

HOSPITALIZATION RELATED TO ISA TOWN HEALTH
CENTER VISITS IN BAHRAIN

By

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A Thesis presented in partial fulfilment of the
requirements for the degree of Master of Sciences

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May, 1977

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MINISTRY OF HEALTH
Date Received: 4.3.82

CHAPTER I

INTRODUCTION

The State of Bahrain consists of an archipelago of small, low-lying islands situated about half way down the Arabian Gulf, some 15 miles from the Saudi Arabian coast. The country with an area of 256 square miles and a population of 255,967 inhabitants (1975 estimate) is one of the most densely inhabited countries of the Middle East.² Over two thirds of its population live in urban areas.³

Faced with a rapidly growing population (rate of growth 3.6% in 1971 census) of whom 46 per cent are below the age of 14 years, the government of Bahrain is increasing its efforts in providing adequate health services to the people. About one fifth of the national income is spent on health.³ Its main concern is in overcoming the barriers to optimum health among the poor, and in reducing the demand for hospital utilization. The hospital admission rate to private and government hospitals was 92 per thousand in 1975, with an average length of stay of 10.6 days in the government hospitals.² For comparison some hospital utilization rates reported from other countries are given in the following table.

TABLE 1
HOSPITAL UTILIZATION RATES IN SELECTED COUNTRIES^a

Country	Hospital Admission Rate Per 1000 Population	Average Length of Stay in Days
United States	170	8
United Kingdom	112	11
Yugoslavia	100	14
Lebanon	63	13
Jordan	39	..
Tunisia	54	..
Quatar	211	..

^aReferences 4, 5, 6

One of the recent developments in the health care field in many countries has been the widespread diffusion of health centers as a system for delivering ambulatory care.⁷ Geiger⁸ has described this system as "an attempt to identify and deal with the real problems of health care, to provide the full range of preventive and curative services in the community, breaking all the traditional barriers to access: distance, time, cost, fragmentation, impersonality and indignity. It represents a shift ... into the community where the people, the problems and the needs are." The health-center system was also thought to be an effective way of reducing the demand for hospital utilization. The availability of facilities, would tend to reduce the need to hospitalize patients for diagnostic purposes, and would promote

early disease detection thus preventing conditions from becoming serious enough to require hospitalization.^{9 to 12} The concept of a health center that would provide a wide range of services ranging from ambulatory medical care for common illness, preventive control and treatment of disease, maternal and child health, school health, environmental sanitation, and health education, has gained increasing importance in developing countries.¹³ Differing slightly in objectives, scope of services and organizations, a significant number of health centers have been established in Egypt, Ethiopia, Iran, Iraq, Lebanon, Syria, and Saudi Arabia.^{13 to 18}

In 1975 Bahrain had thirteen health centers in operation. During that year, a total of 1,137,000 patients were seen at these centers, of whom ten percent were coming for the first time.² Additional care is provided within these centers by eight child welfare clinics and four school health clinics. The plan is to have twenty health centers available by 1980. Most of these, will be staffed by general practitioners, dentists, nurses, sanitarians, pharmacist, clerks, and equipped with laboratory and x-ray facilities. These would provide comprehensive basic health care (child welfare, antenatal and school health care) that is family centered. What would be the impact of these centers on the health status of the community, and how this would affect hospital utilization, remains to be seen.

In November 1968, the government of Bahrain inaugurated Isa Town and its health center. The town with an area of 10.000 square acres, is five miles to the South of Manama, the capital city of Bahrain. Its estimated population in 1976 was about 15.000 persons. As would be expected of a new town, the population of Isa Town has a young age structure; 32 percent of that population are below the age of ten years, and 61 percent are below twenty years, as compared to 30 and 54 percent respectively for the nation as a whole. About 90 percent of heads of households are employed in non-professional occupations, and half of the population earn 100 Dinars or less per month. There are four schools in the town, two for juniors and two for seniors. About 92 percent of primary and intermediate school age children in the population, attend school.¹⁹

The Isa Town health center is the only health facility serving the area. It is staffed by two physicians, one dentist, nine nurses, one sanitarian, four laboratory technicians and two clerks. It offers a wide range of health services, including medical, dental, nutritional, immunizational, educational, family planning and sanitation, as well as virtually complete laboratory services.²⁰ The health center is open daily except on Fridays, from 7 A.M. till 1 P.M., and from 4 P.M. till 7 P.M. Patients living in Isa Town and requiring hospitalization, can be admitted to the three government hospitals only after being referred from the health center. Both, the health center and the government

hospital services, are provided free of charge by the government.

Several studies of health center impact on hospital utilization have been published, but very few of these were done in developing countries. These studies, have given contradictory results. Thus in 1969, a study of the Tufts Neighborhood Health Center at Columbia Point in Boston, has demonstrated the potential effectiveness of the health center in reducing the demand for hospital beds.⁹ While the opening of the Bunker Hill Health Center in Charlestown, Massachusetts in 1974, has resulted in a 56% increase in hospital admissions in that population.²¹ Because of such conflicting results, the present study dealing with the impact of the Isa Town health center on hospital utilization in Bahrain, may give further insight in the planning of health care facilities in that country.

With the increased demand for health services, the increased cost of hospitalization, and the insufficient supply of hospital beds, the system of the health center has gained universal acceptance. By its diagnostic facilities, and by treating illness early enough, this system is thought to decrease the need for, and the use of hospitals; accordingly, patients who use the Isa Town health center frequently are not as likely to be hospitalized as those who use it less frequently. Conversely, patients living in Isa Town and hospitalized in the three government hospitals after being referred from the health center, are expected to have used the health center facilities significantly less than a comparison

group of patients who have not been so hospitalized. The present study, covering the one year period August 1, 1975 to July 31, 1976, was undertaken in order to test this hypothesis.

CHAPTER II

A SELECTIVE REVIEW OF THE LITERATURE

Anderson²² found that hospital utilization was widely studied in the United States mainly because of the rising expenditures for hospital care and the increasing demand placed on these facilities by the population. Several indices were used to measure hospital utilization, some of which are:

1. The in-patient admission rate.-- This is defined as the number of hospital admissions per thousand population per year. An in-patient admission being the acceptance of an in-patient by a hospital and always involves the allocation of a hospital bed. If after discharge an in-patient presents himself for admission at a subsequent time, this is another admission.²³

2. The average length of stay.-- This is defined as the total number of in-patient days in the year, divided by the number of admissions during the year.²³

Rosmer²⁴ viewed the factors determining hospital utilization, as a convergence of three forces involving the patient, the physician, and the hospital.

A. Factors involving the patient

1. Predisposing factors

a) Cultural and demographic characteristics

2. Enabling factors

a) Distance between place of residence and the health service

b) Cost of medical care

B. Factors involving the physician

1. The supply of physicians and their qualifications
2. The method of medical remuneration
3. The nature of community medical practice

C. Factors involving the hospital

1. The supply of hospital beds
2. The availability of alternative bed facilities
3. The availability of out-patient departments
4. The availability of health centers

According to Feldstein²⁵ the level of hospital use in any period of time is determined by the interaction of two sets of conditions; the factors affecting the demand for hospital services and the factors affecting the supply of these services. He further adds, that the demand for hospital services is a combination of the patient's demand for medical care, and the physician's demand for the components of care that he decides to use in caring for the patient.

According to Feldstein, the demand for hospital services is determined by two factors: the patient's demand for medical care and the physician's demand for the components of care that he decides to use in caring for the patient.

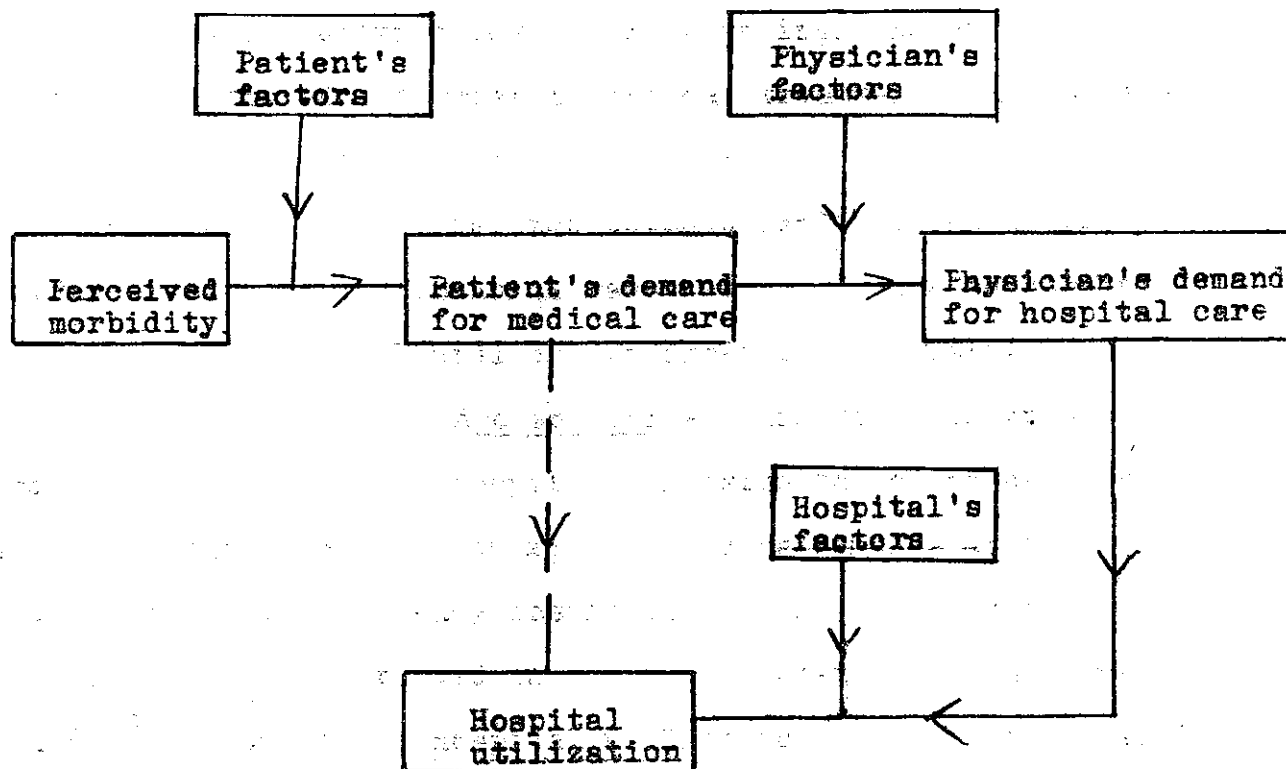
The patient's demand for medical care is determined by the patient's health status, the patient's knowledge of the health care system, and the patient's financial resources.

The physician's demand for the components of care that he decides to use in caring for the patient is determined by the physician's knowledge of the health care system, the physician's financial resources, and the physician's professional judgment.

The interaction of these two sets of conditions determines the level of hospital use in any period of time.

FIGURE 1

FACTORS DETERMINING HOSPITAL UTILIZATION

A. Factors Involving The Patient1. Predisposing Factors

Feldstein²⁵ and Klarman²⁶ summarize the patient's

demand for medical services as the result of three conditions:

(1) The patient's physiological condition, or his need for medical care as believed necessary by medical authorities; (2) The patient's perception of his own illness; (3) The patient's attitude towards seeking medical care. Since these factors can seldom be measured directly, specific population characteristics;

such as age, sex, marital status, family size, and education are substituted as indicators. The relation between the perception of illness and the demand for hospital care is affected by variations in disposition towards risk-taking, and differences in belief in the effectiveness of medical treatment. An increase in information about the apparent benefits of hospital care would help reduce the difference between need and demand for medical treatment, if financial resources are not a constraint.¹⁹

a) Cultural and Demographic Characteristics

(1) Age and sex.-- According to Anderson,²² Cordle,²⁷ and Lazarus,²⁸ hospital admission rates and average length of stay increase with age, excluding females 15 to 44 years, an age group which has many hospitalizations for deliveries. The same findings were reported in the United States Health Survey in 1966.²⁹ Altogether, hospital utilization was higher in female's than in males.^{27,28,30} Feldstein²⁵ found that hospital care expenditures are approximately the same for both sexes in the early years of life, later on the expenditures incurred by women exceed those incurred by men, mainly because of obstetrical charges. The difference persists however far beyond the normal child-bearing age. The highest rate being for separated, (135, 72, and 153/1000 respectively).²⁹ On the other hand, unmarried persons were found to have a longer average length of stay in the hospital as compared to married persons, (10.4 and 7.6 days respectively)

TABLE 2

HOSPITAL UTILIZATION RATES BY AGE AND SEX

Authors	Age in Years				
	Under 15	15-44	45-64	65+	All Ages
United States Survey (Cases per 1000)					
Male	60	66	108	135	78
Female	51	177	111	125	121
Both sexes	56	124	109	130	100
Gordle (Admission rate per 1000)					
Male	70	34	72	118	56
Female	67	146	63	88	101
Lazarus (Average days)					
Male	..	8.3	16.2	20.2	..
Female	..	12.7	26.8	20.7	..

(2) Marital status.-- Hospital admission rates were higher in ever-married as compared to never married persons. The highest rate being for separated, (135, 72, and 153/1000 respectively²⁹). On the other hand, unmarried persons were found to have a longer average length of stay in the hospital as compared to married persons, (10.4 and 7.6 days respectively).³⁰

(3) Family size.-- Roemer³¹ found that the high hospitalization areas (311 cases per 1000 per year) include larger families than the low hospitalization areas (140 cases per 1000 per year). However he found no striking utilization differences between high and low areas in any family size group.

(4) Family income.-- Income not only affects a person's decision to seek medical care, but also the extent of the care, or the length of his stay in a hospital once treatment is undertaken.³² The rate of persons with hospital episodes was found to be inversely related to the amount of family income.³⁰ Richardson³³ found that the discharge rate among families with income below the poverty line of \$ 3,000 was 15.7/100, as compared to 10.7/100 for persons whose family income is \$ 10,000 or more. He points out that these higher rates are reflecting a tendency for the poor to seek medical attention only when the medical condition has reached an advanced stage necessitating hospitalization. The corresponding values given in the United States health survey for similar income level, were 107 and 89 cases per 1000 population respectively.²⁹ Anderson²² specifies further that the income level of a community is a determinant of the health services available to that community, and that due to the inadequate ambulatory care available to the poor, these persons more often use hospital in-patient services as a substitute. Feldstein²⁵, pointing at the difficulties present in separating the economic factors from the other cultural and

demographic factors, states that "families with higher incomes have higher expenditures for medical care; but the percentage of income spent on medical care decreases with higher levels of income."

(5) Education.-- Rosenthal³⁴ found that education is positively associated with admission rates and with length of hospital stay. He interpreted this as indicative of an increased awareness among the more highly educated of the importance of seeking prompt medical treatment. Anderson²² however found that education has no effect on admission rates, and that the association is spurious and results from the fact that both education and admission rates are correlated with the availability of health services. Income increases markedly with education, and hospitals are more likely to be located in areas where the population is better educated and where resources are available to support various health services.

(6) Urbanization.-- Rosenthal³⁴ found that urbanization had no effect on admission rates, but that average number of bed days is lowest in urban areas; probably reflecting the fact that persons needing medical assistance in these areas have a diversity of health services available to them in addition to hospitals. Cordle²⁷ however found that the highest hospital admission rates were for residents of the urban areas of Charlestown (95 cases per 1000 compared to 84 cases per 1000 for rural areas). Anderson²² found similar results in New Mexico,

but he further added that urbanization is related to education, income levels, and housing conditions. Urban population having a greater number and variety of health services available to them. He also noted that hospital utilization rates are higher in rural areas, if the residents are insured; if not, it is higher in urban areas.

2. Enabling Factors

(a) Distance Between Place of Residence and the Health Service

Mellsep³⁵ in 1969 found that the hospital admission rates to Ballarat Mental health facilities decrease with increased distance between the patient's residence and the hospital, particularly beyond fifty miles. Among the total cases referred to this hospital, 7% were living at a distance of 100 miles or more and 26% were living at a distance of less than 50 miles. It was also found that the nearer the hospital, the shorter will be the duration of hospitalization. Hassinger³⁶ in 1973 found that some latitude may exist in the location of health services without affecting the level of utilization of these services. He continues, "our data ... support the feasibility of providing services to wider areas from centrally located health service centers ... However, it should be recognized that with centralization, distance is a cost which is unevenly distributed among clients. Access mechanisms including transportation ... should be a consideration in planning for rural areas."

b) Cost of Medical Care - Insurance Benefits

Concern over the rising costs of medical care and the search for ways of controlling these costs, without sacrificing the quality of care, have stimulated a variety of activities. One of which was the development of a health insurance scheme.³⁸

According to Feldstein²⁵ insurance benefits will have two effects: (1) It reduces the overall price of medical care to the patient with insurance, hence increasing his consumption of medical care services. (2) It causes components of care that are covered by the insurance, to be substituted for those that are not. Thus we can look at two situations; one in which insurance benefits are limited to in-patient care, and another where insurance benefits cover both in-patient and ambulatory care.

(1) Insurance benefits limited to in-patient care. According to Somer²⁹, unrestricted availability of hospital beds together with guaranteed payment, would tend to increase hospitalization. In the United States, the admission rate for persons with hospital insurance benefits was 130 per thousand as compared to 100 per thousand for the uninsured.²⁶ It has been suggested that the benefits provided by some insurance programs, whereby the subscribers are eligible for benefits only when they are in-patients, produce unnecessary hospitalization. "The fact that those covered by health insurance are admitted to hospitals for tests or treatments that could be

done outside institutions, so that charges can be covered by their insurance, is acknowledged, but the extent of such unnecessary hospitalization has not been documented accurately."³⁸

(2) Insurance benefits extending to ambulatory care.--- The common belief

was that insurance benefits extending to ambulatory care would reduce costs for hospital services, by reducing the need for hospitalization. The absence of financial pressure to hospitalize patients for diagnostic services when medical services outside the hospital are insured, would be the responsible factor for such a reduction.³⁹ Lewis and Keairnes³⁸ conducted a study to test this hypothesis. Special benefits were provided without additional charge to a randomly selected group of 5000 subscribers of a hospital insurance plan (Blue Cross or Associated Hospital Service of New York). These benefits covered the costs of diagnostic and treatment services outside hospitals. The experimental benefits however did not affect hospitalization: no significant reductions were noted in admissions and days of stay among the experimental and two control groups. Steep⁴⁰ and Densen⁴¹ found that the inclusion of out-patient diagnostic benefits does not have a reducing effect on the frequency of in-patient admissions. Roemer⁴² compared four types of health-insurance coverage in Saskatchewan and concluded that increasing the benefits for care outside the hospital was associated with rising rates of hospitalization. He attributed this to a sequence of increased use of physician services, with subsequent greater

probability of the detection of any abnormality, followed by hospitalization. Broide⁴³ showed that prepayment alone independently from group practice, resulted in a significant increase in both in-patient and ambulatory care utilization. Peterson⁴⁴ found that members enrolled in the Columbia Medical Plan, a prepaid group practice and entitled to ambulatory and hospital care services, showed an "impressively high ambulatory care utilization" and a low use of hospital in-patient services. There were 335 hospital days per thousand members per year, roughly one third of the national average of 1000 days per thousand population. Enrollees on the other hand, had a history of more frequent hospital use and greater frequency of current health problems than did nonenrollees.

B. Factors Involving The Physician

1. The Supply of Physicians and Their Qualifications

Roemer²⁴ found that up to a certain limit, a greater supply of physicians in relation to population will yield more medical care and more hospitalization. A low supply of physicians may on the other hand increase hospital admission, overloaded physicians hospitalizing patients as a time-saver.³¹ The Health Insurance Plan studies²⁶ have raised the question whether high hospital use may not signify a failure of the physician to diagnose or treat properly medical conditions. The ultimate criteria of the quality of care is provided by the medical status of the patient, but the physician qualifications

are also an important index.

2. The Method of Medical Remuneration

The system of payment of physicians for their services may create incentive for or against hospital utilization.²⁴ The suggestion is that physicians paid fee for service are more likely to hospitalize patients than physicians paid a salary by the medical group.²⁶ The former system (fee-for service) according to Roemer⁴² creates some economic incentives for hospital admission since prepaid fees are received only for in-hospital services.

Densen⁴⁵ comparing the hospital utilization of two matched populations under two different insurance plans found, that the admission rate for members under the Group Health Insurance Plan of Greater New York (GHIP) - a fee for service solo practice plan - is higher (88.3 per 1000) than the rate for members of the Health Insurance Plan - a prepaid group practice plan - (70.2 per 1000).

3. The Nature of Community Medical Practice

Klarman²⁶ and Roemer²⁴, both believe that the possibility of diagnosis and treatment of patients in private offices or in group medical clinics for various conditions, would influence hospital utilization.

Falk⁴⁶ pointed to the presence of large, well equipped clinics at the Kaiser Foundation Health Plan, which reduce the need to hospitalize patients. Roemer and Shain²⁴ observed that

solo practitioner is unable to perform all necessary services in his office; by admitting a patient to the hospital, he can sometimes obtain help without losing the patient.

Perrot⁴⁷ comparing hospital utilization rates for members of group practice insurance plans (Kaiser Foundation Health Plan, HIP, GHIP) with members of solo practice insurance plans (Blue Cross - Blue Shield, Indemnity, Employee Organization)

found the lowest rates among members of group practice plans.

Hasting^{48,49} found that members of a prepaid group practice plan had 25% lower hospital utilization rates than members of a fee-for-service solo practice plan.

Densen⁴¹ however found no difference in the hospital utilization rates of persons under group practice plan as compared to persons under solo practice plan.

It can not be known whether the differences observed are a result of the organization of the medical practice or of the method of physician's remuneration, since these two factors frequently vary together.

The number of beds have materially influenced the practice of medicine. Anderson²² found that an increase in one bed per 1000 population resulted in an increase in the admission rate of 21 persons per 1000.

The discharge rate per 1000 in the United States was 38.5 in hospitals with less than 10 beds, and 23.7 in hospitals with more than 100 beds. Average length of stay was also lower

TABLE 3

HOSPITAL UTILIZATION FOR PERSONS UNDER DIFFERENT INSURANCE PLANS^a

Solo Practice	Hospital Days per 1000
Blue Shield - Blue Cross	826
Indemnity	708
Group Practice	
Kaiser Foundation Health Plan	350
Hospital Insurance Plan	445
Group Health Insurance Plan	459

^aReference 47

C. Factors Involving The Hospital

1. The Supply of Hospital Beds

The ratio of beds to population in an area sets the top limit on hospital utilization.²⁴

Roemer⁵⁰ found that a sudden increase in the supply of hospital beds in an Upstate New York General hospital, resulted in a prompt rise in hospital utilization for most diagnosis. The number of beds have materially influenced the practice of medicine. Anderson²² found that an increase in one bed per 1000 population resulted in an increase in the admission rate of 21 persons per 1000.

The discharge rate per 1000 in the United States was 38.5 in hospitals with less than 100 beds, and 95.7 in hospitals with more than 100 beds. Average length of stay was also lower

in hospitals with less than 100 beds (6.6 days) compared to hospitals with 500 beds or more (10.8 days).⁵¹ Rosenthal³⁴ holds that this observed correlation is explained by the fact that beds have been built in areas where the combination of population characteristics have created a demand for them. Demand for and supply of hospital beds arising from the same underlying causes.

TABLE 4

HOSPITAL UTILIZATION AND BED SUPPLY^a

	Number of Admissions	Average Stay	Patient Days
1957	5800	6.9	39,500
1958	Bed Expansion = 2.8 to 3.8 Beds per 1000 Population		
1959	6400	7.3	47,500
1960	6700	7.5	50,600

^aReference 50

2. The Availability of Alternative Bed Facilities

The degree of development of nursing homes, homes for the aged, organized home care program may influence the utilization of hospitals, by diverting persons with long-term illness to the alternate facilities available.²⁴ These facilities can also help greatly to reduce the number of days spent in the hospital, by assuming responsibility for the

supervision of the post-hospital convalescent care of patients no longer requiring intensive hospital care.⁹

3. The Availability of Out-Patients Departments

The rate of hospital admissions is influenced in part by the availability of diagnostic and treatment services for out-patients.²⁴ The reduction in hospital admissions depends on the extent to which new developments equip health care practitioners with more effective treatment procedures.⁹ Roemer⁴² believes however that these factors present in the out-patients departments will not reduce hospital utilization but will increase it as a result of increased detection of illness. Lovejoy⁵² found that 2.5% of the hospital admissions are unnecessary and 16% are of doubtful necessity; he further adds that since most of these admissions are for diagnostic purposes and do not require in-patient services, an increasing role for out-patients services is seen.

4. The Availability of Health Centers

In 1969, Bellin and Geiger⁹ studied the impact of the Tufts Neighborhood health center, in Columbia Point in Boston, on the demand for hospital beds. The community had a very large pool of medically unattended health problems. Data on hospital utilization were obtained for a sample of 908 residents at Columbia Point from the medical records at Boston City Hospital and the medical billing records at the Boston City Welfare Department. Hospital utilization rates were calculated

for the 12 months before the opening of the Health Center and for the first and second year after its operation. The results showed a reduction in the number of annual hospital admissions from 69 to 41 to 11 over the three years. A similar reduction in total bed days was observed. For this reduction to be credited to the Center, the following alternative explanations had to be ruled out. (1) The possibility that a general decline in the frequency of illness and injury coincided with the establishment of the Center. (2) The possibility that the decline reflects a change in the site of hospitalization rather than a true drop in the demand for hospital beds.

One year later, Klein and Roghmann¹¹ studied the impact of the Rochester Neighborhood Health Center (RNHC) on the hospitalization of children between 1968 and 1970. Two areas were compared; the target area with the health center operating as a comprehensive, multispecialty group practice and a comparison area with a similar population but served by five general practitioners and a health department using part-time physicians. Data on hospital utilization were obtained from the records of the Strong Memorial Hospital (SMH) and the Genesee Hospital (GH) for the base year 1968 and the first two operational years of the Health Center, 1969 and 1970. The results are shown in Table 5.

TABLE 5
HOSPITAL UTILIZATION BEFORE AND AFTER THE OPENING
OF THE RNHC BY AREA AND BY
RNHC USER STATUS^a

	Admissions per 1000			Hospital Days per 1000		
	1968	1969	1970	1968	1969	1970
Comparison Area	36.4	40.4	38.8	197	307	326
Target Area	50.8	58.6	52.8	295	469	364
RNHC Users	-	49.4	32.8	-	346	184
RNHC Non-Users	-	60.2	66.8	-	497	489

^aReference 11

Although admission rates from the target and comparison areas rose slightly after the opening of the health center (40.4 for the comparison area and 58.6/1000 for the target area); the rates for the RNHC users were much lower (49.4 per 1000 and 346 days per 1000) than the hospital utilization rates of those who did not use the health center (60.2 admissions per 1000 and 497 days per 1000). This difference was even more significant two years later.

Moore²¹ studied hospital utilization one year before and two years after the opening of the Bunker Hill Health Center (BHHC) in Charlestown, Massachusetts, to determine the effect of

the health center on hospital use by residents of the community. Data were collected from the records of the Massachusetts General Hospital (MGH) that was affiliated with the Bunker Hill Health Center. The results showed an increase from 29 to 46 admissions per thousand residents of Charlestown between the control (1968) and the study year (1970 to 1971), an increase of 56.1 percent. The mean length of stay however decreased from an average of 12 days in 1968 to 10 days in 1970 to 1971. The increased utilization of the Massachusetts General Hospital after the opening of the center, was due to a shift in the site of hospitalization by the Charlestown residents. They shifted their use to the hospital that was affiliated to the Health Center. However, when this shift was taken into account, an overall increase in the hospital utilization by that population was still observed. The author attributes the difference between his findings and the ones obtained in the previous study of the Columbia Point Health Center to variations between the two communities. Before the opening of the Tufts Neighborhood Health Center, there were no physicians in Columbia Point and patients in this community were relying on hospitals for all their medical care. Opening the Health Center, has reduced this reliance and decreased hospital utilization. In Charlestown in contrast, a number of physicians were present before the opening of the BHHC. The base line of hospital use was lower. Opening the Center, attracted patients with previously unmet medical needs and

increased hospital utilization. However, the author thinks that a long range follow up of hospital utilization by that community may demonstrate an ultimate decrease in hospital admission rates.

In conclusion, it seems that hospital utilization is the result of the interaction of a multitude of factors related to the patient, physician, and hospital. These factors are summarized in Table 6. Factors associated with high hospital utilization, if most of the authors agree to that, are grouped under risk factors. Those factors on which the number of authors who agree as being associated with high rate are more or less equal to those who do not agree, are grouped under doubtful risk factors.

TABLE 6
RISK FACTORS ASSOCIATED WITH HIGH HOSPITAL USE

	<u>Risk Factors</u>	<u>Doubtful Risk Factors</u>
A. Patient Related	1. Old age 2. Female sex 3. Low family income 4. Urban residence 5. Hospital services insured only 6. Married state*	1. Large family size 2. High education 3. Proximity to hospital*
B. Physician Related	1. Fee-for-service payment 2. Solo practice	1. Large supply of physician
C. Hospital Related	1. Large supply of hospital beds 2. No alternative bed facilities 3. No out-patient department available 4. No health center available	

*These factors are related to a high hospital admission rate and low length of stay.

CHAPTER III

METHODS AND PROCEDURES

A. Introduction

Data on hospital utilization were obtained from the records of the three government hospitals - The Salmaniya Medical Center, The Chest Hospital, and The Nervous Diseases Hospital. Data on health center utilization were obtained from the medical records of the Isa Town Health Center. Additional demographic and socio-economic information was collected from the administrative records of the Housing Ministry. Home visits were conducted to supplement the information when needed.

Considering hospital utilization as the dependent variable and health center utilization as the major independent variable, an analysis of the unmatched cross tabulations and a matched pair analysis were done. In addition to this a regression analysis was performed, to determine the independent effect of each variable on hospital utilization, and more specifically the effect of health center visits on hospital admission and length of stay.

B. Study Population

1. Selection of Cases

- a) Definition of a case.-- Any Isa Town resident

who was admitted for the first time to one of the three government hospitals of Bahrain during the year August 1, 1975 to July 31, 1976 after being referred from the health center, was considered to be a case. An admission was defined as a stay in any hospital department excluding the emergency room, for a period not less than 24 hours and involving the allocation of a hospital bed. Admissions for normal childbirth were excluded, but admissions for complications of pregnancy or labor were included. The justification was that once a woman is pregnant, visiting the health center will not affect her hospital admission for childbirth.

Only patients hospitalized for the first time during the study year were selected. This was done to exclude the effect of any previous hospitalization on the subsequent frequency of health center visits. The study aimed at testing the effect of health center exposure on the incidence of hospital admission.

Only admissions to government hospitals were considered in this study. As a rule no Isa Town resident can be admitted to a government hospital without being referred by the Isa Town health center. This however, does not apply to the two private hospitals in Bahrain - The American Mission Hospital, and The Awali Hospital. Patients admitted to these hospitals were not included in this study. They represent however a small proportion of the hospitalized cases in Bahrain (18%).²

b) Sources of cases.-- A total of 442 newly admitted patients from Isa Town were identified by examining the

admission registers of the three government hospitals of Bahrain for the period August 1, 1975 to July 31, 1976. For every case, the following information was sought: (1) Patient's name and age. (2) Date(s) of admission and discharge. (3) Hospital record number: when written in blue meant that this was the patient's first admission, if not, it was written in red. (4) Serial and ward number(s). (5) Preliminary and final diagnosis.

Considering the relatively recent establishment of the Isa Town health center (November 1968), and the fact that this center could not have a major impact on hospitalized illness in the older age groups, with well established hospital utilization and illness patterns, only cases 30 years of age or below were included in this study. A total of 135 patients (30.5%) with ages above 30 years were thus excluded.

On examining the hospital records of the remaining cases, 82 (18.5%) were also excluded for the following reasons: (1) 58 patients (13.1%) had one or more hospital admissions before the beginning of the study year. (2) 9 patients (2.0%) were not residents of Isa Town. (3) 15 patients (3.4%) could not be located in Isa Town due to incomplete address in their hospital records. Thus the final case group consisted of 225 Isa Town residents, admitted for the first time to government hospitals in the year, August 1, 1975 to July 31, 1976.

2. Selection of Controls

a) Definition of a control.-- A control was defined as any Isa Town resident who has visited the health center at least once, but who was not hospitalized during the study year. Considering that as a rule no Isa Town resident can be hospitalized in a government hospital without being referred by the health center, and in order to overcome any bias resulting from this fact, whereby all cases have visited the center at least once; the controls were selected from the frame of the health center users. A user is defined as a person who had visited the health center at least once.

b) Sources of controls.-- Controls were selected from the family records of the Isa Town health center. Each time a family moves to Isa Town, a medical record is made for it at the health center, with information on the size of the family, and the name, age and sex of its members. In September 1976, the total number of occupied houses was 1653.⁵³ Of these, only twenty seven had no family record at the health center (1.6%).

c) The matched variables.-- Houses in Isa Town are of three categories: (1) The low income category with two rooms. (2) The medium income category with three rooms. (3) The high income category with four to six rooms. Houses in the same category are located near one another, and have a house number starting with the same first digit. The house number, and the

health center record number of a family in Isa Town are the same. Thus considering the fact that the health center records are classified by house number, and that houses in the same category have house numbers starting with similar first digit; any two persons selected from two consecutive health center records will be matched on house category (socio-economic status), and on place of residence.

In addition, controls were matched with cases for age (within five years), and for sex.

d) Procedure for selecting controls.--- In order to insure the previously mentioned similarities between cases and controls, the following procedure was followed; a case having his family medical record in one housing category will have his control randomly selected from the health center records of that same category.

A randomly selected two-digit number was assigned to every case. The first digit indicated the direction to follow in selecting the control record. An even number meaning the selection of a record following the case record and an odd number meaning the selection of a record preceding the case record. The second digit, indicated the number of files the control record is away from the case record in the direction previously specified.

Once a control record was identified, the first person listed in this record and satisfying the following criteria was

taken as a control: (1) The control should be of the same sex as the case. (2) He should be within a five years age range. (3) He should have visited the Isa Town health center at least once. (4) There should be no mention of previous hospitalization or previous hospital referral in his medical record. If no member in the identified family record satisfied the above requirements, another record was selected in the same way. No two controls however could be selected from the same family.

One limitation in this study is that cases and controls could not be matched for type of complaints, when seen at the health center. The reason of the visit to the Isa Town health center being usually not stated in the family records of either cases or controls. Bearing this in mind, two hundred and twenty five controls, matched for age and sex, were selected from the records of the Isa Town health center (Table 7).

TABLE 7
PERCENT DISTRIBUTION OF CASES AND
CONTROLS BY AGE AND SEX

Age in Years	Cases			Controls		
	Female	Male	Both Sexes	Female	Male	Both Sexes
Less than 1	8.2	13.6	10.3	6.5	11.3	8.4
1 - 10	24.6	56.8	37.4	29.3	56.3	39.9
11 - 20	44.2	19.8	34.5	40.7	23.8	34.0
21 - 30	23.0	9.8	17.8	23.5	8.6	17.7
All ages	100.0	100.0	100.0	100.0	100.0	100.0
	60.6	39.4		60.6	39.4	

C. Data Collection

1. The Hospital Records

Information on the name, age, date(s) of admission and discharge, ward number(s), and preliminary and final diagnosis of the cases was collected from the registers of the three government hospitals in Bahrain (Section B-1-b). The hospital records were however examined for information concerning the address of the case in Isa Town. Out of the 225 case records examined, 35 had incomplete or wrong addresses (15.5%), that were corrected by calling the patient on the telephone. The above collected information was then put on separate cards for every one of these hospitalized cases.

2. The Health Center Records

There are three types of medical records in the Isa Town health center; (1) the family records; (2) the out-patient records; (3) the records of the Child Welfare Clinic.

a) The family records.-- Any patient coming to the morning clinic of the Isa Town health center, will have his visit recorded in the family record. These records, as mentioned previously, are filed in the health center record room according to the patient's house number.

The health center family records of both the 225 cases and controls were examined, and the following data were recorded on special forms (Appendix A):

1. Patient's name and house number

2. Patient's family size
3. Patient's age and sex
4. Date of first visit made to the Isa Town health center
5. Total number of visits made to the health center from the date of first visit to the date of the case hospital admission
6. Total number of visits made to the health center in the one year period prior to the date of the case hospital admission

This information was available for all but 32 of the cases. According to their family records, these latter cases had made no visits at all to the health center. To clarify this point, home visits were made by the author to these cases and their controls. It became apparent from these home visits, that 15 cases had either been referred by private physicians, other health centers, or admitted as emergencies to the hospital thus not passing thru the Isa Town health center. Another 10 cases had visited the center in the afternoon, so the visit(s) made was not recorded in their family records but in their out-patient records. The remaining 7 cases, were non-residents of Isa Town or had left the country.

As a result of this, 22 cases and their controls were excluded from the study.

b) The out-patient records.--- These are separate records for visits made to the health center during the afternoon. Thus the same patient visiting the health center in the morning

and in the afternoon, will have his first visit appearing in his family record, and his second visit in his out-patient record. Each one of these records having a different number. The number of the out-patient record is written on a white card and given to the patient at the time of his first visit. In case this card is lost, a new one with a different number is given, and a new record made.

It was not possible to review the out-patient records of the 225 cases and controls, since the numbers of these records were known only by the patient. For this reason a 10 percent random sample of the 225 cases was drawn, and home visits were made to these cases and their controls, to inquire about any visits made to the afternoon clinic of the health center. In case a visit was made, the patient's card with the corresponding out-patient record were obtained and the following information was added to their abstract form: (1) The total number of visits made to the afternoon clinic from the date of first visit to the date of the case hospital admission. (2) The number of visits made to this clinic in the one year prior to the case hospital admission. If after visiting the patient twice, no information on this subject was collected due to the absence of the patient or other members of his family, the patient was considered as a non-respondent.



TABLE 8

OUTCOME OF HOME VISITS MADE TO TWENTY-TWO
CASES AND CONTROLS

	Cases		Controls	
	N	%	N	%
Visited the afternoon clinic	8	36.4	2	10.0
Did not visit the afternoon clinic	6	27.3	13	59.1
Non-respondent	6	27.3	7	31.9
Total	22	100.0	22	100.0

c) The records of the Child Welfare Center.---

These are the third type of records at the center. The Isa Town health center has a Child Welfare Clinic (C.W.C.), operating twice a week from 7 A.M. to 1 P.M. on Saturdays and Mondays. Each child visiting this clinic, has a record. These records are arranged by calendar year, and filed by serial number. A child coming for the first time to the clinic is given a blue card on which is registered his C.W.C. record number; subsequent visits are mentioned in this C.W.C. record. Thus a patient in Isa Town might have three medical records at the health center, and each record having a different number. To know the numbers of these Child Welfare records, all cases below four years of age (57 cases) and their controls were home visited. The mothers of these patients, or any other family members were asked about any visits made to the Child Welfare Clinic; in which case the following data were added to the abstract form: (1) Total number

of visits made to the clinic from the date of first visit to the date of the case hospital admission. (2) Total number of visits made to this clinic one year prior to the case hospital admission.

Of the 57 pairs seen, 32 cases (56.1%) and 14 controls (24.6%) had visited the U.S.C. There were 7 non-respondents among the controls (12.2%), but none among the cases.

3. The Housing Ministry Records

The Housing Ministry in Manama has a special statistical section for Isa Town. Every occupied house in the town has a file in the Housing Ministry kept for administrative purposes. These files are arranged by house number.

After a meeting with the director of the Housing Ministry, a permission was taken to examine the municipal records of the 225 cases and controls for the following information: (1) Monthly income of the head of the household. (2) Occupation of the head of the household. (3) Number of rooms in the house. (4) Date at which the family moved to Isa Town.

4. The Housing Ministry Personnel

An interview with the Director of Housing and Loans, and the construction manager of Isa Town was made. Information on the geographic location of the town, its surface area and its estimated population size was collected. A detailed official map of the town, and a report of a house survey done on Isa Town in 1974 by a consultant company were also provided.

The house number of each patient was recorded on the map in its exact location, and the distance to the Isa Town health center was thus measured for each patient.

5. The Population of Isa Town

There was no recent population census or data available on the age and sex distribution of the Isa Town population. The only material on this subject was the population survey done in 1974 by the above mentioned company.

In order to obtain population data for purposes of this study, advantage was taken of the health center family records, which were kept for every family in Isa Town. Thus a 10 percent random sample was taken of the 1626 family records at the health center. These files were examined and population estimates by age and sex were calculated. The data were in agreement with the results of the population survey done by that private company.¹⁹

TABLE 9

ESTIMATED POPULATION OF ISA TOWN BY AGE AND SEX
BASED ON HEALTH CENTER RECORDS

Age Groups in Years	Male		Female		Both Sexes	
	N	%	N	%	N	%
Less than 1	780.8	11.0	861.3	10.9	1642.1	11.0
1 - 10	2101.0	29.6	2244.1	28.4	4345.1	29.0
11 - 20	1405.4	19.8	1817.4	23.0	3222.8	21.5
21 - 30	1043.4	14.7	1288.0	16.3	2331.4	15.5
31 - 40	759.5	10.7	576.8	7.3	1336.3	8.9
41 - 50	347.8	4.9	418.8	5.3	766.6	5.1
51 +	312.3	4.4	458.5	5.8	770.8	5.1
Unknown	347.8	4.9	237.1	3.0	584.9	3.9
All ages	7098.0	100.0	7902.0	100.0	15000.0	100.0
	47.32		52.68		100.00	

D. Data Processing

A coding manual was prepared (Appendix B) and the data were coded on a coding sheet (Appendix C). One sheet for every patient.

The data included:

1. Patient's house number
2. Patient's age and sex
3. Patient's family size
4. Number of persons per bed-room in the house
5. Occupation of the head of the household
6. Monthly income of the head of the household
7. Distance in feet between the house and the health center.
calculated from the map
8. Hospital service to which the patient was first admitted
9. Patient's diagnosis coded according to the International
Classification of Diseases (ICD)⁵⁴
10. Number of hospital admissions for every case during the study
year
11. Total number of hospital bed days for every case
12. Total visits made to the health center by each patient
13. Date of move of the family to Isa Town
14. Date of first visit to the health center
15. Date of first admission to the hospital

1. Time Periods

In addition, the following time periods were calculated and coded.

- 1) The period prior to the utilization of the health center.-- This is the time between the date of

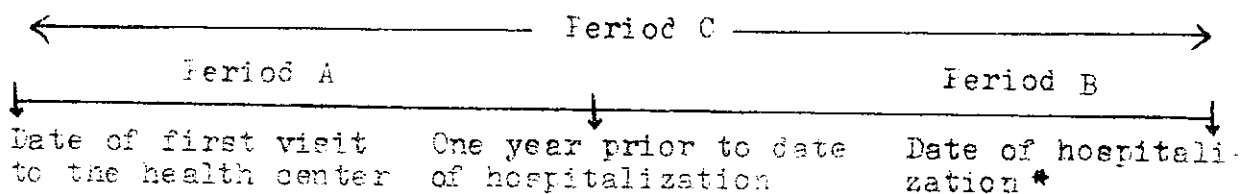
move of the patient's family to Isa Town, and the date of the patient's first visit to the health center. In case a patient was born in Isa Town, the date of his birth was substituted for the date of move of his family to the town.

- 2) The period of utilization of the health center.--

This is the time between the date of the patient's first visit to the health center, and the date of hospitalization. This latter date was considered the same for cases, and their matched non-hospitalized controls. This utilization period was further divided into two periods, (1) period B, or one year before the date of hospitalization, and (2) period A or the time from the date of first visit to health center, up to one year before the date of hospitalization (Figure 2).

FIGURE 2

HEALTH CENTER UTILIZATION PERIODS



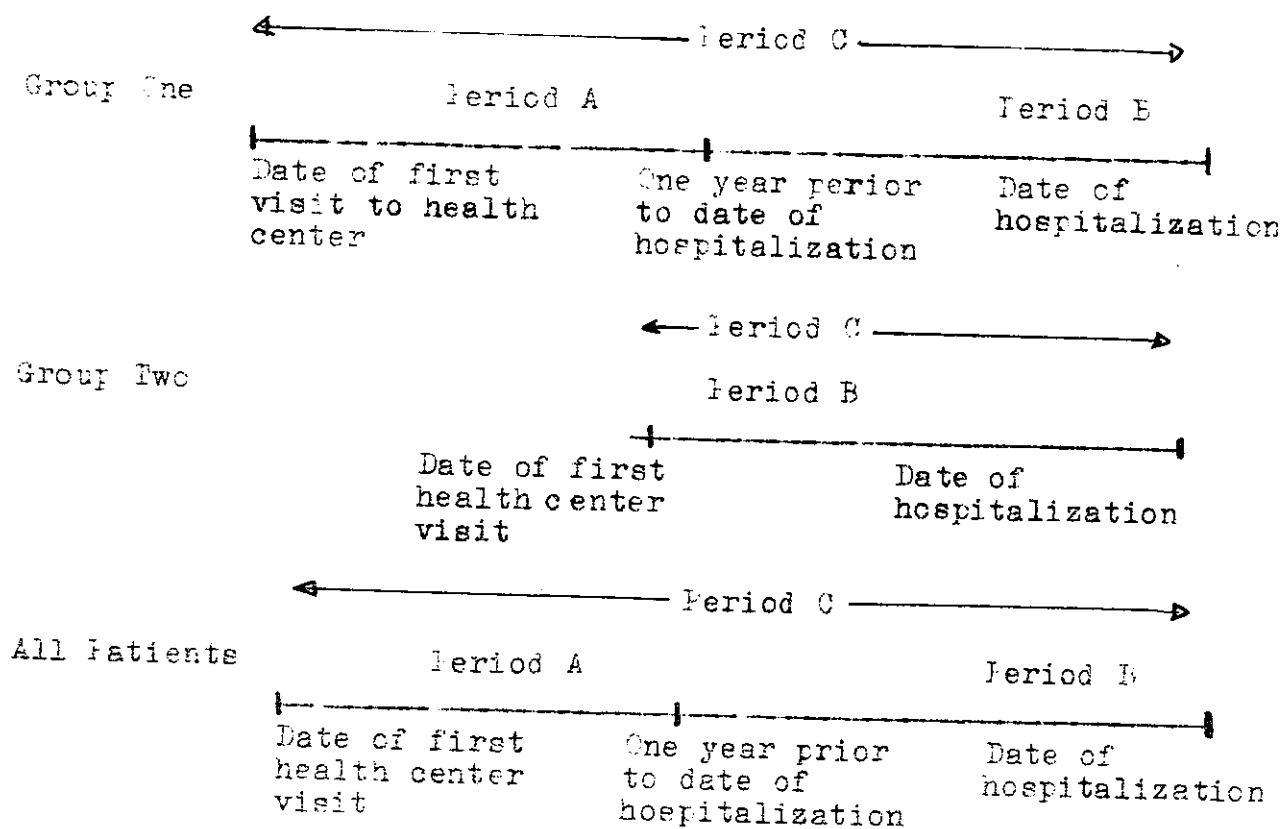
*This date was the same for the matched controls of the cases

Cases and controls were thus divided into two groups:

1. Group one, included the patients who made their first visit to the health center during the two years or more preceeding the date of hospitalization (in Period A).
2. Group two, included the patients who made their first visit to the health center during the one year preceeding the date of hospitalization (in Period B). A comparison of the number of visits made by cases and controls was done for each group separately, and for all the patients together (Figure 3).

FIGURE 3

NUMBER OF VISITS COMPARED FOR EACH GROUP OF PATIENTS
IN THE FOLLOWING PERIODS



2. Hospital Diagnosis

The hospital diagnosis of cases was classified as severe and not severe, basing on the agreement of two or more of three physicians (Appendix D). This included 98.9 percent of the conditions.

TABLE 10
NUMBER AND PERCENT AGREEMENT AMONG
THE THREE PHYSICIANS

	Agreement	
	N	%
All 3 agree	35	39.3
Two out of 3 agree	53	59.6
None of the 3 agree	1	1.1
Total	89	100.0

After coding all the above information, consistency and validity checks were done, and the data were corrected in case of errors. The initial and final analysis were conducted at the computer center of the American University of Beirut; (IBM computer number 370/125).

E. Analysis

Basic frequency distributions of the two study groups were obtained for all the variables, using the following outline of cross tabulations:

STUDY GROUPS

	<u>Cases</u>	<u>Controls</u>
Variable X		
X ₁		
X ₂		
X _i		

Differences in means were tested using the "Student's t test", and the Chi Square test;⁵⁵ and comparison of hospitalized cases and their controls was done using the matched pair analysis, according to the following model:

CONTROL		Factor	Factor
		+	-
Cases	+	a	b
	-	c	d

Odds ratio and Chi Square values were obtained using the frequencies of discordant pairs.

$$\text{Odds Ratio} = b/c$$

$$\text{Chi Square} = \frac{(b-c)^2}{b+c}$$

For the variables that showed some statistical significance in the two comparison groups, a multiple adjustment was done using the multiple regression approach.⁵⁶

The regression model is written as follows:

$$y = b_0 + b_1x_1 + b_2x_2 + \dots + b_nx_n + e$$

where y is the dependent variable,

x 's are the independent variables,

b 's are the estimated regression coefficients and

e is the error, or the difference between the value of the dependent variable and the value predicted by the linear combination of the independent variables.

CHAPTER IV

RESULTS

In the present chapter, cases and controls are compared as to demographic and socio-economic characteristics, and history of health center utilization. In addition, the hospital utilization by cases is described.

A. Demographic and Socio-Economic Characteristics

The distributions of cases and controls by selected variables are given in Table 11. A Chi-Square test showed no significant differences in these distributions between cases and controls.

The average number of persons per family was 9.1 for cases, and 8.8 for controls. Both groups had an average number of 3.3 persons per room.

The majority of cases and controls were in the low socio-economic group. The average monthly income of head of households was 70.5 Bahrain Dinars (\$ 169.2) for cases, and 68.7 Bahrain Dinars (\$ 164.8) for controls. Ninety percent of both cases and controls had non-professional occupations. Eighty eight percent of both groups were living in the low and medium housing categories.

The average distance between the patient's place of residence, and the health center was 2177 feet for cases and 2174

feet for controls.

TABLE 11

PERCENT DISTRIBUTIONS, MFAN, AND STANDARD DEVIATION
OF SELECTED DEMOGRAPHIC AND SOCIO-ECONOMIC
VARIABLES FOR CASES AND CONTROLS

<u>Variables</u>	<u>Cases</u>	<u>Controls</u>
	N = 203	N = 203
<u>1. Family Size</u>		
2 - 4	7.4	10.0
5 - 9	49.3	48.0
10 - 16	41.8	41.4
17 - 23	1.5	1.6
	Mean 9.1	Mean 8.8
	S.D. 3.5	S.D. 3.0
<u>2. Persons per Room</u>		
0.5 - 2.0	19.2	20.2
2.1 - 4.0	56.2	57.6
4.1 - 6.0	20.2	20.7
6.1 - 8.0	4.4	1.5
	Mean 3.3	Mean 3.3
	S.D. 1.4	S.D. 1.2
<u>3. Monthly Income</u> (Bahrain Dinars)		
00 - 50	40.4	42.4
51 - 100	51.2	51.2
101 - 200	6.4	4.4
201 - 600	-	-
601 - 901	2.0	2.0
	Mean 70.5	Mean 68.6
	S.D. 84.2	S.D. 82.2
<u>4. Occupation</u>		
Professionals	4.4	6.0
Clerical-skilled	44.8	30.4
Laborers - Non-skilled	47.8	53.6
Not available	3.0	1.0

TABLE 11--Continued5. Housing Category

Low	42.2	41.9
Medium	46.3	48.2
High	11.3	9.9

6. Distance (in 100 feet)

2 - 9	20.2	20.2
10 - 19	33.0	34.0
20 - 29	24.6	25.1
30 - 66	22.2	20.7
Mean 21.7	Mean 21.7	
S.D. 14.8	S.D. 14.3	

B. Health Center Utilization

Cases and controls were compared with respect to the time period spent in Isa Town prior to the utilization of the health center, and with respect to the actual utilization of the health center. The actual utilization of the health center was studied by taking into account two different variables: The period of utilization, and the degree of utilization as measured by the number of health center visits per year.

1. Time Period Prior to the Utilization of the Health Center

The time period between moving into Isa Town, and first visit to the health center is considered in Table 12. Cases and controls were found to be similarly distributed with respect to this variable. Both groups, stayed on the average three years and four months in Isa Town before starting to use its health center.

Since cases and controls were similar with respect to the time period prior to the utilization of the health center, the whole study group was taken into account in determining the possible effects of demographic and socio-economic variables on this time period. The patient's age, sex, housing category, and place of residence were each found to be significantly associated with this time period (Tables 13 to 16, Appendix E).

A multiple regression analysis was used to assess the independent effect of each of these variables on the time period prior to health center utilization. The results of this analysis are shown in Table 17.

The regression equation explained 26 percent of the variation in the time period. This proportion was statistically significant ($P < 0.005$). The two variables that contributed most to this explained variation were the patient's age, with a statistically significant positive regression coefficient, and the housing category with a significant negative regression coefficient. It was thus found that young patients from high social class visit significantly earlier the health center than others. The patient's sex and place of residence had no effect on this time period.

TABLE 12

ABSOLUTE AND PERCENTAGE FREQUENCY DISTRIBUTIONS OF
CASES AND CONTROLS BY TIME PERIOD PRIOR TO
HEALTH CENTER UTILIZATION

Time Period (years)	Cases		Controls	
	N	%	N	%
Up to 1	31	15.3	37	18.2
- 2	28	13.8	30	14.8
- 4	68	33.5	56	27.6
- 8	76	37.4	80	39.4
Total	203	100.0	203	100.0
	Mean 3.4 S D. 2.0		Mean 3.4 S.D. 2.1	

TABLE 17

RESULTS OF MULTIPLE LINEAR REGRESSION ANALYSIS OF
VARIABLES AFFECTING TIME PERIOD PRIOR
TO HEALTH CENTER UTILIZATION

Independent Variables (X_i)	Estimated Regression Coefficient (β)	Standard Error (S.E. β)	F-Value	Addition to Explained Variation
Age	0.1324	0.0128	$p < 0.001$	0.2095
SES	-7.9107	1.4654	$p < 0.001$	0.0513
Sex	2.5581	2.3230	$p = 0.135$	0.0024
Distance	-0.0005	0.0007	$p = 0.242$	0.0009

Total explained variation : 0.2642
 $P < 0.005$

2. Actual Utilization of the Health Center Services
by Cases and Controls

a) Period of utilization

The time period between the date of first visit to the health center, and the date of hospitalization is considered in Table 18. A Chi-Square test showed no significant difference in the distribution of cases and controls with respect to this variable ($.26 < p < .39$). The average period of health center utilization was found to be two years and three months for cases, and two years and six months for controls.

It should be however noted that 25 percent of the cases had started to use the health center less than one year prior to hospitalization, as compared to 17 percent of the controls.

TABLE 18

ABSOLUTE AND PERCENTAGE FREQUENCY DISTRIBUTION OF
CASES AND CONTROLS BY PERIOD OF
HEALTH CENTER UTILIZATION

Time Period (years)	Cases		Controls	
	N	%	N	%
Up to 1	51	25.1	35	17.2
- 2	38	18.7	44	21.7
- 4	99	48.8	108	53.2
- 7	15	7.4	16	7.9
Total	203	100.0	203	100.0
	Mean 2.2		Mean 2.5	
	S.D. 1.4		S.D. 1.3	

b) Degree of utilization

To study whether health center utilization is directly motivated by the complaints that led cases to hospitalization, cases and controls were compared in two different time periods (Figure 2): The period from first health center visit up to one year prior to hospitalization (Period A), and the time period one year prior to hospitalization (Period B).

Cases and controls were then divided in the following two groups (Figure 3): Group one, or those first entering the health center at a time greater than one year prior to hospitalization (In Period A); and group two, or those first entering the health center during the year prior to hospitalization (In Period B).

The study examined the degree of utilization of each of the three categories of patients (all cases and controls, group one, and group two), in each of the three time periods (total period of utilization, period A and period B).

Because patients had different periods of utilization, the degree of utilization was measured by relating the number of visits to the period, and was expressed in terms of number of visits per year of utilization. The results of this analysis are shown in Table 19.

(1) All patients.-- Considering the time period from the date of first visit to the health center up to the date of hospitalization (Period C), cases were found to visit significantly more the health center than controls ($p < 0.001$). The average number of visits was 7.9 visits per year for cases, and 3.2 visits per year for controls.

Considering the time period one year prior to hospitalization (Period B), cases were also found to visit significantly more than controls. The average number of visits was 7.4 visits per year for cases, and 2.6 visits per year for controls.

As for the time period from date of first visit to the health center up to one year prior to hospitalization (Period A), cases and controls visiting the health center in this period were only group one patients, and will be compared below.

(2) Group one.-- A total of 152 cases, and 166 controls made their first visit to the health center more

TABLE 19

MEAN AND STANDARD DEVIATION OF HEALTH CENTRE VISITS FOR CASES AND
CONTROLS IN DIFFERENT TIME PERIODS

	Number of Patients	Time Periods					
		Period A		Period B		Period C	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
<u>Patients first visiting in Period A</u>							
Cases	152	5.2 ^b	5.6	3.9 ^a	4.0	4.5 ^a	4.0
Controls	166	3.9	7.3	2.1	3.3	2.8	3.2
<u>Patients first visiting in Period B</u>							
Cases	51	-		14.2 ^a	9.4	14.2 ^a	9.4
Controls	37	-		3.8	3.3	3.8	3.3
<u>All patients</u>							
Cases	203	5.2 ^b	5.6	7.4 ^a	11.9	7.9 ^a	9.1
Controls	203	3.9	7.3	2.6	3.8	3.2	3.7

^aP < 0.001^bP = 0.065

than one year prior to hospitalization. This group was compared in the following periods:

1. Period A, or the time period from date of first visit to health center up to one year prior to hospitalization. Cases made an average number of 5.2 visits per year, as compared to 3.9 visits per year for controls. This difference was not statistically significant ($p = 0.065$).
2. Period B, or the time period one year prior to hospitalization. Cases made an average of 3.9 visits per year as compared to 2.1 visits per year for controls. This difference was statistically significant.
3. Period C, or the time period from date of first visit up to date of hospitalization. Cases made an average of 4.5 visits per year, as compared to 2.5 visits per year for controls. This difference was also statistically significant

(3) Group two.-- A total of 51 cases and 37 controls made their first visit to the health center during the one year period prior to the date of hospitalization. The difference in the average number of visits made by cases and controls, was highest for this group of patients. On the average, cases made 14.2 visits per year, as compared to 3.8 visits per year for controls. This difference was statistically significant ($p < 0.001$).

To investigate further the use of the health center by this group of patients, cases and controls were compared by time

period between first visit to health center and date of hospitalization, and by number of visits made during that period. The results are shown in Table 20. It should be noted that 41 percent of the cases in group two first entered the health center three months before hospitalization, as compared to 24 percent of the controls.

TABLE 20

DISTRIBUTION OF PATIENTS WHO FIRST VISITED THE HEALTH CENTER IN THE ONE YEAR PRIOR TO HOSPITALIZATION BY PERIOD AND PERCENT OF UTILIZATION

Period of Use (Months)	Cases		Controls		Mean Number of Visits per Month	
	N	%	N	%	Cases	Controls
0 - 3	21	41.2	9	24.3	1.21	0.39
4 - 6	14	27.4	6	16.2	1.08	0.30
7 - 10	13	25.5	10	27.0	1.18	0.32
11 - 13	3	5.9	12	32.5	0.96	0.10
Total	51	100.0	37	100.0	1.10 ^a	0.32
$\chi^2_3 = 11.6 \quad p < 0.005$						

^a $p < 0.001$

c) Severity of the disease in hospitalized cases and number of health center visits

Further analysis related the severity of the disease as diagnosed in the hospital, with the number of health center visits made by the cases during the one year period prior to the date of hospitalization (Table 21). As no information was

available on the complaints of controls as seen at the health center, these were excluded from this analysis.

Though severe cases were visiting the health center in the year prior to hospitalization more than non-severe cases, this difference was not statistically significant. (Table 21).

To see how the variation in the number of health center visits made one year prior to hospitalization can be explained by the severity of the disease diagnosed in the hospital, a regression analysis was conducted.

The number of health center visits in the year prior to hospitalization was considered as the dependent variable, and severity of the disease, age, sex, housing category, distance between place of residence and the health center, time period prior to health center utilization, and period of health center utilization were considered as the independent variables (Table 22, Appendix E). The regression analysis did not explain a significant amount of the variation ($p > 0.05$), and all variables except severity of the disease were not significantly correlated with the dependent variable. Severity of the disease was however positively correlated with the number of visits made to the health center in the one year prior to hospitalization. Severe cases tended to visit significantly more the health center than non-severe cases ($p = 0.004$).

TABLE 21

MEAN AND STANDARD DEVIATION OF NUMBER OF VISITS DURING
THE YEAR PRECEEDING HOSPITALIZATION BY
SEVERITY OF CONDITIONS

	Severe	Not Severe
Number of cases	141	62
Mean number of visits	4.46 ^a	3.90
Standard deviation	5.26	3.90

$$^aT = 0.4$$

C. Degree of Health Center Utilization and Risk of Hospitalization

An attempt was made to relate the number of health center visits per year made by a patient, to his subsequent risk of being hospitalized. This was done using a matched-pair analysis and a multiple regression analysis.

1. Matched-Pair Analysis

A matched-pair analysis was conducted using the frequency of discordant pairs in terms of the end point which is hospitalization (Table 23). Visits per year were classified as being more or less than the median (2.9). It was found that a patient who made more than 2.9 visits per year to the health center, would have 3.8 times the risk of being hospitalized, as compared to a patient who made less than 2.9 visits per year.

TABLE 23
RESULTS OF THE MATCHED PAIR ANALYSIS

		Controls		
Visits per Year		Less Than 2.9	More Than 2.9	Total
Cases	Less than 2.9	50	21	71
	More than 2.9	79	53	132
	Total	129	74	203

$$X_1^2 = 33.6 \quad P < 0.001$$

2. Multiple Regression Analysis

A multiple regression analysis was conducted to investigate the effect of health center visits on the risk of hospital admission, adjusting for possible confounding variables. The case-control status was considered as the dependent variable, while the number of health center visits was considered as the major independent variable, and patient's age, sex, house category, time period prior to health center utilization, and period of health center utilization were the confounding variables.

Although cases and controls were matched on some of these variables, the variables were included in the analysis to take account of variation that might exist in them within categories of the number of visits variable. The results of the analysis are shown in Table 24. House category was not accepted

by the regression equation due to very low correlation with the dependent variable.

The regression analysis explained 6 percent of the variation in the dependent variable. This proportion was significant ($p < 0.005$). Variables that contributed most to the explained variation were number of health center visits and period of utilization. Adjusting for all the confounding variables it was found that cases visit significantly more the health center than controls, and that they make these visits in a shorter period of time than controls ($p < 0.001$).

TABLE 24

RESULTS OF THE LINEAR MULTIPLE REGRESSION ANALYSIS OF
VARIABLES AFFECTING HOSPITAL ADMISSION

Independent Variables (X_i)	Estimated Regression Coefficient (β)	Standard Error (SE)	P-Value	Addition to Explained Variation
1. Number of visits	-0.0126	0.0024	$p < 0.001$	0.0368
2. Period of health center utilization	0.0686	0.0195	$p < 0.001$	0.0306
3. Sex	-0.0315	0.0527	$p = 0.251$	0.0004
4. Age	-0.0001	0.0003	$p = 0.363$	0.0006
5. Period prior to health center utilization	-0.0002	0.0011	$p = 0.409$	0.0001

Total explained variation : 0.0686
 $P < 0.005$

D. Hospital Utilization

Since our case group included all patients from Isa Town 30 years or below, who were hospitalized for the first time in the year August 1, 1975 to July 31, 1976, it was possible to calculate hospital utilization rates for the Isa Town population 30 years of age or below during that year. Hospital utilization by demographic characteristics, by diagnosis upon discharge, and by hospital service were described. An attempt was made to relate the history of health center utilization with the degree of hospital utilization.

1. Utilization by Demographic Characteristics

The hospital admission rate during the study year was 20.5 new admissions per 1000 population, with an average stay of 7.4 days per patient.

Considering all cases, it was found that the rate of admission for females was higher than the rate of admissions for males (Table 25). The highest admission rate for females was observed in the age group 11 to 20 years, and the highest admission rate for males was observed in the age group 1 to 10 years.

Considering length of stay in the hospital, it was found that the average length of stay for males did not differ significantly from the average length of stay for females. The females show the lowest average length of stay in the age groups 11 to 20 years, the age groups for which they demonstrated the

highest admission rate. On the other hand, the males show the highest average length of stay in the age group 1 to 10 years, for which they demonstrated the highest admission rate (Table 26).

TABLE 25
HOSPITAL ADMISSION RATES PER 1000 POPULATION
BY AGE AND SEX - ISA TOWN
AUGUST 1, 1975 - JULY 31, 1976

	Females	Males	Both Sexes
Age Groups (years)			
Less than 1	12.7	15.3	14.0
1 - 10	15.5	26.1	20.7
11 - 20	35.2	11.3	24.8
21 - 30	27.9	7.6	18.8
All above ages	23.5	17.0	20.5

TABLE 26
AVERAGE LENGTH OF STAY PER PATIENT PER ADMISSION BY
AGE AND SEX - ISA TOWN
AUGUST 1, 1975 - JULY 31, 1976

	Average Length of Stay (Days)		
	Females	Males	Both Sexes
Age Groups (years)			
Less than 1	10.7	7.9	9.2
1 - 10	8.4	9.0	8.8
11 - 20	4.6	6.5	5.0
21 - 30	8.6	6.1	8.2
All above ages	6.9	8.2	7.4

2. Utilization by Diagnosis Upon Discharge

The distribution of cases by diagnosis upon discharge is shown in Table 27. The three leading diagnosis were: Complication pregnancy, childbirth and puerperium; diseases of the respiratory system; accidents, poisoning and violence. The highest average length of stay in the hospital was for patients admitted for diseases of the nervous system and sense organs, and the lowest stay was for patients admitted for diseases of the respiratory system.

3. Utilization by Hospital Service

The distribution of cases by hospital service is shown in Table 28. Most of the cases were admitted to the Pediatric service. Patients admitted to the Medical service had the highest average length of stay, and patients admitted to Obstetrics and Gynecology service had the lowest average length of stay.

4. Health Center Visits and Degree of Hospital Utilization

a) Number of hospital admissions.--- An attempt was made to relate the number of health center visits made by a case, with his subsequent number of hospital admissions. The results of this analysis are shown in Table 29. The mean number of health center visits per year for cases admitted once to the hospital was 7.59 visits, and the mean number of health center visits per year for cases admitted two to five times to the

TABLE 27
 AVERAGE LENGTH OF STAY PER PATIENT PER
 ADMISSION BY DIAGNOSIS

Diagnosis	Number of Admissions		Average Length of Stay (days)
	N	%	
1. Infective and parasitic disease	24	10.1	9.2
2. Disease of the blood and blood forming organs	16	6.7	8.5
3. Mental disorders	4	1.7	7.7
4. Diseases of the nervous system and sense organs	9	3.8	22.2
5. Diseases of the circulatory system	5	2.1	19.2
6. Diseases of the respiratory system	47	19.8	5.5
7. Diseases of the digestive system	24	10.1	6.3
8. Diseases of the genito-urinary tract	10	4.2	7.9
9. Complications of pregnancy and child-birth	50	21.1	5.6
10. Symptoms and ill-defined conditions	15	6.4	6.5
11. Accidents, poisoning and violence	33	14.0	6.3
Total	237	100.0	7.4

hospital was 9.23 visits. This difference was not statistically significant.

Though the number of hospital admissions is affected by the severity of the disease, as well as by demographic and socio-economic variables, no adjustment for these variables was done using the multiple regression analysis. This was due to the skewness of the number of admissions variable, with most cases having one hospital admission per year.

TABLE 28
AVERAGE LENGTH OF STAY PER PATIENT PER
ADMISSION BY HOSPITAL
SERVICE

Service	Number of Admissions		Average Length of Stay
	N	%	
1. Surgical	42	17.7	6.5
2. Pediatric	70	29.5	6.6
3. Medical	49	20.6	12.3
4. Ear, nose, throat	20	8.4	6.4
5. Obstetric. Gynecology	56	23.8	5.4
Total	237	100.0	7.4

b) Number of hospital bed days.--- A regression analysis was conducted to test whether the number of health center visits made by a case, influences his length of stay in the hospital. The number of bed days spent in the hospital was considered as the dependent variable, the number of health center visits was considered as the independent variable, and the number of hospital admissions, the severity of the disease, the patient's age, sex, and housing category the confounding variables.

The results of the analysis are shown in Table 30 (Appendix E). The regression analysis explained 15 percent of the variation in the number of hospital bed days. This proportion was statistically significant. The two variables that contributed most to this explained variation were the number of hospital admissions, and the severity of the disease. It should be noted however that since the total number of bed days was considered in this analysis, and not the average number of bed days per admission, the significant positive regression coefficient of number of hospital admissions, with number of hospital bed days is to be expected.

It was however found that severe cases tend to stay significantly longer in the hospital than non-severe cases ($p = 0.001$).

Adjusting for all the confounding variables, it was found that the number of visits made to the health center had no significant effect on the number of days subsequently spent in the hospital.

1. 29

MEAN AND STANDARD DEVIATION OF NUMBER OF HEALTH
CENTER VISITS PER YEAR BY NUMBER
OF HOSPITAL ADMISSIONS

Number of Hospital Admissions per Year	Number of Cases	Number of Health Center Visits per Year	
		Mean	S.D.
1	1	7.59 ^a	9.12
2 - 5	1	9.23	9.97
Total	2	7.92	9.14

$$a_F = 0.38$$

CHAPTER V

DISCUSSION

The present chapter includes an examination of the findings as they compare with previous studies, an interpretation of these findings, and some suggestions for additional studies to test the basic hypothesis.

A. Comparability of Cases and Controls with Respect to Variables Affecting Hospital Utilization

Hospital admission of a patient is the result of the interaction of a multitude of factors. These factors involve the patient, the physician and the hospital.

Studies have shown that hospital utilization is affected by the demographic and socio-economic characteristics of a patient.^{22,27,28} It is thought that the patient's perception of illness will differ with his age, sex, family size and occupation.²⁵

Furthermore, the translation of this perception into actual demand for medical care, is thought to be affected by variables such as the patient's attitude towards medical care, the cost of the care, and the distance between the patient's place of residence and the source of care.^{26,35}

Cases and controls in this study were matched with

respect to age and sex. Moreover, they were found to be similarly distributed with respect to family size, occupation, income and place of residence (Table 11).

The attitude of these patients towards medical care was hard to assess. It was however found that cases and controls took the same time to start using the health center facilities, an average of three years and four months after coming to Isa Town (Table 12). If this time period can be thought of as measuring the attitude of the patient towards health care, then cases and controls having similar time periods, do not differ in their attitudes towards the health center.

It should be noted however that this time period is a relatively long one. This may be explained, if cases and controls before entering into Isa Town were using other health care facilities. The change in these facilities did not directly follow a change in the patient's place of residence.

Another possible factor is that patients were unaware early enough of the existence of the health center due to the absence of an active outreaching program notifying residents of the available services. Furthermore an analysis of the factors affecting this time period, showed that young patients from high social class use the health center significantly earlier than others. This finding is consistent with the results of previous studies,⁵⁷ and could explain the long period prior to utilization of the health center for our study group

contained a majority of low social class people.

In addition to the previously mentioned similarities, cases and controls were also similar in factors related to the physician and to the hospital. Both groups living in the same town were exposed to the same health care facilities, the same physicians, and the same diagnostic and treatment facilities at the health center. Furthermore the supply of hospital beds and the cost of hospital care were equal for the two study group. Thus hospitalization of cases could not be attributed to the above mentioned variables.

It should be noted however that no information was available on the disease condition for which cases and controls were seen at the health center.

B. Health Center Utilization and Hospitalization

1. Period of Utilization

Though no significant difference was found in the distribution of cases and controls with respect to this period, a larger percentage of cases visited the health center for the first time in the one year period prior to hospitalization than controls (Table 18). When looking closer at this group of late users, it was observed that 40 percent of the cases actually made their first visit to the health center three months or less before hospitalization (Table 20).

Adjusting for possible confounding variables, it was further found that significantly more cases tended to use the

health center for the first time in the few months preceeding their hospitalization, as compared to controls (Table 24).

2. Degree of Utilization

The examination of cases and controls with respect to the degree of utilization of the health center as measured by the number of visits per year, showed the following main findings:

1. Both cases and controls tended to decrease their number of visits per year to the health center when moving from Period A to Period B (Table 19). (Group 1).
2. Cases visited significantly more the health center than controls in the one year period prior to hospitalization (Table 19).

One may speculate that patients visiting the health center for the first time might come with a large pool of unrecognized or medically unattended health problems, thus using a significant amount of the health center services. As most of these needs are met, the use of the health center services by these patients would tend to decrease with time. This might also explain the large number of visits made to the health center by cases who started to use the health center for the first time in the one year period prior to hospitalization.

As to the second finding, and in view of the previously mentioned similarities between cases and controls, the following two explanations can be thought of:

- a) The hospitalization of cases results from their large number of visits made to the health center.-- Though the association

between high number of health center visits and hospitalization was strong, (Tables 23, 24), the possibility of a direct association between these two variables is inconsistent with the following facts: (1) The number of hospital admissions of a case was not related to the number of visits he made to the health center (Table 29). (2) Adjusting for possible confounding variables, the number of days spent in the hospital by a case was not associated with the number of visits he made to the health center (Table 30).

- b) The hospitalization of cases, and their large number of health center visits are each independently associated with a third factor.-- The only main factor that was

not controlled for in this study was the condition for which cases and controls were seen at the health center. Thus the possibility exists that cases and controls might be visiting the health center for different reasons. Those of cases might differ from those of controls in terms of severity of the disease, whereby controls have less severe diseases than the cases and so not needing hospitalization. The severity of the condition implies, the nature of the disease, its seriousness, intensity of symptoms, and prognosis.

Severity of the condition may also be related to delay in seeking medical care, thus allowing it to progress and become

serious. This perhaps was unlikely among these cases because the majority were in contact with the health center for more than one year prior to their hospitalization.

The assumption that the severity of the condition of the cases is responsible for both the hospitalization of these cases and their high number of visits to the health center is supported by the following results: (1) Cases tended to visit significantly more the health center than controls only during the one year period preceeding their hospitalization. (2) The difference in the number of health center visits made by cases and controls was more marked for those patients visiting the health center for the first time in the few months preceeding hospitalization.

To test further this hypothesis, whereby the severity of the disease in the cases is responsible for both their high number of health center visits and their hospitalization, a comparison was made between severe cases and non-severe cases. The hospital diagnosis of the cases were classified as severe and not severe by three different physicians. Adjusting for possible confounding variables, the results of the analysis showed the following: (1) Severe cases were visiting significantly more the health center than non-severe cases, during the one year period prior to hospitalization (Table 22, Appendix E). (2) Severe cases were hospitalized for a significantly longer period of time than non-severe cases

(Table 30, Appendix E). These results support the hypothesis that severity of the disease is related to both number of visits to the health center and length of hospital stay. Assuming that controls were less severe patients might also explain the fact that they visited less the health center and that they were not hospitalized. In this situation the disease severity would be the most probable factor responsible for the observed association between high number of health center visits, and hospitalization.

3. Conclusion

The primary hypothesis of this study, whereby hospitalized cases are thought to have visited less the health center than a similar group of non-hospitalized controls was not supported by the findings.

Hospitalized cases were found to visit significantly more the health center than non-hospitalized controls. The observed association between hospitalization and high number of health center visits is thought to be due to the association of each one of these variables with the severity of the disease condition of the cases.

From this study no conclusion about the impact of the Isa Town health center on admission to hospitals can be made. The fact however, that the hospitalized cases visited significantly more the health center than the non-hospitalized controls, does not discredit the center. It may be that in the

absence of the health center, controls would have sought their needed medical care from the hospital, and cases would have worsened and thus used the hospital services for a longer time. On the other hand, many of the preventive services rendered by a health center to the community can not be easily measured and evaluated. This is specially true for Isa Town where the opening of the town and the opening of the health center coincided with one another.

The findings of this study suggests that for certain disease conditions and severities, hospital services can not be substituted by health center services. The question however of how sick is sick enough to require hospital care is still hard to answer.

As Foster wrote: "It is clear however that both hospital and center personnel are listening to the community and the feeling persists that what goes on at the center is something larger than just a better way to give health services".⁵⁸

C. Suggested Additional Studies

The impact of a health center is measured by considering both its curative and preventive services. One could compare the health status and hospitalization of a community before and after opening a health center. Also, two similar communities one served by a health center and the other not served could be compared. Anyone of these two studies is

hard to do in Bahrain since most of the communities are now served by health centers.

The following study is suggested in a community served by a health center for some time. A random sample of the health center records is taken, and patients are divided into three groups according to the information available in these records, as to the number of visits made to the center during one or more specified years. The high health center users, the low and the non-health center users. The hospitalization experience of these three categories will be examined and followed over subsequent years, after the exposure groups have been defined. Hospital admission rates and average length of stay will be determined, and comparison will be made among the three categories.

The comparability of the three groups with regard to known factors that influence hospitalization will be examined. The necessary adjustment will be made for the many other confounding variables among which are type and severity of the disease.

TABLE 13

DISTRIBUTION OF TIME PERIOD PRIOR TO UTILIZATION
OF THE HEALTH CENTER BY AGE FOR
CASES AND CONTROLS^a

Time Period (months)	Age (years)									
	Less Than 1		2 - 10		11 - 20		21 - 30		All Ages	
	N	%	N	%	N	%	N	%	N	%
0 - 6	32	62.7	4	2.8	4	2.9	1	1.4	41	10.1
7 - 12	19	37.3	4	2.8	3	2.2	1	1.4	27	6.7
13 - 24	-	-	36	25.0	13	9.4	9	12.5	58	14.3
25 - 48	-	-	56	38.9	46	33.1	22	30.5	124	30.5
49 - 72	-	-	34	23.6	46	33.1	26	36.2	106	26.1
73 and more	-	-	10	6.9	27	19.3	13	18.0	50	12.3
Total	51	100.0	144	100.0	139	100.0	72	100.0	406	100.0

$$^a \chi^2_{20} = 321.8$$

$$P < 0.001$$

TABLE 14

DISTRIBUTION OF TIME PERIOD BEFORE UTILIZATION OF
HEALTH CENTER BY SEX FOR CASES
AND CONTROLS^a

Time period (months)	Female		Male		Both Sexes	
	N	%	N	%	N	%
0 - 6	21	8.5	20	12.4	41	10.1
7 - 12	9	3.7	18	11.2	27	6.7
13 - 24	26	10.6	32	19.9	58	14.3
25 - 48	87	35.5	37	23.0	124	30.5
49 - 72	71	29.0	35	21.7	106	26.1
73 and more	31	12.7	19	11.8	50	12.3
Total	246	100.0	160	100.0	406	100.0

$$^a \chi^2_5 = 22.49$$

$$P < 0.001$$

TABLE 15

DISTRIBUTION OF TIME PERIOD BEFORE UTILIZATION OF
HEALTH CENTER BY HOUSING CATEGORY
FOR CASES AND CONTROLS^a

Time Period (months)	Low		Medium		High		Total	
	N	%	N	%	N	%	N	%
0 - 6	5	2.9	33	17.2	3	7.0	41	10.1
7 - 12	7	4.1	13	6.8	7	16.3	27	6.7
13 - 24	13	7.6	41	21.4	4	9.3	58	14.3
25 - 48	57	33.3	54	28.1	13	30.2	124	30.5
49 - 72	58	33.9	39	20.3	9	20.9	106	26.1
73 and more	31	18.2	12	6.2	7	16.3	50	12.3
Total	171	100.0	192	100.0	43	100.0	406	100.0

$$^a \chi^2_{10} = 57.86$$

$$P < 0.001$$

TABLE 16

DISTRIBUTION OF TIME PERIOD PRIOR TO HEALTH CENTER
UTILIZATION BY DISTANCE BETWEEN HOUSE AND
HEALTH CENTER FOR CASES
AND CONTROLS^a

Time Period (months)	Distance (100 feet)									
	2 - 9		10 - 19		20 - 29		30 - 66		Total	
	N	%	N	%	N	%	N	%	N	%
0 - 6	12	14.6	8	5.9	15	14.9	6	6.9	41	10.1
7 - 12	4	4.9	3	2.2	11	10.9	9	10.3	27	6.7
13 - 24	10	12.2	12	8.8	23	22.8	13	14.9	58	14.3
25 - 48	18	22.0	44	32.4	36	35.6	26	29.9	124	30.5
49 - 72	31	37.8	46	33.8	13	12.8	16	18.5	106	26.1
73 and more	7	8.5	23	16.9	3	3.0	17	19.5	50	12.3
Total	82	100.0	136	100.0	101	100.0	87	100.0	406	100.0

$$^a \chi^2_{15} = 57.6$$

$$P < 0.001$$

TABLE 22

RESULTS OF THE LINEAR MULTIPLE REGRESSION ANALYSIS OF VARIABLES
AFFECTING THE NUMBER OF HEALTH CENTER VISITS ONE
YEAR PRIOR TO HOSPITALIZATION

Independent Variables	Estimated Regression Coefficient (β)	Standard Error (SE β)	F-Value p	Addition to Explained Variation
1. Severity of disease ^a	-1.0600	0.4085	p = 0.004	0.0372
2. Period prior to health center utilization	-0.0194	0.0108	p = 0.03	0.0138
3. Sex	-0.5007	0.47523	p = 0.14	0.0079
4. Distance	-0.00006	0.00015	p = 0.35	0.0006
5. Housing category	-0.1283	0.3149	p = 0.34	0.0006
6. Age	0.0010	0.0030	p = 0.36	0.0005
7. Period of health center utilization	-0.0227	0.1768	p = 0.44	0.0008

Total explained variation : 0.060
F > 0.05

^aSeverity was defined as an inverse scale with severe cases as one and non-severe as two.

TABLE 30

RESULTS OF THE LINEAR MULTIPLE REGRESSION ANALYSIS OF VARIABLES AFFECTING THE NUMBER OF HOSPITAL BED DAYS

Variables (X_i)	Estimated Regression Coefficient (β)	Standard Error (SE β)	P-Value	Addition to Explained Variation
1. Number of hospital admissions	7.83903	1.43495	$p < 0.001$	0.12419
2. Severity of the disease ^a	-2.89048	1.36609	$p = 0.017$	0.01934
3. Age	-0.00912	0.00181	$p = 0.15$	0.00650
4. Housing category	0.44102	1.00850	$p = 0.33$	0.00166
5. Sex	0.53984	1.61467	$p = 0.37$	0.00163
6. Number of health center visits	0.00047	0.06338	$p > 0.49$	0.00001

Total explained variation : 0.15332
 $F < 0.005$

^aSeverity was defined as an inverse scale with severe cases as one and non-severe as two.

TABLE 31
 DISTRIBUTION OF CASES AND CONTROLS BY AGE
 AND TIME PERIOD OF HEALTH
 CENTER UTILIZATION^a

Time Period (years)	Age (years)									
	Less Than 1		1 - 10		11 - 20		21 - 30		All Ages	
	N	%	N	%	N	%	N	%	N	%
Up to 1	19	37.3	26	18.1	30	21.6	11	15.2	86	21.2
- 2	9	17.6	27	18.8	32	23.0	14	19.4	82	20.2
- 4	16	31.4	83	57.6	69	49.6	39	54.1	207	51.0
- 7	7	13.7	8	5.5	8	5.8	8	11.3	31	7.6
Total	51	100.0	144	100.0	139	100.0	72	100.0	406	100.0

$$^a \chi^2_{12} = 20.2$$

$$0.05 < P < 0.06$$

TABLE 32

DISTRIBUTION OF CASES AND CONTROLS BY SEX AND TIME
PERIOD OF HEALTH CENTER UTILIZATION^a

Time Period (years)	Female		Male		Both Sexes	
	N	%	N	%	N	%
Up to 1	45	18.4	41	25.5	86	21.2
- 2	51	20.8	31	19.3	82	20.2
- 4	125	51.0	92	50.9	207	51.0
- 7	25	9.8	6	4.3	31	7.6
Total	246	100.0	160	100.0	406	100.0

$$^a \chi^2_3 = 6.2$$

$$P = .11$$

TABLE 33

DISTRIBUTION OF CASES BY SEVERITY OF THE DISEASE AND TIME PERIOD OF HEALTH CENTER UTILIZATION^a

Time period (years)	Severe Cases		Non-Severe Cases		Total	
	N	%	N	%	N	%
Up to 1	34	24.1	17	27.4	51	25.1
- 2	26	18.4	12	19.3	38	18.7
- 4	71	50.3	28	45.2	99	48.7
- 7	10	7.2	5	8.1	15	7.5
Total	141	100.0	62	100.0	203	100.0

$$^a \chi^2_{24} = 30.27$$

$$0.5 < P < 0.2$$