The potential economic value of a hookworm vaccine
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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.

CRD summary
The aim was to evaluate the cost-effectiveness of a hookworm vaccine for school-age children and non-pregnant women of reproductive age, in Brazil. The authors concluded that vaccination would be cost saving and beneficial, for both populations, and vaccination with treatment was best. Some details were not reported, but the methods were adequate and the conclusions reached were appropriate for the analysis conducted.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
The objective was to evaluate the cost-effectiveness of a hookworm vaccine, for school-age children and non-pregnant women of reproductive age, in Brazil.

Interventions
The strategies were: vaccination and drug treatment (albendazole); vaccination only; treatment only; and no intervention. These strategies were considered for two separate populations, school-age children and non-pregnant women of reproductive age.

Location/setting
Brazil/primary care.

Methods
Analytical approach:
A decision model was developed to simulate the potential health states of no hookworm, low-intensity infection, high-intensity infection, and death, and the associated infection pathway. The model was populated with data on the risk of infection and the potential benefits of vaccination. The authors stated that the perspective was societal and the time horizon was 20 years.

Effectiveness data:
The effectiveness data included the potential effectiveness of a vaccine, the efficacy of treatment, and the clinical outcomes of hookworm infection. The efficacy of treatment was from a systematic search for published literature in MEDLINE. The key effectiveness estimates were the risk of hookworm infection, the risk of infection being high intensity, anaemia rates, the cure rate with albendazole, the egg reduction rate, and the probability of the vaccine preventing infection.

Monetary benefit and utility valuations:
The disability weights for the disability-adjusted life-years (DALYs) were based on World Health Organization estimates for Brazil.

Measure of benefit:
DALYs were calculated, as the measure of benefit, and they were used to estimate the ratio of cost per DALY gained.

Cost data:
The cost categories were the direct medical cost of the vaccine, and the costs of the drugs and their delivery. These were based on estimates from the published literature. Clinic visits and sick leave costs were excluded; the authors
stated that their inclusion would increase the benefit of the vaccine. The costs were reported in 2010 US $, and future costs were discounted at a rate of 3%.

Analysis of uncertainty:
The authors conducted one-way sensitivity analyses, varying the values for the key input parameters, across a range of values, to assess their impact on the results and conclusions.

Results
A strategy of vaccination plus treatment dominated all other treatment strategies, for both target populations, as it was less costly and more effective. It only failed to dominate when the vaccine efficacy was low (≤30% in preventing infection; ≤ 40% in reducing egg production), the vaccine cost was high (≥$100), or both.

In school-age children, compared with no intervention, vaccination and treatment was associated with a saving of 0.13 DALYs and $402. Compared with vaccination alone, vaccination and treatment was associated with a saving of 0.05 DALYs and $142.

In non-pregnant women, compared with no intervention, vaccination and treatment was associated with a saving of 0.12 DALYs and $1,459. Compared with vaccination alone, it was associated with a saving of 0.03 DALYs and $502.

Authors' conclusions
The authors concluded that their analyses suggested that a vaccine would be cost saving, and provide benefits, for both populations modelled. Vaccination plus the usual drug treatment seemed to be the most cost-effective option, but further research was needed.

CRD commentary
Interventions:
The strategies appear to have included the relevant options, in the study setting (including current practice), and it was likely that these interventions were relevant to other settings. It was unclear whether other treatments were available and how their efficacy might differ from albendazole.

Effectiveness/benefits:
The reporting of the effectiveness estimates was adequate. A modelling approach was chosen to synthesise the data from the published literature. The methods used to identify the sources were reported, but the selection and synthesis of the data from these studies were not described. This makes it difficult to assess whether the best available data were used. It was unclear how the estimate of vaccine efficacy was derived, but the range used seems plausible and it was clear that a viable vaccine was not available at the time. The authors clearly presented their sources and point estimates for the parameters in a table. The methods used to estimate the DALYs were well reported.

Costs:
The costs were not consistent with the stated perspective, but the authors discussed their reasons for omitting costs and the impact of their omission on the results. The cost data appear to have been identified using the same comprehensive approach as used for the effectiveness data. Similarly, the selection and synthesis of the data were unclear, but the values were well reported in the text and a table. The sources for the cost data were referenced, except for the vaccine estimate. The price year and discount rate were reported, but it was unclear whether any adjustments were made to the cost data.

Analysis and results:
The model structure was well described. An incremental analysis was conducted, which was appropriate, to compare the relative costs and effectiveness across the range of strategies. The authors considered the impact of uncertainty in one-way sensitivity analyses, which are unlikely to have adequately captured the impact of joint parameter uncertainty on the results and conclusions. They considered some of the limitations to their study.

Concluding remarks:
Some details were not reported, but the methods were adequate and the conclusions reached were appropriate for the analysis conducted.
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