Costs of Care

ALAN R. HINMAN AND ROBERT L. PARKER

Certain categories of health care cost information in Shanghai County are readily available, including overall government expenditures and total expenditures for the government welfare, labor insurance, and cooperative health systems. Beginning in 1981, detailed financial information is also being obtained from commune and town hospitals. However, certain categories of health expenditure information are not as easily obtained, including: all expenses involved in the systems providing care to employees in commune-run factories and commune-run enterprises, information regarding direct patient expenditures for health care (non-reimbursed portion), and information regarding out-of-pocket expenditures for health-related items, including non-prescription drugs, transportation, food while in hospital, etc.

This summary is based on information provided by the Shanghai County Bureau of Health and information obtained in the special household survey on illness and use of health care services.[1] Additionally, some information was obtained from a special sample study of factories carried out by the Shanghai County Bureau of Health. Three different types of analyses will be presented: overall health expenditures by system, costs per service in selected facilities, and a limited cost-effectiveness analysis of selected programs.

Overall Health Expenditures

The total identified health expenditures in Shanghai County in 1980 amounted to ¥9,350,000.* Of this total, ¥3,277,000 represented direct government appropriations, of which ¥451,360 was in support of the government welfare system of care and ¥1,494,240 was for salaries of health personnel in county and commune/town hospitals. The remainder was spent in other County Health Bureau activities, including Maternal and Child Health, Family Planning, the Health and Anti-Epidemic Station, the vocational medical school, and the drug and reagent control unit.

Table 1 depicts the direct expenditures identified in 1980 including an allocation of the salaries for medical care personnel. The allocation of salaries is based on a proportional division of the total salary expenditures among the 438,410 identified direct beneficiaries of the systems. This was done because there was no way of identifying the system providing care to the 127,000 county residents who are not shown as receiving care directly under one of the four systems. Some of these persons are direct beneficiaries of the system providing care to employees of commune-run enterprises; the number of these is unknown. The majority probably are individuals covered by labor insurance or general welfare systems in the city, or they are family members of persons covered under the government welfare, labor insurance, or commune-run industry systems. Consequently, the per capita expenditures shown, in all likelihood, represent an overestimate of the systems' cost per person covered. Since there is rarely more than one family member covered per direct beneficiary in these systems, it is unlikely that more complete information would be indicate a per capita expenditure for the welfare, labor insurance, or commune-run industry systems which is as low as that of the cooperative system.

The total shown for personal health services expenditures is obviously an underestimate, since there are no data available about expenditures for persons who are employed by commune-run enterprises. However, if one assumes that

*¥ = yuan, the Chinese unit of currency. At the time this paper was written, ¥1 was approximately equivalent to US $0.60.

TABLE 1—1980 Health Expenditures, Shanghai County

System	Direct Expenditures[1]	+	Salary Allocation[2]	=	Total	Population Covered[2]	Cost per Person
Personal Health Services							
Government Welfare	¥451,360		¥40,757		¥492,117	11,958	¥41.15
Labor Insurance	1,537,000		135,307		1,672,307	39,699	42.12
Collective							
Commune Industries	1,544,000		121,820		1,665,820	35,742	46.61
Cooperative System	2,992,000		1,196,356		4,188,356	351,011	11.93
Sub-total	¥6,524,360		¥1,494,240		¥8,018,600	438,410	¥18.29
Non-Personal Services					1,331,400	565,000	2.36
TOTAL					¥9,350,000	565,000	¥16.55

[1]Excludes an unknown amount expended for care of employees of commune-run enterprises.

[2]Based on number of direct beneficiaries: Excludes family members receiving partial coverage in first three systems; also excludes an unknown number of beneficiaries and partially covered family members in commune-run enterprise system.

the total expenditures for personal health services are correct, but that they are distributed over the entire county population rather than just the direct beneficiaries, the overall per capita expenditure for personal health services in 1980 would be ¥14.19. In addition to the identified expenditures for personal health services, the per capita expenditure for nonpersonal services (preventive and public health expenditures) at the county and commune level was ¥2.36, giving a countywide per capita total of identified expenditures for health of ¥16.55.

Information obtained from the household survey permits an estimate of out-of-pocket expenditures for health. Based on the two-week period, surveyed annual out-of-pocket expenditures for health averaged ¥5.80 per person, with a substantial variation between systems (Table 2). Since the commune-run industry system was not separately identified in the survey, personal expenditures in this system were assumed to be the same as in the labor insurance system, which it closely resembles.

Estimated annual per capita expenditures for the first three systems are relatively comparable and are substantially higher than those in the cooperative system. The countywide estimated total annual expenditure for health care of direct beneficiaries is ¥26.45 per person. Again, it must be recognized that the per capita expenditures for the first three systems do not include persons who are only partially covered under the system, and that there are no data on persons employed in commune-run enterprises.

Costs per Service

County Central Hospital

Table 3 summarizes estimated costs at the County Central Hospital in 1980. Estimates were based on depreciation, the relative proportion of inpatient and outpatient utilization of drugs, staff time, space, etc.

Total estimated expenditures for outpatient services were just over ¥1 million and for inpatient services were ¥687,140. Dividing the outpatient costs by the number of visits in 1980 (354,726) gives an average cost per visit of ¥2.83. Based on the number of bed-days used in 1980 (100,131), the average cost per day of hospitalization was ¥6.86, exclusive of food costs. Food charges are ¥0.58/day and, if added to the per diem cost, yield a total per diem cost for hospitalization of ¥7.44

By excluding the costs of medicines and drugs, one can estimate the costs for running the hospital and maintaining beds available for use, whether occupied or not. There are 335 beds in the hospital, making possible 122,275 bed-days of use. Dividing this number into the ¥486,100 operating cost indicates a cost per bed-day available of ¥3.98.

Commune Hospital Expenditures

Information provided at the Qi-yi Commune Hospital and the Hong-qiao Commune Hospital permits an estimation of 1980 expenditures for inpatient, outpatient, and noncurative services. Table 4 summarizes the Qi-yi hospital expendi-

TABLE 2—Estimated per Capita Expenditures on Health, Shanghai County, 1980

System	Personal Services[1]	+	Non-Personal Services[2]	+	Personal Expenditures[3]	=	Total
Government Welfare	¥41.15		¥2.36		¥9.10		¥52.61
Labor Insurance	42.12		2.36		3.10		47.58
Collective							
Commune Industries	46.61		2.36		3.10[4]		52.07
Cooperative System	11.93		2.36		6.70		20.99
OVERALL	¥18.29		¥2.36		¥5.80		¥26.45

[1]Based only on direct beneficiaries.
[2]Based on total population.
[3]Based on results of household survey.
[4]Not identified separately in household survey; assumed to be same as for labor insurance beneficiaries.

TABLE 3–County Central Hospital, Shanghai County, 1980 Costs

Category	Total Amount	Outpatient Amount	Per Cent	Inpatient Amount	Per Cent
Medicine	¥683,840	¥482,800	48.1	¥201,040	29.3
Salary	400,000	252,000	25.1	148,000	21.5
Other (reported)	501,550	246,950	24.6	254,600	37.1
Other (estimated)	106,100	22,600	2.2	83,500	12.1
TOTAL	¥1,691,490	¥1,004,350	100.0	¥687,140	100.0
		Cost/Visit = ¥2.83		Cost/Day = ¥6.86	

TABLE 4—Qi-yi Commune Hospital, 1980 Costs

Category	Total	Estimated Allocation		
		Inpatient	Outpatient	Non-Curative
Salaries, fringe	¥86,766	¥14,278	¥47,227	¥25,261
Drugs	97,506	12,871	84,635	—
Utilities, etc.	17,604	8,261	6,734	2,609
Equipment, repairs	5,077	2,538	2,538	—
Space -rent	1,105	560	—	545
-owned buildings (estimated)	5,486	2,542	2,498	446
Major equipment (estimated)	8,544	4,272	4,272	—
TOTAL	¥222,088	¥45,322	¥147,904	¥28,861

tures, and Table 5 summarizes the Hong-qiao expenditures. Allocation of expenditures to inpatient and outpatient services was based on estimated or reported relative utilization of drugs, staff time, etc.

The estimated costs per outpatient visit in the two hospitals were remarkably similar (¥1.59 in Qi-yi and ¥1.65 in Hong-qiao). There was considerable difference in the per diem costs of hospitalization, however (Table 6). The cost per patient day (exclusive of food) was ¥3.05 in Qi-yi and ¥5.00 in Hong-Qiao. Adding food expenses, which it was estimated were incurred by virtually all patients, raised these values to ¥3.55 and 5.40, respectively. To estimate the costs of actually running the hospital, drug costs were excluded, and the remaining total was divided by the number of bed-days available. The cost per bed-day available in Qi-yi was ¥1.08; in Hong-Qiao, it was ¥1.48. As shown in Table 6, the per diem costs and the costs per bed-day available at Hong-qiao were higher than those at Qi-yi for all categories except space.

Expenditures for noncurative services, including epidemic prevention, maternal and child health, immunization, etc., if calculated on the basis of the total population within the commune (including Qi-bao town in Qi-yi), come to ¥1.24 per capita in Qi-yi and ¥0.86 in Hong-qiao.

In both institutions, drug costs accounted for more than one-half of all outpatient costs, but a much smaller fraction

TABLE 5—Hong-qiao Commune Hospital, 1980 Costs

Category	Total	Estimated Allocation		
		Inpatient	Outpatient	Non-Curative
Salaries, fringe	¥63,948	¥6,290	¥33,546	¥24,111
Drugs	96,911	5,047	91,864	—
Utilities, etc.	12,707	2,536	4,876	5,295
Equipment, repairs	2,835	1,418	1,418	—
Space (estimated)	3,000	599	1,151	1,250
Major equipment (estimated)	5,322	2,661	2,661	—
TOTAL	¥184,723	¥18,551	¥135,516	¥30,656

TABLE 6—Qi-yi and Hong-qiao Commune Hospitals: Comparison of 1980 Inpatient Costs

Category	Cost/Patient Day		Cost/Bed-Day Available	
	Qi-yi	Hong-qiao	Qi-yi	Hong-qiao
Salaries, fringe	¥0.96	¥1.69	¥0.48	¥0.69
Drugs	0.87	1.36	—	—
Utilities, etc.	0.56	0.68	0.28	0.28
Equipment, repairs	0.17	0.38	0.08	0.16
Space (estimated)	0.21	0.16	0.10	0.07
Major equipment (estimated)	0.29	0.72	0.14	0.29
TOTAL	¥3.05	¥5.00	¥1.08	¥1.48

of inpatient costs. A similar pattern was seen at the County Central Hospital.

Brigade Level Expenditures

Another paper in this series has summarized 1979 health expenditures at the brigade level, based on countywide data.[2] Dividing total expenditure by the number of persons covered yields an annual per capita expenditure in the cooperative health system (at the brigade level) of ¥7.99 per person covered of which ¥7.71 is for curative services and ¥0.28 is for noncurative (preventive) services. More than one-third of the cost of curative services is for referral of patients upward in the system and more than 40 per cent of the total cost is for drugs, herbs, and treatments.

The overall identified cost per visit to a brigade health center can be estimated at ¥1.09. These expenditures do not include the cost of maintaining the brigade health center physical facility nor do they include the value of the work time of health aides, who provide important assistance, particularly in preventive services, and who receive work points for these activities from their production teams.

Factory Expenditures

To obtain information about patterns of use and costs of care for factory workers, personnel from the Shanghai County Bureau of Health surveyed 14 factories with a total of 3,936 workers in June 1981. The information gathered permitted estimates of the use of factory health clinics, the amount of sick leave taken by employees, the hospitalization rate of employees, and costs of providing services. Table 7 depicts the number of employees and the number of visits to the factory clinic per worker during 1980. Workers in the two brigade-run factories had substantially lower rates of use of the factory clinic than was true for workers at other factories. Overall, employees averaged 27.5 visits to the clinic per year, approximately one visit every two weeks. There was substantial variation in the amount of sick leave taken, with workers in municipal- or county-run factories averaging 20 days or more per year; those in factories managed at a lower level took less sick leave. The overall average was 14.7 days of sick leave annually per worker. Hospitalization rates for employees also showed variation, with an overall rate of 36.8 hospitalizations per 1,000 employees in 1980.

TABLE 7—Survey of 1980 Health Data, 14 Factories, Shanghai County

Management	# Factories	# Employees	OPD Visits/ Employee	Sick Leave/ Employee (Days)	Hospitalizations/ 1,000 Employees
Municipal	4	1,573	31.0	21.2	42.0
County	2	452	31.9	20.0	26.5
Commune	4	979	27.7	5.8	40.9
Town	2	667	22.8	12.7	28.5
Brigade	2	265	10.6	5.5	30.2
TOTAL	14	3,936	27.5	14.7	36.8

This figure is very similar to the 35.9 admissions per 1,000 population reported in a preceding paper in this series on use of health services.[3]

Table 8 depicts the costs of provision of health care in these 14 factories. The cost per worker varied from ¥30.09 in the two brigade-run factories to ¥56.72 in the four municipal-run factories. The overall figure was ¥49.30 per worker, a figure not too dissimilar from the ¥42.12 shown for personal services in Table 2. The manner in which data were collected in the survey permitted a breakdown of costs to show: expenditures for services delivered directly to workers fully covered under the system; the cost for reimbursement for services delivered to those who had partial coverage (family members); and the cost for reimbursement of services delivered to retired workers. The two town-run factories and the two brigade-run factories incurred no expenses for persons who were only partially covered. In the brigade-run factories, this reflects the fact that family members would be covered by the cooperative health system. We do not have an explanation for the absence of partial coverage reimbursement in the town-run factories.

To estimate the cost per visit to the factory clinic, salary costs were added to drug costs and divided by the number of outpatient visits. Table 9 shows the costs in the different types of factories; the overall cost per visit was ¥0.80. This cost is fairly comparable to the cost per visit in brigade health centers and is substantially lower than the costs per outpatient visit in the two commune hospitals studied. The cost per hospital day for the different factories is also shown in Table 9. The overall cost per hospital day was ¥3.06.

If we consider that the factories surveyed are representative of all factories of similar management in the county, we can estimate the countywide cost of provision of health care to factory workers. Table 10 depicts countywide estimates based on the 14 factories. In total, there are 132,217 factory workers who incurred an estimated 3.3 million visits to factory clinics during the year at a countywide cost of ¥6.2 million. This figure is substantially higher than the ¥3.3 million total cost identified for labor insurance and commune-run industries shown in Table 1. In large part, this discrepancy is probably due to the fact that the ¥3.3 million figure does not include costs in municipality-run factories. We can also estimate that nearly two million days of work were lost because of illness among factory workers. Assuming an average income of ¥2 per day, this would translate to an annual amount of an additional ¥4 million in wages lost.

Cost-Effectiveness

Information provided by personnel of the Health and Anti-Epidemic Station permitted limited cost-effectiveness analysis of two activities—vaccination programs and filariasis screening.

Vaccination Programs

Table 11 summarizes the costs and effects of the polio vaccination program in Shanghai County, 1963–1980. Cumulative costs of the program, as supplied by program personnel, were ¥185,000. To determine the effectiveness of the program, it was assumed that the average annual incidence of disease reported before the vaccination program began would have continued in the absence of vaccination. Because of uncertainty about the effect of the program during the first year of its implementation, the year the program

TABLE 8–1980 Health Costs, 14 Factories: Costs/Employee

Management	Total	Direct Beneficiaries	Partial Coverage	Retired Employee
Municipal	¥56.72	¥49.18	¥3.30	¥4.23
County	46.37	43.31	0.94	2.13
Commune	47.14	43.94	2.26	0.93
Town	44.61	41.44	—	3.16
Brigade	30.09	30.09	—	—
OVERALL	¥49.30	¥44.61	¥1.99	¥2.70

TABLE 9—1980 Average Health Costs, 14 Factories

Management	Cost per OPD Visit	Cost per Hospital Day
Municipal	¥0.67	¥2.81
County	0.59	5.00
Commune	1.00	2.52
Town	0.91	7.09
Brigade	1.56	2.44
OVERALL	¥0.80	¥3.06

TABLE 10—Countywide Estimates Based on 14 Factories

Management	Employees	OPD Visits	Cost	Sick Leave (Days)
Municipal	58,666	1,818,646	¥3,327,536	1,243,719
County	10,462	333,738	485,123	209,240
Commune/Town	33,124	836,381	1,519,729	306,397
Brigade	29,964	317,618	901,617	164,802
TOTAL	132,216	3,306,383	¥6,234,005	1,924,158

began was excluded from analysis. Overall, there has been a 93.5 per cent reduction in the incidence of polio since the program began and it can be estimated that, in total, 859 cases of polio have been prevented by the program. Dividing this number into the cumulative program expenditures indicates a cost per case prevented of ¥215.37.

A similar analysis of the measles vaccination program (Table 12) indicates a 95.3 per cent reduction in reported incidence and an estimated total of over 100,000 cases prevented, at an average cost-per-case saving of ¥1.47.

These calculations are based only on cases averted and do not take into account deaths which have been prevented.

Filariasis Screening

Surveys in 1958 and 1960 indicated a considerable amount of filariasis in the county. Consequently, an intensive program of screening in infected areas, with treatment of positives, was carried out in 1970–1973. Table 13 summarizes the results and costs of the program. Although the cost per smear has remained remarkably constant (except for a rise in 1980, possibly related to the reduction in the number of smears taken), the cost per case found has risen dramatically, from ¥2.78 per case in 1958 to ¥353.41 per case in 1980.

Filariasis is not usually a fatal disease, and seven of the 22 cases found in 1980 had only one microfilaria per smear, indicating a light infection. The change in cost per case discovered raises questions as to the desirability of continuing the filariasis screening program. It is anticipated that program activities may be suspended following a formal program review later in 1981.

These crude analyses yield some useful information about the programs examined. In considering the vaccination programs, most would probably agree that the relatively low expenditure for preventing a case of measles is worthwhile and that the expenditure to prevent a case of polio is worthwhile. In the filariasis program, it seems that a program which was initially quite cost-effective has lost its cost-effectiveness to the extent that discontinuation of the program should receive serious consideration.

Summary and Conclusions

Data which are presently being collected in Shanghai County permit a reasonable estimate of many of the health expenditures within the county. However, there are gaps in the available data which make it difficult to carry out detailed comparisons between the systems. The gaps include: the current total absence of information about participants and expenditures incurred by persons employed in commune-run enterprises; the absence of information about the numbers of persons who receive partial coverage under the government welfare, labor insurance, and commune-run industry and enterprise systems; the partial lack of information about direct patient expenditures for care, particularly for those who are partially covered under the welfare or labor insur-

TABLE 11—Polio Vaccination Program,* Shanghai County

Cumulative Costs	
Vaccine	¥22,250
Refrigeration	80,000
Records	4,000
Salary	78,750
TOTAL	¥185,000
Annual Reported Incidence/100,000	
1956–62	10.27
1964–80**	0.66
% reduction	93.5
Cases Averted = (10.27 − 0.66) × 5.25635† × 17 = 859	
Cost per Case Averted = ¥185,000 ÷ 859 = ¥215.37	

*Year Program Began—1963
**Omit year program began
†1974 population

TABLE 12—Measles Vaccination Program,* Shanghai County

Cumulative Costs	
Vaccine	¥25,464
Equipment	5,300
Refrigeration	80,000
Records	4,000
Salary	36,000
TOTAL	¥150,764
Annual Reported Incidence/100,000	
1956–65	1,458.4
1967–80**	68.4
% reduction	95.3
Cases Averted = (1,458.4 − 68.4) × 5.25635† × 14 = 102,289	
Cost per Case Averted = ¥150,764 ÷ 102,289 = ¥1.47	

*Year program began—1966
**Omit year program began
†1974 population

TABLE 13—Filariasis Program, Shanghai County

Year	# Smears	# Positives	Per Cent Positive	Total Cost*	Cost/ Smear	Cost/ Case
1958	317,718	5,558	1.75	¥15,440	¥0.049	¥2.78
1960	288,510	2,108	0.73	14,123	0.049	6.70
1970	451,720	2,987	0.66	21,468	0.048	7.19
1971	428,645	2,128	0.50	20,429	0.048	9.60
1972	407,436	1,730	0.43	19,475	0.048	11.26
1973	324,547	713	0.22	15,745	0.049	22.08
1978	176,723	71	0.04	9,093	0.051	128.07
1980	84,263	22	0.026	7,775	0.092	353.41
TOTAL	2,479,631	15,317	0.62	¥123,546	¥0.050	¥8.07

*Includes equipment costs and salaries for government staff, blood collectors, team leaders, and laboratory technicians.

ance systems and those seeking care at higher levels of the cooperative system; and the lack of information about out-of-pocket expenditures for health-related items, including transportation to and from the site of care, food costs while in hospital, and costs of nonprescription drugs and tonics.

Nonetheless, the available data do permit useful analyses of the expenditures for health in Shanghai County and some comparison of costs for the same service in different settings. This information can be quite helpful in guiding program changes in the future. Additionally, the quantity of information available about program activities and results allows estimation of the cost-effectiveness of some programs, which can be quite useful in evaluating existing programs and in planning for new ones.

REFERENCES

1. Parker RL, Gong YL, Shan LG, Huang DY, Hinman AR: The sample household health interview survey. Am J Public Health (supplement) 1982; 72:65–70.
2. Chao LM, Gong YL, Gu SJ: Financing the cooperative medical system. Am J Public Health (supplement) 1982; 72:78–80.
3. Parker RL, Hinman AR: Use of health services. Am J Public Health (supplement) 1982; 72:71–77.