Economic evaluation checklists & case study

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Learning objectives

Describe the intent of economic evaluation reporting checklists including CHEERS

Describe some of the items necessary for reporting an economic evaluation

Explain how the quality appraisal of an economic evaluation is different to assessing comprehensiveness of reporting

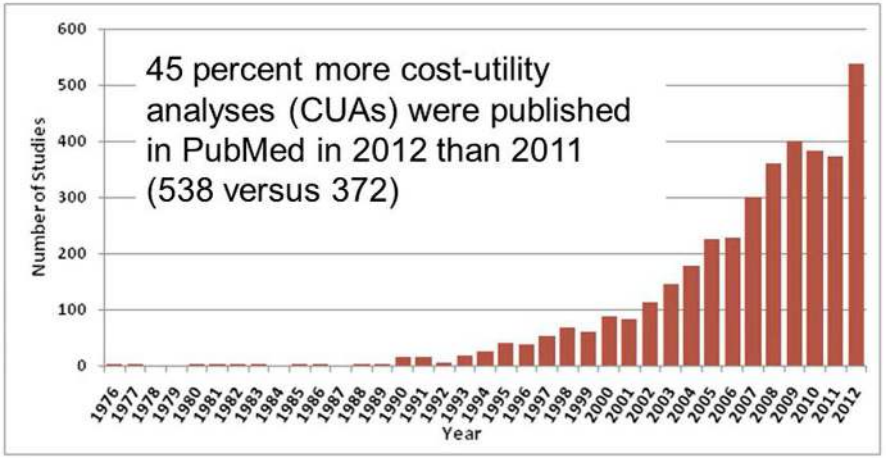
Understand some of the strengths and weaknesses of economic evaluations

Economic evaluations (EEs) on the rise…

Health EEs represent a large volume of research

More than 1200 economic evaluations were published annually between 2012 and 2016 (*Pitt et al, 2016, Health Economics*)

Lack of consistency in methodological and reporting standards for EEs



Source: Neumann PJ, et al. The changing face of the cost-utility literature. Value Health. 2015 PMID: 25773562.

Rationale for Using Checklists…

"The risk of making costly decisions due to poor reporting combined with the lack of mechanisms that promote accountability, makes transparency in reporting economic evaluations especially important and a primary concern among journal editors and decision-makers."

Source: Drummond orcid.org/0000-0002-6126-0944

The CHEERS statement consolidates previous health economic evaluation <u>reporting</u> guidelines

Different groups use CHEERS

Methodology or quality appraisal checklists also exist:

- 2nd panel on CE in Health and Medicine
- Philips checklist for modelling
- Consensus on Health Economic Criteria (CHEC) checklist for trial-based evaluations, etc

CHEERS

The Consolidated Health Economic Evaluation Reporting Standards (CHEERS) statement was created to ensure health economic evaluations are identifiable, interpretable, and useful for decision making. It is intended as guidance to help authors report accurately which health interventions are being compared and in what context, how the evaluation was undertaken, what the findings were, and other details that may aid readers and reviewers in interpretation and use of the study

Source: Husereau et al (2022) Consolidated Health Economic Evaluation Reporting Standards 2022 (CHEERS 2022) statement: updated reporting guidance for health economic evaluations. *BMJ*;375:e067975. http://dx.doi.org/10.1136/bmj-2021-067975

CHEERS 28-Item Checklist

Table 1 | The CHEERS 2022 checklist

Section/topic	Item No	Guidance for reporting
Title		
Title	1	Identify the study as an economic evaluation and specify the interventions being compared.
Abstract		
Abstract	2	Provide a structured summary that highlights context, key methods, results, and alternative analyses.
Introduction		
Background and objectives	3	Give the context for the study, the study question, and its practical relevance for decision making in policy or practice.

Methods		
Health economic analysis plan	4	Indicate whether a health economic analysis plan was developed and where available.
Study population	5	Describe characteristics of the study population (such as age range, demographics, socioeconomic, or clinical characteristics).
Setting and location	6	Provide relevant contextual information that may influence findings.
Comparators	7	Describe the interventions or strategies being compared and why chosen.
Perspective	8	State the perspective(s) adopted by the study and why chosen.
Time horizon	9	State the time horizon for the study and why appropriate.
Discount rate	10	Report the discount rate(s) and reason chosen.
Selection of outcomes	11	Describe what outcomes were used as the measure(s) of benefit(s) and harm(s).
Measurement of outcomes	12	Describe how outcomes used to capture benefit(s) and harm(s) were measured.
Valuation of outcomes	13	Describe the population and methods used to measure and value outcomes.
Measurement and valuation of resources and costs	14	Describe how costs were valued.
Currency, price date, and conversion	15	Report the dates of the estimated resource quantities and unit costs, plus the currency and year of conversion.
Rationale and description of model	16	If modelling is used, describe in detail and why used. Report if the model is publicly available and where it can be accessed.
Analytics and assumptions	17	Describe any methods for analysing or statistically transforming data, any extrapolation methods, and approaches for validating any model used.
Characterising heterogeneity	18	Describe any methods used for estimating how the results of the study vary for subgroups.
Characterising distributional effects	19	Describe how impacts are distributed across different individuals or adjustments made to reflect priority populations.
Characterising uncertainty	20	Describe methods to characterise any sources of uncertainty in the analysis.
Approach to engagement with patients and others affected by the study	21	Describe any approaches to engage patients or service recipients, the general public, communities, or stakeholders (such as clinicians or payers) in the design of the study.

Results		
Study parameters	22	Report all analytic inputs (such as values, ranges, references) including uncertainty or distributional assumptions.
Summary of main results	23	Report the mean values for the main categories of costs and outcomes of interest and summarise them in the most appropriate overall measure.
Effect of uncertainty	24	Describe how uncertainty about analytic judgments, inputs, or projections affect findings. Report the effect of choice of discount rate and time horizon, if applicable.
Effect of engagement with patients and others affected by the study	25	Report on any difference patient/service recipient, general public, community, or stakeholder involvement made to the approach or findings of the study
Discussion		
Study findings, limitations, generalisability, and current knowledge	26	Report key findings, limitations, ethical or equity considerations not captured, and how these could affect patients, policy, or practice.
Other relevant information		
Source of funding	27	Describe how the study was funded and any role of the funder in the identification, design, conduct, and reporting of the analysis
Conflicts of interest	28	Report authors conflicts of interest according to journal or International Committee of Medical Journal Editors requirements.

Today

All checklists share some common domains for appraising economic evaluations used in CHEERS and other checklists

We will take you through a paper (case study) and then ask you to break into small groups and discuss a series a select number of appraisal questions

Case Study

OPEN ACCESS Freely available online

PLOS MEDICINE

Cost-Effectiveness of Male Circumcision for HIV Prevention in a South African Setting

James G. Kahn[1*], Elliot Marseille[1,2], Bertran Auvert[3,4,5]

1 Institute for Health Policy Studies, University of California San Francisco, San Francisco, California, United States of America, **2** Health Strategies International, Orinda, California, United States of America, **3** Institut National de la Santé et de la Recherche Médicale (INSERM), U687, Saint Maurice, France, **4** University of Versailles-Saint Quentin, Faculté de Médecine Paris-Ile-de-France-Ouest, Saint Maurice, France, **5** Hôpital Ambroise Pare (AP-HP), Boulogne, France

Background

1990 - Ecological studies showed countries where males are circumcised are less affected by HIV epidemic

2000 – Meta-analysis of 27 observational studies in sub-Saharan Africa found reduced risk of HIV among circumcised men (RR=0.52, 95%CI 0.40–0.68)

2005 - First randomized clinical trial, conducted in Orange Farm, S.Africa, found a similar risk reduction as meta-analyses (RR=0.40, 95%CI 0.24–0.68)

$$? With limited funds available for HIV prevention in SSA, important to consider economic feasibility

Based on other interventions, a range of $10 - $10,000 per HIV infection averted likely to be acceptable

Methods

PICO-HP

Model assumes cohort of 1,000 men from South African general population

Circumcised vs not

Outcomes included HIV infections averted (primary) and DALYs averted

20-year time horizon

Direct program and medical costs

P – Population
I – Intervention
C – Control
O – Outcome
-
H – Time horizon
P – Perspective

Costs

- Cost of circumcision based on data collected in main trial
- Cost of AEs based on frequency/type of AE in trial and assumed management
- Cost of HIV treatment based on Cleary et al (2004)
- All costs converted from Rand to USD at exchange rate of 7.44/1, and inflated to 2006 USD

Uncertainty and heterogeneity

- Model assumes steady-state epidemic, with calculated incidence of 0.038 required to maintain HIV prevalence of 25.6% - Incidence varied from 0.028-0.048
- CE evaluated in young men and in poor coverage scenario
- One-way, multi-way, and probabilistic sensitivity analyses

Results

Table 1. Input Values and Cost-Effectiveness Analysis of Male Circumcision

Input Category	Input	Base Case Value	Range	Sources
Costs	Cost per male circumcision	$54.72	$27–$82	[13] (OF trial)
	Number of male circumcisions performed	1,000	NA	Assumption
	Cost per 1,000 male circumcisions	$5,472	$2,700–$8,200	Calculated
	Frequency of short-term adverse events (outpatient)	0.037	0.017–0.057	[13] (OF trial)
	Cost per short-term mild adverse event (outpatient)	$13	$6–$20	[39]
	Frequency of short-term adverse events (inpatient)	0.0013	0.0005–0.002	[13] (OF trial)
	Cost per short-term adverse event (inpatient)	$334	$174–$494	[39]
	Frequency of long-term adverse events	0.0093	0.005–0.014	[13] (OF trial)
	Cost per long-term adverse event	$13	$6–$20	[39]
	Lifetime medical care cost of HIV/AIDS	$8,000	$4,000–$12,000	[39]
Effectiveness	Proportion HIV-uninfected	0.744	0.7–0.8	[40]
	HIV incidence rate	0.038	0.028–0.048	Calculated
	Protective effect	0.6	0.34–0.77	[13] (OF trial)
	Risk compensation impact on protective effect (relative)	0.25	0.0–0.5	[13,43,44]
	Years	20	10	Assumption
	Multiplier due to epidemic effects	1.5	1.0–2.0	See Protocol S1

Costs, Effectiveness, and Cost-effectiveness

Table 2. Program Cost, HIA, and Cost-Effectiveness of Male Circumcision

Category	Element	Value
Program cost	Cost of male circumcision	$54,724
	Cost of adverse events	$1,030
	Total cost	$55,754
HIA	Undiscounted	426.7
	Discounted	308.4
Cost-effectiveness	Cost per HIA (unadjusted for averted medical care costs)	$181
	Net cost, adjusted for averted medical care costs, for 1,000 MC (savings)	($2,411,427)

Sensitivity

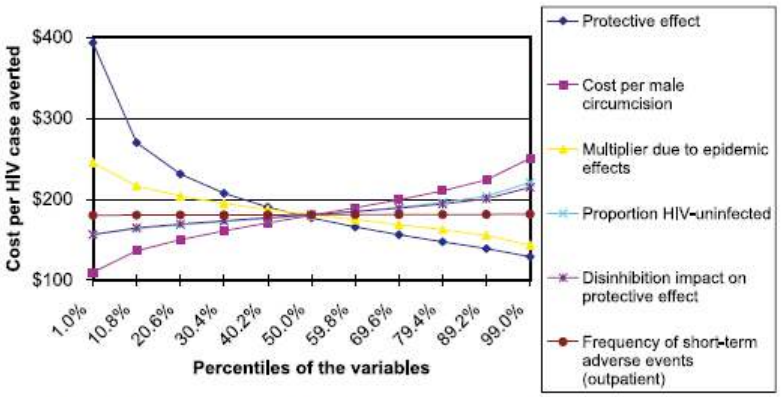


Figure 1. One-Way Sensitivity Analyses of the Cost per HIA Unadjusted for Anticipated Averted HIV Treatment Expenditures

Table 3. Three-Way Sensitivity Analysis

Multiplier Value	Protective Effect	Cost per HIA ($) in Three Unit Cost Groups		
		Unit Cost $30	Unit Cost $50	Unit Cost $100
Epidemic multiplier = 1.0	40%	350	545	1,031
	50%	234	363	688
	60%	175	271	516
	70%	140	218	413
Epidemic multiplier = 1.5	40%	234	363	688
	50%	156	242	458
	60%	117	181[a]	344
	70%	93	145	275
Epidemic multiplier = 2.0	40%	175	273	516
	50%	117	182	344
	60%	88	136	258
	70%	70	109	206

The unadjusted cost (95%CI) per case averted was $181 ($95 to $427)

Adjusted costs (95%CI) per case averted was -$2.4M (-$0.9M to -$4.3M)

Scenario analyses

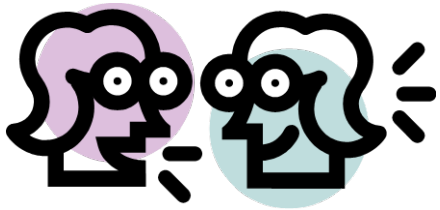
"Performing male circumcision in younger men (18–24 years old) may substantially improve cost-effectiveness, by averting the rise in prevalence that occurs with ongoing risk."

"The effect of coverage on effectiveness is small"

Conclusions

In settings in sub-Saharan Africa with high or moderate HIV prevalence among the general population, adult male circumcision is likely to be a cost-effective HIV prevention strategy, even when it has a low coverage. Male circumcision generates large net savings after adjustment for averted HIV medical costs.

Digging a bit deeper….



Break into small groups to discuss a series of critical appraisal questions.

1. Does the Study Compare Costs and Outcomes of Meaningful and Appropriate Options?

- High-quality economic evaluations will provide justification for why specific alternatives are evaluated.
- Meaningful incremental analysis is only possible if costs and outcomes for competing alternatives for care are reported. It is crucial that options being compared be realistic, appropriate reflections of actual use or care situations.

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2. Does the Study Clearly Justify Its Time Horizon?

- Economic evaluations generally employ modelling techniques to estimate costs and outcomes over time. A high-quality study will use a longer time horizon when outcomes such as sequelae and relapse, reoperation, or recurrence are important.

20-year time horizon – This duration captures the persistent protective effect of male circumcision as well as delayed epidemic effects

3. How Appropriate Are the Data Sources?

- Economic evaluations regularly include a mix of data from sources such as clinical trials, published studies, patient surveys, or health care cost and utilization databases. High-quality studies provide clear descriptions for all data sources, they are complete, justify their selection, and employ data that are least subject to bias.

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4. Were outcomes appropriately measured?

- The choice and measurement of the outcome should reflect the study objective. Instruments and/or clinical endpoints that are reliable and validated in the patient population of interest are often preferred.
- For cost-utility analysis, a high-quality economic evaluation will use validated utility measures and state clearly how they were calculated.

HIV infections averted

DALYs averted – "We calculated the reduction in DALYs for HIV by multiplying HIA by previously reported discounted DALY changes with ART (ten DALYs) and without (21 DALYs), assuming 50% on ART [45]. For increases in DALYs, we estimated the frequency and duration of adverse events from the OF RCT."

5. What about Bias?

Just like in clinical studies, a high-quality economic evaluation will discuss the potential, magnitude, and direction of potential bias. For example, leaving out travel costs to patients in a study where patients in the intervention group must travel long distances to access care is problematic. Failure to account for the range of adverse events can induce bias too.

Accounted for AEs, long time horizon to account for delayed benefit of intervention

6. How Transparent Were the Authors?

The potential for conflict of interest has become increasingly important among policy makers. High-quality economic evaluations will clearly state the funding sources provided to conduct the work and the role of the funder in analysis and reporting of the study.

Funding: The authors received no funding specifically for this study. The funders (see acknowledgements) had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.
Competing Interests: The authors have declared that no competing interests exist.

7. Is the significance of results for policy discussed?

- EE evidence is generated to support resource allocation decision-making. High-quality studies will discuss how the results could improve investment decisions in public health and how transferable the results are to other settings and populations.

"Findings from this study suggest that MC could be highly cost-effective or could save health system funds. Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Uganda, Zambia, and Zimbabwe combine low MC prevalence with high HIV prevalence. These countries are therefore potentially high-priority candidates for implementation."

Key messages

Economic evaluations need to be rigorous, transparent regarding methods, and conducted ethically.

Guidelines and checklists for EEs can:

- Aid readers and reviewers in interpretation and use of the study
- Aid interested researchers in replicating research findings
- Help standardise and increase transparency in reporting

Promoting 'good practice' is likely to improve evidence uptake and make stronger investment decisions.

Caution…checklists have different purposes and audiences. "Even 100% adherence to checklists does not make the study perfect."
(*Frederix PMID: 30680675*)

Useful Resources

ISPOR - CHEERS Related Videos

https://www.ispor.org/heor-resources/good-practices/cheers/cheers-related-videos

Updated 2022 CHEERS checklist
https://www.valueinhealthjournal.com/article/S1098-3015(21)03145-4/fulltext

Guidelines family

Guidelines covering virtually every stage of an evaluation

NSW Health https://www.health.nsw.gov.au/research/Publications/commissioning-economic-evaluations.pdf

Washington Panel https://www.jstor.org/stable/3766373

Guidelines with respect to the conduct of specific parts of an economic evaluation

Cost-effectiveness guidelines alongside clinical trials https://www.ispor.org/heor-resources/good-practices/article/cost-effectiveness-analysis-alongside-clinical-trials-ii

Costing guidelines for TB interventions

https://www.who.int/publications-detail-redirect/9789240000094

Uncertainty analysis https://www.ispor.org/heor-resources/good-practices/article/model- parameter-estimation-and-uncertainty-analysis

1. Title	*Cost-Effectiveness of Male Circumcision for HIV Prevention in a South African Setting*
2. Abstract	✓
3. Background and objectives	✓

4. Health economic analysis plan	✘
5. Study population	*1,000 men from South African general population*
6. Setting and location	*South Africa, generalized HIV epidemic*
7. Comparators	*Circumcised vs not*
8. Perspective	*Direct program and medical costs (Health system perspective)*
9. Time horizon	*20y, this duration captures the persistent protective effect of male circumcision as well as delayed epidemic effects*
10. Discount rate	*3% annually, the rate recommended by the Panel on Cost-Effectiveness in Health and Medicine of the USPHS*

11. Selection of outcomes	*HIV infections averted (primary) and DALYs averted*
12. Measurement of outcomes	*Modelled*
13. Valuation of outcomes	*Based on calculated HIV incidence in S. Africa, QOL assumptions, and trial effect size for male circumcision*
14. Measurement and valuation of resources and costs	*Based on data collected in main trial and assumptions about adverse event and HIV care*
15. Currency, price date, and conversion	*All costs converted from Rand to USD at exchange rate of 7.44, and inflated to 2006 USD (or possibly 2003 USD?)*
16. Rationale and description of model	✓ *Model available on request*

17. Analytics and assumptions	✓ *E.g., model assumes steady-state epidemic, with calculated incidence of 0.038 required to maintain HIV prevalence of 25.6%*
18. Characterising heterogeneity	*Scenario analyses*
19. Characterising distributional effects	✗ *Scenario analyses?*
20. Characterising uncertainty	*One-way, multi-way, and probabilistic sensitivity analyses*
21. Approach to engagement with patients and others affected by the study	✗

22. Study parameters	*Table 1*
23. Summary of main results	*Table 2*
24. Effect of uncertainty	*Figures, Table 3 and text description of sensitivity analysis results*
25. Effect of engagement with patients and others affected by the study	✘
26. Study findings, limitations, generalisability, and current knowledge	✓

27. Source of funding	✓
28. Conflicts of interest	✓