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Adaptive Evidence Synthesis and Economic Evaluation for Health Benefit Package Updating in Low and Middle Income Countries

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Abstract

Health Benefit Package design and revision are central to the realization of universal health coverage in low and middle income countries. The increasing complexity of health systems, rapid innovation in health technologies, and the limited fiscal space available to public payers require decision making approaches that are both analytically rigorous and operationally feasible. Over the past decade, health technology assessment and economic evaluation have become institutionalized in many national priority setting processes, yet the time intensive and resource demanding nature of traditional evidence synthesis has created persistent misalignment between the pace of policy making and the speed at which reliable evidence can be generated. This study develops a comprehensive conceptual and methodological framework for integrating adaptive evidence synthesis and economic evaluation into Health Benefit Package updating processes, drawing exclusively on internationally recognized standards and empirical analyses contained in the provided reference corpus. By synthesizing the Ethiopian experience of Health Benefit Package revision, global surveys of health technology assessment practice, methodological advances in rapid and adaptive reviews, and empirical studies on the timeliness and durability of systematic reviews and economic models, this article demonstrates that adaptive methods are not merely pragmatic compromises but are epistemologically coherent and policy relevant approaches to evidence informed priority setting. The methodology combines institutional analysis, comparative review of rapid evidence services, and critical appraisal of adaptive economic evaluation techniques. Results indicate that when appropriately structured and transparently reported, adaptive methods can preserve scientific rigor while significantly improving the timeliness and relevance of evidence used in benefit package decisions. The discussion explores the implications for governance, methodological standardization, and long term sustainability of Health Benefit Package updating in low and middle income countries. The article concludes that adaptive evidence ecosystems are essential for ensuring that Health Benefit Packages remain responsive to changing population needs, technological innovation, and fiscal realities, thereby strengthening the credibility and impact of health technology assessment in the pursuit of universal health coverage.

Keywords: Health benefit package, health technology assessment, rapid review, adaptive economic evaluation, priority setting, universal health coverage.

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1. Introduction

Health systems across the world are increasingly confronted with the tension between unlimited health needs and finite public resources. This tension is particularly acute in low and middle income countries, where demographic transitions, epidemiological shifts toward chronic disease, and rapid diffusion of health technologies have dramatically expanded both the demand for and the cost of health care (Eregata et al., 2020). In this context, the Health Benefit Package has emerged as a central policy instrument for defining the set of services that a publicly financed health system will guarantee to its population. A Health Benefit Package is not merely a list of reimbursed interventions; it

is a normative statement about social values, equity, and the acceptable trade offs between efficiency and fairness. The process of constructing and revising such a package therefore lies at the heart of universal health coverage.

Historically, many low and middle income countries inherited fragmented and often implicit benefit packages shaped by historical budgeting patterns, donor priorities, and professional norms rather than by explicit and transparent priority setting (Jorgensen, 2023). The movement toward explicit Health Benefit Package design has been strongly influenced by the rise of health technology assessment and economic evaluation as tools for informing resource allocation. Health technology assessment seeks to evaluate the clinical effectiveness, safety, cost effectiveness, and broader social implications of health technologies in order to inform policy decisions (WHO, 2021). Economic evaluation, particularly cost effectiveness analysis using decision analytical modeling, provides a formal framework for comparing the value for money of alternative interventions (Petrou and Gray, 2011).

Despite the theoretical appeal of these tools, their practical application in Health Benefit Package updating has been constrained by significant operational challenges. Traditional systematic reviews and full economic models require substantial time, specialized expertise, and financial resources. Empirical studies have shown that the production of systematic reviews frequently lags behind the pace of policy needs, with many reviews being published years after their protocols are registered (Andersen et al., 2020). Even when reviews are completed, they may quickly become outdated due to the continuous emergence of new evidence (Shojania et al., 2010). Economic evaluations, similarly, are subject to temporal decay as prices, clinical practice, and epidemiology change over time, reducing their relevance for current decision making (Shields et al., 2022).

These temporal mismatches are not merely technical inconveniences; they pose a fundamental threat to the legitimacy and effectiveness of evidence informed priority setting. If decision makers must choose between acting on outdated or incomplete evidence and delaying decisions that affect population health, the promise of health technology assessment risks being undermined. Recognizing this challenge, a growing body of work has explored rapid and adaptive approaches to evidence synthesis and economic evaluation. Rapid reviews, produced through streamlined methods that accelerate the synthesis process, have been institutionalized in agencies such as the Canadian Agency for Drugs and Technologies in Health and the National Centre for Pharmacoeconomics in Ireland (CADTH, 2021; NCPE Ireland). At the same time, methodological research has sought to validate adaptive economic evaluation approaches that can be updated and refined as new evidence becomes available (Chauhan et al., 2023).

The Ethiopian experience of Health Benefit Package revision provides a particularly rich case for examining how these methodological innovations can be embedded within real world policy processes. Ethiopia undertook a comprehensive revision of its Essential Health Service Package using a structured priority setting approach that combined cost effectiveness analysis, equity considerations, and feasibility assessments (Eregata et al., 2020). This process required the integration of diverse sources of evidence under significant time and resource constraints, illustrating both the potential and the challenges of adaptive evidence use in low income settings.

At the same time, global surveys conducted by the World Health Organization indicate wide variation in the institutionalization of health technology assessment and benefit package design across countries (WHO, 2021). Many countries report limited capacity for full scale assessments and rely instead on rapid or partial evaluations. Yet there remains uncertainty about the rigor, transparency, and credibility of such approaches. The question is not whether adaptive methods will be used, but whether they can be designed and governed in a way that maintains scientific integrity while meeting policy needs.

The literature on systematic review methodology provides important insights into this debate. The PRISMA guidelines emphasize transparency and completeness in reporting, even when methods are adapted or simplified (Moher et al., 2009; Page et al., 2021). Studies of protocol adherence and review completion highlight the risks of methodological drift and publication delays, underscoring the need for more flexible yet accountable processes (Runjic et al., 2019). Analyses of the labor and time required for systematic reviews further demonstrate that traditional methods may be ill suited to fast moving policy environments (Borah et al., 2017).

Despite this growing body of work, there remains a significant gap in the literature regarding the integration of adaptive evidence synthesis and economic evaluation within the institutional processes of Health Benefit Package updating in low and middle income countries. Existing studies tend to focus either on methodological issues in isolation or on specific country case studies without a unifying conceptual framework. What is lacking is a comprehensive analysis that links the epistemological

foundations of evidence synthesis, the practical realities of policy making, and the governance structures of health technology assessment.

This article seeks to fill that gap by developing an integrated framework for adaptive evidence informed Health Benefit Package updating. Drawing strictly on the provided references, it synthesizes insights from Ethiopian policy practice, global health technology assessment surveys, rapid review services, and methodological research on systematic reviews and economic evaluation. The central argument is that adaptive methods, when properly designed and institutionalized, can enhance rather than undermine the legitimacy of priority setting. By embracing the dynamic nature of evidence and explicitly managing uncertainty and timeliness, health systems can create more responsive and sustainable benefit packages.

2. Methodology

The methodological approach of this study is rooted in interpretive synthesis and comparative institutional analysis, using only the sources specified in the reference list. Rather than conducting new empirical data collection, the study systematically integrates findings from policy analyses, methodological guidelines, and empirical studies to construct a coherent theoretical and practical framework. This approach is consistent with the traditions of health systems research and health policy analysis, which often rely on triangulation of diverse evidence sources to derive normative and operational insights (Eregata et al., 2020).

The first methodological component involves a close reading and conceptual extraction from the Ethiopian Health Benefit Package revision process. Eregata et al. provide a detailed account of the criteria, deliberative structures, and analytical tools used in Ethiopia to revise its Essential Health Service Package. This case serves as an anchor for understanding how evidence is mobilized within a real policy context. The methodological focus here is not on replicating Ethiopia's results but on identifying the procedural and epistemic principles that guided evidence use.

The second component draws on the World Health Organization's global survey of health technology assessment and benefit package design (WHO, 2021). This survey offers a comparative perspective on how different countries institutionalize evidence synthesis and economic evaluation. The methodological strategy is to identify common patterns, constraints, and innovations that shape the feasibility of adaptive approaches.

The third component integrates the operational models of rapid review services such as those of CADTH and NCPE Ireland. These organizations have developed formalized processes for delivering timely evidence syntheses to policy makers (CADTH, 2021; NCPE Ireland). By examining their templates and service descriptions, the study identifies methodological shortcuts, quality assurance mechanisms, and reporting standards that define rapid evidence products.

The fourth component engages with the methodological literature on systematic reviews and economic evaluation. PRISMA guidelines are used as a benchmark for transparency and rigor (Moher et al., 2009; Page et al., 2021). Empirical studies on review timeliness, protocol adherence, and labor requirements provide a quantitative and qualitative understanding of the costs of traditional methods (Andersen et al., 2020; Runjic et al., 2019; Borah et al., 2017). Finally, methodological analyses of decision analytical modeling and the temporal relevance of economic evaluations inform the adaptive dimension of economic evidence (Petrou and Gray, 2011; Shields et al., 2022; Chauhan et al., 2023).

The synthesis process follows an iterative interpretive approach. Concepts such as timeliness, rigor, adaptability, and institutionalization are identified across sources and compared. Apparent tensions, such as between methodological purity and policy relevance, are examined through critical discourse analysis. The outcome is a conceptual model that articulates how adaptive evidence synthesis and economic evaluation can be embedded within Health Benefit Package updating processes without sacrificing scientific standards.

3. Results

The integration of the reference corpus yields several interrelated findings that illuminate the role of adaptive evidence in Health Benefit Package updating. These findings are presented as thematic results rather than numerical outputs, reflecting the qualitative and conceptual nature of the analysis.

One central finding is that Health Benefit Package updating is inherently a dynamic and iterative process rather than a one time exercise. The Ethiopian revision process demonstrates that benefit packages must be periodically reassessed in light of changing epidemiology, technological innovation, and fiscal conditions (Eregata et al., 2020). Ethiopia's approach involved the systematic re evaluation of existing services and the appraisal of new interventions using cost effectiveness, equity, and feasibility criteria.

Importantly, this process was conducted under significant time constraints, highlighting the need for evidence that could be produced and interpreted rapidly.

The World Health Organization survey reinforces this dynamic perspective by showing that many countries are moving toward continuous or periodic updating of their benefit packages rather than infrequent comprehensive overhauls (WHO, 2021). However, the survey also reveals substantial variation in methodological capacity. While some countries have established health technology assessment agencies with the ability to conduct full evaluations, many rely on ad hoc or rapid assessments. This heterogeneity suggests that a one size fits all methodological model is unrealistic.

A second major finding concerns the operationalization of rapid evidence synthesis. The experiences of CADTH and NCPE Ireland illustrate that rapid reviews are not simply truncated systematic reviews but are structured products with defined scopes, timelines, and quality assurance processes (CADTH, 2021; NCPE Ireland). These organizations use standardized templates, focused research questions, and targeted search strategies to deliver evidence within days or weeks. While certain methodological steps, such as dual screening or exhaustive searching, may be abbreviated, transparency in reporting allows users to understand the limitations and strengths of the evidence.

The PRISMA guidelines provide a crucial anchor for this transparency. By specifying reporting items for both traditional and updated systematic reviews, PRISMA ensures that even when methods are adapted, the resulting products remain interpretable and reproducible (Moher et al., 2009; Page et al., 2021). This suggests that rigor is not synonymous with maximalism but with clarity and accountability.

A third finding relates to the temporal fragility of evidence. Empirical studies show that a significant proportion of systematic reviews are published more than two years after protocol registration, and many are never completed at all (Andersen et al., 2020; Runjic et al., 2019). This lag undermines their usefulness for time sensitive policy decisions. Moreover, Shojania et al. demonstrate that new evidence frequently emerges that can change the conclusions of reviews, implying that even recently published reviews may become outdated (Shojania et al., 2010).

Economic evaluations face similar challenges. Shields et al. argue that cost effectiveness estimates are subject to decay as prices, technologies, and clinical practices evolve, meaning that older studies may no longer reflect current value for money (Shields et al., 2022). Petrou and Gray emphasize that decision analytical models are built on assumptions and data inputs that require regular updating to remain valid (Petrou and Gray, 2011). Chauhan et al. provide methodological validation for adaptive economic evaluation approaches that allow models to be incrementally updated as new data become available, thereby maintaining relevance while preserving analytical structure (Chauhan et al., 2023).

A fourth finding concerns the governance and prioritization of assessment topics. Peacocke et al. highlight that the selection of which technologies or services to assess is itself a critical and often overlooked stage in health technology assessment institutionalization (Peacocke et al., 2023). Jorgensen and Prinja further argue that in low and middle income countries, where assessment capacity is limited, priority setting efforts must be strategically focused on areas with the greatest potential impact on population health and financial sustainability (Jorgensen, 2023; Prinja, 2023). This implies that adaptive methods must be aligned with strategic topic selection to maximize their value.

Together, these findings suggest that adaptive evidence synthesis and economic evaluation are not ad hoc compromises but necessary components of a functioning Health Benefit Package updating system. They allow evidence to be produced in a timeframe that matches policy needs while retaining sufficient rigor and transparency to support legitimate decision making.

4. Discussion

The results of this synthesis have profound implications for how health systems conceptualize and operationalize evidence informed priority setting. At a theoretical level, they challenge the implicit assumption that methodological rigor and policy relevance are in tension. Instead, they suggest that rigor must be redefined in terms of fitness for purpose within a dynamic decision environment.

Traditional hierarchies of evidence, which place exhaustive systematic reviews and fully specified economic models at the apex, were developed in a context where the primary goal was to establish clinical efficacy under controlled conditions. In the context of Health Benefit Package updating, however, the goal is not simply to determine whether an intervention works but to decide whether it should be publicly financed at a given point in time given competing priorities and budget constraints (Eregata et al.,

2020). This requires evidence that is timely, contextualized, and integrated across multiple dimensions.

The Ethiopian experience illustrates how such integration can be achieved through deliberative processes that combine quantitative and qualitative evidence. Cost effectiveness analysis provided a structured way to compare interventions, but it was complemented by considerations of equity, feasibility, and political acceptability (Eregata et al., 2020). Adaptive evidence synthesis plays a crucial role in this context by ensuring that the quantitative inputs to deliberation are as current and relevant as possible.

The global variation in health technology assessment capacity underscores the importance of institutional design. Countries with well resourced agencies may be able to conduct full assessments for a subset of technologies, but even they face backlogs and delays (WHO, 2021). For countries with limited resources, rapid and adaptive methods may be the only feasible way to support evidence informed decisions. The key is to institutionalize these methods within clear governance frameworks that specify standards, roles, and accountability.

Rapid review services provide instructive examples. CADTH's Rapid Response Service and the NCPE rapid review template both emphasize clarity of scope, standardized processes, and explicit communication of limitations (CADTH, 2021; NCPE Ireland). These features are critical for maintaining trust in the evidence. They also facilitate iterative updating, as new evidence can be incorporated into existing syntheses rather than requiring entirely new reviews.

The methodological literature supports this iterative approach. The PRISMA 2020 update explicitly acknowledges the need for living systematic reviews and other dynamic evidence products that can be updated as new studies emerge (Page et al., 2021). This aligns with the findings of Shojania et al. regarding the frequency with which reviews require updating (Shojania et al., 2010). Living reviews and adaptive economic models represent parallel developments in the synthesis and modeling domains, both aimed at preserving relevance over time.

However, the adoption of adaptive methods also raises important concerns about quality and bias. Shortcuts in search strategies, screening, and data extraction can introduce errors and omissions. Chauhan et al. address this concern by demonstrating that adaptive economic evaluation methods can be validated against traditional approaches, providing evidence that rigor can be maintained even when processes are streamlined (Chauhan et al., 2023). Transparency in reporting, as emphasized by PRISMA, further mitigates the risk of hidden biases (Moher et al., 2009; Page et al., 2021).

Another critical dimension is the prioritization of topics for assessment. Peacocke et al. argue that institutionalized health technology assessment requires explicit processes for selecting which technologies to evaluate, as this determines the ultimate impact of evidence on policy (Peacocke et al., 2023). Jorgensen's framework for prioritizing priority setting efforts highlights the need to focus limited analytical resources on decisions with the greatest potential consequences for population health and financial sustainability (Jorgensen, 2023). Adaptive methods enhance the feasibility of such strategic prioritization by allowing resources to be reallocated quickly as policy needs change.

The temporal decay of evidence further reinforces the need for adaptive approaches. Shields et al. show that economic evaluations have a best before date, after which their relevance declines (Shields et al., 2022). In a Health Benefit Package context, relying on outdated cost effectiveness estimates can lead to suboptimal allocation of resources. Adaptive models that can be updated with new prices, epidemiological data, and clinical outcomes provide a way to extend the useful life of economic evidence while maintaining its relevance.

From a governance perspective, the institutionalization of adaptive evidence requires clear mandates, sustainable funding, and integration with decision making bodies. The Ethiopian case demonstrates that strong political commitment and stakeholder engagement are critical for embedding evidence into policy processes (Eregata et al., 2020). Without such commitment, even the most sophisticated methods risk being ignored or misused.

5. Conclusion

The analysis presented in this article demonstrates that adaptive evidence synthesis and economic evaluation are indispensable components of contemporary Health Benefit Package updating in low and middle income countries. Drawing on the Ethiopian experience, global health technology assessment surveys, rapid review services, and methodological research, it is clear that the pace and complexity of modern health systems demand evidence processes that are both rigorous and responsive.

Rather than viewing rapid and adaptive methods as inferior substitutes for traditional systematic reviews and economic models, policy makers and researchers should recognize

them as complementary tools designed for a different decision environment. When grounded in transparent reporting standards such as PRISMA, validated through methodological research, and embedded within robust institutional frameworks, adaptive approaches can enhance the legitimacy, relevance, and sustainability of evidence informed priority setting.

As countries continue to pursue universal health coverage, the challenge will not be to generate ever more detailed evidence, but to ensure that the right evidence is available at the right time to inform difficult choices. Adaptive evidence ecosystems, supported by strategic topic selection and continuous updating, offer a path toward achieving this goal. By embracing the dynamic nature of both evidence and policy, health systems can create Health Benefit Packages that are better aligned with population needs, technological innovation, and fiscal realities.

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