CHAPTER 5

ASSESSING COSTS AND SIMULATING RESOURCE ADEQUACY

The availability of praziquantel for the effective treatment of schistosomiasis, the standardization of diagnostic methods by WHO, and the experience gained by implementation of the large scale schistosomiasis control program in the past 40 years in China and in the world have made schistosomiasis control operationally feasible and potentially effective. However, the financial burdens imposed by the costly control operations make the health planners and administrators more cost-conscious and more cost-efficient oriented. Over the long term, this cost-consciousness will lead to better planning and greater efficiency and thus to better aid for economic development.

The objective of this chapter is to develop a methodology for assessing cost and simulating resource adequacy for the schistosomiasis control program in China. Cost analysis will provide a way to understand the cost behavior of different control options; it will identify controllable and uncontrollable cost components and further derive policy implications of cost analysis for resource allocation. Further, the resource requirement under different scenarios will be simulated.

5.1 Assumptions

Assumptions for cost analysis:

1. Assuming the salary for supervisors is RMBY70 a day, medical officer RMBY50 a day, medical assistant RMBY30 a day and driver RMBY30 a day. The per diem for field work is RMBY30 a day. It is assumed the villagers' earning is Y10 a day while the villager leader's salary is RMBY20 a day. Their per diem is half of their salary, that is RMBY10 per day, respectively.

2. For chemotherapy options, the consumer and community costs are not significant compared with the provider (program cost), thus not included in the costing.

3. For snail control operations, communities contribute a substantial amount of labor and materials, thus the community costs are quite substantial. The total economic costs for snail control should be considered.

4. For mass and selective group chemotherapy, mobile medical teams go to the field to administer the chemotherapy drug. The mobile team usually comprises four staff, one medical officer, one medical assistant, one driver and one supervisor who works half the time as the team staff. It is assumed the team treat 150 person in one day.

5. For selected population chemotherapy, one or two lab technician(s) should be added to the mobile team. The medical assistant in the team participate in collecting blood or stool samples. It is assumed that the team in 10 days can detect and treat 500 positive cases.

6. For snail control, supposing one molluscicide team comprises 10 workers, of which 3 are from the anti-schistosomiasis institution, including a technician, a technician assistant and a driver, and 7 from the local communities. A supervisor will go to the field to monitor the work. Before and after molluscicide, snail surveys will be carried out, and a lab technician is needed to check the infection of snails. It is assumed that the team treats 10,000 square meters of snail habitat a day.

7. For environmental modification of snail control, the schistosomiasis control institutions only send the staff to monitor the projects. The local communities are responsible to provide the labor needed.

Assumptions for estimating resources available:

8. The total World Bank loan, US$16,696,100, for the Hunan Provincial project is divided into equally annual portions during 1992 - 1996;

9. The foreign exchange rate remains unchanged at 1US$ = 8.60 RMBY during the period;

10. Inflation rate is 10%;

11. Budget in 1997, after World Bank Loan finishes, is estimated based on 1990's budget: (a) budget reduces 20%; (b) budget increases 20%; and (c) budget increases 50%; (d) budget increases 100%.

5.2 Cost analysis

Cost analysis is to examine the costs of two or more control alternatives whose effectiveness is not too contentious. In this sense, attention is to be focused on the cost while the options are assumed to be effective. Of course, it is not sound enough to make such simple assumption, but it provides us with a simpler and clearer way to approach the problems in the current schistosomiasis control program in China.

1. Cost for chemotherapy

Based on the itemized cost model and cost menu developed in the earlier chapter, estimated cost data are imputed into the table and cost analysis is undertaken to demonstrate the ways and derive economic implications from the analysis.

a. Cost analysis to mass and selective group chemotherapies:

First, we assume a mobile chemotherapy team comprises four staff, one medical officer, one medical assistant, one driver and one supervisor who works half the time as the team staff. It is assumed that in 10 days they treat 1500 persons in the village (this is the standard work load proposed) with all the necessary procedures completed, including the routine pre-treatment check-up, weighing, registration and treatment of serious side-effects. We also assume the consumer costs and community costs are not significant because the team goes to the residential areas and thus their time and travel costs are neglectable (see Table 5.1).

Table 5.1 gives us a rough idea of how the cost and unit cost of mass and selective group chemotherapy are calculated. Actually, the calculation is near to the real situation and the drug cost, which comprises the major component of the total costs, is the actual price. As the delivering procedure is very simple, the capital cost is quite low.

We can see from Figure 5.1 that, of mass and selective group chemotherapy operations, the major component of the costs go to praziquantel. Because the personnel costs in China are relatively low, this part is comparatively lower than that of other countries. As a result, the unit costs per person treated by mass and selective group chemotherapy scheme in China are comparatively lower. For example, Korte *et al* (1986) demonstrated that operational costs are more important than that of drugs in several African endemic countries. They further pointed out that the importance of operational costs in the execution of the program underlines the necessity to limit vertical action to a minimum. Evans (1993) reviewed the available literature of studies in some African countries and concluded that the costs of chemotherapy-based control strategies are unlikely to be affected significantly by a projected fall in the price of praziquantel, because in most of the programs drugs accounts for only 25% and above of the total costs.

This is of significance, because the World Bank loan is principally allocated to purchase chemotherapy drug and molluscicides at present, which account for over 80% of the total loan (refer Table 7.2). This means the future program has to re-allocate a significant part of money to fill this gap when the loan is terminated. In a later section of this paper, we would discuss its financing implications.

Figures 5.1 and 5.2 show us the way to analyze the cost components by different activities. This example tells us most of the costs are allocated to the treatment activity, while supervision and mobilization costs are only the minor portions. This may not be true in some of the control operations when the compliance of the people to chemotherapy are low. In this case, a lot of manpower should be invested to the mobilization of the population so that they could join in the campaign.

Table 5.1 ILLUSTRATION OF COST CALCULATION FOR MASS CHEMOTHERAPY (PROVIDER)

Category/Item	Unit	Unit cost	Total unit	Sub total cost	Costs Allocated by Activity (RMBY) Supervi.	Mobili.	Train.	Diagnos.	Treat.
Personnel:									
Supervisor salary	Day	70.00	5.00	350.00	350.00				
Supervisor per diem	Day	30.00	5.00	150.00	150.00				
Medical officer salary	Day	50.00	10.00	500.00					500.00
Medical officer per di	Day	30.00	10.00	300.00					300.00
Medical assist.salary	Day	30.00	10.00	300.00		100.00	50.00		150.00
Medical assist.per die.	Day	30.00	10.00	300.00		100.00	50.00		150.00
Lab technician salary	Day			0.00					
Lab technician per die	Day			0.00					
Driver salary	Day	30.00	10.00	300.00	100.00				200.00
Driver per diem	Day	30.00	10.00	300.00	100.00				200.00
Sub Total				2500.00	700.00	200.00	100.00	0.00	1500.00
Vehicle:									
Rental	Km	2.00	500.00	1000.00	333.00				667.00
Running	Km	1.00	500.00	500.00	166.00				334.00
Sub Total				1500.00	499.00	0.00	0.00	0.00	1001.00
Consumables:									
Praziquantel	Person	5.40	1500.00	8100.00					8100.00
Wastage 5% (of drug)		0.05	8100.00	405.00					405.00
Other drugs	Person	0.10	500.00	50.00					50.00
Slides	Person			0.00					
Coverslides	Person			0.00					
Kato-Katz plates	Person			0.00					
IHA plates	Person			0.00					
ELISA plates	Person			0.00					
Antigen	Person			0.00					
Other consumables	Person	1.00	1500.00	1500.00					1500.00
Wastage 5% (of other)		0.05	1550.00	77.50					77.50
Sub Total				10132.50	0.00	0.00	0.00	0.00	10132.50
Capital Cost:									
Building	M2/day	1.50	200.00	300.00	100.00				200.00
Microscope	Work day			0.00					
Weighing scale	Work day	1.00	10.00	10.00					10.00
Bicycle	Work day			0.00					
Other equipment	Work day			0.00					
Sub Total				310.00	100.00	0.00	0.00	0.00	210.00
Grand Total				14442.50	1299.00	200.00	100.00	0.00	12843.50
Total Number Chemotherapied				1500.00					
Unit Cost Per Chemotherapy				9.63	0.87	0.13	0.07	0.00	8.56

Figure 5.1 Cost Components of Mass Chemotherapy

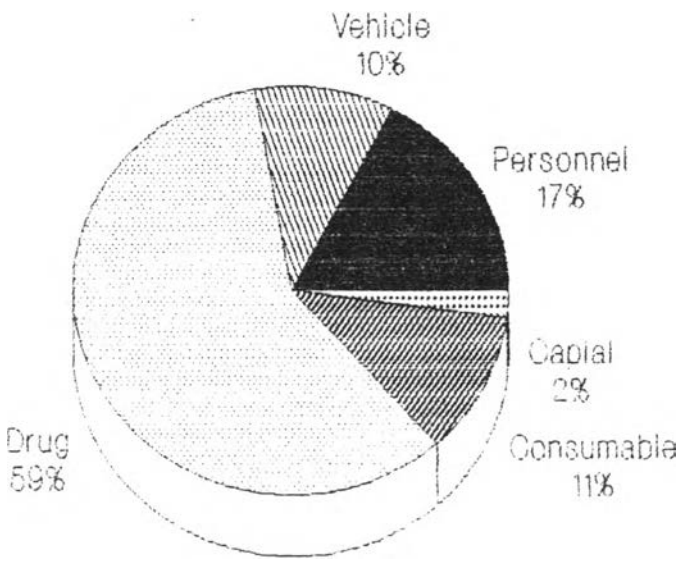
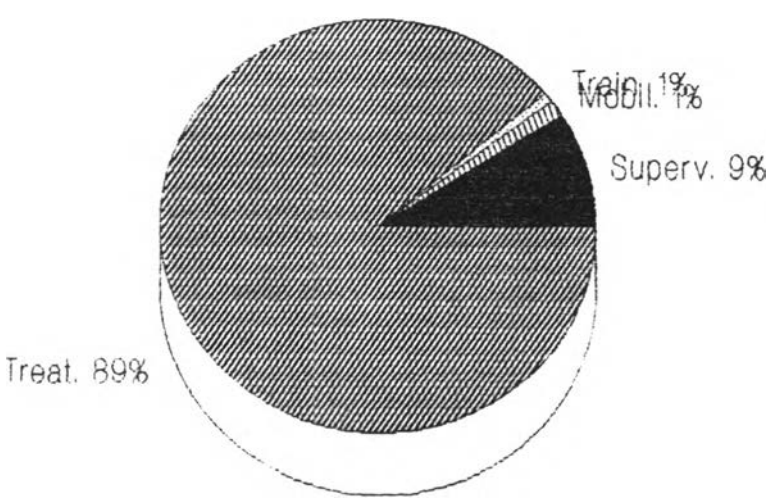


Figure 5.2 Cost Components of Mass Chemotherapy by Activities



b. Cost analysis to selected population chemotherapy:

Selected population chemotherapy involves diagnostic detection of the population and then those positive cases are treated. Compared with mass chemotherapy, a significant amount of manpower and resources should go to the case detection operations. It is out of question that in this case the unit cost per person treated will be increased substantially compared with that of mass chemotherapy (the cost per positive case treated is not to be discussed here).

The drug cost in this approach is relatively a small portion as expected (see Table 5.2, Figure 5.3), while the cost for diagnosis is almost the same as that of treatment. The case detection procedure actually needs a lot od supervision and mobilization work to encourage the population to participate. These hypothesis data here may give us some rough idea about this trend (Figure 5.4).

Table 5.2 ILLUSTATION OFCOST CALCULATION FOR SELECTED POPULATION OTHERAPY(PROVIDER)

Category/Item	Unit	Unit cost	Total unit	Sub total cost	Costs Allocated by Activity (RMBY) Supervi.	Mobili.	Train.	Diagnos.	Treat.
Personnel:									
Supervisor salary	Day	70.00	5.00	350.00	350.00				
Supervisor per diem	Day	30.00	5.00	150.00	150.00				
Medical officer salary	Day	50.00	5.00	250.00					250.00
Medical officer per di.	Day	30.00	5.00	150.00					150.00
Medical assist.salary	Day	30.00	10.00	300.00		100.00	50.00	100.00	50.00
Medical assist.per die.	Day	30.00	10.00	300.00		100.00	50.00	100.00	50.00
Lab technician salary	Day	40.00	20.00	800.00				800.00	
Lab technician per die.	Day	30.00	20.00	600.00				600.00	
Driver salary	Day	30.00	10.00	300.00	100.00			100.00	100.00
Driver per diem	Day	30.00	10.00	300.00	100.00			100.00	100.00
Sub Total				3500.00	700.00	200.00	100.00	1800.00	700.00
Vehicle:									
Rental	Km	2.00	500.00	1000.00	333.00			333.00	334.00
Running	Km	1.00	500.00	500.00	167.00			166.00	167.00
Sub Total				1500.00	500.00	0.00	0.00	499.00	501.00
Consumables:									
Praziquantel	Person	5.40	500.00	2700.00					2700.00
Wastage 5% (of drug)		0.05	2700.00	135.00					135.00
Other drugs	Person	0.10	200.00	20.00					20.00
Slides	Person	0.20	1500.00	300.00				300.00	
Coverslides	Person	0.10	1500.00	150.00				150.00	
Kato-Katz plates	Person	1.00	1500.00	1500.00				1500.00	
IHA plates	Person			0.00					
ELISA plates	Person			0.00					
Antigen	Person			0.00					
Other consumables	Person	2.00	1500.00	3000.00				1500.00	1500.00
Wastage 5% (of other)		0.05	4970.00	248.50				248.50	
Sub Total				8053.50	0.00	0.00	0.00	3698.50	4355.00
Capital Cost:									
Building	M2/day	1.50	200.00	300.00	100.00			100.00	100.00
Microscope	Work da.	5.00	40.00	200.00				200.00	
Weighing scale	Work da.	1.00	10.00	10.00					10.00
Bicycle	Work day			0.00					
Other equipment	Work day			0.00					
Sub Total				510.00	100.00	0.00	0.00	300.00	110.00
Grand Total				13563.50	1300.00	200.00	100.00	6297.50	5666.00
Total Number Chemotherapied				500.00					
Unit Cost Per Chemotherapy				27.13	2.60	0.40	0.20	12.60	11.33

Figure 5.3 Cost components of Selected population Chemotherapy

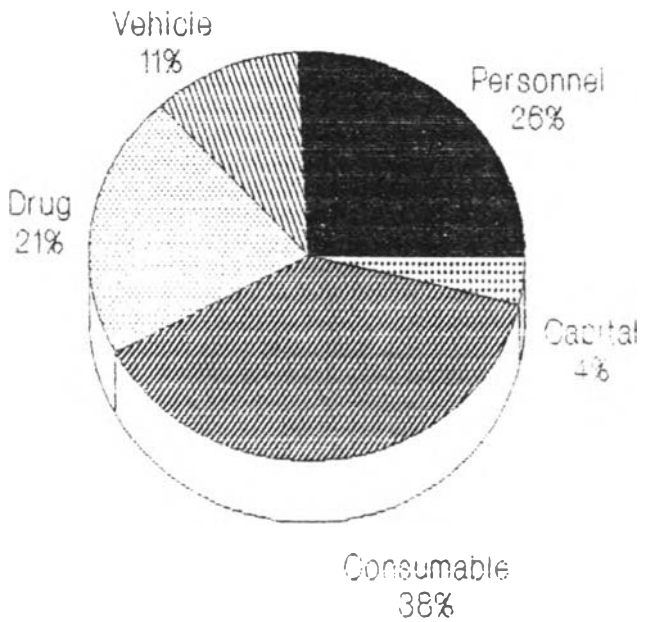
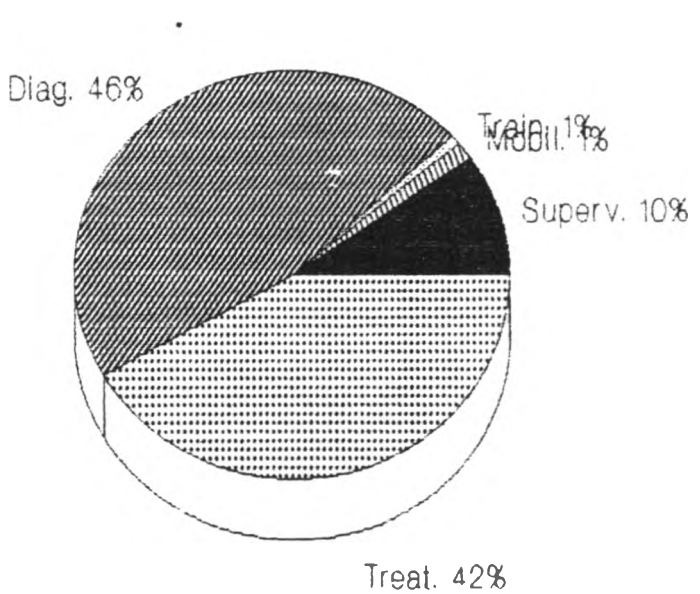


Figure 5.4 Cost components of selected Population Chemotherapy by Activities



2. Cost for snail control

The difference between the cost of snail control and that of chemotherapy is that snail control activities involve a lot of community participation. It is not surprising that the provider cost is relatively low compared with a lot of labor contribution by the community in environmental modification and molluscicide to control the snails.

a. Cost analysis of focal molluscicide:

To calculate the costs of molluscicide, it should be realized that they vary a lot according to the number of staff involved, the distance of the snail habitats to the institution, the complication of the environment of the habitat and the molluscicides adopted. Further, different spraying or immersion methods could be adopted for different environments. All those factors almost make the calculation and comparison impossible. Among the available literature about cost analysis of the schistosomiasis control program, no report made the attempt. However, if we overlook this part of costs in the schistosomiasis control program in China, it means a significant part of the total resource consumption could not be calculated and analyzed, as snail control is a significant part of the total control program and the past achievements in control relied heavily on this. The purpose of this attempt to undertake cost analysis is to estimate roughly the cost components and analyze the significance of the cost items.

Supposing one molluscicide team comprises 10 workers, of which 3 are from the anti-schistosomiasis institution, including a technician, a technician assistant and a driver; and 7 from the local communities. A supervisor will occasionally go to the field to monitor the work. Before and after the molluscicide, a snail survey will be carried out, with a laboratory technician is needed to check the infection of the snails. We assume this team treats 10,000 square meters of snail habitat a day. The cost of five days work is illustrated in Tables 5.3 and 5.4.

Provider costs: From the provider side, the cost of molluscides is the major component which is more than half of the total cost illustrated in the Table. One the contrary, the cost of personnel is only a minor part of the total (Figure 5.5). This will also give us financing implications which will be discussed in the later section of this chapter, because the molluscicides currently being used are supported by the World Bank Loan. Among the operational activities, molluscicide is the major component of cost (Figure 5.6).

Community costs: From the community side, the local villages provide labor for the molluscicide work and they will be paid by the villages. However, the example here shows that costs to the community are not significant in the aggregate cost.

Table 5.3 Illustration of Cost Calculation for Molluscicding (Provider)

Category/Item	Unit	Unit price	Total unit	Sub total	Costs Allocated by Activity (RMBY				
					Supervi.	Train.	Snail sur	Mollusci.	Engeneer.
Personnel:									
Supervisor salary	Day	60.00	3.00	180.00	180.00				
Supervisor per diem	Day	30.00	3.00	90.00	90.00				
Technician salary	Day	40.00	5.00	200.00				200.00	
Technician per diem	Day	30.00	5.00	150.00				150.00	
Technician assist.sal.	Day	30.00	5.00	150.00		50.00		100.00	
Technician assist.per d.	Day	30.00	5.00	150.00		50.00		100.00	
Lab technician salary	Day	40.00	10.00	400.00		50.00	350.00		
Lab technician per di.	Day	30.00	5.00	150.00		50.00	100.00		
Driver salary	Day	30.00	5.00	150.00	50.00			100.00	
Driver per diem	Day	30.00	5.00	150.00	50.00			100.00	
Sub Total				1770.00	370.00	200.00	450.00	750.00	0.00
Vehicle:									
Rental	Km	2.00	500.00	1000.00	200.00			800.00	
Running	Km	1.00	500.00	500.00	100.00			400.00	
Sub Total				1500.00	300.00	0.00	0.00	1200.00	0.00
Consumables:									
Molluscides(spraying)	M2	0.06	50000.00	3000.00				3000.00	
Molluscides(Immersion	M2	0.07		0.00					
Wastage 5% (of chemical)		0.05	3000.00	150.00				250.00	
Fuel for spray machin	Work hour	50.00	30.00	1500.00				1500.00	
Machine maintaining	Work hour	10.00	30.00	300.00				300.00	
Personnel protection	Work hour	10.00	30.00	300.00				300.00	
Other consumables	Work hour			0.00					
Wastage 5% (of other)		0.05	2100.00	105.00				105.00	
Sub Total				5355.00	0.00	0.00	0.00	5455.00	0.00
Capital Cost:									
Building(store house)	M2/day	2.00	500.00	1000.00				1000.00	
Spraying machine	Work day	400.00	5.00	2000.00				2000.00	
Microscope	Work day	5.00	10.00	50.00			50.00		
Bicycle	Work day	2.50		0.00					
Other equipment	Work day			0.00					
				0.00					
Sub Total				3050.00	0.00	0.00	50.00	3000.00	0.00
Grand Total				11675.00	670.00	200.00	500.00	10405.00	0.00
Total Square Metre Treated				50000.00					
Unit Cost Per Square Metre				0.23	0.01	0.00	0.01	0.21	0.00

Table 5.4 Illustration of Cost Calculation for Molluscicding (Community)

Category/Item	Unit	Unit cost	Total unit	Sub total	Costs Allocated by Activity (RMBY)				
					Supervi	Mobili.	Snail sur	Molluscic	Engeneer
Time cost									
Villager pay	Day	20.00	35.00	700.00				700.00	
Villager per diem	Day	10.00	35.00	350.00				350.00	
Village leader salary	Day	30.00	1.00	30.00		30.00			
Village leader perdiem	Day	20.00	1.00	20.00		20.00			
Contribution									
Material				0.00					
Other				0.00					
Total				1100.00	0.00	50.00	0.00	1050.00	0.00

Figure 5.5 Cost Components of Molluscicide

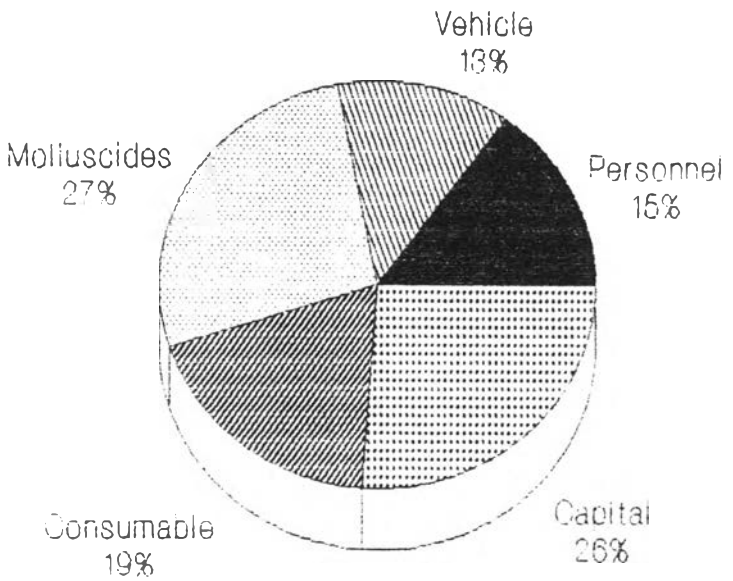
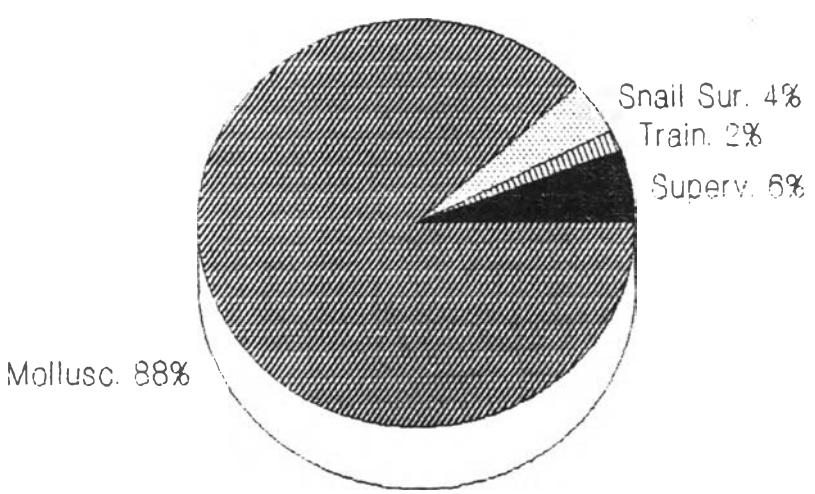


Figure 5.6 Cost Components of Molluscicide by Activities



b. Cost analysis of environmental modification:

Environmental modification is different from molluscicide in the sense that it involves more community participation. The cost incurred by the community, therefore, is quite high. For example, Tables 5.5 and 5.6 give us sample cost calculations for provider and community costs respectively. As can readily be expected, a great quantity of earth work needs a lot of manpower investment. But in the case in China, the civil engineering of snail control is the obligation of the local community assigned by the government and the local villagers are obliged to contribute a certain quantity of labor to the program. On the other side, the provider cost of the schistosomiasis control institutions is not significant compared with other alternatives (Figure 5.7). This will also be discussed in the later section of this chapter about the resources needed each year in the case of the schistosomiasis control program in Hunan Province.

5.3 Simulation of resources adequacy

The resource adequacy can be judged from the difference between resource requirement and resource availability. The simple tool of unit cost will be used for simulation. The resource required is the estimation of financial input needed to keep the program operating under different scenarios, while the resource availability is simply based on the judgement of possible future financial input from governments.

Some epidemiological data of the schistosomiasis control program in the past five years, including those since the starting of the World Bank Loan Program in Hunan Province, China, will be used as an example to demonstrate the procedure of simulating the resource adequacy under different scenarios. Hunan province is one of the most severely endemic areas of schistosomiasis japonica where the number of infected persons and animal and the areas of snail habitat are the highest among the endemic provinces.

The World Bank Loan Program started in 1992 and will be terminated by the end of 1996. The general strategy adopted by the program is to control the morbidity of the disease in the population, in addition to focal molluscicide and limited environmental modification to control the snails. The specific objective is to reduce the prevalence of schistosomiasis by 40% by the end of the program.

1. Simulation of resource required

From the previous analysis, we understand that the resource inputs of chemotherapy options, including mass chemotherapy, selective group chemotherapy (chemotherapy to high risk group) and selected population chemotherapy (treatment to diagnostically confirmed cases) are principally from the provider side, while the costs incurred by the community and consumer are not at all significant. On the contrary, however, for snail control operations, except molluscicides and spraying machines and tools which should be provided by the program,

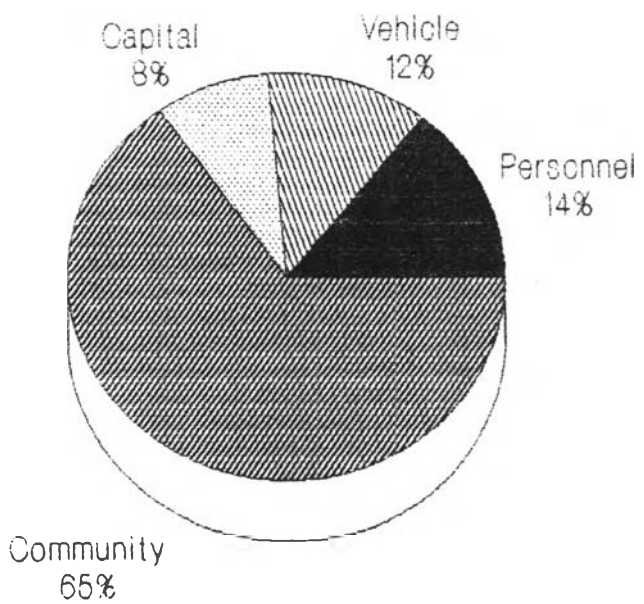
Table 5.5 Illustration of Cost Calculation for Environmental Modification (Provider)

Category/Item	Unit	Unit cost	Total unit	Sub total	Costs Allocated by Activity (RMBY)				
					Supervi.	Train.	Snail su	Molluscc	Engeneer
Personnel:									
Supervisor salary	Day	60.00	3.00	180.00	180.00				
Supervisor per diem	Day	30.00	3.00	90.00	90.00				
Technician salary	Day	40.00	5.00	200.00					200.00
Technician per diem	Day	30.00	5.00	150.00					150.00
Technician assist.salar.	Day	30.00	5.00	150.00					150.00
Technician assist.per di.	Day	30.00	5.00	150.00					150.00
Lab technician salary	Day	40.00	10.00	400.00			400.00		
Lab technician perdiem	Day	30.00	5.00	150.00			150.00		
Driver salary	Day	30.00	5.00	150.00	50.00				100.00
Driver per diem	Day	30.00	5.00	150.00	50.00				100.00
Sub Total				1770.00	370.00	0.00	550.00	0.00	850.00
Vehicle:									
Rental	Km	2.00	500.00	1000.00	1000.00				
Running	Km	1.00	500.00	500.00	500.00				
Sub Total				1500.00	1500.00	0.00	0.00	0.00	0.00
Consumables:									
Molluscides(spraying)	M2	0.10		0.00					
Molluscides (Immersion)	M2	0.07		0.00					
Wastage 5%(of chemical)		0.05	0.00	0.00					
Fuel for spraying machi	Work hour	50.00		0.00					
Material for maintainin	Work hour	10.00		0.00					
Material for personnel	Work hour	10.00		0.00					
Other consumables	Work hour			0.00					
Wastage 5%(of other)		0.05	0.00	0.00					
Sub Total				0.00	0.00	0.00	0.00	0.00	0.00
Capital Cost:									
Building (store house)	M2/day	2.00	500.00	1000.00	1000.00				
Spraying machine	Work day	400.00		0.00					
Microscope	Work day	5.00	10.00	50.00			50.00		
Bicycle	Work day	2.50		0.00					
Other equipment	Work day			0.00					
				0.00					
Sub Total				1050.00	1000.00	0.00	50.00	0.00	0.00
Grand Total				4320.00	2870.00	0.00	600.00	0.00	850.00
Total Square Metre Treated				50000.00					
Unit Cost Per Square Metre				0.09	0.06	0.00	0.01	0.00	0.02

Table 5.6 Illustration of Cost Calculation for Environmental Modification (Community)

Category/Item	Unit	Unit cost	Total unit	Sub total	Costs Allocated by Activity (RMBY)				
					Supervi	Mobiliz	Snail su	Molluscic	Engeneer.
Time cost									
Villager pay	Day	10.00	500.00	5000.00					5000.00
Villager per diem	Day	5.00	500.00	2500.00					2500.00
Village leader salar	Day	20.00	20.00	400.00		400.00			
Village leader perdi.	Day	10.00	20.00	200.00		200.00			
Contribution									
Material				0.00					
Other				0.00					
Total				8100.00	0.00	600.00	0.00	0.00	7500.00

Figure 5.7 Components of Total Economic Costs of Environment Modification



labor contributions are a significant part of resource input. But their "opportunity costs" have seldom been carefully calculated during the implementation of the program. To make the analysis simplified, in this paper only the resource required for the program will be discussed while assuming the community involvement for snail control can be guaranteed.

a. Resource required for chemotherapy

Under the current control strategy, chemotherapy options are employed as the principal control measures for controlling the disease. Therefore, estimating the resources required for chemotherapy is very important to understand the economic scenario of the control program. As has been indicated, drug is a principal input for mass chemotherapy operations, while for selected population chemotherapy (screened chemotherapy), the diagnostic process consumes a lot of resources. In order to make an estimation of possible resources needed, firstly we can come to examine the past work undertaken on chemotherapy. Table 5.7 gives the number of residents and domestic animals chemotherapied in the endemic areas in Hunan Province from the year 1989 to 1993.

Table 5.7 Data on chemotherapy in Hunan Province from 1989-1993

Year	No.persons by mass +selective group chemotherapy	No.persons by selected population chemotherapy		No.heads of animal chemo-therapied
		Diagnosis	Treatment	
1989	91,584	581,770	33,589	46,959
1990	146,482	732,396	59,443	68,773
1991	159,279	864,656	59,859	75,480
1992*	998,688	1,532,662	89,385	111,111
1993*	909,831	1,179,807	121,801	81,163

Source: Statistics of Schistosomiasis Control in Hunan Province, 1989-1993. Unpublished data, Hunan Provincial Office for Schistosomiasis Control, China

* With World Bank Loan

The injection of the World Bank Loan since 1992 saw a big increase in the number of persons detected and treated. This is backed by the adequate supply of chemotherapy drug, and of diagnostic resources. If the current strategy is being carried out according to design and the objective of 40% reduction in the prevalence could be achieved, the resources needed for chemotherapy after the Loan Program will be reduced accordingly. However, the number of persons to be detected and chemotherapied after 1996 will be decided by the revised technical strategy. It is difficult to predict how much work should be done for the time being, but we could make some estimation based on different scenarios from the economic perspective. Table 5.8 gives us some rough estimation of resources required for chemotherapy activities.

Table 5.8a Simulation of Resource Requirement for Mass and Selective Group Chemotherapy under Different Scenarios

SCENARIOS	No. persons of Mass + group (1)	Unit cost (2)	Resourece required (3)=(1)(2)	Drug unit cost (4)	Drug cost (5)=(1)(4)
A: Same strategy, no change of infection	1,000,000.0	9.6	9,630,000.0	5.5	5,500,000.0
B: Same strategy, work load decreased by 20%	800,000.0	9.6	7,704,000.0	5.5	4,400,000.0
C: Same strategy, work load decreased by 40%	600,000.0	9.6	5,778,000.0	5.5	3,300,000.0
D: Same strategy, work load decreased by 50%	500,000.0	9.6	4,815,000.0	5.5	2,750,000.0
E: Same strategy, work load decreased by 60%	400,000.0	9.6	3,852,000.0	5.5	2,200,000.0
F: Change strategy, mass chemotherapy to all areas	2,000,000.0	9.6	19,260,000.0	5.5	11,000,000.0
G: Change strategy, diagnosis before treating *	200,000.0			5.5	1,100,000.0
H: Maintaining the level of 1991's	160,000.0	9.6	1,540,800.0	5.5	880,000.0

Notes: This number is estimated based on that 10% of those diagnosed to be treated, which is from Table 5.7

Table 5.8b Simulation of resource Requirement for Selected Population Chemotherapy under Different Scenarios

SCENARIOS	No.person D&T (1)	Unit Cost (2)	Resources required (3)=(1)(2)	Drug unit cost (4)	Drug cost (5)=(1)(4)
A: Same strategy, no change in infection	100,000.0	27.1	2,713,000.0	5.5	550,000.0
B: Same strategy, work load decreased by 20%	80,000.0	27.1	2,170,400.0	5.5	440,000.0
C: Same strategy, work load decreased by 40%	60,000.0	27.1	1,627,800.0	5.5	330,000.0
D: Same strategy, work load decreased by 50%	50,000.0	27.1	1,356,500.0	5.5	275,000.0
E: Same strategy, work load decreased by 60%	40,000.0	27.1	1,085,200.0	5.5	220,000.0
F: Change strategy, mass chemotherapy to all areas	2,000,000.0			5.5	11,000,000.0
G: Change strategy, diagnosis before treating *	2,000,000.0	27.1	5,426,000.0	5.5	1,100,000.0
H: Maintaining the level of 1991's	70,000.0	27.1	1,899,100.0	5.5	385,000.0

* Assumptions:
(1): 10% of those diagnosed will be treated;
(2): Diagnostic technique is stool examination;
(3): RMBY27.1 is the unit cost for treating one positive case which also iincludes the cost for diagnosing negative cases;

Simulation of scenarios for chemotherapy:

Scenario A: Maintain the current level of number of persons detected and treated based on the actual work of 1992 and 1993. The actual unit cost of drug is used to estimate actual expenditure of drugs, while the unit cost of mass chemotherapy and screened chemotherapy are just from our previous estimations.

Scenarios B - E: Descriptions of different situation after the termination of World Bank Loan Project, when the number of persons to be chemotherapied and screened are decreased according to different corresponding strategies adopted. In this paper, detailed endemic situations and their control measures are not discussed.

Scenario F: It is a situation by assuming all the subjects are chemotherapied without prior screening.

Scenario G: This is the situation when all the subjects are screened before drug is administered. Assuming the positive rate is 30% of the screening tests, the number of persons to be treated is 30% of the number screened.

Scenario H: This is simply the situation of the year 1991 when the program was operated without the support of World Bank loan.

From the above Table 5.8, we could see that if we maintain the current strategy (scenario A), the resources needed for chemotherapy are only about RMB¥12,000,000, within which drug costs account for about half. If the work load is reduced, the costs will be reduced proportionally. However, this estimation may not be realistic because when the number of people to be detected and treated are reduced, the unit cost will increase. The highest costs (scenario G) would be to screen all the residents before giving treatment. If all the residents who are currently screened just simply receive chemotherapy (Scenario F), the costs will be the second highest while the drug costs increase substantially. If the coverage is simply maintained at the level of 1991 (scenario H), both the total delivery costs and drug costs will be the lowest.

b. Resources required for snail control:

Snail control is reputed for its high costs in both the molluscicides and huge quantity of manpower investment. However in China, we are not used to including the labor costs in calculating the total cost, which is not reasonable. Table 5.9 shows the work days consumed in the snail control operations and the earth work done during the process in the recent years, which will be served as a rough basis for estimation of resources needed and to compare with other control measures economically (see Table 5.10).

Table 5.9 Earth work and work days for snail control during 1988-1992 in Hunan Province

Year	Molluscicide		Engineering	
	Work days	Area(M^2)	Work days	Earth work(M^3)
1988	956,860	42,101,856	893,365	812,940
1989	713,753	41,725,566	728,756	2,496,247
1990	1,142,190	98,441,460	930,488	1,151,808
1991	1,474,995	92,978,262	633,896	1,054,485
1992*	1,147,891	163,451,052	458,915	878,069

Source: Statistics of Schistosomiasis Control in Hunan Province, 1989-1993. Unpublished data, Hunan Provincial Office for Schistosomiasis Control, China

* With World Bank Loan program.

Because the World Bank Loan Program does not emphasize snail control activities, there is no clear trend to be seen of the increase in the labor work days and the quantity of earth work. However, the provision of molluscicides enables a larger area of molluscicide than the previous years. Assuming the snail-ridden areas remain unchanged after 1996, we estimate the resource needed for both the program provider and the community in Table 5.10.

Table 5.10 Simulation of Resource Requirement for Snail Control Operations under Different Scenarios

SCENARIOS	Molluscicding area (1,000 m) (1)	Unit cost (2)	Provider Input (Y1,000) (3)=(1)(2	Labour work days (1,000) (4)	Unit Labor Cost (5)	Labor cost required (1,000) (5(6)=(4)(5)	Total resources required (Y1,000) (7)=(3)+(6)	Unit Cost* (8)	Cost of Mollus. (Y1,000) (9)=1*8
A: Maintaining 1991's level	93240	0.1	9324	2000	10	20000	29324	0.06	5594.4
B: Maintaining 1992's level	166500	0.1	16650	2000	10	20000	36650	0.06	9990

*Unit cost of molluscides: Before 1991, the less costly NaPCP are used; but after the loan, niclosamide used.

In scenario A, if it is to maintain the snail control work quantity of 1991, about RMBY5.6 million are needed for purchasing molluscicides, which is much higher than that of chemotherapy drug costs at the same level. When using only the most conservative wage rate for the labor cost, we found that this portion of costs are significantly higher than any chemotherapy options. From this example, we realized that snail control options are very expensive both to the provider and to the community as well.

2. Estimation of resources available:

Since only very limited financial data are available at hand for the time being, it is not possible to make projections of the financial availability simply by using projection models. However, some estimations can be made based on some assumptions.

Table 5.11 Budget estimation for schistosomiasis control in Hunan Province, China (in thousand RMBY)

Year	1990	1992	1994	1996	1997			
					(a)	(b)	(c)	(d)
Budget	9,800	38,517	38,517	38,517	7,840	11,760	14,700	19,600
Deflated based on 1990 prices	--	31,832	26,307	21,741	4,425	6,638	8,298	11,064

a. If the government inputs remain unchanged or even decrease in nominal terms after the finish of the World Bank Loan program, the resources available in real terms could not remain at the level of 1990. This means the government resources will not be enough for keeping the control operating at the level of 1990. This is not likely to happen given the economic development and the continuing political commitment to combat the disease.

b. If the governments could increase the financial input at least at the pace of inflation of the country, the control activity could be kept at the level of 1990. From past experience, it is likely that government inputs for the program are always a little behind the inflation rate of the country, for example, similar to the situation given by (b) and (c). That is, a nominal increase of input but a slight decrease in real terms.

c. It is necessary to realize that the inputs from the central government are unlikely to increase. This is largely due to the economic reform and decentralization process which require the local governments to take up more responsibility for the local affairs. This means the increase of the inputs will mainly come from the local governments while the central financial inputs may gradually reduce.

d. The most possible picture of the program financing from the government source is supposed to be that the central government keep a constant or slightly increased nominal financial input, while asking the local government to increase the financial input according to the local conditions. The local government is on the one hand to deal with more of the local affairs, and on the other hand to repay the World Bank Loan. The total input from the governments will maintain a low level of increase in nominal terms but slightly decreasing in real terms. Based on this analysis, it is difficult to foresee resource from the governments persisting at the level of 1990.

3. Analysis of the financial "gap"

The analysis of the financial "gap" for the control program is simply based on the comparison and analysis of resource requirement and availability. However, this is only a simulation of the real situation which could be different in various extends from the real ones. The scenarios are simulated in Table 5.12 as follows.

Table 5.12 Simulation of Resource Gap of the Schistosomiasis Control Program (in thousand RMBY)

Scenarios	Resoureces Required				Resource Gap			
	(1)	(2)	(3)	(4)	(a)	(b)	(c)	(d)
A	9630	2713	16650	28993	−24568	−22355	−20695	−17929
A*	5500	550	9990	16040	−11615	−9402	−7742	−4976
B	7704	2170	16650	26524	−22099	−19886	−18226	−15460
B*	4400	440	9990	14830	−10405	−8192	−6532	−3766
C	5778	1627	16650	24055	−19630	−17417	−15757	−12991
C*	3300	330	9990	13620	−9195	−6982	−5322	−2556
D	4815	1356	16650	22821	−18396	−16183	−14523	−11757
D*	2750	275	9990	13015	−8590	−6377	−4717	−1951
E	3852	1085	16650	21587	−17162	−14949	−13289	−10523
E*	2200	220	9990	12410	−7985	−5772	−4112	−1346
F	19260		16650	35910	−31485	−29272	−27612	−24846
F*	11000	11000	9990	31990	−27565	−25352	−23692	−20926
G		5426	16650	22076	−17651	−15438	−13778	−11012
G*	1100	1100	9990	12190	−7765	−5552	−3892	−1126
H	1540	1899	9324	12763	−8338	−6125	−4465	−1699
H*	880	385	5594	6859	−2434	−221	1439	4205

Notes:
(1) Cost of mass and selective chemotherapy
(2) Cost of Selective population chemotherapy
(3) Cost of mollusciciding
(4) Total cost of chemotherapy and snail control

Scenarios A – H are as the same described in Tables 5.8 and 5.10.

Scenarios A* – H* are the corresponding drug and molluscides cost of scenarios A – H.

Under the "resource Gap", scenarios (a) – (d) are the resource available described in Table 5.11.

Thus, "resource gap" = Resource available – Resource requirement

a. Simulation of the Scenarios:

Different scenarios are simulated based on the analysis of previous two sections of simulation of resource available and resource requirement. It should be realized, however, that the resource requirements here only include that of chemotherapy and snail control by molluscicíding, while there are much more activities to be carried out under the program such as health education and management etc., even though chemotherapy and snail control are the two major strategies. Table 5.12 is the summing up of simulation of resource requirement and description of "resource gap" for future control program in Hunan Province.

Scenarios A - G are the the modifications of the current strategies, where the chemotherapy are to be kept at differnet levels while the current areas of molluscicíding are to be maintained.

Scenario H is to simply maintain the level of work before the World Bank Loan program.

b. Analysis of Scenarios:

(a) If the program is to be carried out using the same control strategy after the termination of the World Bank Loan Program, a financial "gap" is inevitable under any of the given scenarios. Under any of the given scenarios, the expected governemnt financing could not meet even the resource requirement for purchasing praziquantel and molluscicides. Ideally, the government will increase 50% of input nominally based on the input in 1990, this input is still slightly less than that of 1990 in real terms. Based on the real unit price of 1991, molluscicides alone costed RMBY5,594,400, which is more than 60% of the estimated budget in 1997 (Table 5.11, Scenario C). The praziquantel and molluscicides together nearlly take up all the budget if it is to be kept at the level of 1991 (the crossing of (c) and H*). Even if the government increases the financial input by 100% (scenario d) in nominal terms, it could not make much difference in term of real input and the implementation of the program.

(b). The currently implemented chemotherapy strategy is not economically practicable after 1996 when the World Bank Loan finishes. Even if only 40% of the current number of persons are to be detected and treated, a total of RMBY5 million is needed for the delivery, which alone accounts for more than 60% of the total budget available in 1987, let alone that required for snail control and other activities.

(c). Costs for snail control, whatever it is to the provider or to the community, are indeed much more expensive than the chemotherapy options. Especially, after the change of molluscicides from the cheaper NaPCP to the much more expensive chemical niclosamide, the expenditure for purchasing the latter increases substantially. The cost of molluscicíding will simply out of the reach of the future program. For the provider side, the increased expenditure on

molluscicides will force the program to greatly reduce the area to be molluscicided, if no other reliable financial sources are guaranteed.

(d). Along with the social and economic development, the manpower costs will increase over time. This again will increase the unit costs of delivery of chemotherapy and the labor costs of snail control. The increasing manpower costs will further deteriorate the financing for the program in the future.

(e). The financial constraints already occurred before the start of the World Bank Loan. According to the above analysis, the future financing to the program is not at all optimistic. It is almost certain that financial constraints will occur in the near future.

In conclusion, the schistosomiasis control program in China is going to meet with considerable financial problems which need to be carefully studied and resolved in the near future. Those problems may be from the reduce of government input in real terms, the increasing expenditure of molluscicides and manpower resources, and the termination/withdrawing of the external financing. The following chapters are to discuss the current program financing and the policy implications for financing.