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Health economic analyses of the Global Programme to Eliminate Lymphatic Filariasis

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The Global Programme to Eliminate Lymphatic Filariasis (GPELF) was established by the WHO in 2000. It aims to eliminate lymphatic filariasis as a public health problem. This paper summarises the key estimates of the cost-effectiveness and economic benefits related to the mass drug administration (MDA) provided by the GPELF. Several studies have investigated the cost-effectiveness of this MDA, estimating the cost per disability-adjusted life year (DALY) averted. These cost-effectiveness estimates have consistently classed the intervention as cost-effective and as favourable compared with other public health interventions conducted in low- and middle-income countries. Studies have also found that the MDA used for lymphatic filariasis control generates significant economic benefits. Although these studies are positive, there are still important gaps that warrant further health economic research (particularly, the evaluation of alternative interventions, further evaluation of morbidity management strategies and evaluation of interventions for settings coendemic with *Loa loa*). To conclude, health economic studies for a programme as large as the GPELF are subject to uncertainty. That said, the GPELF has consistently been estimated to be cost-effective and to generate notable economic benefits by a number of independent studies.

Keywords: cost-effectiveness, economic benefits, GPELF, health economics, lymphatic filariasis.

Introduction

The Global Programme to Eliminate Lymphatic Filariasis (GPELF) was established by the WHO in 2000.[1] Since the start of the programme, >7 billion mass drug administration (MDA) treatments have been delivered with >558.5 million people treated in 2018 alone.[2] This level of intervention requires significant investment.[3] Health economic analyses are an important element of decision-making within global health and are key for showing that the costs of the programme are worth its benefit.

The aim of this paper is to summarise the key estimates of the cost-effectiveness and economic benefits related to MDA provided by the GPELF, as well as to highlight remaining health economic research needs. Further details on the health economic studies conducted for lymphatic filariasis can be found in the systematic review by Gedge et al.[4]

The costs of MDA

Estimates of the costs of MDA are a vital component for subsequent economic evaluations. Notably, country programmes and local researchers have a vital role in cost studies, without which economic evaluations would not be possible.

The economic cost of MDA varies between different countries depending on several factors, such as if volunteers are used, the salaries of healthcare personnel, which drug combinations are used and the size of the targeted population.[4,5] For example, a prospective cross-country costing study on the national MDA costs for lymphatic filariasis elimination by Goldman et al.[5] reported the financial cost per treatment as ranging from US$0.07 to US$2.75 and the economic cost per treatment (including the value of the donated drugs) as ranging from US$0.049 to US$7.20 across seven countries (2002 prices). Looking across a number of costing studies relating to lymphatic filariasis, a systematic review by Keating et al.[6] found that direct comparison of many of the cost estimates was difficult due to methodological variations in how the studies were conducted and reported.

Turner et al.[3] estimated the average costs of the treatments given by the GPELF between 2000 and 2014 using a website-based regression model for MDA delivery costs developed by the WHO.[7] The authors estimated that the average economic cost per treatment (without and with the value of the donated drugs)

was US$0.56 (95% CI 0.25 to 0.94) and US$1.32 (95% CI 1.00 to 1.69), respectively (2014 prices). However, this was an overall average for the programme and the costs of MDA delivery varied across different settings.[3]

Estimates of the cost-effectiveness of the GPELF

Cost-effectiveness analysis is a form of economic analysis that compares the relative costs and effectiveness of different courses of action. Several studies have investigated the cost-effectiveness of MDA provided under the GPELF, estimating the cost per disability-adjusted life year (DALY) averted (one DALY can be thought of as 1 y of 'healthy' life lost).

Turner et al.[3] estimated the cost-effectiveness of the GPELF based on the costs and long-term health benefits resulting from the MDA delivered between 2000 and 2014. The cost per DALY averted when using economic costs was estimated to be US$29 (US$14–48) excluding the value of the donated drugs and US$64 (US$49–83) including the value of the donated drugs (2014 prices). This is consistent with other estimates. For example, analysis within the second edition of the Disease Control Priorities in Developing Countries project[8] estimated lymphatic filariasis-related MDA costs of approximately US$29 per DALY averted within a control scenario and between US$4.40 and US$8.10 per DALY averted under elimination scenarios. In addition, Stone et al.[9] estimated the incremental cost-effectiveness of three different scenarios for accelerating the rate of MDA coverage scale-up within an eradication investment case. These varied between US$73–219 per incremental DALY averted (2012 prices).

Differences across these estimates could be due to various factors, such as how the costs of the programme were estimated and the approach used to estimate the number of DALYs averted.[4] Regardless, these cost-effectiveness estimates are highly favourable compared with other public health interventions conducted in low- and middle-income countries.[10] The correct cost-effectiveness thresholds (that class an intervention as cost-effective or not) to use in such settings are currently under debate.[11-15] However, the estimates related to the GPELF appear to be robust to this, even when conservative thresholds are used.

It should be noted that these estimates are typical for the GPELF as a whole. However, there are settings where the costs of MDA are much higher and therefore the cost-effectiveness is lower. This is particularly relevant for countries that treat small populations, such as programmes on small islands.[7] Consequently, the cost-effectiveness of MDA programmes will depend on the local context and will be influenced by the epidemiological setting as well as political, economic and health system conditions. For example, the cost-effectiveness of MDA was estimated to be lower in settings coadministering ivermectin and albendazole as opposed to diethylcarbamazine and albendazole, due to the higher economic value of ivermectin.[3]

The backbone of the GPELF is the significant drug donations from the pharmaceutical industry.[16] However, how to correctly value these donations in the context of an economic evaluation is debatable and a source of variation between different studies.[4,17]

Economic benefits and cost-benefit of the GPELF

The clinical disease caused by lymphatic filariasis is known to have a notable impact on patients' productivity[18] and, furthermore, the disease has been shown to have a notable economic burden.[19-21] For example, prior to MDA programmes, lymphatic filariasis was estimated to have a corresponding annual economic burden of US$5.77 billion (2016 prices).[21]

Several studies have looked at the economic benefits of MDA delivered by the GPELF.[22-24] These studies translate the health benefits of MDA into monetary terms.

Turner et al.[22] estimated the long-term economic benefits of the MDA treatments delivered by the GPELF (an update of the 2000–2007 analysis performed by Chu et al.[23]), projecting that US$100.5 billion (2014 prices) would potentially be gained over the lifetimes of those who received treatment between 2000 and 2014. A subsequent cost-benefit analysis (that compared the estimated economic benefits with the cost of the intervention) estimated that the benefit-cost ratio of these treatments varied between 30 (18–63) and 14 (11–18) when using economic costs, including and excluding the value of the donated drugs, respectively (2014 prices).[3]

Redekop et al.[24] estimated that achieving the WHO 2020 targets between 2011 and 2030 would generate US$24.3 billion (2005 prices) in averted productivity losses over this time period.

It is important to note that these types of economic benefit estimates are directly related to the assumed precontrol number of clinical cases and the number of cases estimated to be averted by MDA. Averted productivity losses consistently made up the majority of the estimated economic benefits across the different studies. However, these estimates depend on several assumptions, such as the effect of clinical disease on productivity,[18] the number of years of productive life lived with clinical disease, employment rates and wage rates. These estimates are also particularly uncertain for those in informal employment, which applies to many individuals with clinical lymphatic filariasis. Furthermore, when estimating these productivity costs, these studies have used the human capital approach, which takes the patient's point of view when valuing lost productivity and therefore counts all the work they miss carrying out as a productivity loss.[4,22] Consequently, this approach estimates potential rather than experienced productivity losses, and the proportion of estimated economic benefits that are actually realisable to endemic countries' economies is uncertain. However, the conclusion that the GPELF generates notable economic benefits seems robust to this uncertainty.

Other studies have also highlighted the importance of the productivity losses associated with lymphatic filariasis-related morbidity.[4,6,25] For example, it was estimated that in India, 3.8–8% of the potential male labour input was being lost due to lymphatic filariasis-related morbidity[26,27]; this was subsequently valued at US$704 million per year (1995 prices).[19] Similarly, a study in Ghana estimated that >7% of potential male labour was being lost due to chronic lymphatic filariasis morbidity.[20] This further highlights the potential impact on endemic countries' economies and the significant benefits of the programme.

Future health economic research needs

The finding that the GPELF is cost-effective and that it generates significant economic benefits appears robust and consistent across a number of studies. However, there are still important gaps that warrant further research.[4]

Evaluation of alternative interventions: Although analyses have shown that the current MDA strategies are cost-effective, alternative strategies that may help to achieve the current elimination goals, such as the use of triple-drug therapy,[28] other novel drug treatments and vector control,[29] should still be investigated.[4]

Evaluation of MDA strategies in settings coendemic with *Loa loa*: An important ongoing challenge facing lymphatic filariasis elimination efforts are settings coendemic with both onchocerciasis and *Loa loa,* where mass ivermectin distribution is not currently possible.[30] Further health economic studies are needed to assess the cost and cost-effectiveness of alternative strategies in such settings.[4]

Evaluation of neglected tropical disease programme integration: Neglected tropical disease (NTD) programmes are becoming more integrated.[31] However, further research is needed as there is currently a lack of understanding of the costs and cost-effectiveness of integrated NTD control programmes.[4,6,32]

The GPELF would have significant auxiliary benefits on other diseases, such as scabies and the soil-transmitted helminths (STHs).[22,33] However, these are typically not considered in these economic evaluations, which would underestimate the cost-effectiveness and cost-benefit of the programme. Likewise, the current economic evaluations for other NTDs are typically looking at one disease at a time.[4,17,34,35] However, it would be useful for policy and programme decision-makers who must make resource allocation decisions for the evaluations to consider an integrated NTD control programme package rather than vertical/standalone disease-specific interventions.

Related to this, there is a need to investigate the impact of stopping lymphatic filariasis-related MDA programmes on STH transmission and the potential risk of STH resurgence.[36]

Diagnostics and surveillance costs: There is a need to evaluate the cost and cost-effectiveness of different diagnostics and surveillance strategies, particularly for post-MDA settings. The importance of this was highlighted in a study by Rao et al.,[37] which demonstrated the resurgence of lymphatic filariasis transmission 6 y after stopping MDA.

Morbidity management strategies: A key element of the GPELF involves morbidity management and disability prevention activities.[1] However, there are currently only three economic evaluations of lymphatic filariasis-related morbidity management. Turner et al.[3] crudely estimated that hydrocele surgery would be classed as highly cost-effective if the surgery cost <US$66 and cost-effective if <US$398 using the healthcare provider's perspective. Sawers et al.[38] estimated that the ratio of the economic benefit of hydrocele surgery to its cost was 24.8 in Malawi. In addition, Stillwaggon et al.[39] estimated that within a lymphedema management programme in India, the average participant would gain lifetime economic benefits 132–165-fold greater than the per-person cost of the programme. Further economic evaluations of potential lymphatic filariasis morbidity management strategies and techniques across a range of settings are still needed.[4]

The burden of lymphatic filariasis: Further work is needed to improve how the burden of lymphatic filariasis and the subsequent health and economic benefits of interventions are quantified. This includes more accurate estimates of the impact of lymphatic filariasis-related morbidity on productivity, the potential additional disease burden related to mental health, the burden associated with cases' informal caregivers and quantification of excess mortality associated with clinical disease.[4,40,41] A particular area that needs further research is more accurate estimates of the productivity costs for those in informal employment.

Conclusion

Estimates of the cost-effectiveness and economic benefits for a programme as large as the GPELF are subject to notable uncertainty. However, throughout a number of independent studies, the GPELF has consistently been estimated to be cost-effective and generate notable economic benefits.

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