

Strategic health policy priorities for health technology assessment development in Iran

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Keywords

Health Technology Assessment • Iran • Multi-Criteria Decision Analysis • Capacity Building • Health Policy

Summary

Background. Health Technology Assessment (HTA) is a key policy instrument for improving the efficiency, equity, and transparency of healthcare resource allocation, particularly in low- and middle-income countries such as Iran. Despite its recognized importance, HTA development in Iran has been hindered by institutional fragmentation, limited capacity, and insufficient financial and data infrastructure. This study aimed to identify and prioritize strategic policy actions for HTA development in Iran using a Multi-Criteria Decision Analysis (MCDA) approach.

Methods. A multi-stage, mixed-methods design was employed, including a systematic literature review, 25 semi-structured expert interviews, and pilot testing. Findings from the systematic review and interviews informed the development of a comprehensive checklist of potential HTA development strategies. The checklist was validated through expert panel review and pilot-tested for reliability and usability. Eight evaluation criteria, such as feasibility, alignment with national priorities, equity, cost-effectiveness, and stakeholder acceptance, were applied within an MCDA framework to prioritize the identified strategies. Weighted scores were calculated and normalized to generate a ranked list of priorities. In addition, a structured expert consensus process was used to ensure that no essential criterion was excluded and that all selected criteria reflected both global evidence and local contextual needs.

Results. Fifteen strategies were identified and evaluated. Establishing a centralized national HTA body ranked as the top priority (weighted score: 82.25), followed by strengthening HTA workforce capacity (79.75) and securing sustainable funding (78.25). Additional high-priority strategies included promoting public awareness of HTA, integrating HTA into national policy processes, and developing robust data infrastructure. Moderate-priority strategies involved enhancing stakeholder collaboration, strengthening research and innovation, and expanding international partnerships.

Lower-priority but still important strategies included enhancing transparency, creating context-specific evaluation metrics, involving NGOs, and promoting equitable access to health technologies. Sensitivity analyses with different weighting scenarios showed consistent top-ranked strategies. This confirmed the robustness and reliability of the MCDA model.

Conclusion. The study proposes an evidence-informed roadmap for HTA development in Iran. It highlights key priorities, including a centralized authority, capacity building, and dedicated funding. These steps can support the institutionalization of HTA and its use in policy decisions. Although focused on Iran, the findings are applicable to other resource-limited settings. The MCDA approach offers a transparent method for priority-setting in HTA systems.

Introduction

Health Technology Assessment (HTA) has emerged as a key policy instrument for improving the efficiency and equity of healthcare resource allocation, particularly in low- and middle-income countries (LMICs) where financial and structural constraints are more pronounced [1]. In Iran, healthcare expenditure represents approximately 6% of GDP, with out-of-pocket payments accounting for nearly 40% of total health spending [2]. These fiscal pressures, combined with demographic changes, population aging, and persistent disparities in access to care, highlight the urgent need for a more systematic and institutionalized HTA framework [3]. While major urban centers increasingly adopt advanced

medical technologies, many rural regions continue to lack essential services, exacerbating inequities and underscoring the importance of evidence-informed decision-making [4]. Various theoretical foundations, including health economics and decision theory, have informed models for HTA implementation in resource-limited health systems [5].

HTA is defined as a multidisciplinary process that examines the medical, economic, social, and ethical implications of health technologies, including medicines, devices, and clinical interventions [6]. By generating robust evidence to guide policy decisions, HTA helps identify cost-effective interventions and supports more transparent and accountable resource allocation [7]. In LMICs such as Iran, where health

systems face substantial budgetary and infrastructural limitations, HTA can play a particularly transformative role in improving system-wide efficiency and addressing inequities [8]. Complementary approaches such as Multi-Criteria Decision Analysis (MCDA) enable decision-makers to incorporate a broader range of criteria, including ethical and social considerations, into the evaluation process, making them especially valuable in contexts where trade-offs between competing priorities are common [9]. Moreover, MCDA provides a structured way to incorporate stakeholder values and non-economic dimensions of decision-making, which is critical in health systems undergoing rapid transition.

Despite these advantages, efforts to institutionalize HTA in Iran have been constrained by several systemic barriers. These include the absence of a dedicated HTA agency, limited engagement from key stakeholders such as private sector providers and civil society, and fragmented data systems that impede reliable assessment of health technologies [10]. Challenges such as the lack of centralized data repositories reduce the accuracy of economic evaluations, while insufficient stakeholder participation may hinder acceptance and implementation of HTA recommendations [11]. Lessons from other LMICs, such as Thailand, South Africa, and Brazil, demonstrate that HTA can be successfully adapted and institutionalized even in constrained environments, provided that development strategies align with national needs and system capacities [12-14]. Iran's earlier attempts to establish HTA functions, initiated in the mid-2000s, were limited in scope and sustainability, further underscoring the need for a more coherent and institutionalized strategy.

Recognizing these challenges, the Iranian Ministry of Health and Medical Education (MoHME) has emphasized the importance of integrating HTA into national health planning to improve resource allocation and promote equitable access to care [15]. However, existing initiatives have largely been fragmented and lack a structured mechanism for prioritizing development strategies tailored to Iran's institutional and socio-political context [16]. This gap underscores the need for a systematic methodology capable of identifying, evaluating, and prioritizing strategic actions for HTA development [17]. In this regard, MCDA offers several advantages over traditional approaches, such as cost-effectiveness analysis or budget impact analysis, as it allows the incorporation of broader ethical, social, political, and organizational, into the decision-making process [18]. Importantly, MCDA is particularly suited to contexts like Iran, where policy decisions often involve balancing competing objectives, such as fiscal sustainability, equity enhancement, and service expansion, within a politically complex governance structure.

MCDA is particularly well-suited for policymaking environments characterized by complex trade-offs and diverse stakeholder perspectives [19]. Unlike traditional economic evaluation methods, MCDA enables a multidimensional assessment of alternatives

based on criteria such as feasibility, equity, social acceptability, and long-term system impact [20]. This makes it highly relevant for Iran, where policymakers must simultaneously address budget constraints, equity concerns, and the challenges of a transitioning health system [8]. For instance, MCDA allows for balancing the pursuit of cost-effective interventions with the ethical imperative of equitable access, an issue especially pertinent in underserved regions [13]. Although the importance of HTA has been increasingly recognized in LMICs, limited evidence exists on how to prioritize HTA development strategies in resource-constrained settings such as Iran [21]. Most prior studies have focused on high-income contexts or have not addressed the specific institutional and societal barriers relevant to Iran [22]. Meanwhile, countries like Thailand, South Africa, and Brazil provide examples of successful HTA institutionalization that can inform Iran's policy trajectory [12-14]. However, these examples also highlight that HTA institutionalization requires strong governance commitment, stable financing, and sustained capacity building, factors that must be critically assessed in Iran's context.

To address this gap, the present study employs an MCDA framework to identify and prioritize strategic actions for HTA development in Iran. By evaluating strategies against criteria such as feasibility, anticipated impact, and alignment with national health priorities, this research aims to generate actionable policy guidance for integrating HTA into the Iranian health decision-making ecosystem. The study also considers the ethical and social implications of HTA, particularly its potential to reduce disparities and improve population health outcomes, which are critical for achieving broad stakeholder support. Furthermore, this research acknowledges that HTA development is inherently shaped by political, organizational, and cultural factors and therefore seeks to provide recommendations that are operationally realistic within Iran's governance structure.

Methods

This study was conducted from May to November 2024 using a multi-stage, mixed-methods design to develop and validate a comprehensive checklist for prioritizing strategies for HTA development in Iran within an MCDA framework. The methodological approach was selected to ensure both theoretical rigor and practical relevance by integrating global best practices with contextual insights from national experts. The process involved four sequential stages: a systematic literature review, expert interviews, checklist development and validation, and pilot testing.

STAGE I: SYSTEMATIC LITERATURE REVIEW

A comprehensive systematic literature review (SLR) was undertaken to identify criteria and strategic actions used for HTA development in various countries. The review followed PRISMA guidelines to ensure methodological

transparency and reproducibility. Four major electronic databases, PubMed, Embase, Web of Science, and Scopus, were searched for studies published between 1990 and November 2024. The search strategy incorporated a combination of keywords and MeSH terms such as “health technology assessment,” “HTA framework,” and “HTA development” to allow for an inclusive search of both foundational and contemporary literature. Eligible studies were peer-reviewed articles, guidelines, and technical reports published in English that focused on HTA development, implementation, or evaluation strategies. Studies that lacked actionable criteria for HTA development or were irrelevant to LMIC contexts were excluded. Disagreements regarding study inclusion were addressed through consensus discussions, with a senior HTA expert (MaB) serving as an arbitrator when needed. Data were analyzed thematically using MAXQDA 13 software to code, categorize, and synthesize key themes. A third author (SA) arbitrated unresolved discrepancies. The extracted items were consolidated into a preliminary list, forming the foundation for further contextualization during subsequent stages.

STAGE 2: CONTEXTUALIZATION THROUGH EXPERT INTERVIEWS

To contextualize the preliminary checklist for Iran’s healthcare system, 25 semi-structured expert interviews were conducted using an interview guide specifically developed for this study. The inclusion of 25 experts is consistent with the typical size of HTA expert communities in LMICs, where specialized expertise is often limited, and reflects established sample ranges reported in previous methodological HTA studies. Derived from the SLR findings, the guide included open-ended questions to assess the relevance of each preliminary item and to allow experts to propose additions or modifications based on their professional experience. Experts were selected through purposive sampling to ensure diverse perspectives across regions, sectors, and expertise levels. Participants included policymakers, healthcare administrators, clinicians, and academics from both the public and private sectors. The interview guide was reviewed by two independent HTA researchers and piloted with two experts before data collection. Ethical approval was obtained from the Institutional Review Board of Lorestan University of Medical Sciences, and informed consent was secured from all participants. Interviews (60-90 minutes each) were conducted either in person or virtually, depending on participants’ availability. All interviews were audio recorded with consent, transcribed verbatim, and analyzed using MAXQDA 13. Two researchers independently coded the transcripts, and discrepancies were resolved through iterative discussions to ensure analytic rigor. The final interview guide is available in Table. S1.

STAGE 3: DEVELOPMENT AND VALIDATION OF THE COMPREHENSIVE CHECKLIST

Insights from the SLR and expert interviews were

synthesized to produce a comprehensive checklist intended to guide HTA development in Iran. To establish content validity, the checklist was reviewed by a panel of 10 experts representing diverse HTA-related backgrounds, including policymakers, healthcare managers, academic researchers, and clinicians. Panel members assessed the checklist’s clarity, completeness, and relevance, ensuring that it reflected both theoretical principles and practical requirements for HTA institutionalization. Panel feedback was systematically collected, analyzed, and incorporated into successive versions of the checklist. Recommendations to add missing items or refine existing ones were carefully integrated to ensure alignment with Iran’s health system needs and contextual realities. This iterative refinement process ensured that the final checklist maintained conceptual clarity while avoiding redundancy and excessive overlap across items.

STAGE 4: PILOT TESTING AND FINAL REFINEMENT OF THE CHECKLIST

A pilot test was conducted with seven HTA experts and policymakers who had not participated in earlier stages to evaluate the checklist’s reliability and practical usability. Participants were asked to apply the checklist to a hypothetical or historical HTA development scenario related to Iran, such as prioritizing new technologies or addressing regional disparities. Structured discussions and written evaluations were used to collect feedback on the checklist’s content, format, and usability. Based on these insights, minor revisions were made to enhance clarity and practicality. Reliability testing confirmed strong internal consistency (Cronbach’s alpha > 0.8) and inter-rater agreement (Cohen’s kappa > 0.7). The finalized checklist was subsequently disseminated to a broader group of 83 HTA experts and policymakers nationwide via a secure online platform. Dissemination through an online platform facilitated broader geographic and institutional representation, thereby improving the validity of the final scoring results.

EXPLANATION OF SCORING LEVELS

A structured three-level scoring system was developed to evaluate HTA development strategies. Scoring categories were defined through expert consensus, reflecting each item’s potential impact on cost-effectiveness, equity, and feasibility:

- High (85-100): strategies offering exceptional value, with strong evidence for reducing healthcare costs and improving population health; well-established and closely aligned with HTA goals;
- Moderate (60-84): strategies demonstrating meaningful improvements in efficiency and outcomes but requiring certain enabling conditions for optimal implementation;
- Low (40-59): Strategies with limited or uncertain effectiveness, often experimental or niche-specific.

This scoring structure was selected to balance discriminatory power with interpretability, ensuring that participants could meaningfully differentiate between high- and low-impact strategies.

STATISTICAL ANALYSIS

The MCDA framework was applied to integrate criterion scores and expert-assigned weights, producing a composite score for each item. Criterion weights were calculated as the mean of participant-assigned importance ratings. The composite score for each item was computed using the formula:

$$\text{Weighted Score (Item)} = \sum (\text{Mean Score for Strategies} \times \text{Weight for Criterion})$$

To support cross-item comparison, composite scores were normalized to a 0-100 scale. This quantitative approach enabled transparent and rigorous ranking of HTA development strategies by incorporating both performance scores and the relative importance of each criterion.

The eight MCDA criteria were identified through a combined process of systematic literature review and expert interviews, ensuring both theoretical grounding and contextual relevance. All initially identified criteria were subsequently reviewed and finalized through a structured expert consensus process, and no key criterion considered essential by experts was excluded. Additional criteria, such as political feasibility and organizational readiness, were discussed during the early stages of expert consultation; however, they were excluded due to substantial conceptual overlap with existing criteria and the need to maintain parsimony within the MCDA model. To evaluate robustness, sensitivity analyses were conducted by varying each criterion weight by $\pm 10\%$ from its baseline value rather than by absolute shifts, ensuring proportional adjustment relative to the original weighting structure. The ranking of top-priority strategies remained unchanged across all tested scenarios, demonstrating the stability of the MCDA outputs. Because MCDA inherently involves subjective judgments in scoring and weighting, the use of multiple expert groups, iterative consensus-building, and sensitivity testing helped mitigate subjectivity and enhance the reliability of the final prioritization results.

Results

The systematic literature review and expert interviews yielded a total of 15 strategies for advancing HTA development in Iran, covering a broad spectrum of activities aimed at strengthening HTA capacity and supporting its integration into the national healthcare system. The search process and extracted items are presented in the supplementary material (Tabs. S2-S3, Fig. S2). The identified strategies include conducting HTA-related research and innovation, developing comprehensive HTA guidelines, creating context-specific evaluation metrics, enhancing data infrastructure, improving stakeholder collaboration, ensuring equitable access to health technologies, establishing a centralized HTA authority, fostering international partnerships, integrating HTA into national policy processes, involving

Tab. 1. Mean weights of evaluation criteria for HTA development strategies in Iran.

Criteria	Weight
Cost-effectiveness	0.20
Equity in access	0.15
Feasibility of implementation	0.15
Impact on health outcomes	0.15
Stakeholder acceptance	0.15
Budget impact	0.10
Alignment with national priorities	0.05
Ethical and social acceptability	0.05

non-governmental organizations (NGOs), raising public awareness of HTA, securing sustainable funding, strengthening regulatory frameworks, improving transparency and accountability, and expanding training and capacity-building for HTA professionals.

To assess these strategies, eight evaluation criteria were identified based on participant feedback: alignment with national health priorities, budget impact, cost-effectiveness, ethical and social acceptability, equity in access, feasibility of implementation, impact on health outcomes, and stakeholder acceptance. Definitions of all criteria are provided in the supplementary material (Tab. S3). Table I displays the mean weights assigned to each criterion, reflecting participants' perspectives on the relative importance of various dimensions of HTA development. Alignment with national priorities and feasibility received the highest weights, emphasizing the importance of practical, context-sensitive strategies for Iran's healthcare environment. These weighting patterns underscore the extent to which policymakers prioritize institutional feasibility and national alignment over purely economic considerations when evaluating HTA development options.

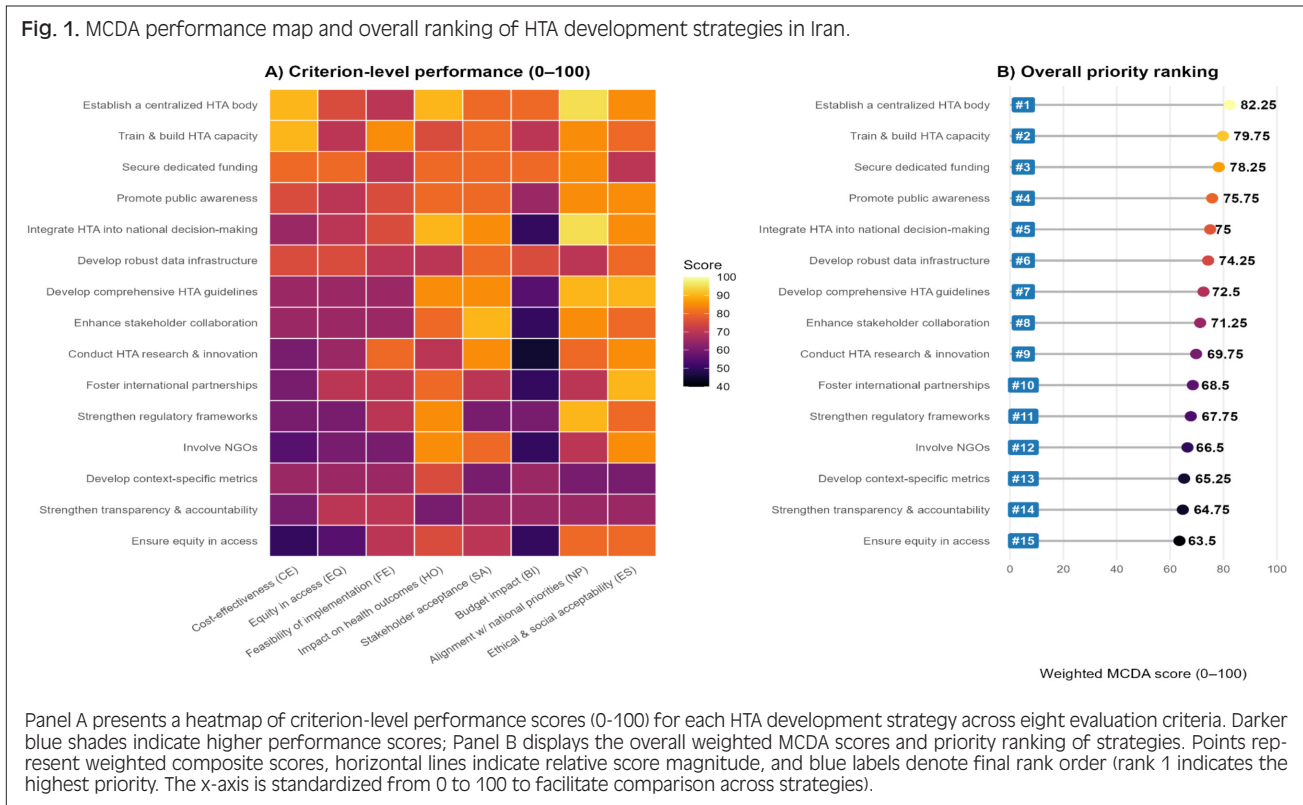
Using the MCDA framework, weighted scores were generated for each strategy and used to rank priorities (Tab. II). The assessment across the eight criteria is illustrated in Figure 1, which presents a heatmap visualizing the performance of each strategy. Darker intensities represent stronger alignment with a given criterion. Strategies such as establishing a centralized HTA body, building professional capacity, and securing dedicated funding scored consistently high across multiple dimensions, suggesting their foundational importance for effective HTA institutionalization in Iran. Among all strategies, establishing a centralized HTA body emerged as the top priority (weighted score: 82.25). This highlights the need for a unified governance mechanism to coordinate HTA activities and ensure methodological and procedural consistency. Training and capacity building for HTA professionals ranked second (79.75), underscoring the need to develop local technical expertise to sustain HTA functions. Securing dedicated funding for HTA activities ranked third (78.25), reflecting the importance of financial stability for long-term system development. Other high-priority strategies included promoting public awareness of HTA (75.75), integrating HTA into national

Tab. II. Mean Scores of HTA development strategies in Iran based on evaluation criteria.

Strategy	CE	EQ	FE	BI	SA	HO	NP	ES
Establish a centralized HTA body	90	75	70	80	80	90	95	85
Train & build HTA capacity	90	70	85	70	80	75	85	80
Secure dedicated funding	80	80	70	80	80	80	85	70
Promote public awareness	75	70	75	65	80	80	85	85
Integrate HTA into national decision-making	65	70	75	50	85	90	95	85
Develop robust data infrastructure	75	75	70	75	80	70	70	80
Develop comprehensive HTA guidelines	65	65	65	55	85	85	90	90
Enhance stakeholder collaboration	65	65	65	50	90	80	85	80
Conduct HTA research & innovation	60	65	80	45	85	70	80	85
Foster international partnerships	60	70	70	50	70	80	70	90
Strengthen regulatory frameworks	60	60	70	60	60	85	90	80
Involve NGOs	55	60	60	50	80	85	70	85
Ensure equity in access	50	55	70	50	70	75	80	80
Develop context-specific metrics	65	65	65	65	60	75	60	60
Strengthen transparency & accountability	60	70	70	65	65	60	65	65

CE: cost-effectiveness; EQ: equity in access; FE: feasibility; BI: budget impact; SA: stakeholder acceptance; HO: health outcomes; NP: alignment with national priorities; ES: ethical & social acceptability)

Fig. 1. MCDA performance map and overall ranking of HTA development strategies in Iran.



policymaking processes (75.00), and developing a robust national data infrastructure (74.25). Moderate-priority strategies included enhancing stakeholder engagement (71.25), strengthening HTA research and innovation (69.75), and expanding international partnerships (68.50). Lower-priority strategies, though still relevant, included strengthening regulatory frameworks (67.75), involving NGOs (66.50), developing context-specific evaluation metrics (65.25), improving transparency and accountability (64.75), and ensuring equitable access to health technologies (63.50).

The prioritization patterns illustrated in Figure 1 underscore the central role of governance, capacity building, and sustainable financing as prerequisites for effective HTA institutionalization in resource-constrained settings. Figure 1 summarizes the results of the MCDA by illustrating both criterion-level performance and overall prioritization of HTA development strategies. As shown in Panel A, foundational strategies such as establishing a centralized HTA body, strengthening workforce capacity, and securing dedicated funding demonstrated consistently high performance across

multiple criteria, particularly feasibility, alignment with national priorities, and impact on health outcomes. Panel B presents the overall weighted MCDA scores, highlighting the establishment of a centralized HTA body as the highest-ranked priority, followed by capacity building and sustainable funding. The clear separation observed between top- and lower-ranked strategies indicates a high level of expert consensus regarding the foundational requirements for HTA institutionalization in Iran.

SENSITIVITY ANALYSIS

A sensitivity analysis was performed to test the robustness of the MCDA results by systematically varying the weights assigned to the evaluation criteria. Multiple weighting scenarios, including ±10% proportional adjustments to each criterion, were simulated to reflect alternative stakeholder priorities. Unlike earlier exploratory analyses, the proportional adjustment approach ensured that changes to individual criteria remained consistent with the baseline structure of Table 1, thereby preventing artificial inflation or distortion of relative weights. For example, the weight for “alignment with national health priorities” (baseline = 0.05) was varied within a proportional ± 10% range (0.045-0.055), with corresponding adjustments applied to the remaining criteria. Similar sensitivity tests were conducted for feasibility, equity, cost-effectiveness, and other criteria. Across all weighting scenarios, the top-ranked strategies, establishing a centralized HTA body, strengthening HTA workforce capacity, and securing sustainable funding, remained unchanged, demonstrating the stability of the results. For instance, even when the weight for feasibility was reduced by 10%, or when the weight for equity was increased by 10%, the top three rankings remained

identical, indicating that the prioritization is not overly sensitive to small changes in criterion importance. Additionally, a threshold analysis identified the minimum weight required for each criterion to influence the ranking. For example, cost-effectiveness needed to increase to at least 0.25 of total weight before it could override the influence of feasibility or national alignment in determining top priorities, highlighting the structural dominance of feasibility-related considerations in Iran’s HTA context.

These findings collectively confirm the robustness of the MCDA model and demonstrate that the prioritization outcomes are not dependent on a narrow set of assumptions. Expanding the analysis to incorporate additional weighting scenarios and a wider range of stakeholder perspectives, particularly comparing results with international HTA systems such as Thailand and South Africa, could further enhance interpretability and policy relevance. Moreover, explicitly examining trade-offs, such as tensions between feasibility and equity, would enrich the policy discussion and better align the findings with global HTA best practices.

Discussion

This study applied an MCDA framework to identify and prioritize strategies for strengthening HTA in Iran, with the results emphasizing the fundamental importance of capacity-building and structural reforms. Strategies such as establishing a centralized HTA body, investing in professional training, and securing dedicated funding emerged as the highest-ranked priorities. These findings underscore the need for institutionalization, stable financing, and systematic capacity development as

Tab. III. Roadmap for short-, medium-, and long-term strategies for HTA development in Iran.

Timeline	Strategic objectives	Key policy actions	Responsible organizations
Short-term (1-2 years)	Establish governance foundations for HTA	<ul style="list-style-type: none"> • Create a centralized national HTA body via MoHME decree or legislation • Define mandate, governance structure, and operating procedures • Begin dedicated budget allocation for HTA activities 	MoHME, Parliament, IFDA, National Insurance Organizations, Universities
Medium-term (3-5 years)	Integrate HTA into routine policy processes	<ul style="list-style-type: none"> • Embed HTA into technology approval, benefits package design, pricing & reimbursement • Develop national HTA guidelines and context-specific evaluation metrics • Strengthen data infrastructure (registries, cost data, utilization databases) • Expand stakeholder engagement mechanisms 	MoHME, IFDA, Insurance Council, National Data Center, Professional Associations
Long-term (5+ years)	Institutionalize HTA and expand its social legitimacy	<ul style="list-style-type: none"> • Link HTA outputs to annual resource allocation and priority-setting cycles • Implement HTA-based equity-focused interventions • Develop participatory HTA models (community-based, deliberative panels) • Strengthen transparency & accountability mechanisms 	MoHME, HTA Authority, Parliament Budget Office, NGOs, Universities, International Partners

essential prerequisites for embedding HTA into Iran's health decision-making processes. In particular, the consistent ranking of these foundational strategies across multiple weighting scenarios indicates that they represent core system requirements rather than optional enhancements.

The prioritization of establishing a centralized HTA body as the top-ranked strategy is consistent with international experiences, where national HTA agencies have played a pivotal role in coordinating activities and ensuring methodological consistency in decision-making [23]. Thailand provides a well-studied example: the establishment of a dedicated HTA body under its Ministry of Public Health has facilitated the evaluation of health technologies and informed national benefit-package decisions. Thailand's achievements, underpinned by strong political commitment, international partnerships, and deliberate investments in capacity building, offer several relevant lessons for Iran [24]. Similarly, South Africa's efforts to integrate HTA into national policy processes have advanced the adoption of cost-effective interventions and reduced inequities in access to healthcare [25]. These cases highlight that long-term political commitment, dedicated financial resources, and sustained technical capacity are indispensable components of successful HTA institutionalization.

China's experience further illustrates how HTA development can be closely tied to broader health sector reforms aimed at improving efficiency and equity. The creation of a centralized HTA mechanism in China has facilitated systematic evaluation of clinical and economic evidence and strengthened alignment with national priorities [26]. International collaborations have also played a key role in expanding China's HTA capacity, highlighting the value of global partnerships for resource-limited settings like Iran [27]. Turkey has likewise established a formal HTA structure that informs national policy, and its experience further demonstrates the benefits of leveraging international collaborations and institutional partnerships to build capacity [28].

Egypt has focused its HTA development efforts on building local technical expertise and embedding HTA into decision-making processes, supported by international organizations [29]. Jordan has also made progress by establishing a centralized HTA body that guides national evaluation efforts and policy decisions [30]. Both cases underscore the importance of political support and sustained financial investment, factors that are equally critical for Iran. These examples also demonstrate that HTA development is not a linear process; instead, it evolves through iterative cycles of institutional learning, stakeholder negotiation, and policy adaptation.

Malawi offers an instructive example from sub-Saharan Africa. Although some HTA-related functions exist within national bodies such as the Ministry of Health Senior Management Team and the Pharmacy and Medicines Regulatory Authority, these mechanisms remain fragmented and informal [7, 11]. Institutionalizing HTA in Malawi would require stronger political will,

dedicated financing, and systematic capacity building, challenges that mirror Iran's context. In India, a national HTA initiative has been established to promote the generation of local evidence for decision-making, illustrating the importance of developing context-specific HTA frameworks in large and diverse health systems [31].

Indonesia has integrated HTA into its national health insurance system to support decision-making on medicines and medical devices, demonstrating the importance of aligning HTA with universal health coverage (UHC) reforms [32, 33]. Brazil, through its national HTA commission, has underscored the need for stakeholder involvement and transparency, elements that can enhance trust and legitimacy in HTA processes [34]. Other South American countries, including Colombia and Argentina, have used HTA to guide decisions on the adoption of new technologies within public health programs [35]. These countries have invested in capacity-building initiatives and institutionalizing HTA processes, highlighting the value of long-term commitment and stakeholder engagement [36]. Taken together, these international experiences demonstrate that HTA development requires context-sensitive strategies that align with institutional capabilities, political environments, and health system goals [37]. Conversely, countries lacking centralized HTA bodies frequently face fragmented processes and limited progress, a challenge also encountered in Iran [38]. Context-specific evaluation methods and capacity-building initiatives have been recommended in such settings [8], emphasizing the relevance of tailored approaches for Iran's socio-political and economic environment. Furthermore, international evidence suggests that failure to build strong governance structures and institutional accountability mechanisms can lead to HTA systems that function symbolically rather than substantively, an important cautionary insight for Iran.

The findings of this study provide a clear roadmap for HTA development in Iran. In the short term, establishing a centralized HTA authority, investing in workforce development, and securing dedicated funding should be prioritized [1]. These foundational steps would help lay the groundwork for a stable and effective HTA system. Over the longer term, enhancing stakeholder engagement and addressing equity issues will be critical for ensuring the ethical and social acceptability of HTA recommendations [5]. Importantly, the prioritization results reveal systematic trade-offs: strategies with high cost-effectiveness did not always score strongly on equity or feasibility, suggesting that policymakers will need to balance technical optimization with social and political realities.

The highest-ranked strategies, establishing a centralized HTA body and investing in professional training, offer actionable pathways for integrating HTA into national decision-making [39]. Creating such a body would require legislative support and dedicated resources, but it could serve as a central institution for coordinating activities, setting national priorities, and ensuring

consistency in HTA methodologies [7]. It would also strengthen stakeholder engagement, which is essential for the acceptability and uptake of HTA recommendations. Likewise, building a skilled HTA workforce is vital for sustaining system functions over time. Training programs could be developed in collaboration with academic institutions, international organizations, and established HTA agencies in other countries [40]. Integrating HTA into university curricula would also help create a pipeline of competent professionals [29]. However, workforce expansion must be accompanied by institutional reforms that clarify career pathways, ensure retention, and create incentives for technical excellence. Ensuring sustainable financing is another priority. Dedicated funding sources could include government budgets, public-private partnerships, or international grants [41]. Participation in global health initiatives may also provide opportunities to secure financial resources for HTA development [8]. Lower-priority strategies, such as strengthening transparency, improving regulatory frameworks, and promoting equity, are nonetheless essential for enhancing the legitimacy and fairness of HTA processes [42]. Pilot initiatives, such as community-based HTA or participatory decision-making approaches, could support progress in these areas [43]. These lower-ranked strategies, while not immediate priorities, represent important long-term commitments necessary to ensure the social and ethical robustness of HTA institutionalization. This study contributes to the growing evidence base on HTA development in LMICs by offering a comprehensive framework for prioritizing strategies tailored to Iran's context. Beyond identifying immediate priorities, it provides insights relevant to other countries with similar institutional and economic challenges. Nonetheless, the study has limitations. Potential biases may have arisen from expert selection, and the MCDA approach inherently involves some subjectivity, particularly in weight assignments. Although multiple layers of triangulation and consensus-building were used to mitigate subjectivity, MCDA outputs inevitably reflect stakeholder perspectives and therefore should be interpreted as one input, rather than the sole determinant in policymaking. Future research could address these limitations by employing alternative multi-criteria approaches, such as Delphi or the analytic hierarchy process to validate results. Comparative studies across multiple LMICs could also deepen understanding of how contextual differences shape HTA development trajectories and enhance the generalizability of MCDA-based prioritization frameworks.

Policy implications

The prioritized strategies identified in this study offer a clear, actionable roadmap for integrating HTA into Iran's health system. Operationalizing these strategies requires coordinated action across key governmental and technical institutions. In the short term (1-2 years), the MoHME should initiate the establishment of a centralized HTA authority through formal legislation or ministerial

decree, defining its mandate, governance structure, and relationships with insurance organizations and regulatory bodies. Concurrently, universities and professional associations should begin developing standardized HTA training programs and accredited courses to expand the national HTA workforce. Establishing early-phase pilot units within selected medical universities or major insurance organizations could provide an initial testing ground for HTA processes before nationwide rollout. In the medium term (3-5 years), HTA processes should be embedded within routine decision-making frameworks of MoHME, the Iranian Food and Drug Administration (IFDA), and major health insurance organizations. Strengthening national data systems, including clinical registries, cost databases, and technology utilization records, will be critical for enabling high-quality HTA analyses. Expanding stakeholder engagement mechanisms, such as consultation platforms with clinicians, NGOs, patient groups, and private-sector actors, will enhance transparency and foster broader acceptance of HTA recommendations. Developing standardized HTA submission pathways for industry and establishing formal consultation procedures can further institutionalize these mechanisms and reduce ambiguity in evidence requirements.

In the long term (5+ years), integrating HTA into national priority-setting cycles and health sector budgeting can promote more equitable and efficient allocation of resources. Institutionalizing periodic evaluation of HTA performance and adopting participatory models, such as community-based HTA or deliberative decision-making, can further strengthen social legitimacy. Aligning Iran's HTA system with successful international experiences, particularly in LMICs, will support ongoing capacity building, benchmarking, and collaboration. Long-term sustainability will also require embedding HTA into regulatory and reimbursement cycles, ensuring that all major clinical or technological investments undergo systematic assessment before approval or inclusion in benefit packages. Taken together, these policy actions provide a feasible implementation pathway that can enhance governance, transparency, and evidence use within Iran's health system. A summarized roadmap outlining the recommended short-, medium-, and long-term actions for HTA development in Iran is presented in Table III to provide policymakers with a clear implementation pathway.

Limitations

While this study provides important insights into HTA development strategies in Iran, several limitations must be acknowledged. First, relying on expert opinions introduces potential bias, as participants' perspectives may reflect their institutional backgrounds and prior experiences. Future studies would benefit from including a broader range of stakeholders, such as patients, civil society groups, and community representatives, to capture a more diverse set of views.

Second, the use of hypothetical scenarios during pilot testing may not fully reflect the complexities of real-world HTA implementation. Applying the prioritized strategies in practical settings or conducting case studies could provide stronger evidence of feasibility and impact. Additionally, the generalizability of these findings is constrained by Iran's unique socio-political and economic context. However, the findings may still help inform HTA development pathways in other resource-limited settings with comparable governance structures and implementation challenges. Future comparative research across multiple LMICs could further clarify which elements of HTA system design are universally applicable and which require tailoring to local institutional realities. Finally, although the MCDA framework offers a systematic and transparent approach to priority setting, it involves subjective judgment in assigning weights to criteria. Although sensitivity analyses demonstrated robustness, further empirical validation using complementary methods, such as Delphi processes, analytic hierarchy process (AHP), or real-world implementation studies, would strengthen the evidence base. Moreover, as HTA systems evolve, periodic reassessment of criteria weights may be necessary to reflect shifting national priorities, technological advances, and stakeholder expectations.

Conclusion

This study offers a structured and evidence-informed framework for prioritizing HTA development strategies in Iran. By highlighting foundational actions, such as establishing a centralized HTA authority, strengthening workforce capacity, and securing sustainable funding, the findings provide a roadmap for integrating HTA into national health decision-making processes. Effective implementation of these strategies has the potential to enhance efficiency, equity, transparency, and overall health system performance. The prioritization results also underscore the importance of aligning HTA system development with broader health sector reforms, ensuring that institutional, financial, and human resources evolve in parallel. Furthermore, the MCDA approach applied in this study demonstrates its value as a practical and adaptable tool for guiding policy decisions in resource-constrained environments. Beyond Iran, the prioritized strategies and methodological approach may also inform HTA development in other low- and middle-income countries facing similar governance constraints and resource limitations. As LMICs increasingly adopt evidence-informed health policies, structured priority-setting tools such as MCDA can provide a transparent and participatory foundation for technology adoption and reimbursement decisions. Overall, this research contributes to both the national policy discourse and the global understanding of HTA institutionalization in LMICs, offering actionable insights for policymakers, practitioners, and researchers seeking to strengthen the use of evidence in health system reform. Continued

investment in HTA governance, capacity, and data systems will be essential to ensure that the momentum generated by this study translates into long-term improvements in health outcomes and resource allocation.

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Ethics approval and consent to participate

This study was approved by the Ethics Committee of Lorestan University of Medical Sciences (IR.LUMS.REC.1402.310). All methods were carried out in accordance with the ethical principles of the Declaration of Helsinki. All participants were informed about the study objectives, assured of confidentiality, and provided written informed consent before participation. Participation was voluntary, and participants could withdraw at any time without consequences.

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Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to institutional restrictions but are available from the corresponding author upon reasonable request.

Competing interests statement

The authors declare that they have no competing interests.

Authors' contributions

MaB, SA, AB: conceptualized the study. MaB, MeB, AB, SS: contributed to data acquisition and analysis. All authors: participated in data interpretation. MaB, SS, MM: drafted sections of the manuscript, and all authors reviewed, revised, and approved the final version; MM: editing. All authors are accountable for the accuracy and integrity of the work.

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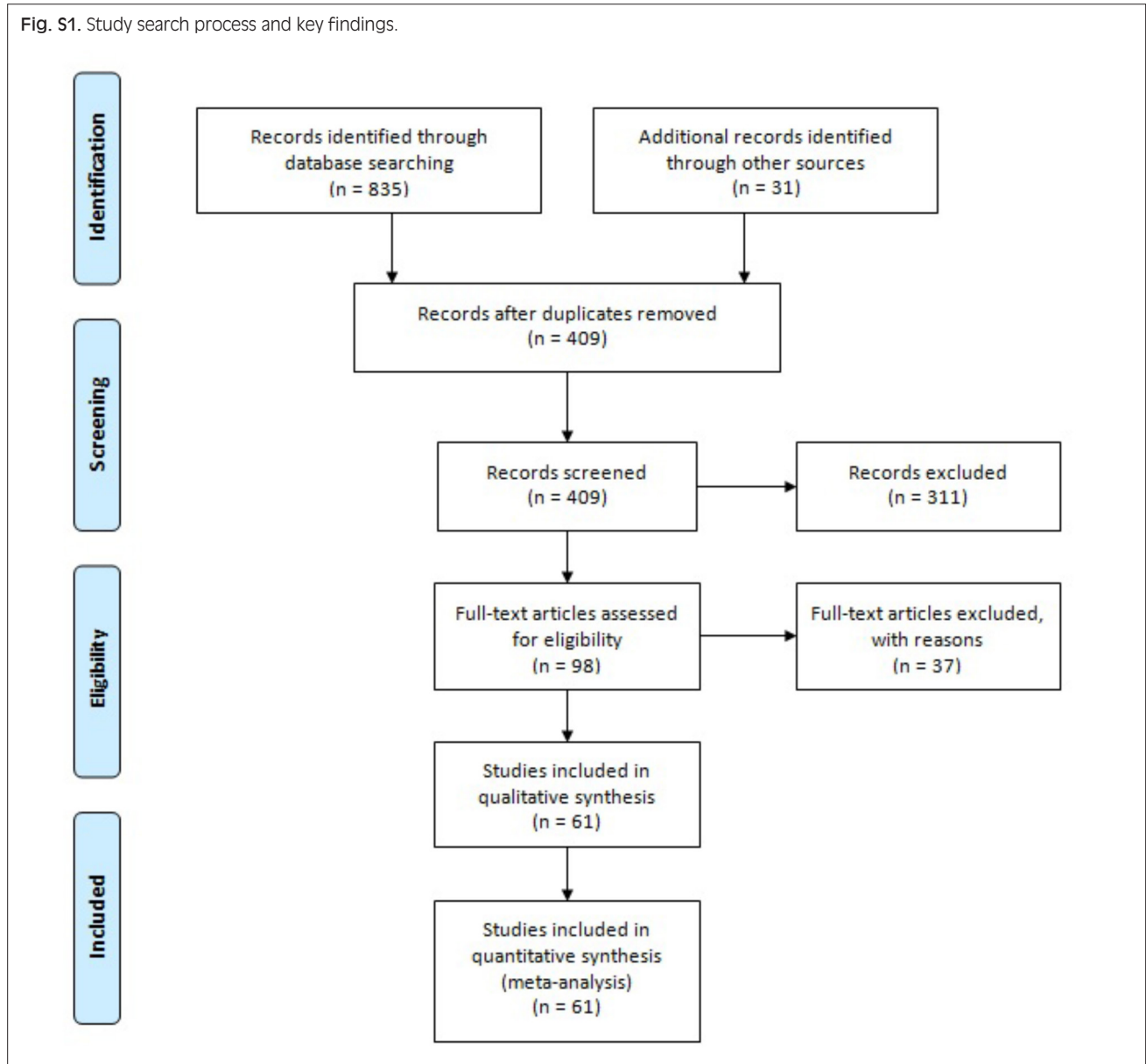
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Supplementary material

Fig. S1. Study search process and key findings.



Tab. S1. Interview guide for prioritizing HTA development strategies in Iran.

Interview Guide for Prioritizing HTA Development Strategies in Iran
Introduction: Thank you for participating in this study. The purpose of this interview is to gather your expert insights on the relevance and applicability of strategies for Health Technology Assessment (HTA) development in Iran. Your input will help refine and prioritize these strategies to better align with Iran’s healthcare system and priorities.
Section 1: background information
1. Can you briefly describe your professional background and experience with HTA or healthcare policy?
2. In your opinion, what are the most pressing challenges for HTA development in Iran?
Section 2: evaluation of HTA development strategies
1. Based on our preliminary findings, we have identified 15 strategies for HTA development in Iran. I will now share these strategies with you. For each strategy, please evaluate its relevance and applicability to Iran’s healthcare system using the following criteria:
• Alignment with national health priorities
• Budget impact
• Cost-effectiveness
• Ethical and social acceptability
• Equity in access
• Feasibility of implementation
• Impact on health outcomes
• Stakeholder acceptance
Strategies:
• Establishing a centralized HTA body
- How relevant is this strategy to Iran’s context?
- What are the potential challenges or barriers to implementing this strategy?
• Training and capacity building for HTA professionals
- How critical is this strategy for sustaining HTA initiatives in Iran?
- What specific areas of training should be prioritized?
• Securing dedicated funding for HTA activities
- How feasible is this strategy given Iran’s current healthcare financing system?
- What funding mechanisms would you recommend?
• Promoting public awareness of HTA
- How important is public awareness for the success of HTA in Iran?
- What methods would be most effective for raising awareness?
• Integrating HTA into national policy and decision-making
- How can HTA be effectively integrated into Iran’s policy-making processes?
- What are the potential barriers to this integration?
• Developing a robust data infrastructure
- How critical is data infrastructure for HTA development in Iran?
- What steps should be taken to strengthen data systems?
• Enhancing stakeholder collaboration
- Which stakeholders should be involved in HTA development, and how can their collaboration be improved?
• Conducting HTA research and innovation
- What areas of HTA research should be prioritized in Iran?
• Fostering international partnerships
- How can international partnerships support HTA development in Iran?
• Ensuring equity in access to health technologies
- How can equity be ensured in the implementation of HTA strategies?
• Involving non-governmental organizations (NGOs)
- What role can NGOs play in HTA development in Iran?
• Developing context-specific evaluation metrics
- What specific metrics should be developed for Iran’s context?
• Strengthening transparency and accountability
- How can transparency and accountability be improved in HTA processes?
• Strengthening regulatory frameworks
- What regulatory changes are needed to support HTA development?
2. Are there any additional strategies that should be considered for HTA development in Iran?
Section 3: Prioritization and Scoring
1. Based on your experience, how would you prioritize the strategies in terms of their potential impact on cost-effectiveness, equity, and feasibility in Iran?



Tab. S1. (follows).

2. For each strategy, please assign a score (0–100) based on the following criteria:
• with national health priorities
• Budget impact
• Cost-effectiveness
• Ethical and social acceptability
• in access
• Feasibility of implementation
• Impact on health outcomes
• Stakeholder acceptance
3. Are there any specific conditions or challenges in Iran that might affect the implementation of these strategies?
Section 4: additional Insights
1. Do you have any additional suggestions or recommendations for improving the prioritization of HTA development strategies in Iran?
Thank you for your time and valuable insights. Your contributions will significantly enhance the development of a contextually relevant HTA framework for Iran.

Tab. S2. Main findings.

<ul style="list-style-type: none"> Health Technology Assessment (HTA) is increasingly being adopted in low- and middle-income countries (LMICs) to support healthcare decision-making. Traditionally led by high-income countries (HICs), HTA is now gaining traction in least-developed and lower-middle-income countries (LLMICs) to optimize resource allocation and improve patient outcomes. However, the implementation faces challenges such as limited funding, insufficient local expertise, and fragmented processes.
<ul style="list-style-type: none"> Governments and policymakers must prioritize investments in capacity-building and institutional frameworks to sustain HTA as a strategic decision-making tool. Strengthening these aspects can ensure that HTA remains relevant and effectively supports healthcare policy decisions in LLMICs.
<ul style="list-style-type: none"> Multi-sectoral collaborations are crucial for the successful development of HTA in LLMICs. Many countries lack formal HTA agencies, making partnerships with universities, international organizations, and non-governmental entities essential. These collaborations facilitate knowledge sharing, technical assistance, and policy advocacy.
<ul style="list-style-type: none"> Engaging the private sector in HTA discussions can enhance the efficiency and sustainability of health interventions. Policymakers should create regulatory frameworks that support transparent and evidence-based decision-making by fostering strong linkages between HTA stakeholders.
<ul style="list-style-type: none"> Despite progress in HTA adoption, gaps remain in its application for disinvestment – phasing out ineffective or obsolete health interventions. Many health systems still allocate resources to low-value technologies, limiting cost-effectiveness. Addressing these inefficiencies is essential for optimizing resource utilization.
<ul style="list-style-type: none"> Early HTA, which evaluates health technologies before large-scale implementation, is underutilized in many LMICs. To strengthen HTA's impact, governments should incorporate mechanisms for continuous reassessment and refine disinvestment strategies to ensure funds are directed toward high-impact healthcare solutions.
<ul style="list-style-type: none"> Most HTA applications in LLMICs focus on evaluating pharmaceuticals and medical devices, often overlooking system-level interventions. These include health service delivery models, referral pathways, and workforce training. Expanding HTA beyond technology-based solutions can yield significant public health benefits.
<ul style="list-style-type: none"> Governments should integrate HTA into national health planning processes to guide policy decisions that enhance healthcare efficiency, equity, and access. This broader application of HTA can improve overall health system performance.
<ul style="list-style-type: none"> For HTA to reach its full potential in LLMICs, it must align with universal health coverage (UHC) objectives. Sustainable funding, political commitment, and technical capacity-building are critical for institutionalizing HTA in health policy frameworks.
<ul style="list-style-type: none"> Regional cooperation can facilitate the exchange of best practices and accelerate HTA adoption. Future efforts should focus on integrating HTA with financial planning, expanding its scope to include social and ethical considerations, and developing long-term strategies for evidence-informed policymaking.
<ul style="list-style-type: none"> Adaptive Health Technology Assessment (aHTA) offers a practical solution for LMICs to implement evidence-based healthcare decisions despite resource constraints. Adaptive methods, such as expedited reviews, international data adaptation, literature synthesis, price benchmarking, and simplified modeling, can help policymakers make timely decisions.
<ul style="list-style-type: none"> These approaches allow countries to leverage existing global evidence while customizing it to their local healthcare contexts. For health systems looking to establish HTA, starting with adaptive methods can provide an initial framework to build capacity and institutionalize robust decision-making processes over time.
<ul style="list-style-type: none"> Despite its advantages, aHTA has limitations. A major challenge is the transferability of international data, as healthcare costs, patient demographics, and clinical guidelines vary across regions. Without proper adaptation and validation, reliance on global evidence may lead to suboptimal policy decisions.
<ul style="list-style-type: none"> Additionally, aHTA does not always foster long-term capacity building in health economics and policy analysis, which are essential for sustainable HTA institutionalization. To mitigate these challenges, health systems should invest in training local experts and data collection efforts to transition from adaptive to full-scale HTA processes.



Tab. S2. (follows).

<ul style="list-style-type: none"> HTA should not replace traditional HTA but serve as a complementary tool within a broader evidence-based policy framework. LMICs can use aHTA strategically to assess well-established technologies and prioritize cost-effective interventions while allocating resources for comprehensive HTA evaluations when dealing with complex technologies.
<ul style="list-style-type: none"> To implement aHTA effectively, governance structures and standardized processes should be established to enhance transparency and credibility. Collaborating with international HTA agencies and academic institutions can bridge technical capacity gaps.
<ul style="list-style-type: none"> Engaging a wide range of stakeholders, including clinicians, policymakers, and patient representatives, can improve the contextual relevance of aHTA recommendations. Integrating aHTA findings into national health policy discussions will ensure meaningful contributions to healthcare priority setting.
<ul style="list-style-type: none"> HTA has proven to be a critical tool for improving healthcare decision-making in LMICs. Countries that have successfully integrated HTA, such as Thailand and Brazil, have achieved significant cost savings and improved resource allocation.
<ul style="list-style-type: none"> However, many LMICs still face barriers in implementing HTA, including limited institutional capacity, lack of funding, and weak regulatory frameworks. To address these barriers, health systems should consider flexible and adaptive HTA approaches that enable pragmatic decision-making while building long-term institutional capacity.
<ul style="list-style-type: none"> Agile leapfrogging is one strategy that allows LMICs to bypass traditional, resource-intensive HTA processes and instead adopt adaptive methodologies. This approach enables HTA assessments of entire health benefit packages rather than individual technologies.
<ul style="list-style-type: none"> Localization of HTA processes is essential for shifting decision-making authority from external donors to national institutions. Greater country ownership enhances accountability, ensures alignment with local needs, and reduces dependency on external funding.
<ul style="list-style-type: none"> Regional collaboration can address challenges such as data scarcity and technical expertise shortages. Instead of establishing separate HTA agencies in each country, regional networks can pool resources, share best practices, and conduct joint evaluations of health technologies.
<ul style="list-style-type: none"> The case studies of Thailand’s HITAP and the UK’s NICE highlight that HTA is not just a technical process but also a policy tool requiring institutional support, stakeholder engagement, and political commitment. Countries must integrate HTA into national health policies to improve efficiency and equity.
<ul style="list-style-type: none"> Ultimately, the sustainability of HTA depends on long-term political commitment and institutionalization. Governments must commit to funding HTA activities, embedding them in policy structures, and ensuring systematic application in decision-making. By doing so, LMICs can achieve efficient, evidence-based healthcare investments that improve population health outcomes.

Tab. S3. Definitions and details of evaluation criteria for HTA development strategies.

Criterion	Definition
Alignment with National Health Priorities	The extent to which the strategy aligns with Iran’s overarching health goals, policies, and priorities, ensuring that HTA development supports the country’s most pressing healthcare needs and objectives.
Budget impact	The financial implications of implementing the strategy, including its potential to affect healthcare expenditures, resource allocation, and the overall budget of the healthcare system.
Cost-effectiveness	The degree to which the strategy provides value for money by comparing the costs of implementation with the health benefits achieved, ensuring efficient use of limited resources.
Ethical and social acceptability	The extent to which the strategy adheres to ethical principles and is socially acceptable to stakeholders, including patients, healthcare providers, and the general public.
Equity in access	The degree to which the strategy promotes fair and equitable access to health technologies across different population groups, reducing disparities and ensuring inclusivity.
Feasibility of implementation	The practicality of implementing the strategy within Iran’s healthcare system, considering factors such as available resources, infrastructure, technical capacity, and political will.
Impact on health outcomes	The potential of the strategy to improve health outcomes, such as reducing morbidity and mortality, enhancing quality of life, and addressing key health challenges in the population.
Stakeholder acceptance	The level of support and approval for the strategy among key stakeholders, including policymakers, healthcare providers, patients, and other relevant groups, ensuring broad-based buy-in and collaboration.