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Estimation of the cost of large-scale school deworming programmes with benzimidazoles

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Summary

This study estimates the cost of distributing benzimidazole tablets in the context of school deworming programmes: we analysed studies reporting the cost of school deworming from seven countries in four WHO regions.

The estimated cost for drug procurement to cover one million children (including customs clearance and international transport) is approximately US\$20 000.

The estimated financial costs (including the cost of training of personnel, drug transport, social mobilization and monitoring) is, on average, equivalent to US\$33 000 per million school-age children with minimal variation in different countries and continents.

The estimated economic costs of distribution (including the time spent by teachers, and health personnel at central, provincial and district level) to cover one million children approximately corresponds to US\$19 000. This study shows the minimal cost of school deworming activities, but also shows the significant contribution (corresponding to a quarter of the entire cost of the programme) provided by health and education systems in endemic countries even in the case of drug donations and donor support of distribution costs.

Keywords

School deworming; Cost; Benzimidazoles; Financial cost

Introduction

Periodical deworming is the strategy recommended by the World Health Organization (WHO)^{1,2} to control morbidity associated with soil-transmitted helminth (STH) infections in school-age children. World Health Assembly (WHA) Resolution 54.193 indicated a

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AM prepared the draft that was critically commented on and improved by AG and DE.

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minimal coverage of 75% of school children at risk a global target for 2010. The Resolution stimulated interest in school deworming from civil society and the donor community. As a consequence, a large number of agencies included school deworming among their supported programmes, and pharmaceutical companies were encouraged to provide drug donations.

Recent estimates indicate that in 2006, approximately 77 million school-age children aged 5–14 years were treated for STH infections (corresponding to 8.8% of the population at-risk of that age).⁴ In view of the expected scaling up of school deworming interventions in the next few years,⁵ we consider that calculation of the average cost of a round of school deworming covering one million children would be helpful and facilitate planning. In addition, we consider that an estimation of the value of the contribution made, both by teachers and health staff, would allow a better understanding of the effort made by endemic countries towards school deworming.

Unfortunately it was not possible to extend this exercise to the joint distribution of mebendazole and praziquantel because of the very limited number of published reports presenting details on costing for this kind of intervention.

Materials and methods

We identified three groups of costs for a school deworming programme:

1. **Drug costs:** include the cost of the product, its international transport and custom clearance
2. **Financial costs:** imply a monetary transaction and include the cost of training of personnel, drug transport, social mobilization and monitoring
3. **Economic costs:** do not imply any monetary transaction but include the time spent by teachers, as well as by health personnel at central, provincial and district level, that are providing this service as part of their routine work

We used different approaches for the different groups of costs we estimated:

Drug cost

As mentioned, drug donation initiatives for benzimidazoles (albendazole or mebendazole) are available, however presently the majority of the drugs used in school deworming programmes are procured on the international market. We investigated the four major international drug suppliers (IDA Foundation, Missionpharma, IMRES, Medical Export Group) and one of the largest procurers (UNFPA) to obtain an average cost per tablet in 2009. In addition, we interviewed procurement officers in two international organizations (WHO and UNICEF) and one NGO (World Vision) to estimate the cost of international transport and custom clearance.

Financial costs

We searched the literature for documented experiences of large-scale school benzimidazoles distribution, reporting cost details. We calculated the cost per round of distribution (where the data referred to distribution of two rounds per year, the annual cost was divided by two).

We calculated the average cost of 'distribution of one million tablets benzimidazoles' assuming that, in the case of large programmes, this value would allow for a quick estimate of the funds necessary for the distribution.

Economic costs

We valued the cost of the contribution of teachers and health workers to a school deworming programme by estimating, from the available literature, the average number of teachers and health staff involved in such a programme and by calculating the approximate time (in hours) of their participation. We then assigned to this time a value based on the salary range of a civil servant in a developing country.

Results

Drug cost

The median price for a container of 1000 tablets of albendazole 400 mg is 18.1 USD (range 15.1-28 USD) this mean that 18100 USD will be sufficient to procure one million dose of albendazole, for mebendazole 500 mg the median price is 19.1 USD (range 11.9 -27.6) for this drug the cost of procure one million doses would be 19100 USD.

The cost of international transport and custom clearance was indicated at 10% of the total value of the drug by the procurement officers interviewed. We therefore estimate the cost of procuring one million tablets of benzimidazole at approximately US\$20 000 (including 10% international transport costs).

Financial costs

We extracted data, from the literature, on large-scale, school-based deworming interventions in seven countries⁶⁻¹¹ as presented in Table 2. In addition to the drug cost, the cost for each child covered with benzimidazole was, on average, US\$0.033 (range US\$0.012-0.060). We therefore estimate that, on average, US\$33 000 would cover the distribution cost of benzimidazoles to one million children.

Economic costs of delivery

In several articles^{10,12,13} we found the description of the contribution provided by teachers and health workers in the context of school deworming interventions with benzimidazoles. Each teacher normally administers treatment and provides health education to an average of 80 students, and this activity is usually conducted in approximately two hours; 25 000 hours of work would be necessary to treat one million children. In addition, prior to the intervention, each of the teachers has, on average, undergone one hour of training and spent approximately one hour on transport, doubling the time dedicated by each teacher to deworming activities. This means that it takes approximately 50 000 hours to cover one million schoolchildren, corresponding to 312 months of teachers' work (based on a working month of 160 hours).

Each health worker is, on average, able to supervise drug administration in two to five schools per day. A total of 2500-5000 children are dewormed in each school. Health

workers are also involved in providing training to school personnel: an average of 150–200 health workers' days are necessary to support drug administration to one million children (corresponding to an average of seven months work). Assuming that US\$60 is the monthly salary of a civil servant in developing countries (average between US\$40 and 80),¹⁴ the contribution of the work force could be evaluated at US\$19 140 per million children.

Discussion

In 1993 the World Bank¹⁵ reported the cost for an albendazole tablet of US\$0.20, about 10 times the 2009 price. The tablet cost in the international market has progressively decreased in the last 15 years, although this price reduction trend is not expected to continue since the present tablet price provides only a minimal profit margin to the producers. However, drug donations of anthelmintics are expected to exponentially grow in the near future because of the fiscal advantages for donors from USA and Canada.

The financial costs of deworming in school shows remarkable similarities in different countries and continents: to cover one million school age children with benzimidazole in the large majority of the programmes the costs was between US\$30 000 and 40 000. In Vietnam costs are significantly lower (US\$0.012 per child) but this was due to minimal teacher training and health education materials that consisted of a one-page flyer sent to teachers together with the drugs. After the evaluation of the first deworming round, distribution costs in Vietnam were increased in order to provide better training to teachers and better health education to schoolchildren (Montresor, personal communication). In Laos¹¹ the higher cost (US\$0.06 per child) is justified by the production of very elaborate health education material (including board games, posters, and several color booklets) and its distribution to each school targeted for deworming.

Our estimate of the cost of deworming presents small discrepancies in different countries and different size of intervention; on the contrary, Brooker et al.¹⁶ reported a case of school intervention in Uganda in which the cost showed a clear variation according to the total number of children covered. A possible explanation for this discrepancy is that the programme in Uganda was distributing benzimidazoles and praziquantel and we included in our estimation programmes distributing benzimidazoles only. In addition, Brooker et al. also included the annuitized capital cost of the buildings, cars, motorcycle and computers, that were not possible to estimate from the articles we analyzed.

In conclusion, we consider that data provided in our study provides a quick method of estimation of the costs needed to distribute drugs in school based deworming programmes. The study shows the minimal cost of school deworming activities; this aspect together with the interest shown in NTD control by several large donors gives hope for a quick scale up of the number of school children in endemic countries covered in the near future. The quantification of the economic cost shows the value of the contribution made by endemic countries to school deworming interventions that corresponds approximately to one quarter of the total cost of the programme. This indicates that, even in a deworming programme in which drugs and financial costs are covered by donors, the involvement of the endemic country in terms of personnel and materials is significant (Figure 1).

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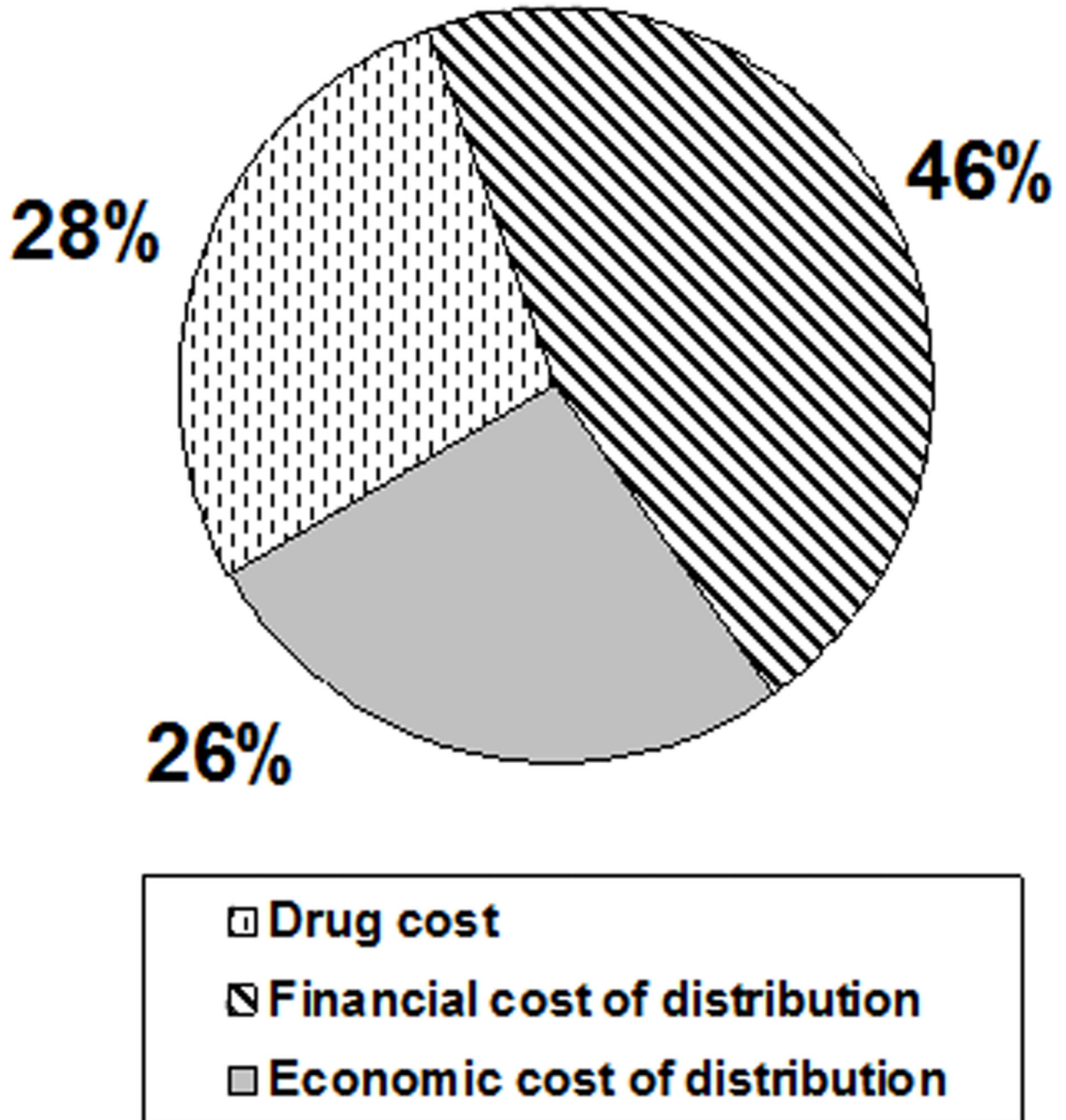


Figure 1.
Respective relevance of drug cost, financial cost and economic cost in the total cost of a school deworming programme with benzimidazoles

Table 1

Cost for containers of 1000 tablets of benzimidazoles used in school deworming

Drug	Price in USD	
	Container 1000 Tablets Median (range)	Drug for 1 million children
Albendazole (400 mg)	18.1 (15.1 -28.0)	18 100
Mebendazole (500 mg)	19.1 (11.9 -27.6)	19 100

Table 2

Cost of deworming in seven school-based programmes.

Country	Children covered (thousands)	Cost / child (USD)	Ref
Ghana	80	0.040	PCD 1999
Tanzania	100	0.030	PCD 1999
Egypt	45	0.030	Curtale et al 2003
Myanmar	25	0.024	Montresor et al 2004
Cambodia	2 880	0.040	Sinuon et al 2005
Vietnam	2 700	0.012	Montresor et al 2007
Lao PDR	1 000	0.060	Phommassack et al 2007