	.039	.039
Hadjeb	.476	.059	.046	.046
Beja[e]	.743	.396	.078	.032
Teboursouk	1.030	.069	.028	.028
Medjez El-Bab	.722	.089	.039	.039
Bou Arada	.550	.049	.033	.033
Kasserine[e]	.922	.029	.018	.005
Sbeitla	1.006	.023	.010	.010
Sbiba	.785	.028	.015	.015
Thala	.842	.012	.005	.005
Feriana	.902	.017	.012	.012
Sousse[e]	.726	.180	.083	.017
Enfida	3.450	.018	.003	.003
Mahdia[e]	.439	.245	.047	.013
Souassi	.596	.078	.044	.044
Le Kef[e]	.877	.060	.044	.013
Makthar	.735	.044	.031	.031
Tadjerouine	.654	.010	.005	.005
Ebba Ksour	.531	.014	.009	.009
Habib Thameur[e]	.868	.099	.041	.012
Zaghouan	.544	.094	.069	.069
Pont du Fahs	.777	.014	.010	.010
Cafsa[e]	.445	.116	.070	.015
Gamouda	.585	.043	.027	.027
Maknassy	1.070	.014	.009	.009

a/ the ratio of total outpatient consultations at hospitals and dispensaries to the total of "soins divers." The latter includes injections, bandaging, etc., performed at outpatient clinics by personnel other than doctors.
b/ the ratio of total admissions to all hospitals in 1971 to total hospital outpatient consultations at these hospitals in 1971.
c/ the ratio of total admissions to all hospitals in 1971 to the sum of total consultations at hospitals in 1971 and total consultations at dispensaries in 1972.
d/ the ratio of general medicine inpatients in 1970 to the sum of total General Medicine consultations at hospitals in 1971 and total consultations in dispensaries in 1972.
e/ relates only to the specific district of . . . . It is not a summary statistic for the Region.

SOURCE: Ministère de la Santé Publique, Statistiques, Vol. 2, 1971.

same institutional level of the pyramid. For the primary inpatient of general medicine, the aggregate probability of admission is considerably higher at the upper levels of the pyramid, particularly at the general hospital level. For other specialty services, the probability sharply differs according to the level of the pyramid and the specialty unit concerned. Not surprisingly, the probability of admission from the specialty services is considerably higher than for general medicine, since any patient who gets to a specialty outpatient clinic has already been screened out as a more complex medical problem.

The variability across specialties merely reflects the mix of medical problems and the relative ease of ambulatory treatment for each. At the district level, columns 2 and 3 suggest that the probability of admission is higher for those districts with a regional hospital, but this merely reflects the higher probability associated with their specialty outpatients. If one compares districts by the probability of admission for general medicine outpatients alone, there is considerable variability, which is unreasonable in terms of the referral theory previously discussed. Presumably, equity would suggest an equal probability of referral from primary outpatient to primary inpatient services across districts.

In tables 14 and 15 more precise measures of referral flows are presented for three regions and for three specific disease types. For Kasserine, Sousse, and Kairouan, we have measured the actual rate of referral from the (1) primary outpatient clinic to the primary general medicine inpatient ward, (2) primary outpatient clinic to the specialty outpatient clinic, and (3) the specialty outpatient clinic to the specialty inpatient ward. We have aggregated all the patients at each level for all institutions in a region.[1] This avoids some of the biases in the previous measure. Specifically, it allows for the possibility that patients may be referred across districts and across institutions within a given health region in order to obtain a specific level or type of medical care.

First, the probability of hospitalization in a service of general medicine is low--less than 4.5 per cent--which corresponds to the measures in table 14. Interregional differences are again apparent. Secondly, the

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[1]For example, the measure of general medicine outpatient consultations sums across all such consultations at dispensaries and hospitals in the region.

TABLE 14

THE ABSORPTIVE CAPACITY OF DIFFERENT TIERS OF THE MEDICAL REFERRAL SYSTEM IN KAIROUAN, SOUSSE AND KASSERINE: 1971 [a]

Level of Pyramid \ Region	Kairouan	Regional Total	Sousse	Regional Total	Kasserine	Regional Total
1) Number of Admissions; Complex Specialties	860=R [a]	860	4100=G	4100		
2) Number of Admissions: Surgery, Pediatrics, Gynecology-Obstetrics	5500=R	5500	16500=G 10500=R	27000	1800=R	1800
3) Number of Admissions: General Medicine	1711=R 4240=A	5950	7412=R 5933=A	13345	536=R 1770=A	2306
4) Number of Outpatient Consultations: Specialty Clinics	33000=R	33000	75000=G 57500=R 1747=A	135000	67000=R	67000
5) Number of Outpatient Consultations: General Medicine	33000=R 52400=A 71198=D	156600	80675=G 73560=R 67000=A 72127=D	293600	38452=R 58700=A 35192=D	132344
$\{[(1) + (2)]/(4)\} \times 100$		19.3%		23.0%		6.1%
(4) / (5) x 100		21.1%		46.0%		50.6%
(3) / (5) x 100		3.7%		4.5%		1.7%

[a] Notation: R = Regional Hospital; A = Auxiliary Hospital; G = General Hospital; D = Dispensaries.

SOURCE: Ministère de la Santé Publique, Statistiques 1969,1970,1971.

TABLE 15

THE ABSORPTIVE CAPACITY OF THE MEDICAL REFERRAL SYSTEM
FOR TUBERCULOSIS, PEDIATRICS AND OPTHALMOLOGY: 1971

Disease Area	(A) Tuberculosis Consultations	(B) Total Tuberculosis Inpatients	(C) A/B	(D) Tuberculosis Admissions (B) / Total Tuberculosis Consultations (A1 to A4)
Tuberculosis				
1) T.B. Institutes	40,929	6,011	.147	.08
2) General Hospitals	25,965	4,936	.190	.065
3) Regional Hospitals	6,945	1,443	.207	.019
4) District Hospitals	1,796	-----	----	----
TOTAL	75,635	12,390	.164	.164
Pediatrics	Pediatric Consultations	Total Pediatric Inpatients	A/B	Pediatric Admissions (B) / Total Pediatric Consultations (A5 to A8) / Pediatric Admissions (B) / Total Pediatric Consultations (A5 to A9)
5) Pediatrics Institutes	99,445	4,890	.049	.024
6) General Hospitals	15,143	9,560	.631	.047
7) Regional Hospitals	52,011	9,869	.189	.048
8) District Hospitals	36,403	-----	----	----
9) MCH Centers	786,449	-----	----	----
TOTAL	989,000	24,319	.025	.119
Opthamology	Opthalmological Consultations	Opthalmological Inpatients	(2)/(1)	Opthamological Admissions (B) / Opthamological Consultations (A10 to A13)
10) Opthamological Institutes	46,515	1,974	.042	.018
11) General Hospitals	97,393	2,559	.026	.013
12) Regional Hospitals	35,875	2,217	.062	.010
13) District Hospitals	10,693	-----	----	
TOTAL	190,478	6,750	.035	

Source: Ministere de la Sante Publique, Statistiques 1969,1970,1971.

probability of referral to a specialty outpatient clinic is quite high, but this is somewhat spurious, since one would want in the numerator a measure of total specialty outpatients rather than specialty outpatient consultations. Thirdly, the probability that an outpatient seen at a referral clinic will subsequently be hospitalized is about 20 per cent in a normal region. Kasserine, with an extremely low specialty inpatient capacity, is lower.

Finally, in table 15 (col. 3), we have measured the probability of an outpatient's admission to selected specialty wards at different institutional levels of the pyramid. Again, the results are quite ambiguous with the probability depending on the level of the tier, particularly for pediatrics and opthalmology. These measures in tables 13 to 15 indicate no clear uniformities in the probability of referral from one level to another of the pyramid. This is troubling. It is not intuitively clear why the probability of specialty outpatient referral or specialty inpatient referral should be higher at one region relative to another. Nor is it clear why such sharp differences emerge at levels of the pyramid where the quality of care is not very different.

The Relative Probability of Access to Higher Referral Units

Does referral to the higher level specialty units occur according to our earlier theoretical norms? In part A, we argued that an examination of the residence of the inpatient population in these units could reveal whether they are representative of the unit's client population. For national hospitals, this would suggest an inpatient mix drawn from all regions in the country according to the relative size of each region's population. For regional hospitals, the relevant client pool would be the regional population.

To test this hypothesis, we collected a sample of inpatient records for hospitals at different levels of the referral pyramid. By classifying inpatients according to the town or region of residence, we can obtain an approximate picture of which population groups are actually served by the hospital.[1] We have inferred what constitutes the "client"

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[1]The major difficulty with this data is that there may be a tendency for these statistics to overestimate the share of the inpatient population actually residing in the city in which the hospital is

population for a given service or hospital, and have calculated the share of that client population from each region or district. The results are presented in table 16. The results may be summarized as follows:

(1) The Opthalmological Institute, the Psychiatric Hospital at "Razi Manouba," and the Pediatric Institute, all located in Tunis, are presumably national institutions, handling the most complex cases associated with their particular specialty.[1] In all cases, but particularly for the Pediatrics Institute, the Tunis region's population is disproportionately represented.

(2) Although the Habib Thameur Hospital (Tunis) is a general hospital, it also services the primary inpatient needs of part of the Tunis community. Thus it is neither surprising nor unreasonable that the Tunis residents account for a large share of the inpatient population on these services, particularly for surgery, pediatrics and gynecology. The important issue is whether Habib Thameur is sufficiently a referral unit to justify its higher expenditure per bed relative to other regional (or auxiliary) hospitals.

The services of otolaryngology, gastrology and dermatology are clearly national services. Few other hospitals outside of Tunis have any such services. The utilization rate by Tunis residents appears disproportionately high.

(3) There are three major hospitals in the region of Sousse: the general hospital in Sousse, and the regional hospitals in Monastir and Mahdia. All three hospitals would presumably supply specialty inpatient

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located. Admittants to a Tunis hospital may give as their address the home of a friend or relative in Tunis rather than their actual address. There is no way of knowing the magnitude of bias or whether it is a significant problem. Although the fiches medicales from which this data are drawn also includes the source of referral, usually this constitutes the secondary outpatient clinic of the hospital rather than the original initiating unit.

[1]For example, the Tunis region has more than twice as many pediatric beds per capita for the under 14 population than any other region. The ratio of the under age 14 population to pediatric beds is 1032 for the Tunis region relative to a national average, exclusive of Tunis, of 5547. Similarly, Tunis has more than half of all opthalmological beds. Similarly, there are only two psychiatric services in the country: Razi Manouba (1018 beds) and Sfax (17 beds). One can only assume that these hospitals are intended to have a national focus.

Table 16

THE REPRESENTATIVENESS OF THE INPATIENT POPULATIONS OF MAJOR REFERRAL HOSPITALS IN TERMS OF THEIR CLIENT POPULATION 1973

NATIONAL REFERRAL UNITS	TOTAL	Tunis	Nabeul	Bizerte	Sousse	Beja	Jendouba	Le Kef	Kasserine	Kairouan	Sfax	Medenine	Gabes	Gafsa	Total Sample Size
	DISTRIBUTION OF THE NATIONAL CLIENT POPULATION ACROSS REGIONS														
	100%	22.34	6.53	6.27	11.6	5.8	5.47	6.72	4.52	5.99	9.56	5.26	4.42	7.22	
INSTITUTES	DISTRIBUTION OF INPATIENTS IN INSTITUTE BY REGION OF RESIDENCE														
% of cases from Regions:															
Institute															
D'Opthalmology	100%	46.5	10.5	1.7	9.7	4.4	.9	4.4	.9	1.7		3.5	1.7		114
Razi Manoua	100%	44.6	7.1	8.1	8.9	8.9	7.1	4.5	1.9	8.9					112
Institute D'enfants															
General Medicine	100%	84.3	3.5	1.7	1.7	2.6		.9	3.4	1.7					115
Surgery	100%	84.5	3.5	1.8	.9	2.7	.9		.9	1.8	1.8			.9	110
HABIB THAMEUR GENERAL HOSPITAL INPATIENT SERVICES															
General Medicine	100%	54.5	12.7	3.6	7.3										
Surgery	100%	74.5	6.7	16.9	3.3										
Pediatrics	100%	75.0	10.0												
Gynecology	100%	74.0	2.3	2.4	7.1										
Opthalmology	100%	53.6	7.3	2.4	14.6										
Otolaryngology	100%	61.0	21.9	9.7											
Gastrology	100%	48.7	12.2	2.4											
Dermatology	100%	73.2	4.8	2.4	4.9										

REGIONAL REFERRAL: SOUSSE													
% of population from Districts:	Sousse	Enfida	Djemmal	Souassi	Msaken	K. Kebira	Ksour Essaf	Moknine	El Djem	Monastir	Mahdia	Kairouan Region	Kasserine
	DISTRIBUTION OF REGIONAL POPULATION OF SOUSSE ACROSS DISTRICTS												
100%	16.4	5.07	8.86	10.2	8.65	8.06	7.6	9.6	5.39	9.1	5.3		

SOUSSE GENERAL HOSPITAL INPATIENT SERVICES														
	DISTRIBUTION OF INPATIENTS IN SOUSSE GENERAL HOSPITAL BY DISTRICT OR REGION OF RESIDENCE													
General Surgery	100%	32.6	2.0		4.1	8.2	18.4	2.0		2.0	8.2	2.0	4.1	2.0
Pediatrics	100%	43.2	6.9	2.3	4.5	13.8	13.8		6.8		2.3		2.3	
Otolaryngology	100%	36.3	4.5	6.8	6.8		11.4	5.4	6.8	5.5	13.8			
Opthalmology	100%	16.3	4.6	4.6	4.6		11.6	2.3		9.4	7.0	2.3	4.6	4.7
General Medicine	100%	47.0	7.8	7.8	2.0	4.0	9.8		2.0		3.9	2.0	4.0	2.0

REGIONAL HOSPITALS

REGIONAL REFERRAL: KAIROUAN						
	Kairouan	Haffouz	Hadjeb	Sidi Amor	Sidi Ali	Outside Regions
	DISTRIBUTION OF REGIONAL POPULATION OF KAIROUAN ACROSS DISTRICTS OF:					
100%	30.6	15.2	6.4	16.8	10.5	

KAIROUAN REGIONAL HOSPITAL INPATIENT SERVICES							
	DISTRIBUTION OF INPATIENTS OF KAIROUAN REGIONAL HOSPITAL BY DISTRICT OF RESIDENCE						
Dental	100%	72.2	3.7	5.5	3.7	3.7	1.9
Surgery	100%	38.9	5.1	3.4	15.5	1.7	10.3
Opthalmology	100%	44.0	20.0	4.0	4.0		4.0
Maternity	100%	73.2	5.3	3.5	8.9		
Gynecology	100%	52.8	16.9	1.8	9.4		3.7
General Medicine	100%	64.8	11.2	1.9	9.3	1.9	
Pediatrics	100%	71.9	11.9	1.7	5.1		1.7
Tuberculosis	100%	18.0	14.4		7.2	5.4	12.6

REGIONAL REFERRAL: KASSERINE				
	Kasserine	Sbeitla	Thala	Others
	DISTRIBUTION OF REGIONAL POPULATION OF KASSERINE ACROSS DISTRICTS OF:			
100%	18.5	25.0	27.9	28.6

KASSERINE REGIONAL HOSPITAL INPATIENT SERVICES					
	DISTRIBUTION OF INPATIENTS OF KASSERINE REGIONAL HOSPITAL BY DISTRICT OF RESIDENCE				
Pediatrics	100%	72.7	15.2	6.0	6.0
Surgery	100%	28.5	12.5	33.9	25.0
General Medicine	100%	70.0	10.4	10.4	8.2
Maternity	100%	54.9	13.7	19.5	12.0

SOURCE: Records of fiches medicales, kept by Ministère de la Santé Publique.

services to residents of the region. It is thus difficult to judge whether the residents of the city of Sousse consume a disproportionate share of the inpatient services of the general hospital at Sousse. Since the region of Sousse appears extremely well-endowed with hospital beds (see table 6), one would expect this hospital to serve as a referral unit for other regions in central Tunisia, in order to justify the higher recurrent and investment expenditure per bed on this hospital. Yet in all the services surveyed, less than 9.3 per cent of inpatients were from outside the Sousse region.

(4) The Kairouan Regional Hospital is a typical regional hospital, basically supplying a specialty inpatient and outpatient capacity to its regional population. As a referral unit, it appears satisfactory only for surgery, tuberculosis and opthalmology. For the other services, the residents of Kairouan occupy a disproportionate share of inpatient capacity relative to their share of the regional population.

(5) Kasserine is the poorest region of Tunisia. The city of Kasserine is itself new (circa 1954) and contains no more than 20 per cent of the region's population. Although it also appears heavily skewed in its inpatient data, this reveals less about the referral structure's inadequacy in the region than about the small number of its bed stock. The services of pediatrics and gynecology have only nine and eight beds respectively, so it is not surprising that these are overwhelmingly used by Kasserine residents. Surgery is the largest service (22 beds) and this is more equitably utilized within the region.

Case Mix Differences at Different Levels of the Referral Pyramid

Another test of the referral structure's performance is whether there is an increase in the medical severity of inpatient cases as one moves to the upper levels of the pyramid. Ostensibly, the higher quality services of the general hospitals should treat medical cases sufficiently complex as to warrant the increased cost per patient. If there were no differences in the case mix of patients for institutions at different levels of the pyramid, this would suggest, at best, a malfunctioning referral system.

A comparison of case mix differences across institutions is fraught with hazards. Since an auxiliary hospital may only have a service

of general medicine, its caseload will obviously differ from a regional hospital with additional services in obstetrics-gynecology, pediatrics and surgery. A fortiori, general hospitals have an even wider set of specialty services, such as otolaryngology, opthalmology or cardiology, which are lacking in most regional hospitals. It can be assumed that the existence of a specialty service implies cases that are substantively different from what would be found in a hospital lacking such a service. For the truly "national" specialty services found at only one of the hospitals, a comparative approach is obviously inapplicable.[1] Thus, one can only compare the case mixes of those medical services found at more than one level of the referral pyramid.

From a sample of cases drawn from the medical services of a small number of hospitals, we were able to differentiate the types of disease problems encountered (see table 17). In the service of general medicine, the most basic and common of the medical services, clear differences emerge in the case mixes. At the auxiliary hospital, respiratory illnesses, intestinal infections and digestive illnesses account for 58 per cent of total cases, as opposed to only 39 and 27 per cent at the regional and general hospitals, respectively.[2] The share of patients with tuberculosis, rheumatism and urinary illnesses, respectively is larger at the regional hospital level than any other. This suggests that regional hospitals may receive many such cases on referral from the auxiliary hospitals. The smaller share of such cases at the general hospitals indicates that referral may be less significant and that these cases are drawn from the urban population.

As one moves up the pyramid, a rise in the share of such medical problems as (i) endocrine llnesses, (ii) blood diseases, (iii) heart disease, (iv) stomach ulcers, and (v) illnesses of the digestive tube are apparent. Others, such as urinary illnesses, hypertension and digestive diseases are clearly higher at the general and regional hospital levels. In the service of obstetrics-gynecology, auxiliary hospitals

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[1]The alternative task of determining whether the hospital has more or less than the inputs necessary for an adequate diagnosis of treatment is equally impractical.

[2]Complications associated with pregnancy are also common (5.38 per cent of total cases), but the small percentage of cases at the other levels reflects their treatment in a service of obstetrics-gynecology.

Table 17

CASE -- MIX OF A SAMPLE OF INPATIENTS IN THE GENERAL AND SPECIALTY MEDICAL SERVICES IN A SAMPLE OF TUNISIAN HOSPITALS

Percentage of Each Disease Problem in the Case Load of of the Following Medical Services	INSTITUTIONAL LEVEL OF REFERRAL PYRAMID		
	General[a/] Hospitals	Regional[b/] Hospitals	Auxiliary[c/] Hospitals
In Service of General Medicine:			
Intestinal infections	3.97	5.50	7.62
Tuberculosis	2.27	4.83	0.80
Viruses	1.63	0.94	1.04
Endocrine illnesses (including diabetes)	5.03	0.85	0.00
Illnesses of the blood (anemia)	4.04	2.01	1.79
Rheumatism	3.35	9.26	4.57
Heart Disease	14.52	7.63	3.30
Hypertension	3.67	4.08	0.51
Respiratory illnesses	11.84	25.68	43.52
Digestive illnesses	11.63	8.59	6.35
Stomach Ulcers	6.59	0.00	.75
Illnesses of annexes of digestive tube	7.76	2.15	2.65
Urinary illnesses	6.71	9.17	4.55
Complications associated with pregnancy	0.00	1.31	5.38
Total	100.0	100.0	100.0
In Service of Maternity Care:			
Deliveries with no complications	65.28	53.51	79.13
Abortion or delivery with complications	13.90	22.00	1.08
Total	100%	100%	100%
In Service of Surgery:			
Respiratory illnesses	3.25	3.23	
Appendicitis	8.38	2.07	
Hernias	6.94	9.30	
Urinary dieases	6.29	3.60	
Skin diseases	20.26	8.07	
Fractures	16.80	14.00	
Trauma internal	3.35	4.94	
Trauma superficial	6.10	11.50	
Bone diseases	1.70	1.74	
Total	100%	100%	
In Service of Pediatrics:			
Intestinal infections	43.90	14.00	
Malnutrition and metabolic troubles	5.25	18.00	
Maladies of nervous system	11.25	3.73	
Respiratory illnesses	18.70	31.80	
Bronchial pneumonia	7.94	5.50	
Urinary infections	5.05	6.06	
Total	100%	100%	
In Service of Opthalmology:			
Cataracts	33.00	60.81	
Total	100%	100%	

a/ Habib Thameur, Sousse

b/ Kairouan, Kasserine

c/ Enfida, Haffouz, Hadjeb El Aioun, Sidi Amor, Ousseltia, Sbiba, Thala, Feriana, Sbeitla

SOURCE: Records of fiches medicales kept by Ministère de la Santé Publique.

clearly have a smaller share of complicated deliveries or abortions.

The remaining services were referral inpatient services, and exist almost exclusively at the regional and general hospitals. In surgery, general hospitals have a higher fraction of appendicitis, urinary and skin diseases. In pediatrics, they dominate in the treatment of intestinal infections and nervous system diseases. Regional hospitals dominate in the treatment of respiratory illnesses, malnutrition and metabolic deficiencies. In opthalmology, cataracts are a larger share of the regional hospital's opthalmological case load.

Assuming that the statistics of table 17 are accurate, the clear differences in the case mixes observed at different pyramid levels are encouraging. It suggests that the higher cost facilities are at least treating a more complex case mix, although a layman cannot judge the extent to which these differences necessitate the actual differentials in treatment cost per patient.

A more complete analysis of the significance of these differences, in the absence of morbidity data for different areas of the country, is not possible. For example, the case mix differences in the service of general medicine may strictly reflect differences in the morbidity patterns of the client populations of the respective areas of the country. The urban populations are generally of a higher socio-economic position, and may be less prone to respiratory and intestinal illnesses. Alternatively, they may receive treatment from many such common problems on an ambulatory basis from private physicians. Similarly, the rural population lacks access to private medical doctor and the poor conditions in the rural areas may preclude adequate ambulatory care for the more common disease problems, thus necessitating a higher hospitalization rate. In either case, one cannot discern whether the referral structure is adequately working without knowledge of (1) the number of cases that ought to have been referred and that were not; (2) the number of cases at the higher levels who are receiving too costly a level of care. For example, perhaps the share of common illnesses in the general hospitals should be even lower than its present level.

In summary, the surveys suggest that inpatients in the higher level units of the referral pyramid--the regional hospitals and above--are disproportionately from the <u>same</u> urban area as the hospital. Population

groups from areas more distant are underrepresented. Nevertheless, the case mixes of these hospitals suggest a more complex mix of disease problems. As noted, one explanation is that there are differences in the morbidity characteristics of the urban and rural populations. As a consequence, the rural groups are accurately represented in the upper level units in terms of their share of particular types of disease problems.

Alternatively, one can assume morbidity differences to be less striking across urban and rural groups. In this case, the referral system is working badly for patients distant from a given hospital unit. The probability that a patient will be referred to a regional hospital or a general hospital or institute is a function of his residence or his (her) primary entry point to the system. Referrals are more likely from the primary outpatient clinic of a general hospital than from a rural dispensary thirty miles away. A disequilibrium between the β_{ij}^{i+m} and γ_{ij}^{i+m} is implied for rural patients with these complex problems.

This appears a more reasonable explanation. Many of the more complex treatment problems do not appear to be socio-economic status related (for example, anaemia, stomach ulcer, urinary illnesses, deliveries with complication, appendicitis, hernias, fractures, pediatric intestinal infections or cataracts). In fact some are more likely to be overrepresented by lower income groups. Moreover, we shall see in part E that the poor are not underrepresented in the urban hospitals, relative to their share in the population. Thus, these are not disease problems only manifested by the affluent. The residence data suggests that these patients are urban poor. The rural poor have weak access due to a breakdown at some point in the referral system.

The Cost of the Specialty Care Option in the Referral System

What is the cost to the Tunisian government of providing the higher level referral capacity? Assume that the differential between the average cost per inpatient day or per outpatient visit of the higher level and lower level units represents the marginal recurrent cost associated with the provision of specialty care. This may be readily calcu-

lated from tables 10 through 12.[1] The marginal cost of higher quality treatment in the regional, general and institute hospitals for the flow of inpatient days in these hospitals may be estimated as:

Inpatient Care

(1) Marginal cost of inpatient treatment above the quality of auxiliary hospitals:	D 3,794,416
(2) Marginal cost of inpatient treatment above the quality of regional hospitals:	D 1,775,229
(3) Marginal cost of inpatient treatment above the quality of general hospitals:	D 69,340
Total Inpatient Expenditure:	D 8,343,659

Outpatient Care

(4) Marginal cost of outpatient treatment above the quality of auxiliary hospitals:	D 1,078,395
(5) Marginal cost of outpatient treatment above the quality of regional hospitals:	D 589,181
Total Outpatient Expenditure:	D 2,638,976

In other words, if one decided to reduce the quality and range of inpatient services provided at the general hospitals and institutes to that provided in the regional hospitals, one could save approximately 21 per cent of the inpatient budget and 15 per cent of the total institutional health budget. These funds could be used to upgrade the quality of services at the primary outpatient and inpatient levels, and still allow for a further increase in expenditure per unit of output at all levels of the system. The cost differential at the outpatient level is somewhat misleading, in that it primarily is due to the far higher cost of outpatient treatment in the urban dispensaries. If one removed this, the estimates in (4) and (5) would fall to D 450,000 and D 59,507,respectively.

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[1]The following average cost estimates were calculated from tables 10 and 11:

Average Cost per Unit of Output in the Medical Sector
(in Tunisian dinars)

Institution	Per Inpatient Day	Per Outpatient Day
Urban dispensary	inapplicable	1.04
Rural dispensary	inapplicable	.32
Auxiliary hospital	1.33	.19
Regional hospital	2.24	.32
General hospital	2.64	.39
Institute	2.72	--

C. The Demand for Medical Services

In evaluating the pattern of resource allocation in a health sector, it is just as important to understand the factors which motivate the demand for medical services as it is the technological problems of supply. The way in which demand is manifested will mediate between the pattern of morbidity in a society and the capacity of a referral system to treat it. Clearly, if many ill persons never come to an outpatient clinic, the impact of the medical system will be lessened, independent of its optimality in treating cases that do reach it.

With the exception of emergencies, the demand for medical services is initially revealed at the outpatient clinic. The demand for inpatient services arises as an output of this clinic and is determined by the clinic physician subject to basic inpatient capacity constraints. In this part, our focus is primarily on the demand manifested at the outpatient level.

In this part, we shall focus on the factors influencing the demand for medical services. We shall initially review the aggregate statistics on the level and trend in the demand for medical services, and the capacity to meet this demand. We will then examine the micro-economic factors influencing this demand. Some of the hypotheses raised will be tested through econometric analysis. The policy implications for the operational effectiveness of the primary outpatient care delivery system will be indicated. Is the Tunisian referral system able to readily accomodate the demand for health services as it is presently manifested?

Aggregative Trends in the Demand for Outpatient Services

Between 1962-1971, two trends in the demand for medical services are striking. One measure of demand, the ratio of outpatient consultations per capita, has increased over the period. Interregional differences in this demand measure have narrowed substantially (columns 6 and 13 of table 18), primarily due to a rise in the demand for outpatient services in regions with previously low demand. The national capacity to diagnose and treat this growth in outpatient demand has increased.

Table 18

THE LEVEL OF OUTPATIENT DEMAND BY REGION: 1962-1971

Region	1962 (1) Population[a]	(2) Number of Physicians	(3) Number of Beds	(4) Total Outpatient Consultations[a]	(5) 4/1	(6) 4/2	(7) 4/3	1971 (8) Population[a]	(9) Number of Physicians	(10) Number of Beds	(11) Total Outpatient Consultations[a]	(12) 11/8	(13) 11/9	(14) 11/10
Tunis	660	274	4,382	890.0	1.34	3.2	203.1	1,126	387	4,982	1,172.9	1.04	3.0	235.2
Bizerte	269	12	422	175.8	.65	14.6	416	316	54	1,071	343.7	1.08	6.4	320.9
Beja	282	9	449	150.5	.53	16.7	335	296	23	492	205	.692	8.9	501.2
Jendouba	230	9	419	88.5	.384	9.8	211	276	24	432	182.5	.661	7.6	422.4
Le Kef	300	17	609	140.0	.47	8.2	229	339	29	646	417	1.23	14.4	645
Kasserine	193	4	144	59.1	.306	14.8	410	228	10	164	194.1	.85	19.4	118.3
Gafsa	283	14	348	144.0	.51	10.3	413.6	364	32	550	340	.934	10.6	618
Medenine	283	8	247	126.6	.45	15.8	512	265	23	382	208.3	.786	9.1	545
Gabes	209	14	412	129.4	.62	9.2	314	223	17	414	365.5	1.63	21.5	882
Sfax	393	29	919	358.2	.91	12.4	389	482	62	949	490.5	1.02	7.9	516.85
Kairouan	246	12	322	113.4	.46	9.5	353	302	24	483	194.8	.64	8.1	403
Sousse	524	45	1,353	385.0	.73	8.6	284	585	72	1,340	925.6	1.58	12.8	690.7
Nabeul	279	22	457	224.7	.805	10.2	491.7	329	36	712	285	.86	7.9	400.2
Total	4,151	469	10,483	3,947.8	.95	8.4	377	5,038	793	12,571	5,325.0	1,057	6,715	423.5
(excluding Tunis)	3,491	195	6,101	3,054.	.87	15.7	500	3,912	406	7,589	4,153.0	1,060	10.22	647.2
Regional Mean					.628	11.0	351					1.0	10.6	404.5
Regional Variance					.27	3.7	160.5					.32	5.2	202

[a] in thousands

Source: Annuaire Statistique, individual years 1962 through 1971.
Ministère de la Santé Publique, Statistiques, 1969,1970,1971.

The number of outpatient consultations per public sector physician[1] decreased from 8400 to 6700, although a few regions have seen a sharp increase in this measure (Le Kef, Kasserine, Gabes, and ironically, Sousse).

However, if the relative probability of hospitalization can be proxied by the ratio of outpatients to beds, then this probability has fallen in all regions except Bizerte. For example, in Kasserine, the ratio of outpatient visits per bed has risen from 410 to 1183; in Gabes, from 314 to 882; in Sousse from 284 to 691. Hence, the inpatient capacity of the system has grown less rapidly than the growth in potential demand over the decade. In terms of the framework of part A, these trends imply that the absorptive capacity of the outpatient system α^1_{oj} in any region s is increasing relative to the manifested demand, but that the capacity for subsequent hospitalization, $\alpha^2_{ij}/\beta^2_{ij}$ has probably declined.

Another measure of the magnitude of the demand for outpatient services is purely impressionistic. To the untrained eye, the outpatient clinics that are available are heavily used, and in fact congested. In the four or five hours available for any day's service, 60 to 150 people may register for an outpatient consultation.[2] The physician may have no more than five minutes, and often as little as two minutes on average per patient. Given the intertemporal trends, this suggests that at the beginning of the decade the degree of congestion and unsatisfied demand must have been appalling. The improved conditions are one measure of the progress made within the Tunisian health system. The implications and significance of this congestion, both as a revelation of demand and as an indication of the system's efficiency will be discussed later in this part.

The interregional variation in current outpatient demand for public services is substantial, with some regions dominating others by a

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[1] It is difficult to make such estimates, since many physicians are not full-time employees of the public sector.

[2] In some urban dispensaries in Tunis, the physician will not accept more than 30 outpatients per day, and rationing occurs on a first-come, first-serve basis. In others that were visited outside Tunis, the number of consultants ranges as high as 150 in a day. For example, in the delegation of Sbeitla, the average number of consultants per day at the Mquilla Dispensary was 70-80; at the Djilma Dispensary, 150 daily.

factor of 2.5 (table 18, column 13). The regional differentials would be enlarged if one included the number of consultations with private physicians. The majority of private practices are in the regions of Tunis, Sousse, Sfax, and Nabeul.

The ratio of outpatients to population may be re-expressed as the product of the percentage of the population utilizing the health services in any year and the number of visits per user, or

$$\frac{O}{P} = \left(\frac{U}{P}\right)\left(\frac{O}{U}\right) \tag{3}$$

where O = the number of outpatient visits, U the number of users, and P the population. Clearly U/P is a better measure of the breadth of utilization in the population. Table 19 estimates this measure for selected districts.[1] Although there is considerable variation across and within regions, there is no consistent trend. However, the cities of Tunis and Sousse have a higher user rate than the average town in the poorer regions of Kairouan, Kasserine and Gafsa.

Urban-rural and interregional differences in the utilization of maternal-child health services are also apparent. From table 20, mothers in the capital district of a region are far more likely to deliver their babies in maternities, to obtain pre-natal examinations and to take their children for post-natal and toddler care. Since these statistics relate to the capital and noncapital districts in the regions, a more rigid delineation between urban and rural areas would probably reveal a sharper contrast. The interregional differences in the rate of consumption of MCH services are equally striking.

The interregional and intraregional variation in demand is matched by similar differences in the capacity to meet this outpatient demand (α^1_{oj}). Table 21 reveals the sharp differentials that exist between and

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[1] There is no data on the number of different persons that use a given clinic; only the total number of consultations (or outpatient visits) is available. Using a sample of the fiches medicales (medical records) of a number of dispensaries and outpatient clinics, we estimated the average number of times that a given individual attended the clinic, during a given year, providing that he had used it at least once. In the poorer rural regions, this averaged at 1.9 visits per annum; in one dispensary in Tunis, this averaged at 2.83 visits per annum. These orders of magnitude are similar to those found in a W.H.O. study on the consumption of medical services in Nabeul.

Table 19

FRACTION OF POPULATION CONSUMING OUTPATIENT SERVICES FOR SELECTED DISTRICTS: 1971

District	Total Outpatients Population	District	Total Outpatients Population
Kasserine[f]		Tunis[f]	31.7-47.5%
Sbeitla[c]	29.7%	Hammamlif[d]	42.9%
Thala[c]	20.3%	Zaghouan[b]	27.9%
		La Marsa[b]	49.8%
Kairouan[e],[a],[f]	37.0%		
Hadjeb[a]	40.1%	Gafsa[f]	
Sidi Amor[a]	28.5%	Degache[a]	27.2%
Ouseltia[a]	35.0%	Tozeur[a]	51.8%
Haffouz[a]	22.6%	Nefta[a]	36.8%
Sousse[b],[e],[f]	53.3%		
Jemmal[a]	36.0%		
Moknine[a]	40.0%		
Ksar Hellal[a]	57.0%		
K. Kebira[a]	41.4%		
Msaken[b]	53.0%		

Source: Based on sample of outpatient records in dispensaries of each district

a/ Assumes 2 visits/consultant

b/ Assumes 2.5 visits/consultant

c/ Assumes 1.74 visits/consultant

d/ Assumes 2.8 visits/consultant

e/ Assumes 50 per cent of outpatient visitors in services other than general medicine and emergency care are from outside the city.

f/ This relates to the utilization rate in the capital district alone, not the entire region.

Table 20

Indices of Demand for Maternal-Child Health Services by Region: 1970-1971

PART A		Capital Districts of Sousse, Sfax, Bizerte		Capital Districts of Other Regions		Other Districts	
Measures of Demand	Variable	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Prenatal Consultations/Total Births	(1)	.10	.08	.13	.14	.05	.08
Total Births/Maternity Beds	(2)	76.79	35.90	103.16	65.09	n.a.	n.a.
Deliveries in Hospital Maternities/Births	(3)	.74	.19	.46	.21	.13	.17
Pediatric Consultations/Population of Ages 0-5	(4)	.98	1.34	1.59	.69	.65	1.04
Population/MCH Center		45871		37313		49285	

PART B	Prenatal Consultations	Total Births	Deliveries in Hosp. Maternities	Pediatric Consultation
Region	Total Births (1)	Maternity Beds (2)	Beds (3)	Population, Age 0-5 (4)
Tunis	.176	94.42	.532	1.71
Sfax	.133	194.53	.300	.80
Sousse	.141	127.30	.393	.56
Bizerte	.131	101.50	.364	1.23
Beja	.056	90.98	.265	.67
Jendouba	.024	114.66	.224	.81
Le Kef	.119	234.41	.136	.40
Kasserine	.013	1159.75	.053	.77
Gafsa	.086	180.12	.166	.53
Medenine	.060	294.68	.088	.43
Gabes	.103	370.57	.171	1.13
Kairouan	.024	396.57	.107	.47
Nabeul	.183	96.92	.406	1.24

Source: Republique Tunisienne, Ministère de le Santé Publique, Profils Démographiques Socio-Economiques et Sanitaires Regionaux.

Table 21

Population Per Doctor by District for Selected Regions: 1970[a/]

Region and District	Population of Delegation or Region	Population Per Total Physicians
Beja	296,000	12,869
Beja	80,200	5,345
Medjez-el-Bab	37,600	18,800
Teboursouk	49,000	49,000
Gafour	20,400	20,400
Testour	25,300	25,300
Bou Arade	27,700	27,700
Bizerte	315,900	5,852
Bizerte	107,000	7,130
Menzel Bourgiba	56,400	3,320
Ras Djebel	38,500	38,500
Sousse	585,000	8,139
Sousse	97,600	3,050
M'Saken	51,400	51,400
Enfida	30,200	30,200
Kairouan	301,800	12,583
Kairouan	92,500	7,115
Haffouz	45,900	45,900
Ouselatia	25,200	25,200
Hadjeb el-Aioun	19,300	19,300
Side Ali ben Nas ral ah	31,700	31,700
Kasserine	228,000	22,900
Kasserine	42,800	7,130
Sbeitla	57,400	57,400
Thala	64,600	64,600
Feriana	33,100	33,100
Sfax	482,000	7,774
Sfax	209,800	4,770
Mahres	38,300	38,300
Djebenia	86,800	86,800
Nabeul	328,900	9,139
Nabeul	56,100	4,315
Menzel Temine	49,700	49,700
Grombaeia	30,900	15,450
Bou Zelfa	32,600	32,600
Kelibia	32,800	16,400
Korbus	31,000	17.050
Hammamet	34,100	34,900
Le Kef	339,000	11,690
Le Kef	71,200	3,955
Makthar	59,100	59,100
Ebba Ksour	40,700	40,700
Siliana	53,100	53,100
Tadjerouine	49,100	49,100
Sakiet S. Youssof	16,900	16,900
Jendouba	276,000	11,500
Jendouba	73,100	5,620
Bou Salem	64,000	64,000
Ain Draham	55,100	27,500
Tabarka	28,500	28,500
Ghardimadu	57,800	57,800

a/Public and private sector physicians

Source: (1) Ministère de le Santé Publique, Profils Démographiques Socio-Économiques et Sanitaires Régionaux (unpubl. 1972)

(2) Unpublished Statistics, Ministère de le Santé Publique

within regions in the number of physicians (public and private) per capita. The urban-rural differences are even larger, with the number of physician hours available to the rural groups only 20 to 33 per cent of that available to urban groups.[1]

What are the implications of these regional differences in demand? If morbidity and demographic characteristics of the population were invariant across regions, then one would expect β^1_{oj} to be the same for all regions, and lower utilization rates could signify that an insufficient level of medical services is provided, whether for demand or supply reasons. The differences in availability of physicians seem to suggest the importance of supply factors. If β^1_{oj} is higher for the low income rural regions due to morbidity differences, then their low relative utilization rate at the present time strengthens this conclusion. However, alternative explanations are possible.

High levels of demand may reflect differences in disease pattern or frivolous consumption of medical services. It is also possible, though quite unlikely, that the differences in supply of public sector physicians per capita are simply a response to the differences in manifested demand. Further policy implications can be drawn only by examining the factors which influence demand for medical services.

Mircoeconomic Factors Underlying the Demand for Medical Services

The Tunisian medical system operates on a self-referral basis. Although an individual may feel ill, the decision to seek modern medical service will depend on whether the individual perceives the illness as unusual or dangerous and on what are the accepted means of treatment for

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[1]The physician of the auxiliary hospital will usually hold a daily clinic at the hospital during the morning. Each afternoon, he will visit a different dispensary, and will hold an outpatient clinic there. If we assume that the population dependent on the dispensaries is largely the rural population of the district, then approximately half of the physician's outpatient clinic time will be allocated to the rural population of a district. Since the rural population is 75 to 85 per cent of the population in many regions, the physician time per rural resident is less than for the urban resident. See Republique Tunisienne, Institut National du Planning Familial et de la P.M.I., Statistiques Demographiques Socio-Economiques et Sanitaires Regionaux (Tunis, 1972).

given symptoms within the culture of the society. The use of modern medical services may be initially deferred when traditional medicine is valued highly and a traditional practitioner is close at hand. The demand decision is also influenced by the cost and perceived quality of alternative sources of care. The cost includes medical fees, drug costs, transportation expenses, and the opportunity cost of the time spent in obtaining care. The quality of facilities and personnel, and the perceived probability that the medical unit will be responsive to the individual's needs will shape the perceived return to seeking care. What is the relative importance of these factors in Tunisia? Do some factors suggest there to be a significant difference between β^1_{oj} and γ^1_{oj}--those that should and those that do seek medical assistance?

The fee for medical care does not appear to be a significant factor. For the 45 per cent of the total population that qualify for a carte d'indigence,[1] the fee in the public dispensaries and outpatient clinics is negligible (100 milliemes or $.24 per visit). In the rural areas, 70 to 80 per cent of the population has a carte d'indigence.[2] For the remaining population, there is a flat charge of 600 milliemes, unless the individual is a member of the Social Insurance Plan (C.N.S.S.) in which case care is completely free. The general consensus of most clinic personnel is that medical fees do not significantly deter the use of primary outpatient services.

There is some evidence that the cost of transportation and of time may deter demand. A W.H.O. sponsored survey of the consumers of medical services in the region of Nabeul found considerable dissatisfaction with the waiting time at the clinic. This appeared to explain differences in consumption rates within the rural and urban sample.[3] They also found

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[1]The criterion for a carte d'indigence is that the income per head of the family be less than 100 D per annum. Each additional household member raises this limit by 45 dinars.

[2]However, this pricing policy applies only if an individual utilizes the dispensary of his town of residence. A holder with a carte d'indigence must pay 600 milliemes at any other clinic.

[3]In the rural areas, only 20 per cent of those with a high consumption rate expressed dissatisfaction, relative to 41.5 per cent among low consumption rate households; in the urban sample, the proportions were 26.4 and 48.5 per cent, respectively. See W.H.O., Etude Pilote en Tunisie sur l'Utilisation des Services de Sante dans le Gouvernorat de Nabeul, pp. 121-122.

that rural consumers of medical services indicated greater difficulties than urban consumers in getting to the clinic. Rural consumers also had a consumption rate of only half as much.[1] Since the regions in southern Tunisia are both less developed and less dense in their population settlements, the transportation difficulties of the rural consumers in these latter regions are probably accentuated.

However, the cost of transportation in Tunisia is probably not a major obstacle. The transportation network is extremely dense and a bus service links villages and cities on a frequent and regular basis. The period of heavy rainfall disrupts the system for only short periods. The proliferation of dispensaries during the 1950s has meant that almost every town has at least one dispensary, with one or more outpatient clinics per week. Only in the areas with extremely dispersed populations is accessibility to some form of care a problem.

A more obvious explanation of the difference in the rural-urban utilization rate observed in the W.H.O. study[2] is the greater frequency of outpatient clinics in the urban areas. Whereas an urban resident can return for medical treatment daily, in the rural areas, a consumer may have only one clinic per week, thus reducing the possibilities for more frequent use. Since a rural resident would have to pay a higher fee and transport costs to obtain more frequent care (say at the nearest auxiliary hospital), this is an additional disincentive to more frequent consumption.

The W. H. O. study in Nabeul also confirms the importance of how the quality of care is perceived. Perceptions as to the (1) sufficiency of medical services and personnel, (2) comportment and capability of personnel, and (3) adequacy of communication between the physician and patient, clearly affected the use rates. The households with the lowest

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[1]Among those families using outpatient services, (1) the number of visits per capita was .3 in the rural sample and .74 in the urban; (2) the proportion of persons visiting the health services during each year was 16 and 29 per cent in the rural and urban samples, respectively; (3) the mean number of visits for a person that utilized the health services in a given year was 1.9 versus 2.5 in the two samples, respectively. Ibid., pp. 112-20.

[2]The use rate in that study was measured by total visits per capita among the population of those using health services during a five-year period.

use rates, in both urban and rural areas, expressed the greatest dissatisfaction with the medical service in terms of each of these factors. In particular, it was the insufficiency of medical services and the inadequacy of patient-physician contact which caused the greatest unhappiness in the W.H.O. sample.

What role do traditional cultural factors play in influencing demand? The W.H.O. study found surprisingly strong acceptance of the efficacy of western medicine and physicians in rural and urban areas. Yet many groups in the rural areas and in the urban migrant communities still accept traditional theories of causality of disease and ill-health. The wearing of fetishes is common, particularly among children.

There is a traditional legacy of fear of hospitalization, which may explain the oft-heard preference for outpatient care as well as the low hospital capacity utilization rates in rural areas. Often parents will not allow their children to be hospitalized.[1] Since custom requires that an individual die at home, patients close to death may be removed from the hospital.[2] Many argue that there is a simultaneous use of both the traditional and modern medical practitioners, which may be seen as a form of "risk-hedging."

Traditional beliefs clearly shape the perceptions of rural consumers as to the appropriateness of the medical care they receive. The preference frequently expressed for injections relative to pills and other drugs undoubtedly may reflect irrational beliefs. Yet a physician who does not prescribe injections is regarded as an inferior physician. Low use of a dispensary or auxiliary hospital clinic may reflect popular dissatisfaction with the clinic physician. The perception and the reality may clearly differ. If the type of care dispensed does not conform to traditional expectations, the client population may become dissatisfied regardless of whether the actual treatment was appropriate. Some patients are antagonized unless a particular form of treatment is prescribed, even if the doctor feels that an injection or drugs is appropriate. Thus, some doctors are said to prescribe treatment regardless of whether it is necessary in order to maintain good public relations.

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[1] On the other hand, it is also argued that in the winter, rural consumers desire hospitalization for the associated hotel services.

[2] This means that the percentage of hospitalized patients who die in the hospital is spuriously low.

Finally, it has been implicitly assumed that those who actually consume outpatient services are motivated by symptoms of illness. Yet in conversations with physicians and nurses in urban and rural areas, one repeatedly hears complaints about the number of faux malades (or hypochondriacs) at outpatient clinics. These are patients who have nothing wrong with them that can be dealt with on a medical basis. Informal estimates place 30 to 74 per cent of outpatients in this category. Females usually predominate.[1]

This phenomenon is complex. One suspects that in Tunisia, most of these outpatients are from the lowest income groups, and live in the poorer urban and rural settlements. Housing, nutrition, and sanitation are poor, and these groups are probably not healthy, often revealing malnourishment, worm-infestation, and other ailments. Although they may feel ill, there may be little that is medically remediable in the absence of a more fundamental improvement in their standard of living. They are faux malade in the sense that they do not have acute disease problems apart from their generally poor state of health. This must be a fairly widespread phenomenon, and not the result of a limited number of hypochondriacs. In a sample we made of outpatient records in a number of rural and urban dispensaries, we found that the average number of visits per consultant to a rural dispensary in any year was 1.7 to 2.0; to the urban dispensary, 2.5 to 2.8. The variance was not large.

Sociological factors appear to be primary. In the rural areas, it is customary for women to rarely leave the family compound. Trips to a dispensary may be the only excuse to justify going to town, visiting with neighbors, or the weekly market. The need for prescriptions reflects a need for credibility.[2] Similarly, men have a higher consumption rate on Mondays and Saturdays, particularly in the urban areas (reflecting the desire for sick leave). Although some of these factors are peculiar to a Tunisian-Arabic culture, the problem of the "faux malade" is said to be common in both developed and underdeveloped societies.

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[1] In the dispensaries visited, the ratio of visits of women to men ranged from two to three.

[2] "Symptom-swapping" is said to be common in the crowded waiting rooms of clinics, and this makes it even more difficult to discern the reality of illness.

Since the direct financial disincentive to demand (medical fees) is negligible for most of the population, no monetary pricing mechanism serves to deter the faux malade. This certainly contributes to the "congestion" problem. Finally, the faux malade problem suggests another interpretation of the interregional variation in outpatient service consumption rates. If the faux malade problem is closely correlated with the rate of consumption, then there may be smaller differences in consumption by those actually in need of care. However, if the faux malade is principally a rural phenomenon, then the relatively low demand in the rural regions should be further deflated.

Econometric Estimates of the Determinants of Demand

We attempted to econometrically estimate the relative importance of these factors in explaining the relative levels of demand across districts. Our discussion has suggested the following important factors: (1) the price of services, (2) the basic availability of outpatient facilities, (3) the perceived quality of outpatient care, (4) the demand for other services, medical or nonmedical, which may lead to simultaneous use of the outpatient clinic, (5) the cost of time and transportation associated with using a clinic, (6) the morbidity and demographic characteristics of the population and (7) cultural factors (such as the degree of modernization).

Since the fee for medical services is negligible we have not included a price variable. The availability of facilities is proxied by the number of urban and rural dispensaries in the district, whereas quality is presumed to be reflected by the number of physicians per capita. The availability of associated maternal-child health services is reflected in the number of midwives per capita. We used a measure of urbanization and the share of the labor force in nonagricultural employment to indicate the degree of modernization. Since we lacked variables to proxy the fourth and fifth variables, our model remains underspecified.

The results in table 22 (equations 9 and 10) suggest that the level of demand is primarily determined by the level of physicians (public and private) and midwives per capita. Although midwives do not provide outpatient care, they may motivate women with ill children to seek medical guidance. Districts with high shares of nonagricultural employment also

Table 22

Determinants of the Demand for the Services of Maternal-Child Health Centers[a/]

Dependent Variable \ Independent Variable	M.C.H. Centers Per Capita	Midwives Per Capita	Doctors Per Capita	Percentage of Urban Population in District	Percentage Unemployment	Births Per Maternal Bed	Percentage of Non-Agricultural Employment	R^2 (N)
1. Antenatal Consultations/Total Births	-.23	1408.4	--	-.01	--	--	--	.157
	(-.48)	(2.57)	--	(-.24)	--	--	--	(59)
2. Antenatal Consultations/Total Births	.12	--	8.22	-.08	--	--	--	.056
	(.25)	--	(.04)	(1.23)	--	--	--	(59)
3. Maternity Deliveries/Births	-.16	--	1289	.22	--	--	--	.590
	(-.20)	--	(4.56)	(2.06)	--	--	--	(58)
4. Maternity Deliveries/Births	--	4363.6	--	.29	.016	--	--	.601
	--	(4.84)	--	(3.00)	(.046)	--	--	(58)
5. Maternity Deliveries/Births	--	2786.0	.91	.25	--	--	-.23	.654
	--	(2.64)	(2.72)	(2.54)	--	--	(-1.55)	(58)
6. Maternity Deliveries/Births	--	3519.4	--	.17	--	-.001	--	.583
	--	(2.79)	--	(1.46)	--	-2.470	--	(30)
7. Pediatric Consultations/0-5 Age Group	.75	3346.0	--	1.50	--	--	--	.226
	(.15)	(.60)	--	(2.43)	--	--	--	(59)
8. Pediatric Consultations/0-5 Age Group	2.46	--	-1573.0	2.14	--	--	--	.230
	(.53)	--	(-.96)	(3.37)	--	--	--	(59)

	Constant	Midwives Per Capita	Doctors Per Capita	Percentage Urban Population in District	Number of Urban Dispensaries	Number of Rural Dispensaries	Percentage of Nonagricultural Employment	R^2 (N)
9. Total Outpatient Consultants[a/] Per Capita	+.03		1419.0		-.09		.005	.540
	(.43)		4.78		-4.23		3.000	(57)
10. Total Outpatient Consultants Per Capita	+.06	2014.9	1033.7		-.09	-.010	.004	.57
	(.86)	(1.38)	(2.33)		(-4.50)	(-1.000)	(2.670)	(57)

[a/] Total outpatient visits divided by an assumed 2.2 visits by each consultant.

[b/] T-ratios in parentheses below coefficients.

have high consumption levels.

A similar model was used to estimate the demand for maternal-child health services. For ante-natal services, the critical factor determining consumption proved to be the availability of staff (rather than facilities) (table 22, equations 1 and 2). Pediatric consultations as a percentage of the total pediatric cohort group are influenced only by the degree of urbanization in a district. Ease of access and modernization appear the crucial factors explaining the use of well-baby care services rather than the availability of doctors or facilities (equations 7 and 8). This reveals nothing about the factors influencing pediatric ill-baby consultations, which are unfortunately not separable from other out-patient visits.

The percentage of births delivered within maternity units is clearly explained by the relative availability of physicians and midwives and the urbanization rate. It may be presumed that the former reflect the quality of care, and the latter the likely proximity of individuals to the source of care. The urgency of a delivery undoubtedly explains the importance of the accessibility factor. The availability of maternity beds is an important factor. The higher the births per maternity bed, the lower the share of births occurring in maternity units.[1] Surprisingly, variables proxying the level of economic conditions, such as the unemployment rate or the share of the population in nonagricultural employment, prove insignificant.

The Congestion Problem: Policy Implications

The pattern of demand suggests that there are both many persons who never reach the medical system at the same time as there is excess demand and congestion by those who do. The effect of these phenomena is a bottleneck at the most basic and essential entry point to the health system. Several policies are implied. First, it is likely that the current network of facilities is sufficient and that greater emphasis on increasing the staffing, and frequency of outpatient clinics would reduce the opportunity

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[1]The higher the ratio of births per regional maternity bed, the greater the inadequacy to meet the potential demand. This ratio is inversely correlated with the number of deliveries per birth (=-.57), MD's per capita (r = -.453), and the degree of urbanization (r = 0.38).

cost of seeking care and increase the perceived quality of the services obtained. The use of mobile clinics in the rural areas could further expand clinic accessibility. The development of a mechanism for rooting out those groups of the population who fail to reach the system--the overly traditional groups, the poor, the dependent population unable to act for themselves--is also necessary. Some countries have developed a cadre of village health workers, who are close enough to any community to know the people who fall in this category.

The current technology of outpatient care is also in desperate need of reform, in order to prevent increases in demand from accentuating the current congestion. The present requirement that all patients be seen by a physician guarantees that any diagnosis or medical guidance will be cursory. The time limitation has already been described. Since most of the rural physicians are foreign (often from Eastern Europe), their need for a transltion into Arabic halves the effective time available for communication, examination, and diagnosis.

Longer waiting time, inadequate physician-patient contact, and insufficient care become logical concommitants of this congestion. With the obvious exception of emergency cases, for which diagnosis is easily made and critically urgent, the quality and adequacy of the diagnostic and treatment process at the primary level becomes highly questionable. It is likely that any severe medical problem is detected only after subsequent visits by the patient, triggering further examination by the physician. The cost of delay is a potential worsening in the condition of patient and an increase in the cost of treatment and disability to the patient.

If fee rationing is regarded as politically undesirable for equity reasons, the need for some form of medical screening or <u>triage</u> process by an <u>infirmier</u> becomes compelling. The time of the physician is clearly wasted if much of his time is spent ferreting out those patients for which his services are not truly needed. The inadequacy of time, medical equipment and lab facilities at many outpatient units narrows the comparative advantage of the physician as a diagnostician.

This would not be an easy reform. It would require changes in the attitudes of the medical personnel involved, both <u>infirmiers</u> (nurses) and physicians. The population would have to gain confidence in the judgment

of the infirmier, and in the capacity of the screening process to accurately channel serious problems to the physician or higher level units. This is a reform which runs counter to current manpower policy but, as will be argued in section IV, a reform which is indispensable.

However, these policies are focused only on the congestion problem, which influences the capacity (α^1_{oj}) to adequately diagnose and treat the potential outpatient population. Even in the absence of differentials in the quality of primary outpatient care, the pattern of demand in the rural areas implies equally significant problems for the effectiveness of further referral. The cost to a rural resident of any referral act is inevitably greater than for his counterpart in the urban area. In most rural villages the patient must either travel to the auxiliary hospital or defer the receipt of treatment until the weekly clinic. Ambulances are available only for clearly urgent trauma cases.

Similarly, the referral act will take longer in the rural areas. Diagnostic tests may require the patient to travel to an auxiliary or regional hospital for the test, with the cost in time and income to the patient conceivably significant. For cultural reasons, patients may resist going far from home for diagnostic tests or hospitalization. The time lag between the initiation of a diagnostic decision and the response from the laboratory may take as much as two weeks. In the interim, further medical action is temporarily stalled. It is also contingent on the return of the patient to the clinic. Particularly when the patient is a child or is very ill, this is not always the case. These factors may reduce the effectiveness of the treatment process.[1]

These costs arise in any referral system and are primarily a function of the degree of modernization of the society. In a society with a large rural population, it is crucial that the referral linkages be designed with the pattern of rural demand in perspective. The linkage

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[1] If a patient cannot be expected to return within a period of time to obtain the results of a laboratory test, etc., then any significant time lag in obtaining such results--as may occur if a lab test must be referred to another more distant hospital unit--may render the test irrelevant. Similarly, if the cost to a low-income patient of transporting himself to another unit, either for further tests or hospitalization is prohibitive, then the existence of a referral capacity is irrelevant.

mechanisms for diagnostic referrals that are efficient in the urban areas may not be equally efficient when transplanted to rural areas. This suggests either an increase in the level of services provided at the base levels, through mobile specialist clinics or laboratories, or an increase in the ease with which referral may occur. For example, increased frequency of regular ambulance runs between different levels of the referral system may be necessary.

D. Measures of Allocative Efficiency Within Existing Hospital Institutions

Another determinant of a medical system's effectiveness is the efficiency with which resources are utilized within specific medical units. We have already noted that the significant congestion found at the outpatient level precludes an efficient diagnostic, treatment and screening capacity. Is inpatient capacity used as efficiently as possible? Does it guarantee the maximum productivity of the resources allocated to inpatient care?

To answer this question adequately, one would need conceptually relevant measures of output, such as the change in morbidity status, number of lives saved, or the degree of reduced patient dysfunctionality. These measures could not be obtained easily from existing data.[1] Measures of "failure," such as the number of deaths, are equally unrevealing.[2]

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[1] R. Barlow has suggested a method to estimate the cost of lives saved due to hospitalization. However, this method has too many questionable links in its methodological chain. It uses exogenous medical estimates of the lowered probability of death due to hospitalization for the observed mix of medical illnesses of a hospital. Yet these parameters would be a function of the inputs in the hospital. Moreover, inpatient expenditure not only reduces the probability of death but also reduces the degree of dysfunctionality caused by a disease. To avoid overestimation of the cost of saving a life, one would need to supplement this output measure with a normalized measure of the reduced dysfunctionality due to hospitalization. R. Barlow, "Planning Public Health Expenditures: With Special Reference to Morocco," International Journal of Health Services (1975)

[2] Death statistics in Tunisian hospitals must be regarded with considerable skepticism. Hospital failure cannot be easily imputed, since many cases (particularly children) are brought to the hospital so late in the illness that the probability of an altered prognosis through hospitalization is negligible. Similarly, many patients who are close to death are removed from the hospitals by their families for religious reasons in order to die at home.

Hence, we must rely on more unsatisfactory measures reflecting the utilization of hospital capacity and inputs. Specifically, we shall examine three measures of the utilization of hospital inpatient services: (1) the rate of capacity utilization (CU), (2) the average length of inpatient stay (in days) (ALS), and (3) the average number of hospital admissions per bed (IP/BD).

These are not independent measures. Specifically, the rate of capacity utilization, which measures the degree of bed utilization, is simply the product of ALS and IP/BD, divided by 365:

$$CU = \frac{ALS}{365} \times \frac{IP}{BD} = \frac{\text{Total Inpatient Days}}{\text{Total Bed Days}}$$

Occupation of all hospital beds for a given period would constitute full utilization of capacity. In general, hospitals prefer a CU rate of 80 to 85 per cent, thus allowing flexibility in the event of medical emergencies. The CU actually realized in a hospital is determined by the magnitude and case-structure of the indirect demand for inpatient services, the budgetary constraint of the hospital and the standard of quality desired by the managing physician at the hospital.

Specifically, insufficient outpatients with illnesses requiring hospitalization or negative cultural attitudes toward hospitalization may lead to a low CU rate. Limited budget resources may constrain the feasible number of patients that may be hospitalized at any standard of medical care. This is a frequent problem for hospitals with exogenously imposed fee structures and dependent on a central government budgetary allocation. For example, the hospital may not be able to feed more than a given number of inpatients.[1] Conversely, the physician or government may consciously decide on a standard of medical care which cannot be realized, with the given budget and manpower resources, at a full level of CU. In this case, the budget constraint implies a lower effective bed capacity, at that standard of care. Subject to demand conditions and limited budget resources, the managing physician may set the CU as one instrument to produce desired treatment levels.

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[1]This was offered by the physician in one Tunisian hospital to explain the hospital's low rate of capacity utilization. The annual budget for diet had been based on the previous year's diet expenditure. Since the hospital had lacked a physician in the previous year, there had been few patients hospitalized, and thus historically low expenditure. The past lives on!

Variations in the desired level of CU may be achieved in two ways. First, the managing physician can change the average length of stay for the hospital's inpatient population (ALS). The ALS of a hospital is primarily a function of the mix of cases accepted for hospitalization, since any particular medical problem will necessitate a fairly specific duration of stay for a given standard of diagnosis and treatment. Thus, extreme changes in ALS can be made only by deciding to admit a different case mix structure, with obvious implications for the level of referral. However, physicians have considerable discretion in individual cases, and usually may release a patient a few days earlier or later without severe jeopardy. The decision may be influenced by the ease of ambulatory treatment for the patient, or the socio-economic conditions of the patient's home environment. In rural areas, a physician may be reluctant to release a patient if there is uncertainty concerning access to care, hygienic conditions or food availability. In the urban areas, one would expect the physician to have greater latitude for relying on ambulatory care.

Secondly, the physician may limit the number of patients admitted for hospitalization (IP/BD). If the ALS is medically determined and a given CU rate is chosen, this implies a target level of admissions for a given stock of beds (IP/BD).[1] High levels of ALS reduce the number of potential inpatients. The choice between lowering the ALS or the IP/BD rate will obviously be influenced by the level of demand for outpatient and inpatient care, as perceived by the managing physician. Manipulation of the IP/BD ratio occurs through decisions at the outpatient clinic level to treat on an ambulatory basis or to refer to another hospital facility. Efforts to increase the percentage of cases treated on an ambulatory basis will lower the demand for inpatient services. Hence, the level of demand, measured by the ratio of outpatient consultations to beds, may have an endogenous component. The number of outpatient consultations may be increased due to pressures to substitute ambulatory for inpatient care.

The optimization decision of the managing physician of a hospital is complex. Exogenous forces such as the budget and staff constraint, the specific mix and volume of cases that appear at the outpatient clinics,

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[1] One would expect that the IP/BD ratio is directly correlated with the level of demand for outpatient medical services.

the cultural attitudes of consumers, and the socio-economic conditions of their environment all limit his flexibility and his map of possible decisions. The structure of the cost function for treatment also enters into the decision. In most hospitals, the average cost per day of hospitalization declines with the length of stay, implying that the budget constraint cannot be simply satisfied by setting capacity levels, with ALS and IP/BD completely free to inversely vary. The quality standards imposed by the physician will affect his willingness to trade off quality for quantity.

Several striking differences emerge from a comparison of these variables for the general, regional and auxiliary hospitals of Tunisia (table 23). The CU rate is noticeably lower in the auxiliary hospitals, averaging 59 per cent, with a variance of 21 per cent. Assuming 85 per cent as a norm full capacity rate, the regional and general hospitals are also underutilized but to a lesser extent. Within the latter units, there is considerable variation in the CU rates across specialty medical services. Underutilization is greatest in the services of pediatrics, opthalmology and otolaryngology.

The ALS is noticeably shorter at the lower levels of the pyramid. This is consistent with our finding in part B that the general and regional hospitals have a more complex case mix. For example, in the service of gynecology-obstetrics, the rankings in ALS in table 23 are consistent with the percentages of complicated deliveries in the respective units (table 17). The higher share of cases of stomach ulcer, heart disease, endocrine and urinary illnesses found in the regional and general hospitals might explain the higher ALS in their services of general medicine. The presence of other specialty services would also explain the higher overall ALS for these hospitals.[1]

These differences in the CU rates and the ALS explain the surprisingly small variance in the level of annual admissions per bed.[2] Given

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[1]However, we cannot determine whether the absolute differential in the ALS more than compensates for the differences in the disease mix.

[2]The IP/BD exhibits more variance in the specific services than for the hospitals as a whole, but there is no clear rationale for the latter variation.

Table 23

Indicators of the Cost and Pattern of Resource Utilization in the Tunisian Hospital System

Utilization Variables by Service \ Institution	General Hospitals	Regional Hospitals	Auxiliary Hospitals
Total Capacity Utilization[a] in service of:	.79	.74	.53
General Medicine	.93	.74	.55
Gynecology	.90	.76	.50
Pediatrics	.67	.74	.24
Surgery	.82	.78	.33
Opthalmology	.64	.49	n. applicable
Otolaryngology	.52	.19	n. applicable
Others	.82	.76	n. applicable
Average Length of Stay (ALS) in service of:	11.68	8.85	7.22
General Medicine	14.95	9.42	7.95
Gynecology	3.63	3.91	3.09
Pediatrics	12.15	8.68	8.78
Surgery	13.36	10.03	7.11
Opthalmology	18.44	15.02	n. applicable
Otolaryngology	9.32	5.70	n. applicable
Others	24.98	47.17	n. applicable
Average Inpatients per Bed (IP/BD) in the service of:	24.57	30.59	29.17
General Medicine	22.50	28.52	25.22
Maternity	90.90	70.57	58.66
Pediatrics	19.57	30.97	9.87
Surgery	22.44	28.54	16.93
Given the ALS and a capacity utilization rate of 85%, the maximum (IP/BD) that could be sustained in the hospitals :	26.25	35.05	42.97
Actual Expenditure Data			
Hospital Expenditure/Admission	48.229	37.61	26.69
Hospital Expenditure/Inpatient Day at present capacity level	4.13	4.25	3.70
Hospital Expenditure/Inpatient Day at full capacity (85%)	3.82	3.71	2.56
Hospital Expenditure/Bed	1185.00	1150.50	793.00
Medical Staff Expenditure/Bed	626.00	737.00	277.00
Non-Medical Staff Expenditure/Bed	160.00	136.00	146.50

[a] Capacity Utilization = (total inpatient days)/(365 x Beds)

SOURCE: Ministère de la Santé Publique, Statistiques 1969,1970,1971.

the ALS, a rise in the CU could allow a significant increase in the number of patients admitted. With the present ALS, and an 85 per cent capacity utilization rate, the auxiliary, regional and general hospitals could admit 13.8, 4.5, and 1.75 more inpatients per bed, annually. Quantitatively, this implies 31,350, 13,284 and 8,321 more inpatients at each level, respectively--or a total of 53,000 more inpatients. This represents a 20 per cent increase over the number currently hospitalized.[1]

The determinants of this underutilization may theoretically be explained by a simple model of hospital behavior. We posited the following reduced form relationships for the regional and auxiliary hospitals:

$$CU = f\ (C,O,B,M,\varepsilon_1) \qquad (1)$$

$$ALS = f\ (C,O,B,M,\varepsilon_2) \qquad (2)$$

$$IP/BD = f\ (C,O,B,M,\varepsilon_3) \qquad (3)$$

where C = the total expenditure per bed, O = total outpatient visits per bed, B = total beds, M = the share of medical personnel costs to total costs and where ε_1, ε_2, and ε_3 are the set of error terms.

The cost variable, C, measures the availability of budgetary resources, and is assumed to be exogenously determined by the government.[2] Although one might expect greater resources to allow a higher rate of CU, its division between increases in ALS and IP/BD is less clear and would depend on the preferences of the managing physician. With a rigidly imposed standard of care set by the government and a case mix exogenously presented at the outpatient clinic, one would expect the effect of C to be wholly on IP/BD. In fact, in the case where ALS is exogenously determined by disease mix, equation (2) would drop out and equations (1) and (3) would become identical, with only scalar differences. A test of this hypothesis is possible.

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[1]This obviously assumes unchanged levels of ALS and total expenditure. This magnitude of increase in the number of patients would probably lead to a decrease in the quality of care provided, or to a change in the level of ALS required for effective treatment. Full capacity levels of utilization might slow the treatment process.

[2]In fact, C may be a function of some measure of hospital activity in the previous year. Alternatively, the government may rigidly budget resources to hospitals according to a formula embodying specialty bed mix and scale of hospitals.

The share of total hospital expenditure on medical personnel (M) is a measure of the capacity of the hospital to deliver adequate care. It includes expenditure on all medically related personnel (nurses, doctors, etc.). An increase in M would probably increase CU, but only if the residual [(1-M)C] were beyond a threshold level, ensuring an adequate subsistence and drug budget per bed. For the auxiliary hospitals, an additional variable reflecting the medical staff constraint was measured by the share of physician costs to total costs.

The outpatient variable O measures the level of outpatient demand impinging on the individual hospital. The effect of O is ambiguous. The greater the demand, the more likely the disease mix and quantity of demand will pressure the hospital into increasing IP/BD and CU or decreasing the ALS. On the other hand, a high level of outpatient demand may reflect consumer preference for ambulatory rather than inpatient treatment. In this case, O might enter with a negative sign. From our earlier discussion, O is not completely exogenous to the model, since the pressure of inpatient demand may be reduced by increasing the importance of ambulatory treatment for potential inpatients. Since this fraction of outpatient demand is unlikely to be significant relative to the completely exogenous component, this partial endogeneity probably will not jeopardize the accuracy of our coefficients. Finally, the number of beds, B, is a measure of scale. Small hospitals are more likely to have a different case mix than larger hospitals. This will hopefully capture the effect of these differences.

Our data consisted of observations on all regional and auxiliary hospitals for the years 1970 and 1971. For the auxiliary hospitals, our results are consistent with the hypothesis that the ALS is exogenous.(Table 24) None of the variables were significant in explaining ALS and the correlation coefficient of this equation was negligible. The ALS is presumably determined by the exogenous mix of disease problems presented at the outpatient clinic. The level of patients admitted (IP/BD) is the mechanism through which CU is influenced. The same set of variables influence both the CU rate and the level of (IP/BD). Total costs entered with a marginally positive effect on capacity utilization rates. Both O and M proved negative, though the former was not highly significant. The latter may reflect the higher quality standards of care imposed by hospitals with a larger number of physicians, thus pressuring toward lower CU's.

Table 24

Determinants of the Pattern of Resource Utilization in Auxiliary and Regional Hospitals in Tunisia

Dependent Variable \ Independent Variable	Constant	Total Cost Per Bed[a]	Outpatients Per Bed[b]	Medical Personnel / Costs - Total	Total Beds[c]	R^2	N
Auxiliary Hospitals							
Capacity Utilization	.69* (.18)[d]	+.447* (.226)	-.185 (.129)	-.811* (.359)	.056 (.144)	.120	49
Average Length of Stay	7.23* (3.44)	+.844 (4.110)	-.900 (2.900)	.999 (6.530)	1.650 (2.610)	.031	49
Inpatients per Bed	36.10* (13.34)	24.600* (15.900)	-.910 (9.120)	-62.170* (25.310)	-2.230 (10.130)	.151	49
Regional Hospitals							
Capacity Utilization	.89* (.26)	.186 (.128)	-.226* (.111)	-.506 (.651)		.196	22
Average Length of Stay	33.46* (5.04)	4.010* (2.450)	-.652 (2.110)	-51.200* (12.400)		.606	22
Inpatients per Bed	+49.70* (25.01)	-13.220* (7.600)	-4.190 (6.270)	41.410 (41.930)	-8.030* (2.080)	.422	22

*Significant at 10% level.

[a] in 1000 Dinars

[b] in 1000 outpatients

[c] in 100 beds

[d] standard errors in parentheses

These results confirm the impressionistic views held in Tunisia that an insufficiency of budget resources explains the low utilization rates of the auxiliary hospitals.

Different results emerge for the regional hospitals. Budget resources principally influence the way in which this capacity is utilized, and not the rate of capacity utilization. The more relaxed the budget constraints, the longer the care extended to inpatients, and the smaller the number of IP/Bd. As with the auxiliary hospitals, the level of outpatient demand negatively affects only capacity utilization, and this may reflect the endogeneity postulated above. Specifically, the lower CU reflects the need to treat more patients on an ambulatory basis.

This analysis implies that the pattern of capacity utilization in Tunisia's hospital system accentuates the weight of the higher pyramid levels in the distribution of effective inpatient capacity. Their receipt of a large share of the government's recurrent health budget means insufficient expenditure at the lower levels. This has led to an underutilization of the inpatient capacity in the auxiliary hospitals. One consequence of the differences in the utilization rates is that the effective capacity of rural inpatient facilities is even lower than the stock of beds would suggest. Given the barriers to referral discussed in part B, the probability of adequate care is strongly influenced by the fact of one's residence.

E. The Incidence of Government Medical Expenditure in Tunisia

Which income groups benefit from the government's expenditure on the health and medical sector? Given the magnitude of the government's recurrent health expenditure, it is of importance for policy to evaluate the incidence of this expenditure. We shall examine some equity implications of the government's health program.

Since the government does not obtain information on a patient's income, a precise description of the income characteristics of the inpatient and outpatient populations is unobtainable. An indirect picture may be gleaned from the "payment" status of patients. Specifically, recipients of medical care fall into four groups: (1) families possessing the carte d'indigence, (2) members of the Caisse Nationale de Securité Sociale (C.N.S.S.), (3) members of specific social or occupational groups

(students, police, National Guard, Army, Navy, Public Health Service), and (4) all the remaining households. The first three groups pay only a negligible fee for service. The last group is required to pay for all inpatient and outpatient services.

The recipients of a carte d'indigence are those at low incomes. The precise criterion is an annual income of less than 100 D for the head of a household plus 45 D for each additional member of the household. In an average household of five members, an income of less than 280 D per year would imply eligibility for the carte d'indigence, which allows for free medical care.[1] This would apply to approximately 45 per cent of the families in Tunisia (table 25).[2]

The Caisse Nationale de Securite Sociale is a social insurance scheme that pays for retirement benefits, sick pay, maternity leave, family grants, and free medical care. Seventy-five per cent of the contributions to this scheme are borne by the employer (equalling 15 per cent of the employee's salary) with the residual borne by the employee (5 per cent of the employer's salary). The C.N.S.S. annually pays a lump sum grant to the government in order to reimburse for the government's provision of free health and medical services to its members. Membership is determined by occupational status and industry, and includes students, public sector employees, and workers in industrial and commercial establishments beyond a given size. It also includes salaried agricultural workers on private farms and cooperatives working more than 180 days for the same agricultural employer. Approximately 21 per cent of the population are members of the C.N.S.S. scheme, with approximately 60 per cent of members in the Tunis region.

The average incomes of the C.N.S.S. members by region, are listed in table 25. Nationally, the average annual C.N.S.S. household income was 371 dinars in 1971, reflecting the high proportion of members from the Tunis region. This places all members in the top 60 per cent of the income distribution, and the average member is in the top 47 per cent. The

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[1] A small charge of 50 milliemes, or US $.10 is required of all "indigents" for each outpatient consultation. Inpatient services are free.

[2] It is often claimed that many households ineligible for a carte d'indigence nevertheless obtain one through the use of political connections.

Table 25

Statistics on the National Distribution of Income and of the Incomes of C.N.S.S. Members (Social Security)

Region	Average Salary Per C.N.S.S. Earner in Given Region (1)	Distribution of C.N.S.S. Members Across Regions (2)	Household Income Bracket (3)	Share of Households in Given Income Bracket a/ (4)	Cum. Share of Households in Given Income Bracket (5)	Average Income in Dinars of C.N.S.S. Members in Following Industries (6)	
Tunis	410 dinars	58.8%	<60 dinars	16.5%	16.5%	Commerce	418
Bizete	291	3.9%	60-100	15.7%	32.2%	Industry-Manufacturing	363
Jendouba	281	1.5%	100-150	1.9%	34.1%	Services	345
Beja	277	1.3%	150-200	3.4%	37.5%	Transportation	378
Kairouan	270	.7%	200-250	2.5%	40.0%	Construction	207
Sfax	247	11.0%	250-300	4.6%	44.6%	Agriculture	262
Sousse	342	7.2%	300-350	4.3%	48.9%	Mining	437
Gafsa	418	4.0%	350-400	4.1%	53.0%	Electricity and Water	448
Kef	335	1.7%	400-450	5.6%	58.6%		
Kasserine	303	.4%	450-500	5.2%	63.8%		
Gabes	247	1.9%	500-550	3.9%	67.7%		
Medenine	246	2.4%	500-700	11.2%	78.9%		
Nabeul	206	4.9%	>700	21.2%	100.0%		
Total: Tunisia	371	100.0%		100.0%	100.0%		

a/Average income of households of indigent with 5 members equals 280.

Table 26

Share of Outpatient Consultations Received by Members of Social Security Scheme: 1970

Region	Share of C.N.S.S. Members in Pop. of Each Reg. a/	Share of C.N.S.S. Members of Tot. Outpat. in Given Region	Share of C.N.S.S. Members of Total Outpatients in Given Region at Following Institution: General Hospitals	Regional Hospitals	Auxiliary Hospitals	Dispensaries
INSTITUTES: Total	19.6%	42%				
I.N.S. Enfance	19.6%	65%				
Opthalmological	19.6%	33%				
REGION						
Tunis	51.9%	45%	35%		30%	58%
Bizerte	12.4%	46%	36%	57%	20%	48%
Sousse	12.5%	41%	38%	44%	37%	42%
Sfax	23.1%	26%	30%		21%	37%
Beja	4.3%	21%		28%	11%	23%
Jendouba	5.8%	24%		30%	25%	21%
Le Kef	5.0%	20%		20%	19%	19%
Kasserine	1.9%	30%		33%	27%	31%
Gafsa	11.4%	59%		27%	80%	31%
Medenine	9.7%	20%		10%	24%	20%
Gabes	8.4%	28%		32%	13%	28%
Kairouan	2.4%	19%		25%	16%	15%
Nabeul	14.6%	23%		26%	20%	21%

a/Share of C.N.S.S. members in total population.

Source for Table 25: Ministère de la Santé Publique, Statistiques, 1970.

Source for Table 26: Unpublished data, Caisse Nationale de Securité Sociale, Stolper and Kline, Chapter 8.

member's entire family is eligible for free medical benefits.[1]

From published statistics of the Ministry of Health and the C.N.S.S., we are able to compare the fraction of total outpatient visits accounted for by members of C.N.S.S. with their relative weight in the population of each region (table 26). With the exception of Tunis and Sfax, C.N.S.S. members are considerably overrepresented in the total outpatient population. In particular, there is an even larger share of this group in the outpatient populations of the regional hospitals, which includes the higher cost specialty outpatient services. Whether there is a possible net transfer to these groups is unclear, since the incidence of the social security tax is unknown, and part of this tax ultimately is repaid to the Ministry of Health. Nevertheless, it suggests the possibility of underutilization of health services by other groups. The economic characteristics of all other users cannot be determined. If all other consultations were in the indigent groups, this would suggest they are adequately represented. This is highly probable, in that middle- and upper-income groups are likely to consult with private sector physicians rather than at government outpatient clinics.

Our sample of the inpatient records of selected hospitals allowed us to classify inpatients by payment category (table 27). At the Pediatric Institute, the indigent class appears adequately represented, though members of the C.N.S.S. appear to utilize the Institute disproportionately relative to their weight in the population. This suggests that any displacement that occurs is at the expense of non-C.N.S.S. members of the middle- and upper-income groups. The Opthalmological and Psychiatric In stitutes also are primarily utilized by the indigent class. The former would be expected since opthalmologic disorders are more common among the lower-income groups.

At the other hospitals, assessment of the patient distribution according to payment class is complicated by the absence of proper norms for comparison. The distribution of income by region rather than nation would be far preferrable, since it is the regional population which is the relevant client population. Similarly, without morbidity data income

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[1]From Ministry of Plan data, we assumed an average household size of 5.1 members.

Table 27

Sample Distribution of Hospital Inpatients by Income Category
(Share in Each Category)

Institution & Specialty Service \ Payment Category of Patient	Share of CNSS members in client population of hospitals	Paying	C.N.S.S. Members	Indigent	Students	Others or Unident. a/	Tot	Sample Size
Opthalmological Institute		10%	18%	68%		4%	100%	116
Psychiatric Institute (Razi Manouba)	20.75%	5	9	76	3	7	100	112
Pediatric Institute								
General Medicine		11	43	38	--	8	100	115
Surgery		11	50	34		5	100	109
Habib Thameur General Hospital	Tunis: 51.9%							
General Medicine		15	16	60		9	100	55
Surgery		32	11	46		11	100	59
Pediatrics		15	30	45		10	100	20
Gynecology		24	33	29		14	100	42
Opthamology		n.a. b/	n.a.	n.a.		3	100	41
Otolaryngology		7	36	54		3	100	41
Gastrology		24	17	54		5	100	41
Dermatology		22	22	51		5	100	41
Sousse General Hospital	12.5%							
General Medicine		10	41	29	6	14	100	51
Surgery		16	39	43		2	100	49
Pediatrics		2	32	52		14	100	44
Gynecology		12	40	35		13	100	80
Opthalmology		2	14	76	2	6	100	43
Otolaryngology		2	50	36		12	100	44
Kairouan Regional Hospital	2.4%							
General Medicine			9	89	2		100	54
Surgery		5	7	82	2	4	100	58
Pediatrics		4	16	72		8	100	57
Obstetrics		5	14	68		13	100	56
Opthalmology				96		4	100	25
Gynecology		2	19	75		4	100	53
Dental			6	87	6	1	100	54
Tuberculosis			2	82	9	7	100	55
Kasserine Regional Hospital	1.9%							
General Medicine		4	23	69	2	2	100	48
Surgery		2	13	77	2	6	100	56
Pediatrics			24	76			100	33
Maternity		10	20	67		3	100	51
Auxiliary Hospital at:								
Sbiba			4	96			100	
Feriana		1	17	77	1	4	100	60
Sbeitla			16	82		2	100	73
Thala		3	2	93	2		100	41
Haffouz		2	5	87	3	2	100	133
Sidi Amor			8	92			100	
Hadjeb			9	91			100	
Ouseltia			1	97		2	100	166

a/ Includes personnel of the army, navy, national guard, Ministry of Health, and police.
b/ Not available

Source: Sample of fiches médicales for individual hospital units (see Appendix A).

group, the implications of proportional incidence of hospital utilization is uncertain. (Perhaps the poor should be overrepresented, given the structure of morbidity.)

In general the auxiliary hospitals in our sample regions (Sousse, Kairouan, Kasserine, Tunis) are primarily utilized by the poor, as is the case for the regional hospitals of both Kasserine and Kairouan. The share of the indigent falls sharply for the general hospitals. Both sets of statistics suggest that the hospital population is probably more representative of the local population than of the larger referral or national referral client populations. At the regional and general hospitals, members of the C.N.S.S. scheme clearly overutilize the facilities relative to their shares in the regional populations, except in Tunis, but given the utilization of the poor, any displacement appears to be at the expense of other nonpoor groups.

In general, this analysis suggests that the Tunisian government's health expenditure is yielding significant expenditure benefits to the lower income groups. They are not shut out from the higher-cost, urban hospitals, and thus are consuming medical services at every level of the pyramid. However, our observations on the operations of the system suggest neither that the allocation of these benefits are to those in the greatest medical need, nor that the medical impact of this expenditure is as large as it could be.

IV

Issues in Medical Manpower Policy: 1962-1971

A. The Experiment in Socialization: the Policy of "Plein Temps"

A fundamental technological premise of Tunisia's health policy was that the physician would play a key role in the diagnostic and treatment process. At the inception of the decade, this severely constrained the set of viable policy options for Tunisia. The scarcity of physicians had, if anything, been exacerbated between independence and 1962 by the emigration of many French physicians. The stock of physicians had fallen from 576 in 1957 to a nadir of 417 in 1961. The reduction in the number of French doctors from 329 to 81 contributed to this in no small way. At the same time, more than half of the physicians were based in the Tunis

region; 77 per cent in Tunis and region I. Combining the regional maldistribution of physicians with this technological constraint precluded a rapid expansion in inpatient and outpatient capacity in the short-run (table 28). What policies were chosen to resolve this medical manpower problem?

In July 1962, medical services were available from physicians in the public and private sectors. Recognizing that the option of private medical practice inevitably led to an excessive concentration of physicians in the major cities principally catering to the middle- and upper-income groups, the Tunisian government attempted to force a reallocation of medical manpower by "nationalizing" the medical profession. Initially, this only constituted a requirement that physicians devote three hours per day in public sector medical institutions (the so-called mi-temps (half-time) reform. This quickly was perceived as inadequate, with better care being delivered by physicians to their normal paying clients relative to the mass of the population.

In January 1963, more radical measures were introduced with the requirement that most physicians serve on a plein temps (full-time) basis within the public medical institutions. Only a limited number of hours were allowed for private paying clients (and these were to take place within the hospitals themselves). Home visits by public sector physicians were similarly limited. This reform concerned most Tunisian physicians and all European physicians outside of Tunis or in the public sector. This was approximately 80 per cent of the total stock of physicians.[1]

The rationale for this policy was obvious. The public sector physician's caseload was considerably larger than that of a private sector physician. Reallocation from the private to the public sector would theoretically expand the physician-time available to the mass of the population dependent on the public sector's medical services. In addition, it was hoped that the quality of services would be improved through better

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[1] M. Seklani estimates that 118 of the 576 physicians in 1965 were still engaged either in free practice or half-time during the "plein temps" period. These were primarily Tunisians with private practices installed ten to fifteen years previously, as well as European doctors in Tunis. M. Seklani, La Promotion et la Côut de la Santé Publique en Tunisie (Tunis: C.E.R.E.S., 1968), pp. 104-105.

Table 28

DISTRIBUTION OF PHYSICIANS BY REGION

1962 - 1971

Region	(1) Total Physicians	(2) Physicians in General Medicine	(3) Population per Physician	(4) Population per General Practitioner	(5) Public Sector Physicians Tunisians	(6) Public Sector Physicians Foreigners	(7) Total Physicians	(8) Physicians in General Medicine	(9) Population per Physician	(10) Population per General Practioner	(11) (.70)xPopulation a/ General Public Sector Physician	(12) Population per Paramedical	(13) Paramedic per Physician
Tunis	274	162	2,405	4,074	201	77	387	101	2,912	11,147	20,200	490	5.94
Bizarte	14	9	19,192	29,888	8	33	54	17	5,852	18,582	18,416	812	7.2
Beja	9	5	31,388	56,400	6	16	23	11	12,869	26,909	23,021	1333	9.65
Jendouba	9	6	25,600	38,335	1	17	24	12	11,500	23,000	19,320	1747	6.58
Le Kef	17	14	17,650	21,430	4	19	29	11	11,690	30,800	29,662	1638	7.12
Kasserine	4	3	48,250	64,333	1	9	10	6	22,900	38,000	31,920	1991	11.15
Gafsa	14	11	20,192	25,727	1	30	32	19	11,406	19,157	14,155	1789	6.38
Medenine	8	5	35,537	56,600	3	16	23	17	11,565	15,582	15,458	1574	7.35
Gabes	14	10	14,935	20,900	4	15	17	12	13,176	18,583	19,512	1032	12.8
Sfax	29	14	13,586	28,070	25	34	62	36	7,774	15,970	12,976	1039	7.5
Kairouan	12	8	20,515	30,750	3	17	24	9	12,583	33,533	26,440	1452	8.7
Sousse	45	28	11,648	18,714	33	32	72	42	8,139	13,900	15,750	816	9.97
Cap Bon	22	15	12,700	18,600	19	17	36	23	9,139	14,300	16,440	1123	8.14
Regional Mean			21,046	31,837					10,809	21,997			
Regional Variance			11,875	17,001					4,780	8,466			

a/ There is some overlapping between Tunisian physicians in the private and public sectors.

Source: Unpublished statistics, Ministère de la Santé Publique, Annuaire Statistique 1962 - 1971

utilization and more careful supervision and training of paramedical personnel. Ostensibly, nationalization would also permit a geographic reallocation of physicians, thus remedying regional and urban-rural inequities.[1] The policy ultimately proved a failure. The problems with this policy have been discussed in considerable detail elsewhere, and we will only briefly summarize the key reasons.[2]

First, plein temps strongly aroused the hostility of the medical profession. Public sector salary levels could hardly match that which could be earned in the private sector. The small number of hours allowed per week for paying clients proved insufficient to remedy this. The decline in real income led to a decline in effort and initiative by the physicians affected. Sick leaves, lateness, etc., were common. Physician hostility was also caused by the perceived insufficiency in the complement of paramedical manpower in the hospitals, the inadequate equipment and medical supplies, and inadequate recurrent funding. In their eyes, they were being asked to provide an inferior quality of medical care.

Secondly, although precise statistics are unavailable, it is believed that the plein temps reform stimulated further emigration of physicians, and more importantly, discouraged Tunisian doctors and medical students in training abroad from returning to Tunisia. Hence, the policy further reduced the total stock of physicians below that which would have prevailed under free market conditions.

Thirdly, the government was unable to significantly reallocate

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[1]The advantages expected from the reform were summarized in a 1966 study by the government and included:

"1) de meilleures conditions pour le travail d'équipe des médecins;
2) l'amélioration des soins dans les consultations externes et au lit du malade;
3) le perfectionnement du personnel para-médical en service et la formation professionelle;
4) une meilleure utilisation du personnel para-médical et la surveillance de ce personnel;
5) un meilleur rendement dans les services hospitaliers, des soins de qualité meilleure avec réduction de la durée d'hospitalisation;
6) l'ouverture de l'hôpital à toutes les catégories socials et un meilleur confort pour le malade en générale;
7) le développement de la recherche médicale et scientifique pour le progrès de la médecine tunisienne."

[2]M. Seklani, op. cit., pp. 102-118; also Le Rapport du Conseil de

physicians out of the major urban centers of Tunis, Sousse and Sfax. Whether this was because of conflicting priorities or because of a deficiency of coercive power is not clear. Finally, the plein temps aroused the hostility of the middle- and upper-income groups. Other than the physicians, they suffered the principal loss from the reform. Private medical care was scarce, particularly domiciliary care, by a physician. These groups were also unhappy about the quality of care received in general outpatient clinics, about the conditions in these services, and by the high effective cost to utilization (lengthy queues, in particular).

The combined hostility of these groups and the unwillingness of physicians to participate meaningfully, guaranteed the failure of this reform. As summarized in the Retrospective of the decade:

> L'expérience du plein-temps engagée pendant la décennie n'a pas pu atteindre les résultats escomptés et répondre aux espoirs mis en elle, en raison d'une préparation insuffisante au niveau des structures hospitalières d'accueil, au niveau du corps médicale et au niveau d'une bonne partie de l'opinion publique.[1]

The experience serves as a valuable lesson to other LDCs which believe that the physician problem can be easily solved by "requiring" physicians to serve in the public sector and move to rural areas. Such a policy may require as a precondition a coercive authority unless it gains the voluntary commitment of physicians. A Chinese solution cannot be instituted unless the preconditions are successfully laid.[2]

B. The "Liberalization" of Medical Manpower Policy

The reversal of Tunisian policy in 1969 could have moved in several directions. The principal policy change that was not made was to allow paramedical and auxiliary personnel a greater role in the diagnostic

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l'ordre des Médecins de Tunisie (mimeo), 1966; Gilleo Rossignol, "Les Médecins en Tunisie," in Servir, vol. 1, no. 5 (1969), pp. 32-43.

[1] Ministère de la Santé publique, Tunisie, Retrospective 1962-1971 la Santé.

[2] Peter S. Heller, "The Strategy of Health Sector Planning in the Peoples' Republic of China," in M. Wegman, et. T. Lin, Medicine and Public Health in China (J. Macy Foundation, 1973).

and treatment process. The possibility of limited substitutability between physicians and paramedicals remained strongly excluded. Consequently, the absolute shortage and regional maldistribution of physicians necessarily implied a two-pronged policy of (1) development of a domestic training capacity for physicians (which was begun in 1966) and (2) of importation of foreign physicians to ameliorate current deficits in medical manpower. Foreign physicians could be assigned to any region, thus dealing directly with the regional maldistribution problem, and the only constraining factor was the government's ability to find and hire them.

The long-term manpower policy is implicitly predicated on a model of the supply response of Tunisian doctors. Currently, there are substantial differentials between the incomes earned by an established physician in private practice in the major urban centers relative to that in the public sector.[1] Although there is a three to five year period before a newly established private physician can expect to obtain the full differential, only in the first year might the income be less than the salary of the public sector physician.

Government policy is based on the premise that the expanding supply of newly trained physicians will ultimately outdistance the absorptive capacity of Tunis and the other major urban centers. It is expected that the new physician will experience increasing difficulty in establishing a lucrative private practice in these urban centers. This will lead them to move to those regions and smaller cities lacking private physicians and yet capable of financially supporting a remunerative practice. Alternately, the new physicians will perceive the public service as being sufficiently remunerative and secure and, given the distribution of hospital

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[1]For example, the average full-time doctor in the public sector (at a nonuniversity hospital) can earn from 269 D to 340 D per month (unless they are a Chef de Service, where the range is from 412 D to 461 D). The rate is 405 D to 475 D for a full time physician at a university hospital. Although no comprehensive study has been made, a private sector physician can easily earn, at the minimum, more than this and conceivably far more. In a study prepared for the Ministry of Plan, it has been estimated that the average physician (public and private) received 376 D per month. Since most public sector physicians are below this, the mean for private sector physicians is likely to be higher. The general impression of several private physicians was that income per month could range from 300 dinars for a new MD to 1000 dinars in an established full time general practice, and up to 1200 dinars per month for a specialist. (This is based on the assumption of 20 outpatients per day; at a fee of 1 dinar per consultation for a generalist, 2 dinars per consultation for a specialist).

beds, associated with a reasonable probability of assignment to a congenial urban area. Hence, the expectation is that over time centrifugal market pressures will drive the new medical graduate out of Tunis and Sousse, and into the rural areas. This would also allow the gradual replacement of the foreign physicians by Tunisians over the next decade.

Since the Faculty of Medicine at Tunis has only recently begun to graduate physicians, it is premature to evaluate whether such a strategy has been or will be successful.[1] The latest statistics on private medical practices[2] (see table 29) indicate the trend between 1971 and 1973. Clearly, more than half of new private practices by Tunisians were in the Tunis region. The remaining increases were distributed among Sousse, Sfax, Nabeul and Bizerte, all of which are either major urban regions or congenial coastal areas. Only two private practices were opened in the interior regions. Also worth noting is that there were 45 private European medical practices, 34 of which are in Tunis, which are "replaceable" by Tunisian physicians. However, since the Medical School will soon graduate approximately 80 medical doctors per year, this is not a large stock to overcome.

The government's perception of the medical manpower market also appears faulty. First, the policy presumes that emigration of Tunisian physicians is not a problem. Specifically, Tunisian medical students are receiving a medical education of high quality and rigor. If the marginal alternative for a physician in Tunisia is to practice in a situation which is neither highly remunerative nor associated with reasonable quality service it may be preferable to emigrate. Although the Tunisian and French governments have entered into an agreement to preclude the emigration of Tunisian physicians to France without Tunisia's permission, there are obviously other overseas options available unless they are coercively closed. Hence, the assumption that an expanding supply of physicians will

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[1]Since these graduates necessarily must do a year of internship, and since many opted for further years of residency in a specialty, the major impact of the Faculty of Medicine on the market for physicians is still several years off.

[2]It is extremely difficult to know the percentage of these physicians who are also part-time employees in the public sector hospitals (namely mi-temps practitioners).

Table 29

DISTRIBUTION OF PRIVATE SECTOR PHYSICIANS BY REGION

Region	Number of Private Practices 1971	1972	1973	Change in Total Private Practices (1971 to 1973)	Change in Private Practices by Tunisian Physicians (1971 to 1973)
Tunis	180	201	191	+11	+21
Bizerte	9	10	10	+1	+2
Beja	2	3	3	+1	+1
Jendouba	2	2	2	0	0
Le Kef	3	3	3	0	0
Kasserine	0	0	1	+1	+1
Gafsa	2	1	1	-1	0
Medenine	5	6	6	+1	0
Gabes	3	3	3	0	0
Sfax	22	22	24	+2	+3
Kairouan	2	2	2	0	0
Sousse	19	22	25	+6	+4
Cap Bon	3	4	9	+6	+6

Source: Unpublished statistics, Ministère de Santé Publique, Annuaire Statistique 1962-1971

force a filtering-down of physicians to the deficient regions may not be justified.[1] At the minimum, this alternative option may necessitate granting additional incentives (financial or otherwise) to attract physicians to these areas.

Secondly, it is not clear how the public planners perceive this diffusion process occurring, as between the public and private sectors. The present fee schedule prescribed by the government for visits to private physicians is likely to be beyond the financial capacity of a substantial fraction of the population for many years to come. It is questionable whether many regions will have urban centers large enough and with sufficient financial capacity to support the private practice of a physician unless he is also employed by the government on a mi-temps basis.[2] Hence, in many areas, the diffusion process that occurs in the private sector will largely leave the lower- to middle-income groups excluded on a financial basis from the additional medical services. In other words, it is not clear whether many districts can financially support a physician at a level above his likely opportunity cost. Simultaneously, the major urban regions are by no means saturated with physicians and their density of physicians compares unfavorably with that in developed countries. Rising incomes may support an expanded demand for medical services and the influx of new physicians may be absorbed entirely within these high growth areas. This is likely to be supported by inequalities in the rate of regional economic growth. Hence, one may envision a further widening in the regional differentials in doctors per capita.

Thirdly, it is questionable whether the public sector itself will

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[1] In effect, the government has recognized this in the report of the National Commission on Health: "Cependant la formation medicale actuelle du profil très fin ne permet pas d'espérer dans un moyen terme une installation, voluntaire de cafres spécialisés dans ces zones [rurales] et que de surcroit, les formations régionales et de circonscription n'ont pas les équipments et moyens de fonctionnements nécessaires, de nature à constituer un environment technique et scientifique adéquat pour une activité rentable de cadres spécialisé. République Tunissienne, Commission Nationale de la Santé, La Santé: Perspectives 1973-1981 IV Plan 1973-1976 (Dec. 1972), p. 7.

[2] This also stems from the low density, highly dispersed character of the population in many districts. High transport costs would render private practices in these areas less than profitable.

contribute to an expansion in the number of physicians, particularly in the medically deprived areas, at least within the next five to ten years. Three factors are important:

1) Although the Faculty of Medicine has graduated classes of medical doctors since 1970, there is a long lead time before these will begin to expand the supply of practicing physicians. Of 80 graduates, half are likely to pursue further specialty study in France for four to five years. After a year of internship (which must be in a major university or general hospital in Tunisia), perhaps half of the remaining forty will go into private practice, twelve will work mi-temps for the government and eight plein-temps. Hence, excluding the possibility of emigration, it will be a minimum of five years before the supply begins to expand at a rate of more than forty per year (twenty per annum in the public sector).

2) In 1973, there were 332 foreign physicians in the public sector (of which 175 were in Tunis and region I). It can be presumed that over the first eleven years the absorption of new Tunisian graduates will coincide with the replacement of these foreign doctors (particularly the substantial contingent of East Europeans). Although the Tunisian doctor is likely to be better trained than his East European counterpart, total supply will not be incremented. Since the new graduates will have their choice of public sector postings, the substitution of Tunisians for foreign physicians in the backward areas will proably occur only at the tail end of the next decade.

3) The number of physicians employed in the public sector cannot exceed the number of posts approved by the Civil Service and the Ministry of Finance. Although the Minstry of Health's ability to find qualified physicians to fill these posts is one limiting factor on the number of posts allotted, an independent budget constraint imposed by the Ministry of Finance is also critical. Since the cost of each physician is from 4000 to 5000 dinars per annum, this budget constraint will probably preclude as rapid an expansion in posts as may be desired by the Ministry of Health.

Briefly, several supplemental policies may be suggested given the trend of current policy. First, greater emphasis could be given to the hint in the Plan Perspectives of a policy of "la démedicalisation de certains acts à definir." Greater latitude could be given to the infirmier

(nurse) to legally diagnose and treat certain cases. This is not a novel suggestion, but it would clearly be a significant policy change in Tunisia. This would require changes in curriculum, retraining courses and a complete reorientation as to the role of the infirmier, both in the eyes of the infirmiers themselves and the mass of the population. The arguments for such a policy are several.

It is likely to be the only way in which a greater medical competence will, in the foreseeable future, be extended to the rural areas. The urban-rural dichotomy in the availability of doctors is striking. In table 21 we examined seven regions, indicating the district population associated with specific regional or auxiliary hospitals, and the ratio of doctors per capita in each. The disparities between the noncapital districts are considerable and an expansion in the stock of physicians in these areas is unlikely for the reasons outlined above. Since the infirmiers are, in fact, shouldering much of the present responsibility for many medical actions, such a policy would resolve what is de facto a presently untenable situation for the infirmier. The infirmier would be freed from the legal and attitudinal straight-jacket which suggests that there is a large sphere of health actions that can only be performed by a physician.

It would also reduce the cost of delivering primary health care services to a significant degree. Also, reliance on foreign physicians is an unsatisfactory solution. The language barrier constitutes a considerable burden as translation proves an inefficient use of physician time. Moreover, it is difficult for a Bulgarian serving a one or two year term of service to fully understand the causes and problems of disease in a different culture, and the appropriate means of treatment. This compounds what is already a difficult problem in locating physicians to serve in these areas. Finally, considerable sentiment exists among international health care planners that there is considerable inefficiency in the present use of physicians. Many of their present activities could be easily delegated to well-trained auxiliaries, with a resulting improvement in the functioning of both types of manpower.

Given the current reliance on a market strategy, a second policy might be an increase in the wages of public sector doctors in the rural areas in order to provide greater incentives for rural service. Subsidies

to physicians locating private practices in the rural areas is another option, with the subsidy graduated according to the priority attached to the area. In effect, such differential wage payments are presently being made to the foreign physicians.

Third, the government could tighten its requirements for compulsory service by newly graduated physicians. Present requirements are generally perceived to be easily avoided. This type of compulsory service or bonding is commonly used in other LDCs and could assure a minimal expansion in the stock of Tunisian physicians in the rural areas. Such a policy would obviously require a tightening of controls over the emigration process.

V

Conclusion

The thrust of our empirical analysis is consistent with this book's central argument. Tunisia has failed to achieve the maximum productivity possible from its investment and recurrent expenditure programs. In the medical sector, a complex network of urban and rural hospital and health institutions has been established, representing a significant achievement when compared with the efforts of many other developing countries. The benefits of the government's financial effort in the health sector has not only accrued to the wealthy; the poor are a significant fraction of the consumers of any hospital services. Yet a more detailed analysis of the operating characteristics of the system tarnishes this luster. We found that the nominal and effective capacity of these institutions differ, and that the way in which capacity is used is often inefficient and underproductive. The rural poor have far less effective access than the poor of urban areas to highly specialized medical services.

The primary inpatient and outpatient care services appear as the principal bottlenecks to a higher level of productivity for the medical system as a whole. Auxiliary hospitals operate at a low level of inpatient capacity utilization, thus narrowing the breadth of the medical pyramid at one of its critical base-level institutions. Primary outpatient clinics are heavily congested. Patients who are seriously ill may never reach the clinics, and if they do, must compete with the "faux malades" for the

limited available time and services of the medical staff.

If the system is congested and inefficient at the base level, the effectiveness of the entire referral system is also affected. Higher level institutions cannot be treating the set of patients most in need of their complex services, if these patients are unable to obtain effective entry into the medical system. Thus, despite evidence that the Regional and General hospitals are treating more complex medical problems, we still may infer the likelihood that the case-mix is not optimal relative to the demands on the medical system.

The obstacles to expanded primary care capacity are financial only to a limited degree. The cost of upgrading the quality of the auxiliary hospitals and dispensaries would involve less than a ten percent reallocation of the budget, or alternatively the level of the annual increment to the Ministry's budget over a couple years. This would allow a higher utilization rate in the auxiliary hospitals, which is one possible way of deepening the effective level of primary inpatient capacity.[1] However, given the shortage of medical manpower, basic and realizable technological changes in the medical delivery system of outpatient services are likely to have a more profound effect on productivity than additional financial resources. As we argued in Section IV, a triage system involving substitution of paramedical for medical manpower could sharply increase the diagnostic and treatment capacity of the outpatient system. It would winnow the "faux malades" while improving the standard of care to those in need of medical services. Moreover, this change would not only improve the productivity of the referral pyramid at the base, but also at the higher levels.

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[1] Qualitative improvements of the auxiliary hospitals may not be desirable in all cases. Some auxiliary hospitals are so small -- less than forty beds -- that they may simply be uneconomic.

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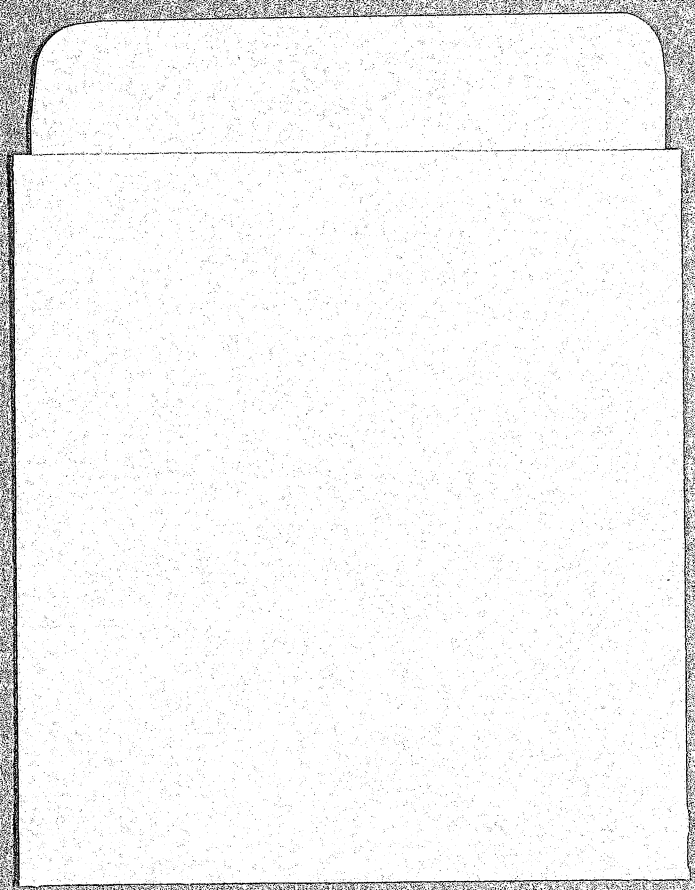

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