

Community Hospital Expenses and Revenues: Pre-Medicare Inflation

by KAREN DAVIS*

To identify causes of hospital inflation in the years immediately before Medicare began, this study examines several inflation theories on the basis of data on components of hospital revenue and expenses for the period 1962-66. In testing the theories based on a labor-cost-push model or stressing wasteful capital expenditures, the study examines hospital expenses by type of factor inputs. To discover implications for the theories that emphasize technology advances and expansion in services provided, trends in departmental hospital revenues and expenses were also explored.

Some of the findings have significant implications for the various theories: A substantial part of hospital inflation results from a rise in the quantities of inputs used to provide a day of care; nonlabor costs have risen more rapidly than labor costs; most of the increase has been in ancillary services; there has been some shift toward higher-skilled occupations in the composition of personnel and toward more major equipment in the composition of plant assets; and increases in days of hospital care have been moderate, as outpatient services expanded significantly. These findings are more consistent with the demand-pull view of inflation and the views that emphasize changes in technology and expansion of the community hospital's role.

ONE OF THE GREATEST concerns about the provision of medical services in the United States is the rapid increase in the cost of medical care. Attention has been increasingly focused on this aspect of the delivery of health services following the implementation of the Medicare and Medicaid programs in 1966. In a period of general price inflation, the inflation in medical care prices has been even more marked. These trends have resulted in the implementation of overall price guidelines under the Economic Stabilization Program with regulations covering the allowable costs of medical services.

* Dr. Davis, research associate at the Brookings Institution, was formerly on the staff of the Division of Health Insurance Studies, Office of Research and Statistics, Social Security Administration. The study reported here was made under a Social Security Administration contract. For a more complete report on the study, see Karen Davis and Richard W. Foster, *Community Hospitals: Inflation in the Pre-Medicare Period* (Research Report No. 41), Social Security Administration, Office of Research and Statistics, 1972.

Although the marked inflation in hospital costs is well-known, there is very little consensus regarding the basic causes of the inflation and very little information on the form that cost increases have taken. To help remedy these gaps in understanding hospital inflation, this article presents detailed data on the components of hospital expenses and revenues for the fiscal years 1962-66 based on a nationwide study—the Hospital Economic Survey—conducted by the American Hospital Association for the Social Security Administration.¹ Future studies will present data for the Medicare period, using data collected from the same sample hospitals but submitted directly to the Social Security Administration under the Medicare program. The pre-Medicare data may be useful in two respects: (1) as a possible basis for establishing guidelines or controls on hospital inflation designed to restore the pre-Medicare trends in hospital expenses and (2) as indications of the basic underlying causes of inflation in hospital costs.

Two different perspectives on hospital costs are possible with the detailed data available from the pre-Medicare survey. One approach decomposes hospital expenses by type of factor inputs and determines the portion of increases in costs attributable to increases in prices of labor and nonlabor inputs and in quantities of factor inputs. The other approach decomposes hospital expenses and revenues by type of services provided (routine room and board services, various ancillary services, outpatient services).

THEORIES OF HOSPITAL INFLATION

Many different views of hospital cost inflation have been put forth. One view emphasizes the importance of increases in demand in inducing

¹A description of the sample design, estimation procedures, and reliability of the sample is presented under "Methodology" on pages 16-19. For a more complete breakdown of these components by type of hospital ownership and by bed size, see Karen Davis and Richard W. Foster, *op. cit.*

an upward shift in hospital costs. Others point to specific factor inputs—such as excessive wage gains by hospital workers or duplication of capital facilities—as the major source of cost increases. A more benign view of hospital inflation stresses the expanded role of the hospital and the importance of changes in technology that lead to improvements in health status and reduce mortality but at a high cost. Still another view of hospital inflation focuses on cost reimbursement methods as encouraging inefficiency in the provision of hospital services.

The appropriate policy for combating hospital inflation depends crucially on which one, or which combination, of these views is correct. If the inflation is a consequence of increasing demand without increases in supply, an expansion in number of hospital beds may be warranted. If the increase in costs is a result of additional bed capacity, the opposite policy should be appropriate. If the inflation is a labor-cost-push inflation, attempts to curtail labor costs through wage guidelines or controls may be the appropriate policy. If the inflation is induced by certain types of insurance coverage, a restructuring of insurance coverage may be called for. If the inflation is induced by inefficiencies in the hospital market, structural reform of the industry may be a desired course of action. If the inflation is the result of advances in technology, inflation may simply be a necessary price of improvement in health status. If cost reimbursement is identified as a major factor in hospital inflation, alternative reimbursement mechanisms should be sought.

Sorting out the portion of inflation attributable to various causes requires simultaneous consideration of all determinants of hospital expenses. Before conducting a sophisticated analysis of the determination of hospital costs, however, it is useful to examine the nature of hospital cost increases. Some views of inflation based on factual assertions can be ruled out by direct examination of the evidence. For example, if labor costs were constant over the period, labor-cost-push theories of inflation could be dismissed. Factual evidence can also indicate the magnitude of possible sources of inflation and can delineate the major components of inflation so that attention can be focused on those expenses showing the most rapid growth. The remainder of the article therefore attempts to indicate which types of trends are

consistent or inconsistent with various views of the mechanism by which inflation occurs.

LABOR AND CAPITAL COMPONENTS OF HOSPITAL INFLATION

Since some theories of hospital inflation are based on a labor-cost-push model and others emphasize wasteful capital expenditures, an insight into the validity of these theories for the early 1960's can be obtained by decomposing total hospital expenses into factor input expenses. Several types of information are useful in determining the potential magnitude of these sources of inflation. First, information on the relative importance of labor and capital expenses should provide some perspective on the relation between increases in factor costs and overall hospital costs. Second, it is important to know how much of the rise in factor expenses represents an increase in the price paid for inputs and how much represents an increase in the quantity of inputs used in the provision of a day of hospital care. Finally, it is important to know whether the types of labor and capital inputs used have changed over a period of time.

Investigation of the labor and capital components of hospital costs in the pre-Medicare period reveals several important findings.

- A major part of the growth in hospital costs has been caused by an increase in the quantity of inputs used to provide a day of hospital care. Added to an annual 3.8-percent increase in the price of hospital inputs is an annual 3.0-percent increase in inputs per day of care for a total annual increase of 6.8 percent in operating expenses per patient day.
- Labor expenses have not risen as rapidly over the period as other types of expenses—particularly capital expenses.
- About three-fourths of the increase in labor expenses is accounted for by increases in average earnings of employees, and about one-fourth of the increase represents an increase in number of employees per day of care.
- Some slight shift has occurred in the composition of hospital personnel toward more technical occupations such as professional

patient care and administrative employees.

—The lowest-paid occupations (dietary and household and property) have had the biggest percentage increases in annual earnings.

—Rates of increase in major equipment plant assets per day of hospital care have been twice as high as those shown for building plant assets per day of hospital care. Expansion of bed capacity did not altogether keep pace with increases in days of hospital care.

Major Labor and Capital Components of Hospital Expenses

Operating expenses may be decomposed into payroll expenses; depreciation, interest, and rent expenses; and other operating expenses (primarily supplies, food, utilities, drugs, and linen). Table 1 indicates that capital expenses have increased much more rapidly from 1962 to 1966 than other types of expenses—with depreciation, interest, and rent per patient day rising 52 per-

TABLE 1.—Labor and capital components of hospital operating expenses, 1962-66

Year	Operating expenses			
	Total	Payroll	Depreciation, interest, rent	Other
	Total amount (in millions)			
1962.....	\$6,365	\$3,919	\$297	\$2,119
1963.....	6,867	4,261	333	2,273
1964.....	7,604	4,679	389	2,556
1965.....	8,411	5,162	430	2,819
1966.....	9,517	5,797	515	3,205
Percentage Increase				
1962 to 1966.....	49.5	46.8	73.4	51.3
Average annual, 1962-66.....	10.6	10.1	14.8	10.9
	Amount per patient day			
1962.....	\$34.44	\$21.36	\$1.60	\$11.47
1963.....	36.72	22.79	1.78	12.15
1964.....	38.93	23.96	1.89	13.09
1965.....	41.28	25.34	2.11	13.83
1966.....	44.79	27.28	2.43	15.08
Percentage Increase				
1962 to 1966.....	30.1	27.7	51.9	31.5
Average annual, 1962-66.....	6.8	6.3	11.0	7.1
	Percentage distribution			
1962.....	100.0	62.0	4.6	33.3
1963.....	100.0	62.1	4.8	33.1
1964.....	100.0	61.5	4.9	33.6
1965.....	100.0	61.4	5.1	33.5
1966.....	100.0	60.9	5.4	33.7

TABLE 2.—Labor and capital hospital inputs, 1962-66

Year	Number of full-time equivalent employees ¹		Average annual earnings ²	Plant assets	
	Total (in thousands)	Per daily census		Total (in millions)	Per daily census
1962.....	1,243	2.46	\$3,176	\$8,971	\$17,716
1963.....	1,285	2.51	3,317	9,627	18,789
1964.....	1,361	2.54	3,438	10,612	19,831
1965.....	1,443	2.59	3,577	11,797	21,132
1966.....	1,519	2.61	3,816	12,985	22,308
Percentage Increase					
1962 to 1966.....	22.2	6.1	20.2	44.7	25.9
Average annual, 1962-66.....	5.1	1.5	4.7	9.7	5.9

¹ One-half the number of part-time employees added to the number of full-time employees

² Payroll expenses divided by the number of full-time equivalent employees.

cent, compared with a rise of 28 percent in payroll expenses. Other operating expenses per patient day increased by 32 percent. The slower rise in payroll expenses led to a decline in the proportion of all expenses that are labor expenses—from 62 percent in 1962 to 61 percent in 1966. Capital operating expenses—a relatively small component of all operating expenses—accounted for 4.7 percent of the total in 1962 and 5.4 percent in 1966.

Labor expenses.—Although these trends in factor expenses disprove the allegation that rising hospital costs are merely a reflection of rising labor costs, labor expenses still represent a sizable portion of hospital costs and warrant deeper examination. In particular, it would be useful to know how much of the 28-percent increase in payroll expenses per patient day stems from an increase in average wages and how much stems from use of more employees per day of care. Table 2 indicates that about three-fourths of the increase was caused by the rise in average annual earnings of hospital employees and that one-fourth was caused by a rise in the number of employees per day of care.

Average annual earnings of hospital employees went up from \$3,176 in 1962 to \$3,816 in 1966, or 20 percent. Although these salaries are low and few would call a wage increase at such a low level excessive, the increases are greater than those in other industries. Average weekly earnings of retail trade workers, for example, increased by only 13 percent over the same period.²

Also in contrast to other industries, hospitals have increased the number of employees per unit

² *Economic Report of the President, 1971, table C-30.*

TABLE 3—Indexes of components of hospital operating expenses per patient day, 1962–66

[1962=100]

Item	1963	1964	1965	1966	Average annual increase
Total operating expenses per patient day.....	106 6	113 0	119 9	130 1	6 8
Price of all inputs ¹	106 7	112 2	118 6	127 7	6 3
All inputs per patient day ¹	104 4	108 2	112 6	120 2	4 7
Payroll expenses per patient day.....	102 0	103 3	105 3	106 1	1 5
Average annual salary.....	111 3	118 1	131 9	151 9	11 0
Labor inputs per patient day.....	101 6	101 3	102 8	120 1	4 7
Capital expenses per patient day.....	109 5	116 7	128 3	126 4	6 0
Price of capital inputs.....	105 9	114 1	120 6	131 5	7 1
Capital inputs per patient day.....	101 2	102 5	104 3	107 3	1 8
Other expenses per patient day.....	104 7	111 3	115 6	122 5	5 2
Consumer price index (BLS).....	103 2	105 9	109 3	115 9	3 8
Other inputs per patient day.....	103 3	106 7	109 9	112 6	3 0

¹ Weights are 0.615 for payroll expenses, 0.049 for capital expenses, and 0.336 for other expenses. The weights are obtained from the proportion of

all operating expenses represented by each component in 1964

of output during the period. The number of full-time equivalent employees per day of patient care rose 6 percent—from 2.46 in 1962 to 2.61 in 1966. Several explanations are possible for the increase in labor inputs per patient: It may represent a decline in hospital efficiency (or a decline in labor productivity), but a more plausible explanation is that the nature of hospital care has altered. This shift could result from a change in technology that requires additional labor, from an increase in the quality of care provided, or from a change in the range of services offered by hospitals. Regardless of the underlying reason for the increase in labor inputs, it is important to understand that hospitals, unlike other industries, cannot rely on productivity gains to offset higher wages. Instead, increases in labor requirements add to the increases in wages to produce an even higher rate of growth in labor expenses.

Capital expenses.—Although they do not represent the major portion of hospital expenses, capital expenses have also been the focus of much concern. One theory of hospital inflation pins the blame for rising costs on the desire of hospital administrators to acquire “excessive” capital equipment. In fact, capital expenses have increased markedly. Depreciation, interest, and rent expenses per patient day increased 52 percent from 1962 to 1966. Plant assets per day of hospital care increased by 26 percent.

Unfortunately, a good measure of physical capital is not available. Increases in plant assets represent increases both in prices of capital goods (or historical cost of assets) and in the physical quantity of capital. In addition, plant assets do not reflect the extent of rented capital. In order

to derive a measure of physical capital, an index of capital cost is constructed by assuming that capital costs increased at the same rate as the interest rate for high-grade municipal bonds—a 20-percent increase.³ With this measure of the price of capital services, an index of physical capital is constructed by deflating total capital expenses per patient day by the price of capital. This procedure yields an increase in physical capital inputs per daily census of 26 percent for the period—the same as the increase in plant assets per day of care.

Other operating expenses.—From 1962 to 1966, other operating expenses rose 32 percent. Though the exact composition of these expenses is unknown, they consist primarily of supplies (including disposable items such as surgical gowns, syringes, and thermometers), food, utilities, drugs, and linen. If the composite average price of these commodities moves similarly to the consumer price index, a physical measure of other inputs can be constructed by deflating other expenses per patient day by the consumer price index. Under this procedure, other inputs per patient day rose 23 percent from 1962 to 1966. Deflating by the wholesale price index yields an only slightly higher increase of 25 percent for the period.

These trends in physical inputs and prices of inputs are summarized in table 3. An aggregate price index is constructed by weighting the prices of each of the factor inputs by the proportion of expenses represented by that factor in 1964. An aggregate physical input index per patient day

³ *Economic Report of the President*, 1971, table C-57.

TABLE 4 —Hospital employees per daily census and average annual earnings for selected types of employees, 1962-66

Year	All employees	Administrative	Dietary	Household and property	Professional patient care	Other
Number of employees per daily census						
1962.....	2 46	0 21	0 26	0 34	1 45	0 19
1963.....	2 51	.22	27	34	1 48	20
1964.....	2 54	.22	26	35	1 52	.19
1965.....	2 59	.24	26	34	1 56	.19
1966.....	2 61	.25	26	.34	1 55	22
Percentage increase						
1962 to 1966.....	6 1	19 1	0	0	6 9	15 8
Average annual, 1962-66.....	1 5	4 5	0	0	1.7	3 7
Average annual earnings						
1962.....	\$3,176	\$4,077	\$2,373	\$2,735	\$3,418	\$2,213
1963.....	3,317	3,918	2,529	2,891	3,642	2,000
1964.....	3,438	4,097	2,617	2,966	3,746	2,227
1965.....	3,577	4,201	2,774	2,661	3,951	2,491
1966.....	3,816	4,131	2,965	3,384	4,217	2,286
Percentage increase						
1962 to 1966.....	20 2	1 3	24 9	23 7	23 4	3 3
Average annual, 1962-66.....	4 7	.3	5 7	5 5	5 4	.8

is also constructed using the same weights. The overall annual increase of 6.8 percent in operating expenses per patient day may then be decomposed into a 3.8-percent annual increase in the prices of hospital inputs and a 3.0-percent annual increase in the quantities of inputs used in the provision of a day of hospital care.

Labor Expenses and Type of Employee

One of the reasons frequently advanced for rising labor costs is the increasing tendency of hospitals to hire a more highly skilled labor force.⁴ Technological change resulting in more complex methods of treatment is cited as the primary reason for the upgrading of the hospital labor force. Others make the reverse argument and contend that a shortage of highly skilled labor has caused hospitals to make greater use of less highly skilled labor.⁵ Unfortunately, almost no information on the composition of hospital payroll expenses by type of employee has previously been available on a nationwide basis. It has been difficult, therefore, to determine accurately if the hospital skill-mix has changed in either direction. The Hospital Economic Survey provides, for the first time on a nationwide basis, breakdowns of labor expenses over a period of

time for five employee classifications: administrative employees, dietary employees, household and property employees, professional patient-care employees, and a residual category covering primarily nonprofessional patient-care employees and those professional employees not covered by the above categories. Since the residual group covers a wide variety of employees, most of the analysis concentrates on trends in the four major occupational classifications.

Trends in the number of employees per day of hospital care by occupational classification indicate a shift to more technical occupations. The biggest increases in the four major occupational classifications came in professional patient-care employees (from 1.45 to 1.55 employees per day of care as shown in table 4) and in the number of administrative employees. The number of the dietary and the household and property employees per day of hospital care remained constant over the period.⁶

For the two more highly skilled employee classifications (administrative and professional patient-care) the earnings pattern was mixed. From

⁴ See, for example, Department of Health, Education, and Welfare, *A Report to the President on Medical Care Prices*, February 1967.

⁵ Martin Feldstein, in *The Rising Cost of Hospital Care* (chapter 5), presents some evidence indicating that the skill level has actually declined.

⁶ The occupational classifications provided in the survey are not perfectly suited for testing the hypothesis that the level of the skill-mix of hospital employees has increased, since the skill levels within each broad employee classification may have changed. It is possible to determine if the rising wage level is primarily attributable to a shift from less technical to more technical occupations. If the occupation composition had remained constant during the period, the average wage rate would have risen by 20.0 percent rather than by 20.2 percent.

1962 to 1966 professional patient-care employee earnings rose rapidly (23 percent) while administrative employee earnings were virtually constant. This difference may reflect an expansion of administrative personnel to include more clerical personnel, with the result that the higher salaries of the hospital administrator and his assistants are increasingly diluted over the period by the expansion in lower-paid administrative personnel. The increase in professional patient-care earnings, on the other hand, may reflect an addition of more highly skilled employees such as more physicians on the hospital staff.

Although dietary employees and household and property employees are near the bottom of the wage ladder, they had the greatest percentage increases in annual earnings (25 percent for dietary employees and 24 percent for household and property employees). Some substantiation is thus provided for the claim that part of the increase in wage levels represents an increase in the wages of low-paid workers.

These trends in number of employees and average earnings by occupation are combined in the data on payroll expenses presented in table 5. By far the most rapid increase in payroll expenses has been in the professional patient-care category with expenses per patient day increasing 32 percent over the period. Professional patient-care payroll expenses increased from 63.6 percent of all payroll expenses in 1962 to 65.6 percent in 1966, while all other employee categories declined as a proportion of payroll expenses.

Composition of Hospital Beds and Plant Assets

At the core of several different theories of inflation is the notion that a large portion of hospital inflation is attributable to acquisition of hospital capital equipment. Rises in costs as a consequence of capital investment are not restricted to capital expenses such as depreciation but also include labor costs of personnel that must be hired to operate the capital equipment and the costs of materials and supplies. In some theories of inflation, capital accumulation is a desirable phenomenon—merely reflecting changes in medical technology that enable more lives to be saved with new, sophisticated equipment. In other theories of inflation, much of the capital accumulation is depicted as wasteful.

Judgments about the validity of this cause of inflation have been hampered both by an absence of measures of socially optimal investment and by the absence of information on the extent and the types of hospital capital investment. In at least this second respect, the survey makes a useful contribution by obtaining data on the composition of hospital plant assets and beds. These data are presented in tables 6 and 7. The article by Paul Ginsburg that follows presents some empirical evidence on the determinants of hospital investment.

The data confirm the allegation that most of the increase in hospital capital has come in acquisitions of hospital equipment rather than additional investment in buildings. During the 1962-66 period, rates of increase in major equipment

TABLE 5.—Payroll expenses, by type of employee, 1962-66

Year	Total payroll expenses	Payroll expenses by types of employees				
		Administrative	Dietary	Household and property	Professional patient care	Other
Amount per patient day						
1962.....	\$21 36	\$2 39	\$1 72	\$2 52	\$13 58	\$1 15
1963.....	22 79	2 38	1 84	2 73	14 76	1 07
1964.....	23 96	2 51	1 89	2 81	15 56	1 18
1965.....	25 34	2 72	2 01	2 46	16 84	1 32
1966.....	27 28	2 79	2 10	3 12	17 91	1 37
Percentage increase.						
1962 to 1966.....	27 7	16 7	22 1	23 8	31 9	19 1
Average annual, 1962-66.....	6 3	3 9	5 1	5 5	7 2	4 5
Percentage distribution						
1962.....	100 0	11 2	8 0	11 8	63 6	5 4
1963.....	100 0	10 4	8 1	12 0	64 8	4 7
1964.....	100 0	10 5	7 9	11 7	65 0	4 9
1965.....	100 0	10 7	7 9	9 7	66 5	5 2
1966.....	100 0	10 2	7 7	11 4	65 6	5 0

TABLE 6.—Composition of plant assets, by type, 1962 and 1966

Year	Total plant assets	Land and land improvements	Buildings	Major equipment	Minor equipment	Under construction	Other
Total amount (in millions)							
1962.....	\$8,971	\$343	\$5,734	\$1,819	\$37	\$536	\$502
1966.....	12,985	525	7,987	2,972	65	523	912
Percentage change							
1962 to 1966.....	44.7	53.2	39.3	63.4	75.1	-2.4	81.7
Average annual, 1962-66.....	9.7	11.3	8.6	13.1	15.0	-6	16.1
Amount per daily census							
1962.....	\$17,716	\$677	\$11,324	\$3,591	\$73	\$1,059	\$992
1966.....	22,308	902	13,722	5,106	112	899	1,567
Percentage change							
1962 to 1966.....	25.9	33.2	21.2	42.2	53.4	-15.1	58.0
Average annual, 1962-66.....	5.9	7.4	4.9	9.2	11.3	-3.6	12.1
Percentage distribution							
1962.....	100.0	3.8	63.9	20.3	0.4	6.0	5.6
1966.....	100.0	4.0	61.5	22.9	.5	4.0	7.0

plant assets per day of hospital care were twice as high as rates of increase in building plant assets per day of hospital care. Although buildings still represent the major portion of hospital plant assets, their share of all plant assets declined from 63.9 percent in 1962 to 61.5 percent in 1966.

Expansion in bed capacity was moderate. The number of beds did not fully keep pace with increases in days of hospital care over the period. Some interesting changes in the composition of total hospital beds, however, did occur. The total number of obstetrical beds declined by 2 percent in response to a decline in hospital births. The biggest increases were in intensive-care beds—with the number of beds devoted to this purpose rising from 4,000 in 1962 to 14,000 in 1966.

TRENDS IN REVENUES AND EXPENSES OF INDIVIDUAL HOSPITAL SERVICES

Another way of viewing hospital operating expenses is to examine growth in expenses of providing various hospital services. This approach is particularly useful in determining whether the major types of inflation have been in the provision of standard room-and-board services, in the provision of ancillary services (operating room, drugs, laboratory tests, X-rays, etc.), or in the provision of outpatient services.

Viewing expenses from this perspective should also yield additional information relevant to the-

ories of hospital inflation. Some theories of inflation, for example, emphasize the expanded scope of hospital services, and others emphasize the advances in scientific know-how that have made it possible to treat more difficult cases. If either of these theories is correct, one would expect a large increase in ancillary service expenses without much change in standard room-and-board expenses.

In addition to the detailed information on operating expenses for individual services, the survey obtained data on sources of patient revenues. It is possible, therefore, to compare revenues from various ancillary services with the direct costs of providing those services. With the aid of revenue-

TABLE 7.—Composition of hospital beds, by type, 1962-66

Year	All beds †	Obstetrical	Pediatric	Intensive care	Other †
Number (in thousands)					
1962.....	652	85	62	4	501
1963.....	671	84	64	9	515
1964.....	694	84	66	9	535
1965.....	715	84	68	11	552
1966.....	739	84	69	14	572
Percentage change.					
1962 to 1966.....	13.3	-1.9	12.0	274.1	14.2
Average annual, 1962-66.....	3.2	-5	2.9	39.0	3.4
Percentage distribution					
1962.....	100.0	13.1	9.4	0.9	76.9
1963.....	100.0	12.5	9.5	1.3	76.7
1964.....	100.0	12.1	9.5	1.3	77.1
1965.....	100.0	11.7	9.5	1.5	77.2
1966.....	100.0	11.3	9.3	1.9	77.4

† Excludes bassinets for the newborn

cost margins on individual services, the pricing mechanism can be explored. In particular, it can be determined if prices are passively equated to costs of services or whether prices exploit differences in demand elasticities for different services—yielding higher rates of return on some services than others.

Important findings on trends in individual departmental expenses and revenues include the following:

- Increases in expenses of standard routine services such as dietary, housekeeping, plant engineering, and nursing services have been moderate while increases in inpatient ancillary service expenses (particularly laboratory and radiology expenses) and outpatient department expenses have risen markedly over the period.
- Philanthropic contributions represent a very minor but stable source of hospital revenue. Revenues from other sources (patient revenue and revenues on nonpatient services) more than cover operating expenses.
- Revenues from room-and-board charges represent less than half of hospital patient

revenues, and the importance of this source of revenue has declined slightly over the period with the more rapid increases in ancillary service revenues (radiology, laboratory, and outpatient revenues, in particular).

- Revenue-cost margins on ancillary services range from 0.89 on delivery-room services to 2.05 on pharmacy services.

Departmental Operating Expenses

Table 8 depicts the growth in various departmental costs. Although all operating expenses rose 50 percent from 1962 to 1966, individual departmental expense increases ranged from 35 percent for dietary and housekeeping expenses to 78 percent for outpatient department expenses. In general, routine costs of providing hospital care such as dietary, housekeeping, plant engineering, nursing, and medical service increased at a less-than-average rate. Expenses of specialized hospital services rose much more rapidly. Ancillary service expenses incurred by the radiology department and the laboratory department increased 65 percent.

Although ancillary service expenses have been

TABLE 8.—Departmental operating expenses, by type, 1962-66

Year	Total operating expenses	Administrative, dietary, and plant	Nursing service	Medical service	Pharmacy	Operating and delivery room	Radiology	Laboratory	Outpatient department	Depreciation, interest, rent	Other
Total amount (in millions)											
1962.....	\$6,365	\$2,292	\$1,527	\$310	\$274	\$441	\$305	\$367	\$146	\$297	\$408
1963.....	6,867	2,434	1,656	339	293	477	333	416	160	333	426
1964.....	7,604	2,654	1,821	380	318	520	387	461	187	369	506
1965.....	8,411	2,901	2,013	408	340	577	434	522	224	430	564
1966.....	9,517	3,251	2,221	464	387	651	503	603	260	515	661
Percentage increase											
1962 to 1966.....	49 5	41 8	45 4	49 7	41 2	47 6	64 9	64 3	78 1	73 4	62 0
Average annual, 1962-66.....	10 6	9 1	9 8	10 6	9 0	10 2	13 3	13 2	15 5	14 8	12 8
Amount per patient per day											
1962.....	\$34 44	\$12 40	\$8 26	\$1 68	\$1 48	\$2 39	\$1 65	\$1 99	\$0 79	\$1 60	\$2 21
1963.....	36 72	13 02	8 85	1 81	1 57	2 55	1 78	2 22	85	1 78	2 28
1964.....	38 93	13 59	9 32	1 95	1 63	2 66	1 98	2 36	.96	1 89	2 59
1965.....	41 28	14 23	9 88	2 00	1 67	2 83	2 13	2 56	1 10	2 11	2 77
1966.....	44 79	15 30	10 45	2 18	1 82	3 06	2 37	2 84	1 22	2 42	3 11
Percentage increase											
1962 to 1966.....	30 1	23 1	26 5	29 8	23 0	28 0	43 6	42 7	54 4	51 2	40 7
Average annual, 1962-66.....	6 8	5 4	6 1	6 7	5 3	6 4	9 5	9 3	11 5	10 9	8 9
Percentage distribution											
1962.....	100 0	36 0	24 0	4 9	4 3	6 9	4 8	5 8	2 3	4 7	6 4
1963.....	100 0	35 4	24 1	4 9	4 3	6 9	4 8	6 1	2 3	4 8	6 2
1964.....	100 0	34 9	23 9	5 0	4 2	6 8	5 1	6 1	2 5	4 9	6 7
1965.....	100 0	34 4	23 9	4 9	4 0	6 9	5 2	6 2	2 7	5 1	6 7
1966.....	100 0	34 2	23 3	4 9	4 1	6 8	5 3	6 3	2 7	5 4	6 9

going up much more rapidly than routine expenses, the latter still constitute a major portion of all expenses. Administrative, dietary and house-keeping, plant engineering, nursing service, and medical services accounted for 62 percent of all operating expenses in 1966. Ancillary service departmental expenses ranged from \$1.82 for pharmacy expenses per patient day to \$3.06 for operating and delivery-room expenses per patient day in 1966.

The rapid increase in ancillary service expenses is consistent with several different theories of hospital inflation. Technological change may have greatly increased the need for diagnostic services as additional diagnostic tests have been developed. Advances in radiation therapy may be responsible for the large increases in radiological expenses. It is also possible that the rise in ancillary service expenses may have been induced by increased hospitalization insurance. As more and more individuals obtain hospitalization insurance that covers diagnostic tests while they are hospitalized, physicians may feel less constrained by concern over the patient's financial burden and may order a wider range of tests. Fear of malpractice suits may add to the tendency to overtest. The rise in ancillary service expenses may reflect acquisition of excessive or wasteful capital equipment with concomitant operating expenses. Clearly, the growth of some types of expenses, such as those of the outpatient department, reflects a broadening of the role of the hospital in providing medical care.

It is difficult to reconcile these findings, however, with claims that the primary cause of hospital inflation is an increased demand for amenities such as better food service and more luxurious surroundings. Nor is there any indication that increased nursing service is a prime mover in hospital inflation. The cost-push arguments, at least in the provision of routine services, do not seem to apply.

Sources of Hospital Revenues

Absence of concrete data on hospital revenues has led to widespread acceptance of a number of assertions about hospital pricing and revenue policies to the effect that: (1) hospital prices are passively determined and simply set at levels sufficient to break even, (2) a sizable portion of

TABLE 9 —Sources of hospital revenues, 1962-66

Year	Total revenue	Net patient revenue	Contributions	Other
Total amount (in millions)				
1962.....	\$6,584	\$5,768	\$155	\$661
1963.....	7,100	6,260	173	667
1964.....	7,890	6,965	197	728
1965.....	8,715	7,714	206	794
1966.....	9,859	8,757	232	870
Percentage increase				
1962 to 1966.....	49 7	51 8	49 7	31 6
Average annual, 1962-66.....	10 6	11 0	10 6	7 1
Amount per patient day				
1962.....	\$35 62	\$31 20	\$0 84	\$3 58
1963.....	37 96	33 47	92	3 57
1964.....	40 39	35 66	1 01	3 72
1965.....	42 77	37 86	1 01	3 90
1966.....	46 40	41 22	1 09	4 10
Percentage Increase				
1962 to 1966.....	30 3	32 1	29 8	14 5
Average annual, 1962-66.....	6 8	7 2	6 7	3 4
Percentage distribution				
1962.....	100 0	87 6	2 4	10 0
1963.....	100 0	88 2	2 4	9 4
1964.....	100 0	88 3	2 5	9 2
1965.....	100 0	88 5	2 4	9 1
1966.....	100 0	88 8	2 3	8 8

hospital revenue comes from philanthropic contributions, (3) room-and-board charges are the main source of patient revenue, and (4) prices of individual services are simply marked up at a constant proportion of their direct cost.⁷ The data obtained in the survey provide detailed data on sources of hospital revenue so that these assertions can be investigated.

Table 9 shows the distribution of hospital revenue among patient revenue, contributions, and other revenue (such as earnings on investment, cafeteria sales, and rental of nonpatient facilities). It should be noted that since other sources of revenues also generate expenses frequently included in operating expenses (such as cafeteria expenses), it is not appropriate to compare patient revenue with operating expenses. Table 10 shows the distribution of gross patient revenues stemming from room-and-board charges and from charges for various ancillary services. The data on gross patient revenue contained in table 10 differ from the data on net patient revenue in table 9

⁷ For a discussion of pricing behavior in hospitals, see Edward M. Kaitz, *Pricing Policy and Cost Behavior in the Hospital Industry* (Frederick A. Praeger), 1968. For some evidence that price-cost margins reflect economic conditions, see Karen Davis, "Relationship of Hospital Prices to Costs," *Applied Economics*, June 1971, pages 115-125.

TABLE 10—Departmental patient revenues per patient day, 1962-66

Year	Gross patient revenue	Inpatient revenue						Out-patient revenue
		Room and board	Operating room	Radiology	Laboratory	Pharmacy	Other	
Amount per patient day								
1962.....	\$34 99	\$16 50	\$3 26	\$2 26	\$3 37	\$3 14	\$3 67	\$2 80
1963.....	37 50	17 74	3 42	2 47	3 66	3 21	4 10	2 91
1964.....	39 97	19 04	3 50	2 64	3 89	3 31	4 43	3 16
1965.....	42 40	19 89	3 68	2 79	4 29	3 41	4 93	3 42
1966.....	46 13	21 40	3 93	3 03	4 63	3 69	5 51	3 94
Percentage increase								
1962 to 1966.....	31 8	29 7	20 6	34 1	37 4	17 5	50 1	40 7
Average annual, 1962-66.....	7 1	6 7	4 8	7 6	8 3	4 1	10 7	8 9
Percentage distribution								
1962.....	100 0	47 2	9 3	6 5	9 6	9 0	10 5	8 0
1963.....	100 0	47 3	9 1	6 6	9 8	8 6	10 9	7 8
1964.....	100 0	47 6	8 8	6 6	9 7	8 3	11 1	7 9
1965.....	100 0	46 9	8 7	6 6	10 1	8 0	11 6	8 1
1966.....	100 0	46 4	8 5	6 6	10 0	8 0	11 9	8 5

in that gross patient revenue represents billed charges—without reduction for reimbursement on the basis of costs and without deduction of bad debts.

As table 9 indicates, patient revenue is the major source of hospital revenue and has been increasing as a fraction of all revenue throughout the period (from 87.6 percent in 1962 to 88.8 percent in 1966). Contributions have represented a fairly small but stable fraction of revenues (2.4 percent).

Although room-and-board revenues are a substantial source of patient revenue, they constitute slightly less than half of all patient revenues and this proportion has been declining slightly in recent years. Room-and-board revenues per patient day increased by 29.7 percent over the period, compared with a rise of 34.7 percent in all patient revenues per patient day. Since the basic room-and-board charge is used by the Bureau of Labor Statistics as an index of hospital costs, these data indicate that the BLS index may understate increases in hospital costs.

Just as ancillary-service operating expenses have increased much more rapidly than standard room-and-board expenses, revenues of ancillary services have increased markedly. Radiology, laboratory, and outpatient revenues have been the major sources of growth, with operating-room and pharmacy revenues increasingly fairly slowly.

Departmental Revenue-Direct Cost Ratios

If hospitals pursue an overall pricing policy of equating prices with average costs without regard to economic conditions, it seems reasonable to assume that they would also equate the price of each service with the cost of that service (with a uniform markup to cover overhead expenses). If, on the other hand, hospitals respond to economic pressures, prices may be higher on services for which the demand is relatively inelastic and lower for services for which the demand is elastic.

Table 11 presents the ratios of patient revenues to direct costs of various ancillary services. Sev-

TABLE 11.—Ratio of patient revenue to direct costs of selected ancillary services, 1962-66

Year	Revenue/direct cost ratios						
	Operating room	Delivery room	Anesthesiology	Radiology	Laboratory	Physical therapy	Pharmacy
1962.....	1 43	0 97	1 62	1 37	1 70	1 27	2 12
1963.....	1 43	91	1 57	1 39	1 64	1 24	2 05
1964.....	1 40	88	1 53	1 33	1 65	1 29	2 04
1965.....	1 37	.86	1 52	1 31	1 68	1 23	2 04
1966.....	1 37	81	1 50	1 28	1 63	1 28	2 02
Average annual, 1962-66.....	1 40	.89	1 55	1 34	1 66	1 26	2 05

eral words of caution are in order. First, the costs are direct costs—that is, they do not include overhead, such as administrative expenses, depreciation expenses, etc. Second, the patient revenue data reflect gross charged revenue rather than actual collected revenue. Third, some hospitals may include some outpatient expenses in inpatient ancillary-service expenses, so that inpatient expenses (particularly radiology and laboratory expenses) are overstated.

Revenue-cost ratios range from an average of 0.89 on delivery-room services to an average of 2.05 on pharmacy services for the period from 1962 to 1966. Delivery-room revenues do not even cover direct costs. The demand for such services might be expected to be fairly inelastic. Although this is undoubtedly true for the market as a whole, these services are the most likely to be excluded from insurance coverage and families using the services are likely to have lower-than-average incomes. Given these considerations and the fact that the need for hospitalization is anticipated in advance, it is reasonable to expect that patients consider price of delivery-room services in making a choice among available hospitals. This behavior, combined with declining birth rates, may account for the low returns on delivery-room services.

The market demand for drugs is very different. Drugs used while the patient is hospitalized are covered by most insurance policies. In addition, since prescription drugs retail at high prices in relation to costs, hospitals can charge fairly high prices for medication without either arousing the patients' indignation or causing them to obtain drugs from other sources.⁸ Through bulk discounts or purchase of drugs on a generic name basis, hospitals can keep their drug costs fairly low.

An attempt was made in the survey to relate expenses of routine services to room-and-board revenues. If all expenses for dietary, housekeeping, laundry, linen, maintenance of personnel, nursing service, nursing education, medical and surgical service, medical record and library, and

⁸ For current information on prices and rates of return in the drug industry, see *Prescription Drug Data Summary, 1971* (Social Security Administration, Office of Research and Statistics), 1971. For an interesting exposé of drug-pricing policies, see Estes Kefauver, *In a Few Hands: Monopoly Power in America* (Penguin Books), 1965, chapter 1.

social service departments are assigned to expenses of routine services, the revenue-cost ratio on routine services averages 1.02 for the period. This ratio is in some sense a lower bound on the ratio of revenue to expenses incurred directly in the provision of routine care. In general, demand for hospital care might be expected to be most sensitive to the room-and-board charge since this charge is simpler to understand and more likely to be quoted. Low revenue-cost ratios on room-and-board services, therefore, would be observed if hospitals responded to this elasticity of demand.

OVERALL TRENDS IN HOSPITAL REVENUES AND EXPENSES

The overall financial position of community hospitals improved slightly from fiscal year 1962 to fiscal year 1966. As table 12 shows, revenues increased from \$6.6 billion in 1962 to \$9.9 billion in 1966—a 50-percent rise. Expenses increased somewhat less rapidly, so net income (the difference between revenues and expenses) went from \$127 million in 1962 to \$198 million in 1966. There has been some tendency, therefore, for prices to increase in relation to average costs over the period.

In part, the 50-percent increase in community hospital revenues and expenses reflects a growth in the use of hospital services. When revenues and

TABLE 12.—Revenue, expenses, net income, and cash flow, 1962–66

Year	Total revenue	Total expenses ¹	Net income	Cash flow
Total amount (in millions)				
1962.....	\$6,584	\$6,456	\$127	\$388
1963.....	7,100	6,972	128	419
1964.....	7,890	7,714	176	492
1965.....	8,715	8,538	177	540
1966.....	9,859	9,661	198	625
Percentage increase				
1962 to 1966.....	49 8	49 6	56 1	61 1
Average annual, 1962–66.....	10 6	10 6	11 8	12.7
Amount per patient day				
1962.....	\$35 62	\$34 93	\$0 69	\$2 10
1963.....	37 96	37 28	.68	2 24
1964.....	40 39	39 49	.90	2 52
1965.....	42 77	41 90	.87	2 65
1966.....	46.40	45 47	.93	2 95
Percentage increase				
1962 to 1966.....	30 3	30 2	34 2	40 5
Average annual, 1962–66.....	6 8	6 8	7.8	8 9

¹ Total expenses include both operating expenses reported in table 1 and other expenses incurred in providing nonpatient services

expenses are divided by the number of inpatient days provided by hospitals, the growth in revenues and expenses per patient day is reduced to about 30 percent. Daily costs of hospital care increased from \$35 in 1962 to \$45 in 1966.

The cash-flow position of community hospitals, defined as net income plus depreciation expenses, showed an even more favorable growth than net income—from \$388 million in 1962 to \$625 million in 1966. Since hospitals receive a large proportion of their capital funds from government grants and donations, hospital depreciation expenses do not play the same role as depreciation funds in other types of business. Typically, hospital depreciation expenses are not funded or restricted to replacement of existing capital facilities, so they may be used for any of several purposes. The excess of revenues over expenses other than depreciation reflects more accurately than net income data, therefore, the pool of funds available to the hospital for future use. These cash-flow data present, for the first time, the magnitude of this component for U.S. community hospitals.

Despite the fact that most community hospitals are nonprofit hospitals, on balance, profits are not zero. Table 13 presents trends in net income and cash flow as percentages of total revenue and plant assets. Net income averaged 2 percent of total revenue from 1962 to 1966, and the annual average for cash flow was 6 percent. In relation to plant assets, the ratios were somewhat lower: Net income represented 1.5 percent for the period, and cash flow 4.5 percent. In some respects, these ratios are comparable to rates of returns on sales or assets for other types of firms. It should be noted, however, that expenses on borrowed capital are excluded from returns, so the ratios understate total returns to all capital. Adding interest expenses to net income yields an average capital return of 1.9 percent of plant assets.

Utilization of Hospital Services

Most theories of inflation are concerned with rates of increase in average costs or prices, but some theories have emphasized the growth in utilization of hospital services as an important contributor to inflation in total hospital costs or expenditures. Some theories emphasize the role of insurance in greatly increasing the number of hospital admissions, reducing incentives for rapid discharge from the hospital, and favoring inpatient care (which tends to be covered by insurance) over outpatient care (which is not as well covered by insurance). Other theories emphasize the fact that hospitals have increasingly substituted for other forms of medical care—such as the use of hospital emergency rooms in place of physician visits to the home.

Several policy suggestions have been aimed at offsetting some of the undesirable changes in utilization of hospital services that are believed to have occurred. These proposals include the establishment of utilization review committees to act as watchdogs on unnecessarily long hospital stays and moves toward more comprehensive insurance coverage that will, it is hoped, encourage the substitution of less expensive outpatient care for inpatient care.

A glance at table 14 reveals that community hospitals have experienced only moderate increases in inpatient services. Admissions per capita rose only 5 percent from 1962 to 1966 although patient days rose at a somewhat higher rate (9 percent). Beds per capita did not exactly keep pace with the increase in patient days, so occupancy rates went up slightly—from 77.7 percent to 78.7 percent.

The most striking change in utilization occurred in outpatient visits. Outpatient visits increased from 382 per 1,000 population in 1962

TABLE 13 —Net income, cash flow, and capital return ratios, 1962-66

Year	Net income ratio		Cash flow ratio ¹		Capital return ratio ²	
	Total revenue	Plant assets	Total revenue	Plant assets	Total revenue	Plant assets
1962.....	1 93	1 42	5 89	4 33	2 34	1 72
1963.....	1 80	1 33	5 90	4 35	2 23	1 64
1964.....	2 23	1 66	6 24	4 64	2 68	1 99
1965.....	2 03	1 50	6 20	4 58	2 60	1 92
1966.....	2 01	1 52	6 34	4 81	2 65	2 01
Average annual, 1962-66.....	2 00	1 49	6 11	4 54	2 50	1 86

¹ Net income plus depreciation expenses.

² Net income plus interest expenses

TABLE 14.—Hospital utilization, 1962-66

Year	Rate per 1,000 population			Mean stay (in days)	Occupancy rate	Number of outpatient units per 1,000 population
	Beds	Admissions	Patient days			
1962.....	3 57	135	1,013	7 5	77 7	382
1963.....	3 62	135	1,010	7 5	76 4	393
1964.....	3 69	137	1,040	7 6	77 2	409
1965.....	3 76	140	1,070	7 6	78 0	438
1966.....	3 84	142	1,103	7 8	78 7	466
Percentage increase						
1962 to 1966.....	7 6	5 2	8 9	4 0	-----	22 0
Average annual, 1962-66.....	1 8	1 3	2 1	1 0	-----	5 1

to 465 per 1,000 in 1966—a 22-percent growth. Several studies have noted this growth and have attempted to explain its cause.⁹ Factors frequently suggested as important include: (1) growing insurance coverage for emergency-room services; (2) a tightening of hospital occupancy rates that induces physicians to treat more patients on an outpatient basis; (3) a decline in physician visits to the home; (4) unavailability of private physicians outside of office hours; (5) increasing concentration of low-income groups in central-city areas, accompanied by movements of physicians out of those areas; (6) increased mobility of the population, which frequently leaves individuals without a personal physician to turn to for medical care; and (7) changes in the practice of medicine that require extensive laboratory and X-ray equipment available only in hospitals.

Since the outpatient component of hospital care has been increasing in relative significance, the deflation of hospital expenses by the quantity of inpatient services provided tends to overstate the rise in hospital expenses. Deflating expenses by an output measure that combines both inpatient and outpatient care yields an increase in total expenses per unit of adjusted output of 29.4 percent—from \$32.13 in 1962 to \$41.59 in 1966.¹⁰ This rise is somewhat smaller than the 30.2-percent growth in total expenses per patient day.

⁹ For a multivariate regression analysis of the determinants of demand for hospital outpatient care, see Karen Davis and Louise B. Russell, "The Substitution of Hospital Outpatient Care for Inpatient Care," *Review of Economics and Statistics*, May 1972.

¹⁰ The adjusted output measure used is defined in the same way as by the American Hospital Association. If the average revenue of an outpatient visit is one-fourth the average revenue of an inpatient day, an outpatient visit is considered to be the equivalent of one-fourth of an inpatient day. Total expenses are then divided by equivalent inpatient days. For additional details, see *Hospitals* (Guide Issue), August 1, 1969, pages 466-467.

In summary, increases in utilization of inpatient services per capita have been moderate and cannot be blamed for a significant portion of hospital inflation. Increases in outpatient visits, on the other hand, have been very marked, so some of the rise in total hospital costs may be attributable to an expansion of the role of the hospital as a primary source of medical care, replacing care formerly provided by private physicians.

IMPLICATIONS OF TRENDS IN PRE-MEDICARE PERIOD

Several characteristics of hospital inflation in the pre-Medicare period are particularly distinctive and have significant implications for various theories attempting to explain this inflation. First, unlike most industries where gains in productivity tend to offset rises in prices of factor inputs, for the hospital industry a substantial portion of inflation results from an increase in the quantities of inputs used in providing a day of care. Second, though hospitals are labor-intensive, with payroll expenses accounting for about 60 percent of all operating costs, nonlabor costs have risen more rapidly during the period than labor costs. Third, most of the increase in expenses has occurred in the provision of ancillary hospital services rather than in providing basic room-and-board services. Fourth, some shift has occurred in the composition of hospital personnel toward such higher-skilled occupations as professional patient-care employees, as well as in the composition of plant assets—toward more major equipment, for example. Fifth, increases in days of hospital care and number of admissions have been moderate while outpatient services have been significantly expanded.

These findings are most consistent with the

demand-pull view of hospital inflation and the views that emphasize changes in technology and expansion in the role of the community hospital. The labor-cost-push model of inflation is revealed as an inadequate explanator of hospital inflation, since hospital costs per patient day would have increased at an annual rate of 4 percent even if wages had remained constant.

The sizable contribution to hospital inflation made by increases in quantities of factor inputs per day of care and the rapid growth in ancillary service expenses is predicted by the demand-pull model of inflation.¹¹ In this theory of inflation, expansion in insurance coverage and rising incomes permit hospitals to raise the "quality" of hospital care as perceived by hospital decision-makers—that is, to increase the quantities of inputs used to provide a day of hospital care. The growth in the outpatient component of hospital expenses, on the other hand, clearly indicates an expansion in the community hospital's role.

METHODOLOGY

In order to analyze the impact of the Medicare program on hospital financial operations, the Social Security Administration contracted with the American Hospital Association to obtain audited data on hospital revenues, expenses, and capital assets for a representative sample of hospitals in the United States. Permission was given by participating hospitals for the American Hospital Association to receive data for the 5 fiscal years before the July 1966 start of Medicare, directly from firms auditing hospital operations, with the assurance that confidentiality of data on individual hospitals would be maintained. In addition, information on hospital beds, utilization, personnel, and payroll expenses were obtained directly from the individual hospitals for the same period.

Sample Design

The sampling frame comprised all hospitals meeting the following criteria: (1) registered by the American Hospital Association in 1967; (2) short-term nonpsychiatric community hospitals

(hospitals operated by the Federal Government were excluded); and (3) certified by the Medicare program. The Medicare certification distinguishes this group from all community hospitals listed in the American Hospital Association's annual Guide Issues (*Hospitals*). Table I contrasts the distribution of hospitals and beds by ownership control and bed size of the sample universe with all community hospitals. The Medicare-certified group has a lower proportion of small hospitals and hospitals operated for profit.

An attempt was made to supplement this sam-

TABLE I—Percentage distribution of hospitals and beds, by ownership control, two sources, 1965

Type of control and number of beds	Hospitals		Beds	
	Survey universe	Guide Issue	Survey universe	Guide Issue
All hospitals				
Total.....	100 0	100 0	100 0	100 0
6-99.....	58 2	60 8	20 7	22 2
100-199.....	20 4	19 3	20 7	20 7
200 or more.....	21 5	19 9	58 7	57 0
Nonprofit.....	61 3	59 7	69 8	69 5
6-99.....	29 3	29 8	11 2	11 7
100-199.....	14 9	13 9	15 3	15 2
200-299.....	8 2	7 7	14 6	14 5
300-499.....	7 0	6 6	19 0	18 8
500 or more.....	2 0	1 7	9 8	9 2
For-profit.....	12 5	14 9	5 6	6 3
6-49.....	7 0	9 4	1 5	2 0
50-99.....	3 5	3 6	1 8	2 0
100-199.....	1 6	1 6	1 6	1 6
200 or more.....	4	4	7	7
State and local government.....	26 2	25 3	24 5	24 2
6-99.....	18 4	18 0	6 2	6 5
100-199.....	3 9	3 8	3 8	3 9
200-299.....	1 5	1 4	2 6	2 6
300-499.....	1 1	1 0	3 1	2 9
500 or more.....	1 3	1 1	8 9	8 3
Nonprofit				
Total.....	100 0	100 0	100 0	100 0
6-99.....	47 8	49 9	16 1	16 9
100-199.....	24 2	23 3	21 9	21 9
200-299.....	13 4	12 9	20 9	20 9
300-499.....	11 4	11 0	27 2	27 1
500 or more.....	3 2	2 9	14 0	13 3
For-profit				
Total.....	100 0	100 0	100 0	100 0
6-49.....	56 2	63 0	27 4	32 3
50-99.....	28 0	24 2	32 1	31 0
100-199.....	12 4	10 4	27 6	26 2
200 or more.....	3 5	2 5	12 9	10 4
State and local government				
Total.....	100 0	100 0	100 0	100 0
6-99.....	70 4	71 0	25 4	26 8
100-199.....	14 8	15 1	15 3	16 3
200-299.....	5 7	5 6	10 7	10 9
300-499.....	4 3	3 9	12 4	11 9
500 or more.....	4 8	4 4	36 2	34 1

¹¹ Martin Feldstein, *op. cit.*

ple with hospitals that were Medicare-certified providers but not registered by the American Hospital Association—primarily osteopathic hospitals and hospitals with fewer than 6 beds. The extremely low sampling response of this group led to a decision to restrict the sample to the original sample of hospitals certified by Medicare and registered by the American Hospital Association.

The sampling elements for this study were individual hospitals. Data were collected for the base period of the study from all sample hospitals. Originally, the sampling elements were organized into 40 strata. Stratification was on the basis of:

(1) *Ownership control*: Non-Federal governmental, for-profit, Catholic nonprofit, other nonprofit.

(2) *Number of beds in 1965*: For nonprofit hospitals—6-99, 100-199, 200-299, 300-499, 500 or more; for State and local government hospitals—6-99, 100-199, 200-299, 300-499, 500-999, 1,000 or more; for hospitals operated for profit—6-49, 50-99, 100-199, 200 or more.

(3) *Financial growth*: Whether the ratio of total hospital expenses in 1960 was greater or less than 1.53.¹²

The selection within each stratum was an equal-probability selection of hospitals. A total of 462 hospitals was sampled. The number of hospitals sampled within each stratum was determined on the basis of the number of beds falling in that stratum and the variability of hospitals with respect to bed size within the stratum. This procedure results in more intensive sampling of those strata that have the greatest effect on aggregate estimates. As a consequence, aggregate estimates are generally more reliable than those of individual strata.

Sampling Response

Table II indicates the participation of hospitals by stratum. Participation by State and local government hospitals in the largest bed-size category and by for-profit hospitals was particularly low.

¹² Stratification based on financial growth was later discarded, since expense information was lacking for almost 40 percent of the sampling-frame hospitals. Preliminary projection of expenses based on financial-growth stratification yielded estimates substantially similar to those based on the collapsed growth-rate strata.

TABLE II.—Participation by control and stratum, 1966

Type of control and stratum	Sample size	Participants	Participation as percent of—	
			Sample	All participation
All strata.....	462	306	66 2	100 0
State and local government, total.....	125	69	55 2	22 5
6-99.....	53	36	67 9	11 8
100-199.....	15	9	60 0	2 9
200-299.....	7	4	57 1	1 3
300-499.....	9	6	66 7	2 0
500-999.....	20	10	50 0	3 3
1,000 or more.....	21	4	19 0	1 3
Catholic, total.....	66	49	74 2	16 0
6-99.....	15	10	66 7	3 3
100-199.....	17	12	70 6	3 9
200-299.....	11	6	54 5	2 0
300-499.....	15	14	73 3	4 6
500 or more.....	8	7	87 7	2 3
Other voluntary, total.....	223	173	77 6	56 5
6-99.....	77	50	64 9	16 3
100-199.....	43	30	69 8	9 8
200-299.....	21	19	90 5	6 2
300-499.....	37	34	91 9	11 1
500 or more.....	45	40	88 9	18 1
For-profit, total.....	48	15	31 3	4 9
6-49.....	17	4	23 5	1 3
50-99.....	13	3	23 1	1 0
100-199.....	12	4	33 3	1 3
200 or more.....	6	4	66 7	1 3

Only 15 of the hospitals operated for profit submitted data, representing 31 percent of sampled hospitals of this type. Fifty hospitals failed to respond because of inadequate records. An additional 75 hospitals provided either no response or a negative response. Nonresponse or a negative response from the auditor accounted for 18 hospitals. Thirteen hospitals gave other reasons for nonparticipation. The low response rate of large State and local government hospitals is attributed to difficulties in reporting information in the form requested.

Estimation

The method of estimation used for aggregate values based on the sample data was the separate ratio-estimate method related to the number of hospital beds.¹³ The average value of each variable per bed for all hospitals within a stratum was multiplied by the number of hospital beds in the stratum universe. Overall aggregates for all

¹³ For a fuller description of the estimation procedure, see Richard W Foster and Belverd Needles, Jr., *The Financial Structure of American Community Hospitals: 1962-1966*, American Hospital Association (mimeographed), 1971.

U.S. community hospitals certified by Medicare were obtained by summing the individual stratum aggregates. Experimentation with other methods of projection of the sample data, including the reciprocal of the probability of selection adjusted for sampling response, did not perform as well as the separate ratio-estimate method based on comparable data from the Guide Issues.

One difficulty encountered in the study was a tendency for hospitals to lump one or more items together—laundry and linen expenses, for example. One procedure that might have been used to infer the appropriate breakdown would have been the application of the percentage breakdown of those hospitals in the stratum that list the components, separately, to all other hospitals in the stratum.

This procedure was not followed, however, because too few hospitals provided the required breakdowns. Instead, for hospitals combining data on two or more items in one item, the combined item was treated as if it represented only data for that item, and the other items were treated as nonresponse items. Aggregate values of the components for the stratum were then compared with aggregate values of the sums of the components. If the sum of the estimated components was within 10 percent of the estimated total, components estimated on this basis were shown. Where the sum was more than 10 percent different from the estimated total, it was assumed that the bias introduced by partial reporting was too serious to permit any attempted breakdown.

Since only hospitals certified for Medicare participation were included in the sample, it was necessary to make some assumption about the number of hospitals and beds in the universe in the pre-Medicare period. The proportion of all certified community hospitals at the end of the period was applied to the number of community hospitals in the pre-Medicare years to obtain the universe of all community hospitals (potentially certifiable by Medicare) in the pre-Medicare period.

Reliability of Estimates

Since the estimates presented here are based on samples, they may differ somewhat from the fig-

TABLE III—Approximate standard errors of total expenses, by control and number of beds, 1962 and 1966

Type of control and number of beds	Total expenses (in thousands)			
	Estimated value		Estimated standard error	
	1962	1966	1962	1966
All hospitals.....	\$6,456	\$9,661	108	175
Control				
Nonprofit.....	4,545	6,818	82	135
For-profit.....	225	402	23	37
State and local government.....	1,686	2,439	66	105
Beds				
6-99.....	1,037	1,402	46	55
100-199.....	1,197	1,734	45	66
200-299.....	1,285	1,764	54	83
300-499.....	1,447	2,342	39	77
500 or more.....	1,490	2,419	55	101

ures that would have been obtained from all hospitals in the universe. As in all survey work, the results are subject to errors of response and non-reporting as well as sampling variability. Table III indicates the approximate standard errors of hospital expenses in 1962 and 1966 for all U.S. community hospitals, as well as control and bed size.

The standard error of the aggregate estimate for a stratum is given by:

$$er(\hat{A}_h) = B_h \cdot er(\bar{y}_h)$$

$$= B_h \sqrt{\frac{N_h^2 (1-f_h)}{n_h B_h^2} \left[\frac{\sum_{i=1}^{n_h} (A_{hi} - \bar{y}_h b_{hi})^2}{n_h - 1} \right]}$$

where N_h = number of hospitals in stratum h of universe

n_h = number of hospitals in stratum h of sample responding

B_h = number of beds in stratum h of universe

b_h = number of beds in stratum h of sample responding

b_{hi} = number of beds in i th sample hospital of stratum h

A_{hi} = value of the variable in the i th sample hospital of stratum h

$$f_h = n_h / N_h$$

$$w_h = B_h / \sum_{h=1}^L B_h$$

$$\bar{y}_h = \sum_{i=1}^{n_h} A_{hi} / \sum_{i=1}^{n_h} b_{hi}$$

$$\hat{A}_h = B_h \bar{y}_h$$

When combining strata, the standard error of the aggregate estimate for all community hospitals is given by:

$$er(\hat{A}) = \left(\sum_{h=1}^L B_h \right) \cdot er(\bar{y})$$

$$= \left(\sum_{h=1}^L B_h \right) \sqrt{\sum_{h=1}^L w_h^2 [er(\bar{y}_h)]^2}$$

where $\hat{A} = \sum_{h=1}^L A_h$

$$\bar{y} = \hat{A} / \sum_{h=1}^L B_h = \sum_{h=1}^L w_h \bar{y}_h$$

Comparison of Sample Results With Guide Issue Data

Sample results may differ from those presented for all community hospitals in the annual Guide Issues of *Hospitals* for two major reasons: (1) the sample universe is restricted to those hospitals certified by the Medicare program and (2) the two groups have slightly different reporting periods.

The first difference has been illustrated above by table I. Hospitals in the sample were requested to provide data for the 5 fiscal years before the introduction of Medicare in July 1966. If the hospital's fiscal year ended between January and June, data for 1962-66 were reported. If the hospital's fiscal year ended between July

TABLE IV.—Comparison between survey data on total expenses for 1966 and average Guide Issue data for 1965 and 1966

Type of control and number of beds	Difference (percent) between beds in survey universe and in Guide Issue data	Total expenses	
		Survey standard error as percent of Guide Issue value	Difference between survey estimate and Guide Issue value as percent of Guide Issue value
All hospitals.....	-2.1	1.7	-1.4
Control			
Nonprofit.....	-1.7	1.9	-5.1
For-profit.....	-12.0	6.9	-30.6
State and local government...	- .8	4.9	18.0
Beds			
6-99.....	-8.3	3.5	-9.3
100-199.....	-3.1	3.6	-9.9
200-299.....	-1.4	4.5	-4.3
300-499.....	- .7	3.2	-3.0
500 or more.....	4.3	4.9	16.8

and December, data for 1961-65 were requested. Data for the Guide Issues reflect data for fiscal years ending by September of each year. The sample data therefore fall approximately one-half year before the corresponding Guide Issue data.

Table IV compares estimates of beds and total expenses from the survey for 1966 with the average of Guide Issue data for all community hospitals between 1965 and 1966. The bed column indicates the difference between the two sets of hospitals caused by the Medicare certification requirement. Overall, the sample universe contained 2 percent fewer beds than all community hospitals.