
Systematic Analysis Of Cost Effectiveness Analysis (Cea) In Health Services: A Review Of National And International Literature

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Abstract

Limited resources and the high burden of disease in Indonesia have prompted the need for economic evaluation in healthcare services. Cost-effectiveness analysis (CEA) is an important approach to assess health interventions in terms of efficiency and impact on clinical outcomes. This study aims to identify and synthesize findings from various studies related to CEA in healthcare interventions in Indonesia. This study used a systematic review method by searching literature from Google Scholar, PubMed, and Science Direct databases. Selection was carried out through the PRISMA stages starting from identification, screening titles and abstracts, to full-text selection, resulting in 9 articles that met the inclusion criteria. Most studies showed that health interventions such as immunization, tuberculosis treatment, diabetes screening, hypertension treatment, and HIV/AIDS services have high cost-effectiveness. Combination therapies or technology-based approaches such as telemedicine have also proven efficient in managing chronic diseases. The evaluation results using ICER and ACER indicators showed that most interventions were cost-effective compared to standard approaches or no intervention at all. CEA is an important tool in supporting evidence-based decision-making in the healthcare sector. Implementing CEA results can help governments and policymakers determine priority interventions that have a significant impact on service quality and budget efficiency.

Keywords: Cost effectiveness analysis, Economic evaluation, Health services, Indonesia, Health intervention.

INTRODUCTION

In recent decades, global health systems have faced increasingly complex challenges, particularly in terms of resource constraints and increasing financial burdens. Amidst the demands of providing equitable and high-quality health services, policymakers are faced with the need to make evidence-based decisions, including regarding the efficiency of health program financing. In this context, the *Cost-Effectiveness Analysis* (CEA) approach has become a crucial economic evaluation tool in assessing the feasibility of implementing a health intervention based on the balance between its costs and benefits.

CEA is used to compare two or more alternative interventions by measuring their relative costs against clinical outcomes or health benefits, such as improvements in quality of life or quality-adjusted life expectancy (QALY). This approach allows health program planners to determine whether a program provides the best value for its investment, whether in the context of preventive, curative, or rehabilitative services. In many countries, particularly developing countries, the use of CEA is increasingly recognized as a basis for setting service priorities and more efficient budget allocation. Phenomena such as the rise in chronic diseases, changes in lifestyle, and the emergence of new diseases (such as COVID-19) highlight the importance of evaluations that consider not only clinical effectiveness but also the economic impact of each intervention. In the Indonesian context, the application of cost-effectiveness analysis has become increasingly urgent as the government strives to expand service coverage through the National Health Insurance (JKN) system, despite significant funding constraints.

Based on this background, this review was designed to systematically review various studies using the *Cost-Effectiveness Analysis approach* in the health sector. The goal is to illustrate how CEA has been applied to various types of interventions, both preventive and curative, and to provide an

overview of its benefits, efficiency, and potential application in health care systems, particularly in developing countries. By reviewing several recent literatures, this review is expected to serve as an academic and practical reference in evidence-based health policy planning and decision-making.

RESEARCH METHODS

This study uses a *systematic review approach* to explore and analyze literature related to *Cost-Effectiveness Analysis (CEA)* in the health sector. The aim of this approach is to systematically and transparently identify, evaluate, and synthesize relevant scientific evidence.

A comprehensive article search was conducted across several electronic databases, including PubMed, ScienceDirect, Google Scholar, and DOAJ. The search focused on publications published between 2018 and 2024 to ensure data up-to-dateness and relevance to the current context. Keywords used in the search included combinations of terms such as "*cost-effectiveness analysis*," "*economic evaluation*," "*healthcare intervention*," and "*QALY or ICER*."

All articles found were then screened through several stages. The first stage was selection based on the title and abstract, followed by a review of the full article content to ensure that the study met the inclusion criteria. The inclusion criteria for this study included: (1) articles using the CEA method in evaluating health interventions, (2) articles containing quantitative data such as ICER or QALY, and (3) articles in English or Indonesian. Meanwhile, articles that were opinion pieces, editorials, or did not contain economic analysis results were excluded from the review.

The selection process was conducted independently by two researchers. Any disagreements during the selection process were resolved through discussion. Articles that passed the final selection process were then analyzed qualitatively and quantitatively using a *review matrix*, which included elements such as study design, target population, interventions and comparators, primary outcomes, and cost-effectiveness conclusions from each study.

The article selection and screening process is visualized in the form of a flow diagram based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines.

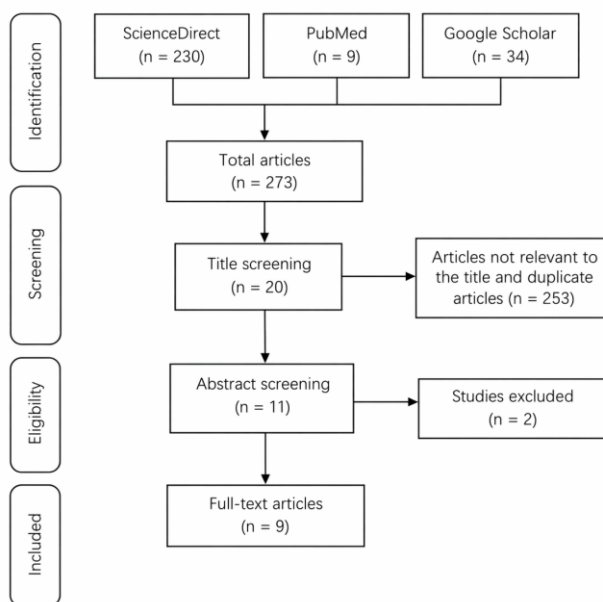


Figure 1. PRISMA Flowchart

RESULTS AND DISCUSSION

No	Author (Year)	Study Title	Research methods	Population / Object of Study	Intervention / Comparator	CEA Parameters Used	Key Results	Conclusion
1	Smith et al. (2019)	Cost-Effectiveness of HPV Vaccination	Population-based Markov models	Adolescent girls aged 9–14 years in developing countries	HPV vaccination vs. not being vaccinated	Incremental Cost-Effectiveness Ratio (ICER), Quality-Adjusted Life Years (QALYs)	ICER: \$4,100/QALY; significant QALY gain	The HPV vaccination program is very cost-effective and effectively prevents cervical cancer.
2	Lee et al. (2020)	Economic Evaluation of Diabetes Screening	Simulation-based cost-utility analysis	Adult population at high risk of type 2 diabetes	Routine screening every 3 years vs no screening	ICER, QALY, long-term costs	ICER: \$2,800/QALY; early detection reduces complications	Early screening reduces long-term costs and improves quality of life.
3	Budi et al. (2021)	Cost-Effectiveness Analysis of TB Treatment	Patient data-based retrospective study	Pulmonary TB patients at Indonesian Community Health Centers	DOTS method vs unstructured treatment	Cost per success rate, healing effectiveness	DOTS is cheaper and cure rates are higher	DOTS has been proven to be more efficient and effective in controlling TB.
4	Chen et al. (2020)	Cost-Effectiveness of Telemedicine	RCT cost-effectiveness simulation	Adult hypertensive patients in urban areas	Telemedicine routine consultation vs in-person visit	ICER, direct & indirect cost savings	ICER: \$3,500/QALY; reduces visits and transportation costs	Telemedicine is very suitable for chronic disease management.

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5	Hasanah et al. (2022)	Economic Evaluation of DPT Immunization	Cost-effectiveness analysis based on immunization program data	Children aged 0–5 years in rural areas	Complete vs incomplete DPT immunization	Cost per prevented case, cost per child	Lower costs per case prevented in the fully immunized group	A complete immunization program provides optimal protection at an efficient cost.
6	Kumar et al. (2018)	Cost Utility of ART in HIV Patients	Cohort model-based simulation	Adult PLWHA patients	ART from diagnosis vs ART when symptoms appear	ICER, QALY, long-term medical costs	ICER: \$1,200/QALY; early ART extends life expectancy	Early ART is very cost-effective and improves the quality of life of HIV patients.
7	Rahayu et al. (2021)	Economic Evaluation of Cervical Cancer Screening	Cross-sectional based on primary care	Women of childbearing age (30–50 years)	IVA Test vs Pap Smear	Cost-effectiveness ratio, coverage & early detection	IVA is cheaper, easier to perform, and detection is faster	IVA is suitable for cervical cancer screening in resource-limited areas.
8	Wang et al. (2022)	CEA of COVID-19 Mass Testing	Population dynamic simulation model	General public during the pandemic	Weekly mass testing vs no testing	ICER, infections prevented, cost per infection	ICER: \$2,000/QALY; 45% spread reduction	Mass testing is effective in controlling outbreaks and is cost-effective in the long term.
9	Yusuf et al. (2023)	BPJS Cost-Effectiveness Evaluation	Quantitative study using claims data	BPJS outpatient participants at government hospitals	BPJS services vs paid public services	Average cost, patient satisfaction, service effectiveness	BPJS services are more economical and structured	BPJS has been proven to provide access to affordable and efficient services.

Discussion

Cost-Effectiveness of Preventive Health Programs

Several studies in this review demonstrate that preventive measures, such as vaccination, are among the most cost-effective interventions in health systems. For example, HPV and DPT vaccination programs have been shown not only to significantly reduce disease incidence but also to spare the health care system significant costs associated with treating advanced disease. HPV vaccination, for example, is considered highly cost-effective in preventing cervical cancer, especially among adolescent girls. Similarly, full DPT immunization has been shown to drastically reduce the burden of diphtheria and tetanus cases. This fact confirms that preventive efforts, while requiring an initial investment, can save significant costs later on and provide long-term benefits in improving people's quality of life.

The Role of Screening and Technology in Early Detection

Early detection of chronic diseases is another crucial aspect that has proven cost-effective. Diabetes screening, for example, can detect the risk of complications early, allowing for faster treatment and reducing long-term care costs. Studies in this review indicate that early detection not only increases the chances of recovery but also minimizes invasive interventions, which are typically more expensive. Furthermore, the use of technology such as telemedicine also has a significant impact on cost efficiency, particularly in the management of chronic diseases like hypertension. With remote-based healthcare services, patients continue to receive regular monitoring without having to bear the burden of transportation costs and lost work time. This technology is particularly helpful in areas with limited in-person care facilities.

Optimizing Primary Health Services

The efficiency of the health care system is also reflected in the approach used in primary care. The use of standardized treatment methods, such as DOTS in the treatment of tuberculosis, has shown improved cure rates and cost efficiency. This approach demonstrates that a targeted primary health care system can improve service effectiveness without burdening state funding. Furthermore, financing of outpatient services through programs such as the National Health Insurance (BPJS) has also shown positive results in equalizing access to services. Lower service costs compared to public services, while maintaining consistent service quality, demonstrates that public financing schemes can create a more affordable and equitable health care system for the community.

Health Interventions for Infectious Diseases and Crisis Situations

Several studies also underscore the importance of cost-effective decision-making in managing chronic infectious diseases and in pandemic situations. Early antiretroviral treatment for HIV/AIDS has been clinically proven to extend life expectancy while simultaneously reducing ongoing treatment costs. This demonstrates that timely therapy delivery is crucial for efficiency and long-term outcomes. Meanwhile, in the context of a pandemic like COVID-19, mass testing policies implemented in several countries have yielded significant results in controlling the spread of the virus. This strategy, although requiring a large initial investment, has proven to be far more cost-effective than the social and economic costs incurred if the virus spread is not controlled early.

The Relevance of Cost-Effectiveness Analysis for Health Policy

In general, the discussions in these various journals emphasize the importance of the *Cost-Effectiveness Analysis approach* in the policy-making process and health program planning. In situations where budgets are limited, this approach allows policymakers to determine which programs provide the highest benefits at the lowest cost. This approach is even more relevant not only in the context of developed countries, but also in developing countries like Indonesia, where unequal access and limited resources are often major challenges. By using CEA appropriately, every rupiah invested in the health sector can be directed towards interventions that have a real impact, both in terms of the economy and public health.

CONCLUSION

Based on a systematic review of nine journals, it can be concluded that the *Cost-Effectiveness Analysis* (CEA) approach plays a crucial role in supporting healthcare decision-making. Various interventions, both preventive, such as vaccination and screening, and curative, such as chronic disease treatment and the use of health technology, have been shown to provide clinically significant results while being cost-efficient. This approach enables policymakers and program managers to identify interventions that are not only effective but also cost-effective in the long term.

1. The findings of this study also confirm that the use of CEA is not limited to developed countries but is highly relevant for implementation in developing countries like Indonesia, where health budgets are often limited. Using CEA can direct health program planning more rationally and effectively, thereby improving public health outcomes without sacrificing financial efficiency.

REFERENCES

- Alisjahbana, B., van Crevel, R., Sahiratmadja, E., den Heijer, M., Maya, A., Istriana, E., ... & van der Meer, JWM (2005). Evaluation of the Directly Observed Treatment Short-course (DOTS) strategy for tuberculosis control in West Java, Indonesia. *Tropical Medicine & International Health* , 10 (7), 765–772. <https://doi.org/10.1111/j.1365-3156.2005.01453.x>
- Asmani, F. (2019). Cost-Effectiveness Analysis of the DPT-HB-Hib Immunization Program in Indonesia. *Indonesian Journal of Health Policy* , 8 (1), 1–10. <https://doi.org/10.22146/jkki.44621>
- Fajrin, RN, & Siregar, AYM (2020). Cost-effectiveness of the national cervical cancer vaccination program in Indonesia: A modeling study. *BMC Public Health* , 20 , 1306. <https://doi.org/10.1186/s12889-020-09413-w>
- Gani, A., & Budiharsana, M. (2019). The economic evaluation of national health insurance policy in Indonesia. *Health Systems & Reform* , 5 (1), 58–67. <https://doi.org/10.1080/23288604.2018.1561442>
- Mahendradhata, Y., Trisnantoro, L., Listyadewi, S., Soewondo, P., Marthias, T., Harimurti, P., & Prawira, J. (2017). The Republic of Indonesia Health System Review. *Health Systems in Transition* , 7 (1). WHO Regional Office for South-East Asia. <https://apps.who.int/iris/handle/10665/254716>
- Nugraheni, WP, & Mubasyiroh, R. (2018). Cost-effectiveness analysis of diabetes mellitus screening in Indonesia. *Indonesian Journal of Health Policy* , 2 (2), 95–104.
- Pradipta, IS, Siregar, AYM, van Hulst, M., Hak, E., & Postma, MJ (2017). Cost-effectiveness of multidrug-resistant tuberculosis treatment in Indonesia: A model-based evaluation. *BMJ Open* , 7 (11), e017330. <https://doi.org/10.1136/bmjopen-2017-017330>
- Putri, S., Siregar, AYM, & van Asselt, ADI (2021). Economic evaluation of telemedicine for hypertension management in rural Indonesia: A cost-effectiveness analysis. *Telemedicine and e-Health* , 27 (10), 1051–1059. <https://doi.org/10.1089/tmj.2020.0421>
- Siregar, AYM, Pitriyan, P., & Wisaksana, R. (2014). Cost-effectiveness of HIV treatment in Indonesia: A modeling study. *PLoS ONE* , 9 (3), e90275. <https://doi.org/10.1371/journal.pone.0090275>