

**Takemi Program in International Health**

**Harvard School of Public Health**

**Performance and Efficiency of Public Hospitals in Mexico**

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**Research Paper**

**August, 1996**

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## Abstract

Hospitals consume about 40 percent of the annual fiscal expenditures on health in Mexico. However, few studies analyze the efficiency in the provision of these clinical services. This study was conducted to evaluate the performance of public hospitals using indicators of capacity, utilization, productivity, and efficiency. Data from 277 public hospitals government financed (PH) and from 260 hospitals owned and operated by the social security system (SSH) were analyzed. Input-to-output ratios were computed by combining information on global budget, staffing, hospital activity, capacity, and utilization. Several hospital services were transformed into relative value units of output or "adjusted discharges" to create composite measurements of productivity and efficiency. There were significant differences between PH and SSH in operating expense per bed per day (US\$39.61 vs \$283.78). SSH had almost four times higher expense per adjusted discharge than PH (USD\$2,554 vs \$675). The hospital activity analysis showed lower bed occupancy in PH as compared to SSH (50% vs 84%) as well as lower annual discharges per bed (38.6 vs 66.8). Overall, public hospitals had longer average length of stay than SSH (7 vs 6 days), particularly for pediatric services (6.3 vs 5.4 days). A composite measurement of efficiency (input labor required to produce 100 units of output), showed differences between PH and SSH in the number of full employees required to produce 100 adjusted-discharges (11 vs 10 employees). Also, a greater number of high level workers such as physicians (2.5 vs 1.5) and nurses (4 vs 3) were required in PH to produce 100 adjusted-discharges. Lower in-hospital mortality observed in PH than in SSH (2.4% vs 2.6%) might suggest lower case-mix load and less severely ill patients. Significant inefficiencies such as low occupancy, longer length of stay, and low productivity were observed in public hospitals. Interventions both at the regulatory and hospital level are required to improve the use of limited resources. Economic constraints are challenging the mission of these public institutions in the provision of curative care for the disadvantaged.

## INTRODUCTION

Despite of substantial efforts to promote preventive interventions aimed to reduce the incidence of acute and chronic conditions, the demand for curative and rehabilitation services is expected to increase. Mexico, like other middle income countries is observing a demographic transition; high levels of injury, chronic conditions, endemic infectious diseases, and a growing aging population have profound implications for hospitals and the health care system in general. The proportion of Mexicans living in poverty is increasing. The elderly and the poor not only are admitted to hospitals more frequently but also have average longer lengths of stay. While the provision of hospital services is warranted for most people in the formal sector of the economy, a growing concern refers to the provision and access to health services for people in the informal sector of the economy, the unemployed, and the poor living in large cities, as well as people living in geographically isolated rural communities. Higher unemployment mean more poverty and a larger uninsured population shifting the demand for health services from private providers and social security services to public facilities.

Curative or preventive services are competing for very limited resources. Public hospitals in most countries consume a major share of health services expenditure. For example, an study of 17 developing countries reported that hospitals receive between 30 and 80 percent of the total health expenditures, half is allocated to tertiary care. In Latin America several countries are taking steps to overhaul the health system, a major component of these reforms include financing and paying for hospital services. For example, Brazil, Colombia, and Argentina are following the American paradigm of market competition to control costs and increase quality in the provision of hospital services. In the U.S., hospitals are facing unprecedented pressures toward higher levels of efficiency. Increased cost-consciousness of health care purchasers has spurred the movement toward managed care. These changes in the financing and delivery of care are forcing hospitals to a complete reorganization. Bed capacity is changing from revenue generators to cost centers.

Public hospitals in developing countries also work under financial pressures due to very restricted budgets. Nonetheless, there are almost no incentives to pursue efficiency. From a managerial point of view improving hospital efficiency can free up resources for service expansion and improvements in quality of care.

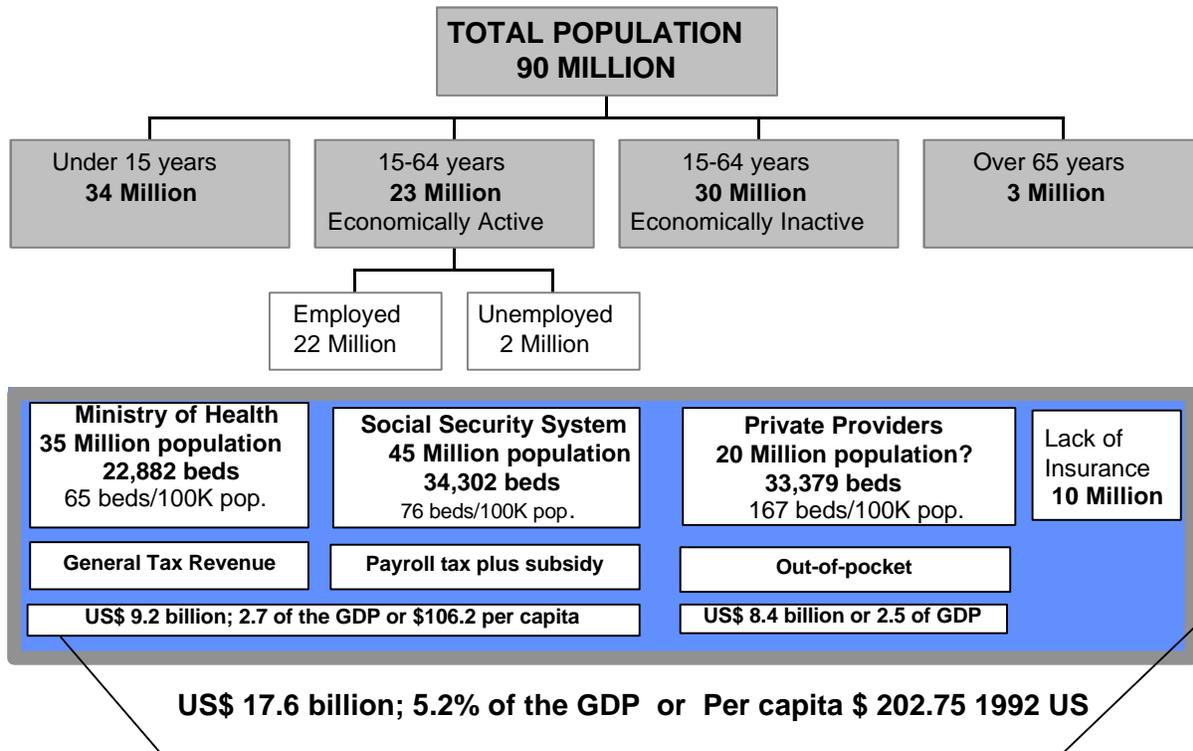
There are several indicators to assess hospital performance which depend on the information available. These indexes can be useful in achieving an assessment of managerial practices, institutional behavior, and hospital performance. Econometric estimation of production function and linear programming technics such as Data Envelopment Analysis (DEA) are techniques requiring sophisticated methodology. However, simple and low costs indicators such as input output ratios are available for most hospitals and might be used as proxy measures of technical efficiency.

This report is aimed to describe the provision of curative services and to analyze the performance of public hospitals in Mexico. Specifically, to describe the regional distribution of beds as well as measures of capacity, utilization, and hospital performance using simple indicators.

## **OVERVIEW OF THE HEALTH CARE SYSTEM**

The health care in Mexico is provided by the Ministry of Health, the Social Security System, non-for-profit institutions, state government facilities, and private providers. It is estimated that 49% of the population in Mexico is uninsured (43 out of 87 million population). About 35 million of this uninsured population receive health care services from the Ministry of Health and nearly 10 million (9.7%) are living in rural areas lacking any access to health services. Federal health expending has increased from 2.8 GDP in 1988 to 4.2 in 1994. In 1992, health expenditures for social security represented 85% (IMSS and ISSSTE), for the Ministry of Health to cover uninsured population 13.5%, and resources allocated to indigenous rural population was 1.5% (IMSS-Solidaridad). Figure 1 presents the structure and organization of the health care system in Mexico.

**Figure 1. The Health Care System in Mexico**

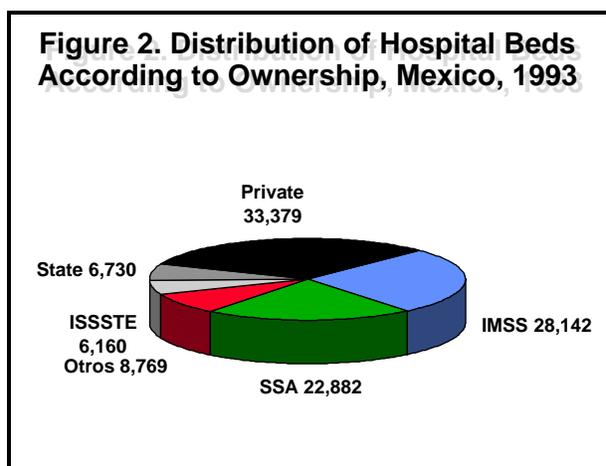


Over the years, the delivery of health care in Mexico has become a complex system of interrelated institutions including government, social security, and private providers. However, the disarray of the system, overlap of services between institutions, and a bureaucratic medical culture has deteriorated the provision of clinical services. The needs to increase the coverage and quality of hospital care poses a major challenge. While some groups support the expansion of the social security to achieve universal coverage, others advocate hospital privatization relying in a free market to control costs and increase efficiency. However, a free market for medical services is likely to increase inequity in the provision of medical care. Two major

assumptions under the private scheme of hospital services are that medical care is a commodity with no market imperfections and that for-profit oriented providers behave fairly. Expanding the current scheme of fee-for-services, private providers are likely to induce consumption, increase costs, and potentially generate greater inequities in the access to clinical services. Moreover, there is no evidence that private providers deliver higher quality of care than public institutions. A health reform is potentially dangerous without regulation and legislation. Any change towards privatization of government-hospitals has the potential to change the mission of community hospitals.

### THE HOSPITAL SYSTEM

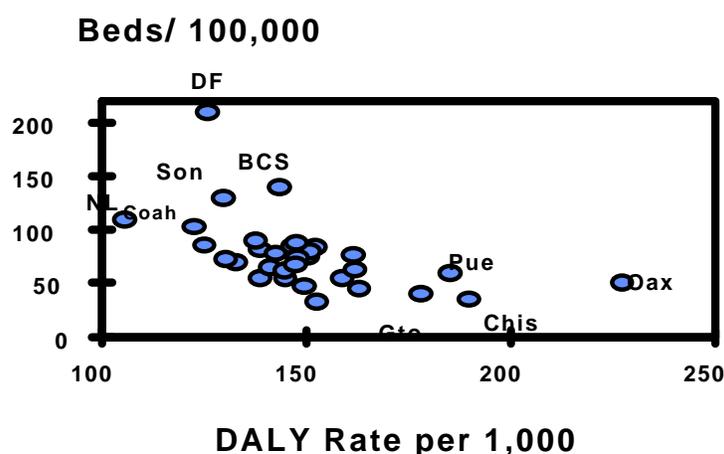
In Mexico, there are a total of 679 general hospitals and 157 tertiary level hospitals for specialties; of which, 310 are general hospitals and 100 specialties centers are government financed and serving open uninsured population. Figure 2 shows the number of beds in Mexico according to ownership. There are 71,500 registered beds; of which 32,890 are allocated to the uninsured population. This number is equivalent to 94 beds per 100,000 population, figure substantially inferior to some international references of 150 beds per 100,000 population. Expenditures in curative services represent approximately 43.5% of the total expenditures in health for fiscal year 1992; 55% were allocated to hospitals, 38% to ambulatory services, 6% to emergency services, and 1% to rehabilitation. It is estimated that 98,500 physicians, 4,700 dentists, and 150,000 nurses work for public institutions, about 50 percent of them are employees of the social security system (IMSS and ISSSTE).



### POVERTY, BURDEN OF DISEASE, AND HOSPITAL BEDS

There are 39 million uninsured people that receive services provided by the SSA and IMSS-Solidaridad, an estimated 10 percent of this population are living in distant rural areas lacking any access to health services. Among the factors limiting access to care the most important are: (1) geographic barriers, (2) poor quality of care and lack of drugs and supplies in health clinics, and (3) economic barriers. While in rural areas all these factors operate, in urban areas poverty and unemployment explain a growing number of uninsured population. Figure 3 shows the relationship between hospital bed availability and burden of disease as measured by Disability-Adjusted Life Years (DALYs)<sup>1</sup>. Clearly, there are important regional disparities between the burden of disease and the number of hospital beds by state. The poorest states of Chiapas, Oaxaca, Guanajuato, and Guerrero not only have the highest burden of disease but also the least number of hospital beds available.

**Figure 3. Burden of Disease and Availability Hospital Beds by State**



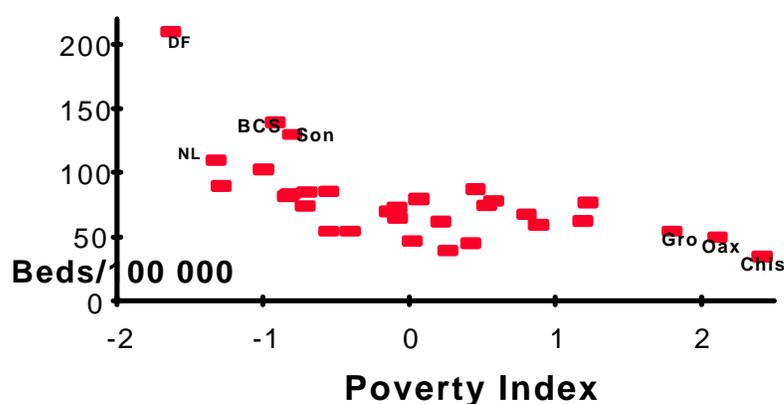
Significant regional variation in the rate of annual DALYs lost per 1,000 population is observed in Mexico. Children under five account for more than a third of the disease burden, mostly due to infectious diseases. The economically active population (15 to

<sup>1</sup> Disability Adjusted Life Years (DALY) is a composite measure of adjusted years lost due to premature death and disability.

44 years) is subject to an increasing burden of trauma. The increasing number of chronic conditions such as cancer reflect also an aging population.

Rural areas are affected by poverty and a high burden of disease due to disability and premature death. Figure 4 shows the inequitable distribution of hospital beds in relation to a poverty index developed by the National Population Council (CONAPO)<sup>2</sup>. The distribution of resources between states remains also highly inequitable. The poorest states receive 25% fewer resources per capita from the SSA budget than the national average. Again, the poorest states: Chiapas, Oaxaca, and Guerrero have the lower number of available beds. Urban and rural differences in life years lost due to premature mortality and disability are significant.

**Figure 4. Beds Availability in Relation Poverty, by State**



The burden of disease due to infectious diseases is 50 percent higher in rural areas. The situation is reversed for injury and non-transmissible conditions. Homicide and Cancer are almost 40% higher in urban areas as compared to rural areas.

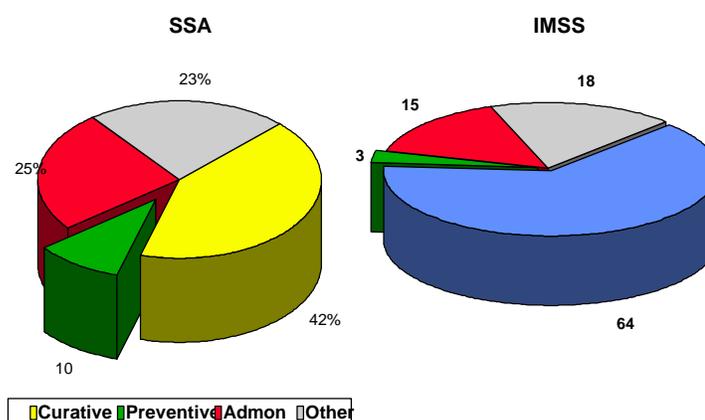
<sup>2</sup> The CONAPO poverty index ranks states based on results of principal component analysis using the 1990 national census. The following variables are used: (a) population density, (b) illiteracy, (c) sanitation, (d) percentage of households without electricity, (e) drinking water, (f) dirt floor, (g) per capita income. The national average index is 0. A negative index would indicate better than the national average.

In 1992, the budget for health was of approximately \$3,983 million USD (3.7% of the GDP) with an average \$48.57 USD per capita, private sector spending accounted for about 2% of GDP, or an estimated US\$84.00 per capita. However, in destitute rural population represented only about \$0.59 USD per capita.

## EXPENDITURES FOR CURATIVE SERVICES

The resources allocated to hospitals services represented 20.1% of the Ministry of Health and 39.9% of the Social Security total operating expenditures in 1992. The amount allocated to hospital services contrast with the resources allocated to preventive services in the Ministry of Health and the Social Security System of 10% and 2.9% respectively. This finding suggest low priority for preventive programs in the social security system. There were also differences in the allocation of resources for

**Figure 5. Operating Expenses by Institution**



administrative services (25.5% vs 15.5%). There were substantial differences in expenditures incurred by PH as compared to SSH for daily expenses per bed (US\$39.61 vs \$283,78). The median gross expense per discharge in social security hospitals was three times higher than in public government hospitals (USD\$675.45 vs 2553.99). The differences may be attributed to a greater case-mix complexity and more sophisticated equipment used in SSH. These differences reveal also significant inequities in the allocation of resources between the two hospital systems.

## METHODS TO ASSESS HOSPITAL PERFORMANCE

Institutional reports of 537 hospitals were used to evaluate hospital performance. Sources of information included reports from the Ministry of Health, the Mexican Institute for Social Security, and the National Institute for Statistics and Information for the fiscal year 1992.

The performance of these hospitals was evaluated using five groups of indicators: (1) financial, (2) capacity, (3) utilization, (4) productivity, and (5) efficiency. These indicators were used to compare 277 government Public Hospitals (PH) and 260 Social Security Hospitals (SSH). Financial indicators included information from global budget, and annual operating expenditures. All of the costs and expenditures were converted to 1992 US dollars using the official exchange rate (Peso 1.00= 0.32 US dollars). Hospital performance was evaluated using input-to-output ratios. Annual hospital expenses were combined with measurements of output to determine the expense per adjusted discharge.

Indicators of capacity reflects

the size of the hospital in terms of the number of beds and staff. Hospital activity included bed occupancy and average length of stay. Occupancy is a ratio of average daily census to the average number of beds maintained during the reporting period. Average length of stay represent the total number of acute care inpatient days in a hospital divided by the total number of acute care discharges from the hospital. A hospital's acute care average length of stay is a key indicator of utilization and clinical management and is predictive of the average resources used by a hospital per patient discharge.

Measures of productivity and efficiency often illuminate the underlying cause of favorable or unfavorable performance. We used three measures to compare measures

#### **Table 1. Areas Of Assessment**

- Ownership
  - 277 Government Subsidized Public Hospitals
  - 260 Social Security Hospitals
- Financial Indicators
  - Annual operating expenses
- Capacity
  - Number of beds
  - Number of personnel
- Utilization:
  - Average length of stay
  - Bed Occupancy

of hospital output (discharges and inpatient days) with a measure of the inputs required to produce the output: the number of acute care discharges per bed, and the number of personnel used to provide either a day of hospital care (full time equivalent personnel per average daily census) or per 100 discharges (full-time equivalent personnel per 100 adjusted discharges). Lower values are favorable for the number of employees per occupied bed or per 100 discharges.

Operating expense per adjusted discharge is a measure of the hospital's average cost of delivering inpatient care per unit (per case) in a hospital. Thus, reflecting the overall hospital efficiency. Expenses are all the operating expenses for the fiscal year which include payroll expenses and non-labor-related expenses. We use a measure of expense per adjusted discharge without adjustment for case mix or wages, which are the two major predictors of operating expenses. Case mix and wage adjusted measures of operating expense per adjusted discharge, transform the raw measure in one that is adjusted by the effect of the relative complexity of care provided in each hospital and for the effect of differences in prevailing wage rates.

A hospital's productive capacity and the utilization of that capacity are key predictors of financial performance. The number of acute care beds in service, those beds set up and staffed for use, is the best measure of hospital's productive capacity. Measurements of productivity and efficiency were combined. Measurements of output include services provided such as outpatient visits, number of discharges, surgeries, and number of diagnostic tests and the number of acute care discharges per bed. Productivity was defined as the amount of resources needed to derive a single unit of output, in this case specifically a patient discharge. Composite measurements were used to generate efficiency indexes by combining hospital activity indicators. Since hospitals offer a multiplicity of products (inpatient acute care services, inpatient non-acute care services, and outpatient services), we developed a system of relative value units. Outpatient and inpatient outputs are transformed into a measure that can be

aggregated using "relative value units". All the hospital output is expressed as "equivalent units of inpatient acute care services" or adjusted-discharges.

Another measure of efficiency relates the of hospital aggregate outputs (adjusted-discharges) with a measure of labor inputs required. The number of personnel required to provide either a day of hospital care (full-time equivalent

personal per adjusted average daily census) or 100 adjusted-discharges (full-time equivalent personal per 100 adjusted discharges). Low values are favorable for the number of employees per occupied bed or per 100 discharges.

Statistical tests were used to compared difference of proportions between groups using the chi-square test. For non-normal distributed continuous variables analyzed, the Wilcoxon test was used to compare ranks.

## CAPACITY AND UTILIZATION

A total of 2.264 million discharges were registered in 1992; of which 910,237 patients were discharged from public hospitals (PH) and 1,868,365 were discharged from the social security hospitals (SSH). There were major differences in the distribution of beds according to level of complexity between PH and SSH, for first level of care (11.3% vs 2.8%), secondary care (48.4% vs 71.4%) and tertiary care (40% vs 25.8%). There were also differences in the assignation of high level workers between PH and SSH, for the proportion of nurses (35.7% vs 12.7% ) and physicians (49.2% vs 31.3%) at the first level of care. Most interestingly the staffing patterns showed differences between PH and SSH, public facilities had lower ratio of nurses per bed (1.6 vs 2.3) and physicians per bed (0.8 vs 1.2) at the secondary level of care; and also lower ratio of nurses (1 vs 2.3) and physicians per bed (0.6 vs 0.8) at tertiary care hospitals. The hospital activity

**Table 2. Relative Value Units**  
**"equivalent units of inpatient acute services"**

$$\begin{aligned} \text{Total Output} &= (\text{inpatient} + \\ &\quad \text{outpatient} + \text{emergency} + \text{rehab}) \\ \text{Adjustment Factor} &= \\ &\quad \frac{\text{Total Expenditures}}{\text{Inpatient expenditures}} \\ \text{Adjusted Discharges} &= \\ &\quad \text{Acute care discharges} * \text{Adjustment Factor} \end{aligned}$$

analysis showed lower bed occupancy in PH as compared to SSH (50% vs 84%) as well as lower annual discharges per bed (38.6 vs 66.8). These findings have tremendous relevance for public hospitals. At lower rates of occupancy, the overhead costs represent a greater proportion of the hospital's total operating costs and hamper its ability to operate efficiently.

**Table 3. Capacity of Public Hospitals**

Hospitals	PH	SSH
Number of Units	277	260
Beds in Service	23,566	27,603
Full Personnel	121,068	193,846
Total Discharges	910,237	1,843,845
Personnel/Outpat-visit	293.8	417.8
Personnel/Crude-Disch	7.5	9.5
Overall Personnel/Bed	5.1	7.0
Occupancy Rate (%)	50.3	84.2

A crude measurement of utilization showed no difference in length of stay

**Table 4. Average Length of Stay**

Hospital	PH	SSH
• Crude	4.6	4.5
• Excluding/NB	7.0	6.0
• Internal Medicine	6.1	6.1
• Surgery	5.6	5.5
• Obstetrics	2.1	2.6
• Pediatrics	6.3	5.4

between PH and SSH. We were unable to adjust these measurement by case-mix or severity of illness. However, we were able to stratify by type of service provided. When excluded newborns, PH had longer average length of stay (7 vs 6 days) than SSH. Interestingly, pediatric patients in PH had longer length of stay in days (7 vs 6) than in SSH. Other services

provided showed not significant differences in ALOS when compared PH and SSH, for internal medicine (6.4 vs 6.1), surgery (5.6 vs 5.6), obstetrics (2.1 vs 2.5).

## Hospital Performance

A simple measurement of productivity showed significant differences in the number of annual discharges per bed (38.6 vs 66.8) in PH as compared to SSH. Hospitals typically offer a multiplicity of products (inpatient acute care services, inpatient non-acute care services, and outpatient services) and there are also a multiplicity of inputs processes involved in their production. Among them, labor inputs are complex combinations of activities. In most public hospitals physicians are involved in the production of inpatient and outpatient activities. Nursing work also combines high and low level skilled tasks depending on the level of support personnel available.

In order to account for these multiple processes and products, we developed a system of relative value units. Thus, outpatient and inpatient services were aggregated and all the hospital output is presented as adjusted-discharges.

These composite measurements showed

**Table 5. Hospital Indicators**

INDICATOR	PH	SSH
Discharges/Bed	38.6	66.8
Expense/A-D (1992USD)	\$374	\$1550
Personnel/100/A-D	11.1	10.0
Physicians	2.4	1.6
Nurses	4.0	3.1
Administrative	1.8	1.1
Other	2.7	3.1

differences between PH and SSH, for different indicators. There were significant differences between PH and SSH in operating expense per bed per day (US\$39.61 vs \$283.78). Also, SSH had almost four times higher expense per adjusted discharge than PH (USD\$2,554 vs \$675). A composite measurement of efficiency (input labor required to produce 100 units of output), showed differences between PH and SSH in the number of full employees required to produce 100 adjusted-discharges (11 vs 10 employees). A greater number of high level skilled workers such as physicians (2.5 vs 1.5) and nurses (4 vs 3) were required to produce 100 adjusted-discharges.

## DISCUSSION

Despite of substantial investment in curative care there is few information about the efficiency of public hospitals in most countries. A growing evidence suggest that a significant amount of the health care is inappropriate and wasted. The identification of modifiable parameters to increase hospital efficiency might reduce the financial barriers for the access to clinical care for the uninsured. The results of this study, using simple indicators to evaluate performance, are useful in identifying four major areas requiring improvements. The study provide preliminary evidence of major inefficiencies in the operation of public hospitals. These institutions are not operating at full technical capacity as reflected by the low occupancy rate, have greater overall resource utilization indicated by longer lengths of stay, and show low productivity requiring greater number of personnel to produce one unit of output.

The results also point out significant inequities in the distribution of hospital beds and in the allocation of financial resources between public and social security hospitals. Administrative expenditures were 25% of the total budget in PH, while in the social security system represented only 15%. This difference is more likely due to economies of scale. Certain categories of overhead costs such as administration and plant maintenance do not increase proportionally as the number of beds in service increases. The social security system operates not only as an integrated system sharing administrative costs, but also enforce reference of patients. Public hospitals at least at the regional level are required to develop an strategy to consolidate an integrated hospital system, to achieve economies of scale, to develop discount bulk purchasing programs, and built information systems.

We also find that public hospitals are not operating at full capacity which might increase overhead costs. Occupancy rate and its trends are predictors of performance. Persistently low or declining occupancy rates may require the development of plans to scale down the size of the hospital, convert underutilized capacity to more productive uses, change the service offering of the hospital, or affiliate with other hospitals.

Factors modifying the occupancy rate are: the population of a hospital market area, the admission rate in that market, the average length of stay, and the hospital's market share. This is particularly relevant for urban areas in Mexico where either social security or government hospitals operate in close geographic proximity. Low occupancy rates indicate an inability on the part of the public hospital to attract patients. This might reflect low perceived quality of the services provided by PH due to lack of drugs, diagnostic procedures, or long waiting times. In public hospitals a bureaucratic culture, low wages, lack of accountability, shortages of supplies, and limited diagnostic and therapeutic resources has conducted to a deterioration in the quality of patient care. In fact, in recent surveys users have reported low satisfaction with the provision of services in public hospitals. These findings have tremendous relevance for public hospitals. At lower rates of occupancy, the overhead costs represent a greater proportion of the hospital's total operating costs and hamper its ability to operate efficiently. Feasibility studies are required to estimate the financial impact on a public hospital of adding or eliminating services and programs. Further analysis for the alternative uses of unoccupied beds in public hospitals is warranted.

Public hospitals showed also longer length of stay as compared to social security hospitals. Average length of stay is a function of the complexity of a hospital's case mix, customary periods of hospitalization for a condition in a geographic area, the availability of home health services for those needing support after discharge, and the efficiency with which hospitals treat its patients. Given the availability of data we were unable to adjust neither for severity of illness nor for case mix. However, there was significantly higher mortality in SSH as compared to PH (2.6 vs 2.4%  $p < 0.001$ ). Since SSH cover cancer, injury, intensive care services in higher volume and intensity than most public hospitals, it is likely that this differences reflect case-mix characteristics in the underlying population. A lower mortality in public hospitals suggests lower complexity in patient's disease. Thus, it is likely that these inefficiencies are real and not confounded by a high complexity in case mix load.

The longer length of stay in public hospitals might have two explanations: the lack of availability of home health services support after discharge in Mexico and some degree of inefficiency in management of clinical cases. Average length of stay significantly longer, that are not justified by a more complex case mix are viewed as inefficiencies in operation. Currently in Mexico, there are not nursing homes for sub-acute care and most physician are unconfident of the care provided at home. A low economical and educational level of patients and their families receiving care in public hospitals prevent physicians to practice early discharges. Thus, in order to support acute care public hospitals alternatives for non-acute care after discharge should be provided for the Mexican hospital system. Length of stay as proxy of overall resource utilization, shortening it have the potential to increase efficiency by reducing hospital expenditures, staff requirements, and overall the utilization of hospital services. For example, length of stay was in average one day longer in public hospitals than in SSH. The expense per patient per day was estimated in \$61.06 US dollars. Thus, average reductions of one day, for a system that produce 900,000 annual discharges, have the potential of saving about \$ 55 million US dollars annually.

Low productivity in public hospitals was reflected by the higher of number of employees required to produce 100 discharges. This indicator might represent inappropriate staffing patterns. A greater number of high skilled workers such as physician and nurses are employed in public hospitals. It is likely that high-level health workers are conducting many tasks without support from low-level health workers, resulting in serious inefficiencies in the daily hospital operation. The results suggest that public hospitals are not using cost efficient combinations of high-level health workers and support staff. Since the largest single contributor of a hospital expenses is labor, a stringent review of staffing patterns and functional task analysis might have implications in hospital costs, productivity, and efficiency.

## **IMPLICATIONS FOR MANAGEMENT**

Interventions to improve performance of public hospitals can be identified at two inter-related levels: (1) managerial practices, and (2) policy interventions. The results of this study have implications for management. The process of strategic planning is critical for positioning public hospitals for continued viability and the development of a comprehensive course of action for the entire delivery system. There is a rich experience from the international literature about utilization management, variation in patterns of use of health resources, and efficiency of the services. There are several managerial interventions that can improve the processes of care and are clustered into major areas: (1) review staff requirements in clinical, administrative, and support areas, (2) upgrade cost-accounting systems, (3) upgrade the inventory control system, (4) increase involvement in discount bulk purchasing programs, and (5) development of cost containment education programs.

At the hospital levels the factors affecting resource utilization such as case mix, number of cases, resource per case, input unit price, and input efficiency are the most important cost-influencing variables. The major controlling forces of these variables are the environment, physician and administrators. While case mix is determined by epidemiological and demographic factors external to the hospital, the volume of patients in hospitals is influenced by the reimbursement system. The use of resources per case is highly determined by the style of practice and mode of treatment, thus influenced by physician behavior. Based in published experiences, implementing changes in 9 specific processes should be able to increase efficiency in the provision of care: (1) admission criteria, (2) discharge plan since admission, (3) length of stay, (3) ambulatory surgery, (4) indications for C-section, (5) second surgical opinion, (6) patient flux in an integrated hospital system of referrals, (7) develop programs to treat patients on an outpatient basis, and (8) variation in the use of diagnostic procedures and (9) patterns of drug prescription.

Some of these interventions have been successfully applied reducing costs without decreasing the quality of care. So, it might be acceptable the development of a theoretical framework based in published information and to propose interventions to be validated in the Mexican context.

### **IMPLICATIONS FOR POLICY**

These results have also policy implications, since government has a major role in regulating hospitals services, reimbursement mechanisms, and the allocation of subsidies to the poor. The hospital system is a major player in any proposed health sector reform. Government has also a major role in regulating market competition or in providing subsidies that warrant coverage of hospitals services regardless a citizen ability to pay.

Currently, the medical private practice in Mexico is based in users fee, the driving force is a profit seeking behavior that induces consumption to increase profits, there is no pressure on prices since there are no organizations of purchasers of health care services, there are no federal or state certification committees, medical suits are almost nonexistent, and most physicians practice clinical medicine without liability insurance. We did not analyze the private provision of hospital services. However, it is important to highlight that 30% of hospital beds in Mexico are private. This reflect a substantial market for private health services operating almost in an unknown and unregulated way.

A privatization of government hospitals might reduce the access of the poor and would represent a profound change in mission of community hospitals. Hospitals traditionally have had a reponsability to the community and the patient as opposed to profit maximizer business. Free markets did not create these public institutions. Communities gave them free land, endowements, phylantophic gifts, and tax free status. Underpaid physicians, nurses, and staff have worked in this institutions for years with the motivation of compasion and the incentive of public good. Government has to regulate the hospital system in a country with such economic inequities.

## **Limitations**

The results here presented have some limitations. For example, the quality of the data on expenditures might be affected by the important proportion of discretionary budget not necessarily used for the care of patients. It is not possible to derive a production function since we do not have data on costs. Misclassification may be related to the level of care, some hospitals classified as tertiary level of care might be in fact providing secondary level of care. The use of crude measurements reduce the comparability between the two hospital systems. We did not adjust for case-mix, severity of illness, size of the hospital, or teaching status which might represent confounding factors. Case mix adjustment transform raw measures into adjusted measures that control for the effect of the relative complexity of care provided in each hospital. Finally, since this is a descriptive study any conclusion is speculative and warrants further research.

## **Conclusions**

In summary, this analysis of the Mexican hospital system reveals enormous inequities not only in the availability of beds but also in the resources directed to public hospitals providing services for the poor. Community hospitals in developing countries have to find ways to achieve savings, since budgetary constrains challenge the provision of curative and rehabilitation care for the disadvantaged. Regions with higher poverty and burden of disease have the lowest number of available beds. The expenses per adjusted discharge in public hospitals are only a quarter of those in social security hospitals.

In order to overhaul the hospital system in Mexico a major investment is required to develop reliable information systems that combine clinical and accounting information. Changes in reimbursement systems might increase the efficiency of scarce resources directed to public hospitals. The allocation of major financial resources combined with strategies to increase hospital efficiency would allow the expansion of coverage and to increase the quality of the services, recognizing the important role

public hospitals play in meeting the goals of society by providing health care services to all people, regardless of their ability to pay.

## REFERENCES

Mahapatra P, Berman P. Using Hospital Activity Indicators to Evaluate Performance in AP, India. Research Paper #84. Takemi Program in International Health. Harvard School of Public Health, August, 1993.

Pavon-Laso I. Evaluation of Hospital Performance through simultaneous application of several indicators. Bull Pan Am Health Org 1986;20:341-357.

Barnum HN, Kutzin J. Public Hospital in Developing Countries: resource use, cost and financing. Johns Hopkins Press, 1994.

National Health System: Statistical Information Bulletin. Volumen 10. Mexico, 1990.

Frenk Julio. Propuestas para el avance del sistema de salud en Mexico. Economia y Salud. FUNSALUD, 1994.

Indicadores Socioeconomicos e Indice de Marginacion. Instituto Nacional de Estadística y Geografía. (INEGI) 1990/ CONAPO, Mexico, 1990.

Aguirre-Gas H. Evaluación de la calidad de la atención médica. Expectativas de los pacientes y de los trabajadores de las unidades médicas. Salud Publica de Mex 1990;32:170-180.

Arredondo A, et al. Costos de los servicios de salud en México. Fundación Mexicana para la Salud, México, 1993.

Comisión Mexicana para la Acreditación de Hospitales. Estandares mínimos para la certificación hospitalaria. México, 1993. Documento no Publicado.

Concamin. Encuesta de opinión acerca de los servicios que proporciona el Instituto Mexicano del Seguro Social en el Sector industrial afiliado a cámaras y asociaciones. Confederación Nacional de Cámaras de la Industria de la transformación, México, 1994.

Cruz C, Domínguez-Villareal M. Equidad en el cobro de los servicios médicos hospitalarios: el caso de las cuotas de recuperación en la secretaria de salud. Salud Publica de Mex 1990;32:449-464.

DeGortari GE, Castro ME, Fernández PJF. The costs of operating psychiatric hospitals of the Ministry of Health in the Federal District. Salud Publica Mex 1993;35:563-8.

Duran LI, Becerra J. Costos de la consulta médica según diferentes insumos. México, 1989. Documento no publicado.

Frenk J. El financiamiento como instrumento de política pública. Bol Of Sanit Panam 1987;103:719-725.

González-Block MA. El traslape de la demanda en el sistema nacional de salud de México. Limitaciones a la integración sectorial. Salud Publica Mex 1988; 30:804-814.

Instituto Nacional de Estadística Geografía e Informática. Encuesta de opinión sobre los servicios de salud. INEGI, México, 1993.

Laguna GJ, Fernández CJ, Cordera A. Equidad y Salud. *Salud Publica de Mex* 1992;34(sup):9-15.

Lastiri QS. Financing the national health system in México and the role of private sector in the financing and health care. Madison: University of Wisconsin.

Lee Ramos A. Evaluación del envío de pacientes entre unidades médicas. *Bol Med IMSS* 1975;17:187.

Ponce de Leon S. Eficacia de un programa de control de infecciones nosocomiales: una posibilidad para mejorar la calidad de la atención médica. *Salud Pública Mex* 1986;28:593-598.

Villareal E. Costo de la atención del parto normal. Un modelo alternativo de atención perinatal. Tesis de Grado de Maestría. Instituto Nacional de Salud Publica, México 1993.

Fleming ST, Boles KE. Financial and clinical performance: bridging the gap. *Health Care Management Rev* 1994;19:11-17.

Gray BH, Field MJ. Controlling Costs and Changing patient care? The role of utilization management. Institute of Medicine. National Academy Press. Washington DC, 1989.

McGreevey W. Social Security in Latin America. Washington, DC: World Bank, 1990. Discussion Paper No 110.

Musgrove P. Measurement of equity in health. *Health Stat Quart* 1986;39:525-546.

Young DW, Saltman RB. Preventive medicine for Hospital costs. *Harvard Business Review*. Jan-Feb 1983