Costs and effectiveness of neonatal male circumcision
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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
This study examined the clinical and economic impact of a reduced rate of newborn male circumcision, in the USA. The authors concluded that reducing the rate of male circumcision increased the infection prevalence and medical costs, for both men and women. Limited details of the data sources were given, but extensive sensitivity analyses were carried out, which showed that the authors’ conclusions were robust.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study examined the clinical and economic impact of a reduced prevalence of newborn male circumcision, focusing on the rates of sexually transmitted infections, for both men and women.

Interventions
The usual male circumcision rate (79%) was compared with an insurance policy change that could reduce the rate to 10%, as reported in Europe. Other rates (50%, 25%, 20%, and zero) were considered.

Location/setting
USA/hospital.

Methods
Analytical approach:
A Markov model was developed to estimate the change in costs and infection prevalence with decreasing rates of newborn male circumcision. A lifetime horizon was considered. The authors stated that a societal perspective was adopted.

Effectiveness data:
A key input was the efficacy of circumcision, which was defined as the reduction in a wide range of male and female sexually transmitted infections. These data were from a randomised trial of the impact of male circumcision, in Uganda, which was supported by US observational studies. The reduction in infant male urinary tract infections, with male circumcision, was from a meta-analysis. Epidemiological data were from age-specific US studies and databases, including those of the Centers for Disease Control and Prevention (CDC). Other published studies were used.

Monetary benefit and utility valuations:
Not considered.

Measure of benefit:
No summary benefit measure was used. The primary outcomes were the rates of male and female infections.

Cost data:
The economic analysis included the direct medical costs of male circumcision (procedure and treatment of complications) and the management of urinary tract infection, human immunodeficiency virus (HIV), human papillomavirus (HPV), herpes simplex virus type 2, bacterial vaginosis, and trichomoniasis. These costs were from published sources or authors’ assumptions. They were in US $ and the price year was 2011. A 3% annual discount rate was applied.
Analysis of uncertainty:
A probabilistic analysis was carried out, using a Monte Carlo simulation, with probability distributions assigned to the model inputs, based on published or assumed ranges of values. The main analysis was conducted using 500,000 simulations, and the sensitivity analysis was conducted using 1,000 simulations of 10,000 individual trials. In a deterministic sensitivity analysis, changes in the outcomes when using extreme values for HIV and male circumcision procedure costs were investigated.

Results
In the male population, the total cost per person was $3,259 with the usual male circumcision rate, and $3,465 with the reduced 10% rate. Compared with the usual rate, the 10% rate increased the lifetime prevalence of HIV by 12.2%, HPV by 29.1%, herpes simplex virus type 2 by 19.8%, and infant urinary tract infection by 211.8%. The average cost increase across all reductions in rates was 78.9% for HIV, 1.2% for HPV, 4.5% for herpes simplex virus type 2, and 6.3% for infant urinary tract infection.

In the female population, the total cost per person was $222 with the usual rate and $265 with the 10% rate. Compared with the usual rate, the 10% rate increased the lifetime prevalence of high-risk HPV by 18.3%, low-risk HPV by 12.9%, bacterial vaginosis by 51.2%, and trichomoniasis by 51.2%. The average cost increase across all reductions in rates was 6.8% for high-risk HPV, 0.6% for low-risk HPV, 1.4% for bacterial vaginosis, and 0.4% for trichomoniasis.

The probabilistic sensitivity analysis confirmed that these findings were robust, after accounting for uncertainty in the model inputs. As long as the cost of HIV treatment was over $120,000 to $125,000, and the cost of male circumcision was less than $640 to $660, higher male circumcision coverage was cost saving.

Authors' conclusions
The authors concluded that reducing the rate of male circumcision increased the infection prevalence and medical costs, for both male and female populations.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear. The usual male circumcision rate was that for men who were born in the 20 years before the rate decreased. The comparators were various lower rates of male circumcision. The 10% rate was based on the rate in Europe where the procedure is not covered by insurance.

Effectiveness/benefits:
The clinical data appear to have been from valid sources. The effect on sexually transmitted infections was from randomised trials conducted in Africa that should have high internal validity, but it was unclear whether these studies were relevant to the USA. The authors stated that similar findings were obtained in US observational studies. A published meta-analysis was appropriately used for the effect on infant urinary tract infections. Large US databases were selected for most of the epidemiological data. Extensive sensitivity analysis was conducted on the clinical inputs.

Costs:
The authors stated that a societal perspective was adopted, but the analysis was restricted to the direct medical costs of male circumcision and subsequent diseases. The authors stated that the inclusion of transport costs and productivity costs would have increased the savings from male circumcision as the indirect costs of sexually transmitted infections were high. Most of the costs were presented as category totals. All the economic data were from published sources, which were not described. The individual items included in each cost category were not clear and this reduces the transparency of the analysis. The key costs were appropriately varied in the deterministic analysis. Reflation exercises are possible, as the price year was explicitly stated.

Analysis and results:
The study results were clearly reported. The costs and benefits of the various strategies were not synthesised. A probabilistic model was used to simulate the changes in male circumcision rates in an appropriate Monte Carlo simulation. Deterministic and probabilistic sensitivity analyses were carried out to show the impact of uncertainty on the model outcomes. The authors acknowledged some limitations to their analysis, which were mainly due to the need for assumptions, but these were generally conservative against male circumcision. The findings appear to be specific to
the USA, with its high male circumcision rate, and might be not relevant to other countries.

Concluding remarks:
Limited details of the data sources were given, but extensive sensitivity analyses were carried out, which showed that the authors’ conclusions were robust.

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