An economic evaluation of the national schistosomiasis control programme in China from 1992 to 2000


Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The study evaluated a special programme on schistosomiasis control, the World Bank Loan Project (WBLP) launched in certain geographical areas in China. The main objective of the WBLP on schistosomiasis control in China was to significantly reduce and control morbidity, and to interrupt transmission of the infection in highly endemic areas. Control activities of the project included cases detection and treatment, snail survey and molluscicide spraying, health education, individual protective measures, control activities in livestock, project management and training.

Type of intervention
Primary and secondary prevention.

Economic study type
Cost-effectiveness analysis and cost-benefit analysis.

Study population
Since the unit of study was the county, study population characteristics were not discussed.

Setting
The setting was schistosomiasis institutions and the community. The economic study was carried out in China.

Dates to which data relate
The effectiveness and cost data were collected retrospectively for the period 1992 to 2000. They were derived from available records and databases for the six specific counties included in the study. All costs were reported for the price year 2000.

Source of effectiveness data
The data were derived from records and databases on the schistosomiasis control programme.

Link between effectiveness and cost data
The costing was undertaken retrospectively on the same Chinese counties participating in the effectiveness study.

Study sample
The unit of study was the county. The authors chose six Chinese counties participating in the programme according to intensity of schistosome transmission and type of endemicity. Three of the counties were located in lake marshland, one in river marshland and two in mountain areas. The areas were categorised according to human infection rate into high (≥ 5%), medium (3 - 5%) and low prevalence (< 3%). The authors reported specific characteristics of the counties in
detail. In particular, the type of endemic area, number of endemic townships or towns, number of endemic villages, population size in the endemic areas, human infection rate, number of cattle in endemic areas, bovine infection rate, size of snail-infested areas, size of areas with infected snails, and percentage of infected snail areas among snail-infested areas.

Study design
This was a multi-centred (six counties), retrospective, geographical correlation study. The data were collected for 9 years.

Analysis of effectiveness
The primary outcomes used were indicators associated with the reduction of the disease (e.g. the annual infection rates in both humans and cattle), the infection rate of intermediate host snails and the density of infected snails. The six specific Chinese areas were shown to differ at baseline. For example, the human infection rate varied from 0.6% (Dali county) to 8.8% (Yugan county) and the bovine infection rate varied from 1.3% (Dali county) to 21.0% (Xichang county). The percentage of infected snail areas varied from 1.6% (Huarong county) to 70.0% (Yugan county).

Effectiveness results
From 1992 to 2000, the human infection prevalence rates decreased from:

- 8.8 to 2.7% in Yugan county,
- 7.6 to 1.9% in Tongling county,
- 4.67 to 2.2% in Qianjiang county,
- 4.2 to 1.7% in Xichang county,
- 3.7 to 2.6% in Huarong county, and
- 0.7 to 0.1% in Dali county.

In terms of the annual bovine infection rates, the highest reduction was observed in Qianjiang. Huarong, Tongling, Xichang and Yugan counties demonstrated poorer results. The reverse was observed in Dali, that is, there was a significant increase in infection prevalence of Schistosoma japonicum in bovines.

The intermediate host snail-infested areas and the rate of snails remained rather constant with a slight increase. The only exception was the county of Yugan where the extent of snail-infested areas decreased considerably.

Clinical conclusions
The authors concluded "significant control effectiveness has been gained from the implementation of the World Bank Loan Project".

Measure of benefits used in the economic analysis
The measures of benefit used in the cost-effectiveness analysis were cases detected, cases detected to reduce the Schistosoma japonicum human infection rate per 100 persons by 1%, mollusciding to reduce snail-infested areas by 1,000 m², and a reduction of 1% in the bovine infection rate per 100 cattle.

The measure of benefit used in the cost-benefit analysis was the money gained for every dollar spent during the project period. Benefits were evaluated using data on the decline of losses due to infection and disease including further control activities.
Further economic benefits, owing to mollusciciding and engineering carried out during the programme, were evaluated by estimating changes in income, increased grain, water products, fruits and woods, increased income of livestock, decreased input of anti-flood engineering, and increased access to local markets due to improvement and new constructions of road networks. Three indices were also estimated, the net benefit-cost ratio, the net benefit (net value), and annual average benefit of mollusciciding engineering. The benefits were discounted, but the discount rate was not reported.

**Direct costs**
The project-related costs included in the analysis were for:

- the treatment of acute, chronic and advanced cases of schistosomiasis;
- cattle treatment;
- case detection;
- snail survey and mollusciciding;
- health education;
- individual protective measures;
- control activities in livestock;
- project management and training;
- weighted participation of manpower;
- costs related to personal needs in the schistosomiasis institutions at county level;
- construction fees related to molluscicide engineering; and
- running costs for the use of buildings, communication tools, and general equipment and supplies.

The quantities were not described separately. The quantities of resources used were derived from records and datasets kept in each county during the years when the project was implemented. The costs were derived from project records, as well as from official sources (relevant local governmental departments). Owing to the long time period of the project (9 years), all costs were appropriately adjusted for inflation and reported for the price year 2000. The costs were discounted, but the discount rate was not reported.

**Statistical analysis of costs**
The costs were treated deterministically.

**Indirect Costs**
The indirect costs were not included in the analysis.

**Currency**
Chinese RMB Yuan.

**Sensitivity analysis**
No sensitivity analysis was carried out.
Estimated benefits used in the economic analysis
The estimated benefits were not reported separately.

Cost results
The total direct cost of the schistosomiasis control project was RMB Yuan 97.170 million (value index 2000).

Synthesis of costs and benefits
The average cost per case detection was RMB Yuan 12.48 per person. The average cost for all control measures was RMB Yuan 41.86 per capita.

The average cost to reduce the human infection rate of Schistosoma japonicum per 100 persons by 1% was RMB Yuan 7,732.42.

The average cost for case detection and treatment alone was RMB Yuan 2,176.72.

The average cost for reducing the bovine infection rate per 100 cattle by 1% was RMB Yuan 162,891.10.

The cost of mollusciciding to reduce snail-infested areas by 1,000 m2 was RMB Yuan 3,573.18.

The losses due a case of acute, chronic or advanced schistosomiasis japonica were RMB Yuan 992.62, RMB Yuan 640.47 and RMB Yuan 3,807.80, respectively.

When taking the cost of treating equivalent cases into consideration, the total benefit of the project in the six counties during the 9-year period was RMB Yuan 699.512 million. The direct benefit of schistosomiasis control was RMB Yuan 650.676 million.

The benefit from the mollusciciding engineering project was RMB Yuan 48.835 million.

The total per capita benefit was RMB Yuan 1,804, the gross benefit-cost ratio was 7.20, the net benefit-cost ratio was 6.20 and the net benefit value was RMB Yuan 602.34 million.

The correlation coefficients of the net benefit-cost ratio to the human and bovine infection rates at the beginning of the project were 0.55 and 0.66, respectively.

Authors' conclusions
The project resulted in high effectiveness and economic benefits for the areas in which it was implemented.

CRD COMMENTARY - Selection of comparators
The authors evaluated the national schistosomiasis control programme implemented in their setting (China). The study was carried out in six project counties of China, which were representative of the various eco-epidemiological series in China. The different geographical sites had different human infection prevalence rates and varied in demographic characteristics (e.g. population size, number of cattle, or number of endemic villages). Therefore, they represented valid comparators.

Validity of estimate of measure of effectiveness
The analysis was based on a retrospective geographical correlation study, which is associated with some limitations given the study question. For example, the data were collected retrospectively from records and datasets kept during the implementation of the programme. Therefore, it is not possible to comment on the internal validity of the effectiveness data since there was no information on the methods and quality of record and data filing. In addition, no statistical analysis were undertaken to account for potential confounding factors and biases.
Since the six study counties represented the three different types of schistosomiasis transmission in China, and had different degrees of endemicity at baseline and varied with regard to snail-infested areas and geographic distribution, it was felt that the counties were representative of the schistosomiasis situation in China as a whole.

Validity of estimate of measure of benefit
The authors used cases detected to reduce the Schistosoma japonicum human infection rate per 100 persons by 1%, mollusciciding to reduce snail-infested areas by 1,000 m², and a reduction of 1% in the bovine infection rate per 100 cattle as measures of benefit. These were derived directly from the study. These measures of benefit were appropriate for the type of intervention under analysis. The measure of benefit in the cost-benefit analysis was money gained for every dollar spent on the project. The data were collected from records kept during the implementation of the project. The authors acknowledged that the overall benefit was "a likely underestimation as some indirect benefits, as well as social benefits, were not included because of the lack of standard methods and respective formulae to calculate them". The benefits were appropriately discounted, but the discount rate used was not reported.

Validity of estimate of costs
The perspective adopted in the economic analysis was not explicitly reported. Consequently, it was not possible to determine whether all the relevant categories of costs were included in the analysis. The costs and the quantities were not reported separately, which does not enable the analysis to be easily reworked for other settings. In addition, the use of summary costs made it impossible to know which aspects of cost were included (professional fees, equipment, drug costs, etc.). No statistical analysis or sensitivity analysis was performed on the costs and quantities, which might limit the generalisability of the results and the interpretation of the study findings. All the costs were appropriately adjusted for inflation and the price year was reported. Since all the costs were incurred during more than 2 years, the costs were appropriately discounted. However, the discount rate used was not reported.

Other issues
The authors compared their findings with those from another study, reporting consistency in the results. The issue of the generalisability of the results was partially addressed. The results suggested that "more efforts are required in implementing mollusciciding in a mountainous region and that environmental management may be more suitable for snail control there". The results were not presented selectively and the scope of analysis was reflected in the authors' conclusions. The authors did not explicitly report any limitations to their study.

Implications of the study
The authors did not make explicit recommendations for changes in policy or practice. However, they recommended that future research should attempt to evaluate the long-term cost-effectiveness of mollusciciding of land as its implementation is very costly, but at the same time crucial, for the sustainability of schistosomiasis control efforts.

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