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Cost-Effectiveness Analysis of Universal Health Coverage Expansion in Middle-Income Countries: A Systematic Review

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ABSTRACT

Background: Universal health coverage (UHC) has become the dominant organizing framework for health system reform in middle-income countries, yet the cost-effectiveness of major coverage-expansion programs, and the financing architectures that best deliver it, remain contested. Objective: To synthesize the empirical and methodological literature on the cost-effectiveness of UHC expansion in middle-income countries, spanning country-level program evaluations and cross-national methodological contributions on cost-effectiveness thresholds and extended cost-effectiveness analysis (ECEA). Methods: A narrative systematic review of peer-reviewed literature on health, utilization, financial-protection, and cost-effectiveness outcomes associated with national UHC expansion programs in middle-income countries (Thailand's Universal Coverage Scheme, Mexico's Seguro Popular, Indonesia's Jaminan Kesehatan Nasional, Rwanda's Mutuelles de Santé, Ghana's National Health Insurance Scheme, Turkey's Health Transformation Program, and multi-country Latin American and Southeast Asian evidence), together with methodological literature on cost-effectiveness thresholds and ECEA. Twenty-two studies met inclusion criteria. Findings: UHC expansion consistently generated substantial gains in financial risk protection across virtually all programs reviewed, with out-of-pocket expenditure shares and catastrophic health expenditure incidence falling markedly following reform (e.g., Thailand's out-of-pocket share fell from approximately 45% to below 15% of total health expenditure). Population health outcome improvements were more variable and slower to materialize than financial-protection gains. Mandatory, general-revenue-financed models (Thailand, Turkey, Malaysia) achieved substantially higher and more equitable coverage than voluntary, contributory community-based or informal-sector schemes (parts of Ghana, Rwanda, and Cambodia), which faced adverse selection and narrow revenue bases. Supply-side capacity constraints limited translation of insurance coverage into realized health gains in several settings, most clearly in Mexico and Indonesia. Methodologically, the field has shifted away from the traditional 1-3x GDP-per-capita cost-effectiveness threshold toward empirically derived, country-specific thresholds that are frequently lower, with extended cost-effectiveness analysis emerging as a more complete framework for valuing UHC financing decisions across health, financial-protection, and equity dimensions. Conclusions: UHC expansion in middle-income countries delivers robust financial protection benefits and more heterogeneous health gains, with cost-effectiveness strongly conditioned by financing architecture and complementary supply-side investment. Wider adoption of empirically grounded thresholds, extended cost-effectiveness analysis, and more rigorous evaluation designs is needed to guide future benefit-package and financing decisions.

Keywords: *universal health coverage; cost-effectiveness analysis; health financing; middle-income countries; health insurance*

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Introduction

Universal health coverage (UHC) — defined as access for all people to the health services they need, of sufficient quality to be effective, without exposing users to financial hardship — has become the organizing framework for health system reform across low- and middle-income countries (LMICs) since its endorsement in the 2005 World Health Assembly resolution and its later incorporation into Sustainable Development Goal (SDG) target 3.8. Middle-income countries occupy a distinctive position in this global movement: unlike low-income countries, which typically depend heavily on external assistance and a narrow package of donor-prioritized interventions, middle-income countries generally finance UHC expansion predominantly from domestic general revenues or contributory social insurance, and they possess enough administrative and fiscal capacity to design

nationally owned benefit packages, provider payment systems, and purchasing arrangements [1]. Thailand's Universal Coverage Scheme (UCS), Mexico's Seguro Popular, Indonesia's Jaminan Kesehatan Nasional (JKN), Rwanda's community-based health insurance (Mutuelles de Santé), Ghana's National Health Insurance Scheme (NHIS), Turkey's Health Transformation Program, and a series of Latin American reforms collectively constitute the empirical core of what has become known as the "middle-income country UHC transition" [2,3].

Two questions dominate the policy and academic literature on this transition. The first is whether UHC expansion delivers commensurate health gains and financial protection relative to its fiscal cost — that is, whether it is cost-effective in the health-economic sense of yielding acceptable incremental cost-effectiveness ratios (ICERs) or cost per disability-adjusted life-year (DALY) averted relative to a defensible willingness-to-pay threshold [4,5]. The second is a broader question about the productive efficiency of UHC financing architectures themselves: which institutional models (tax-funded single-payer schemes, social health insurance, community-based risk pooling, or hybrid arrangements) generate the largest health and equity returns per unit of expenditure. These two questions are conceptually distinct — the first concerns intervention-level cost-effectiveness within a benefits package, the second concerns system-level allocative efficiency of financing architecture — but the applied literature on UHC in middle-income countries frequently addresses both simultaneously, since coverage expansions are typically evaluated using a combination of population health outcome trends, catastrophic health expenditure indicators, and, less commonly, formal economic evaluation.

This review synthesizes the empirical and methodological literature on the cost-effectiveness of UHC expansion in middle-income countries, drawing on country-level implementation evaluations, cross-national comparative studies, and methodological contributions on cost-effectiveness thresholds and extended cost-effectiveness analysis (ECEA). Its objectives are threefold: (1) to characterize the empirical evidence on the health, financial protection, and cost outcomes of major UHC expansion programs in middle-income countries; (2) to summarize the methodological debate over appropriate cost-effectiveness thresholds for LMIC decision-making, including the shift away from the traditional 1–3× GDP-per-capita heuristic; and (3) to identify persistent evidence gaps that limit confident generalization about the cost-effectiveness of UHC expansion as a policy instrument.

Methods

This is a narrative systematic review rather than a quantitative meta-analysis, reflecting the heterogeneity of study designs, outcome metrics, and national contexts found in the UHC cost-effectiveness literature — a heterogeneity that precludes meaningful pooling of ICERs or effect sizes across country programs. The review was informed by structured searches of PubMed/MEDLINE, the Lancet and Lancet Global Health archives, PLOS journals, Value in Health, PharmacoEconomics, and American Journal of Public Health, together with citation tracking from key health-financing syntheses (the Disease Control Priorities, 3rd edition [DCP3] volumes; the Lancet Latin America and Thailand health-system series). Search terms combined "universal health coverage," "health insurance," "cost-effectiveness," "cost-effectiveness threshold," "incremental cost-effectiveness ratio," "extended cost-effectiveness analysis," and country- or scheme-specific terms (Seguro Popular, Universal Coverage Scheme, Jaminan Kesehatan Nasional, Mutuelles de Santé, National Health Insurance Scheme, Health Transformation Program).

Eligible studies were peer-reviewed articles reporting empirical outcomes (health, utilization, financial protection, or formal cost-effectiveness metrics) associated with a national or subnational UHC expansion program in a World Bank–classified middle-income country, or methodological papers establishing frameworks for cost-effectiveness threshold determination or extended cost-effectiveness analysis applicable to UHC decision-making in LMICs. Studies confined to high-income country settings, single-disease cost-effectiveness analyses unconnected to a UHC financing reform, and non-peer-reviewed grey literature were excluded, with the exception of internationally recognized technical reports embedded within peer-reviewed synthesis papers (e.g., DCP3-derived Lancet and Lancet Global Health papers). Twenty-two studies met these criteria and form the evidence base synthesized below. Findings are organized thematically by country/region — Thailand, Mexico, Indonesia, Sub-Saharan Africa (Rwanda, Ghana, and multi-country West African evidence), Turkey and Latin America, and Vietnam/Southeast Asia — followed by a dedicated section on cost-effectiveness threshold methodology, before a discussion that integrates cross-cutting themes.

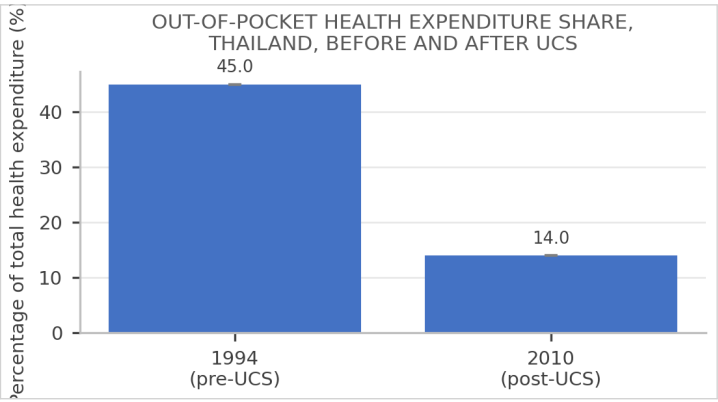
Thailand: The Universal Coverage Scheme and Systemic Cost-Effectiveness

Thailand's 2002 Universal Coverage Scheme is the most frequently cited example of successful, domestically financed UHC expansion in a middle-income setting, having been introduced when Thailand's gross national income per capita was approximately US$1,900 [6]. Monitoring data assembled from national household surveys show that direct out-of-pocket payments fell from approximately 45% of total health expenditure in 1994 to below 15% by 2010, with parallel declines in the incidence of catastrophic health expenditure and medical impoverishment, and disproportionately large increases in outpatient service utilization among the poorest income quintile relative to wealthier groups [6]. These outcomes were achieved through a locally financed, general-revenue-funded, capitation-based purchasing model that explicitly avoided donor dependency, a design feature widely credited with the scheme's long-run political and fiscal sustainability [6,1].

From a cost-effectiveness perspective, the UCS is notable less for a single headline ICER than for its systemic approach to priority-setting: Thailand's National List of Essential Medicines and its Health Intervention and Technology Assessment Program embed formal cost-effectiveness analysis directly into benefit package decisions, using an explicit cost-per-DALY-averted threshold to determine which interventions are included. This institutionalization of health technology assessment (HTA) within the UHC governance structure is frequently cited as a structural precondition for the scheme's ability to expand coverage without proportionate cost escalation, and situates Thailand as an outlier among middle-income countries in having developed a domestically calibrated, rather than externally imported, cost-effectiveness threshold [4].

Mexico: Seguro Popular and the Limits of Insurance-Based Expansion

Out-of-pocket health expenditure as a share of total health expenditure in Thailand before and after introduction of the Universal Coverage Scheme in 2002, based on national household survey data (Tangcharoensathien et al., 2014).



Mexico's Seguro Popular, launched in 2003–2004, extended subsidized public insurance to the roughly half of the population previously excluded from social security-linked health coverage, financed through a combination of federal, state, and household contributions calibrated to income. Knaul and colleagues' comprehensive assessment of the Mexican reform documents substantial gains in effective coverage, catastrophic expenditure reduction, and financial protection for previously uninsured households, alongside persistent gaps in quality of care and specialist service availability that limited the translation of nominal coverage into equivalent health outcomes across income strata [7]. A large-scale randomized assessment of the program's rollout — among the few UHC expansions evaluated with an experimental design — found that Seguro Popular affiliation reduced catastrophic and out-of-pocket health spending and increased utilization of preventive services, though the magnitude of health outcome improvements was more modest than the financial protection gains, illustrating a recurring theme in the UHC cost-effectiveness literature: financial risk protection benefits often materialize more clearly, and more quickly, than aggregate population health improvements [8].

The Mexican case is instructive for cost-effectiveness analysis because its explicit, quantifiable financial-protection outcomes (reduction in catastrophic expenditure incidence, reduction in medical impoverishment) provided the empirical template later formalized in extended cost-effectiveness analysis, a methodology explicitly designed to value insurance-based UHC expansion along the joint axes of health gain and financial risk protection rather than health gain alone [9]. Mexico's experience also underscores that insurance-based coverage expansion, absent parallel supply-side investment in provider capacity, can generate diminishing marginal cost-effectiveness as newly insured demand outpaces the availability of quality services — a supply-side constraint that recurs across the middle-income country evidence base [7].

Indonesia: Jaminan Kesehatan Nasional and Scale-Related Cost Challenges

Indonesia's JKN scheme, consolidated in 2014 from a fragmented set of prior social and community insurance programs, is the largest single-payer national health insurance scheme in the world, enrolling more than 200 million people by the late 2010s [10]. Comprehensive analysis of Indonesia's UHC trajectory documents marked gains in life expectancy (from 48 to 69 years over the reform period examined) and reductions in infant mortality (from 76 to 23 per 1,000 live births), alongside persistent challenges: incomplete enrollment among informal-sector and near-poor populations, geographic inequity in benefit incidence between Java and the outer islands, and a rapidly rising burden of non-communicable disease claims that has strained the scheme's contribution-to-expenditure balance [10].

The Indonesian case illustrates a scale-related cost-effectiveness dynamic distinct from smaller schemes such as Thailand's: because JKN operates as a single national risk pool covering a population larger than most countries, even modest per-capita cost overruns translate into very large aggregate fiscal exposure, and the scheme has experienced repeated funding shortfalls despite substantial premium subsidies for the poor. This experience reinforces a broader methodological point emphasized in the DCP3-derived literature — that cost-effectiveness at the level of an individual intervention is a necessary but not sufficient condition for the fiscal sustainability of coverage expansion at national scale, since aggregate resource envelopes, not merely per-DALY costs, determine what a rapidly scaling UHC program can sustainably finance [11,12].

Sub-Saharan Africa: Rwanda, Ghana, and Community/National Insurance Models

Rwanda's Mutuelles de Santé, a community-based health insurance (CBHI) system introduced nationally in the early 2000s, achieved population enrollment exceeding 90% within its first decade — a rate of coverage expansion notable among low- and lower-middle-income countries. An evaluation of the scheme's first eight years found substantial increases in utilization of maternal and child health services and reductions in out-of-pocket expenditure among insured households, though the authors cautioned that the scheme's low, flat-rate premiums and correspondingly limited revenue base constrained the depth and quality of the benefits package relative to contribution-based schemes in wealthier middle-income settings [13]. Rwanda's experience is frequently cited as evidence that CBHI models can achieve high coverage rates at comparatively low fiscal cost, but the sustainability of this model is contingent on continued donor co-financing and government subsidy for the poorest enrollment quintiles, raising questions about the CBHI approach's suitability for wholly domestic financing at higher-income thresholds [13,1].

Ghana's National Health Insurance Scheme, established in 2003 as a hybrid model combining formal-sector payroll contributions, a dedicated value-added-tax levy, and premium payments from informal-sector enrollees, presents a more mixed cost-effectiveness picture. A systematic review of 31 studies spanning 2003–2016 found that the NHIS improved service utilization and maternal health outcomes but faces significant sustainability threats, including cost escalation from a broad, poorly costed benefits package, extensive statutory exemptions that narrow the contributing base, delayed provider reimbursement that undermines quality of care, and weak administrative and actuarial capacity [14]. A subsequent systematic review of observational studies across Ghana and Nigeria similarly found that while NHI enrollment reduced the probability of catastrophic health expenditure relative to non-enrollment, approximately one-third of the reviewed studies still reported that more than half of insured households experienced catastrophic expenditure, indicating that nominal insurance coverage in West African NHI schemes has not yet translated into robust financial risk protection at the level

achieved by Thailand's UCS or Rwanda's Mutuelles [15]. Together, the Ghanaian and broader West African evidence illustrates that scheme design — particularly exemption policy, benefit package breadth relative to revenue base, and provider payment timeliness — is as consequential for cost-effectiveness outcomes as the underlying financing architecture itself.

Turkey and Latin America: Health System Reform Pathways to UHC

Turkey's Health Transformation Program (2003–2013) unified a fragmented social insurance system into a single-payer General Health Insurance scheme while simultaneously expanding primary care infrastructure and family medicine coverage. A comprehensive evaluation found substantial equity gains in service utilization and financial protection following the reform, attributing much of the program's cost-effectiveness to its combination of demand-side coverage expansion with supply-side investment in primary care capacity — precisely the complementary investment that was comparatively underdeveloped in the Mexican case [16]. The Turkish experience is frequently invoked as evidence that sequencing UHC expansion with parallel primary care strengthening improves the cost-effectiveness of coverage reform by preventing the mismatch between insured demand and available supply that constrained health gains elsewhere.

Latin America as a region offers the most heterogeneous evidence base among middle-income settings, reflecting the diversity of financing models — from Mexico's Seguro Popular to Brazil's tax-funded Sistema Único de Saúde to Colombia's managed-competition social insurance model. A comprehensive assessment of health-system reform and UHC progress across the region found consistent improvements in coverage and financial protection indicators across most reforming countries, but substantial cross-country variation in the pace of health outcome improvement, attributable in part to differing degrees of fragmentation between subsystems serving formal-sector, informal-sector, and indigent populations [2]. Complementing this regional synthesis, cross-national econometric analysis spanning multiple LMICs found a statistically robust association between progress toward universal health coverage — measured via composite indices of service coverage and financial protection — and improvements in population health outcomes, including reductions in under-five and maternal mortality, providing macro-level corroborating evidence for the health-improving effect of UHC expansion documented in country-specific studies [17]. A synthesis drawing lessons from eleven country UHC reform experiences similarly concluded that UHC is an achievable but non-linear process, shaped as much by sustained political commitment as by technical financing design, with successful reforms typically combining incremental population and benefit expansion with parallel investment in provider payment and quality assurance systems [3].

Vietnam and Southeast Asia: Extending Coverage to the Informal Sector

Vietnam's health insurance system, which has pursued near-universal enrollment through a combination of compulsory formal-sector insurance, subsidized coverage for the poor, and voluntary schemes for the informal sector, illustrates the persistent cost-effectiveness challenge posed by informal-sector enrollment. A household-survey-based evaluation found that insured individuals experienced lower outpatient and inpatient treatment costs and longer hospital stays than the uninsured, alongside fewer missed days of work or school, indicating meaningful financial protection and utilization benefits; however, the authors concluded that comprehensive reforms were still required to close accessibility and adequacy gaps, particularly for households at the margin of formal and informal employment [18].

A broader systematic review of health financing schemes extending UHC to informal workers across eight Southeast Asian countries similarly found substantial heterogeneity in coverage outcomes tied directly to financing design: countries employing universalist, mandatory, general-revenue-financed approaches — exemplified by Thailand and Malaysia — achieved near-complete population registration, whereas countries relying on voluntary, contributory schemes for informal workers, such as Cambodia, achieved coverage rates below 6% among the eligible informal population [19]. Across the reviewed schemes, financial protection indicators (out-of-pocket expenditure share, catastrophic health expenditure incidence, and impoverishment) showed a consistent downward trend following implementation, with the largest improvements observed in schemes combining full government subsidy with mandatory enrollment [19]. This evidence base reinforces a conclusion echoed across the Ghanaian, Rwandan, and Cambodian cases: voluntary, premium-financed insurance models for informal-sector populations are systematically less cost-effective, on a population coverage basis, than mandatory or automatically enrolled, general-revenue-financed alternatives.

Cost-Effectiveness Thresholds and Methodological Considerations

A cross-cutting methodological problem constrains interpretation of the country-level evidence reviewed above: there is no settled consensus on the appropriate cost-effectiveness threshold — the maximum acceptable cost per DALY averted or per quality-adjusted life-year gained — for decision-making in middle-income countries. For much of the past two decades, health policy analyses relied on the WHO Commission on Macroeconomics and Health heuristic classifying interventions costing less than one times GDP per capita per DALY averted as "highly cost-effective" and less than three times GDP per capita as "cost-effective." Woods and colleagues demonstrated that this heuristic lacks empirical grounding in the actual opportunity cost of health spending in specific health systems and proposed instead country-specific, supply-side threshold estimates derived from the observed relationship between health expenditure and mortality reduction, yielding thresholds for several LMICs substantially below the conventional GDP-based benchmarks [4].

Building on this critique, a more recent cross-national analysis of 174 countries derived empirical cost-effectiveness thresholds based on the observed elasticity of life expectancy gains with respect to health expenditure growth, finding that thresholds appropriate to health-budget decision-making in most middle-income countries fall considerably below the traditional 1–3× GDP-per-capita range, implying that many interventions previously classified as cost-effective under the older heuristic may not, in fact, represent efficient uses of scarce domestic health budgets [5]. This threshold revision has direct implications for UHC benefit package design: a mechanical application of the 1–3× GDP-per-capita threshold, still the modal approach used in published economic evaluations conducted in LMICs, likely overstates the number of interventions that are genuinely affordable and efficient within constrained UHC budgets [5].

Complementing threshold methodology, the DCP3-derived literature has generated the most extensive available compilation of intervention-level cost-effectiveness evidence for LMIC decision-making. A systematic ranking of 93 health interventions synthesized across 149 published cost-effectiveness studies found that more than half of the ranked interventions cost less than US$200 per DALY averted (in 2012 dollars), a threshold affordable even for low-income health budgets, though the evidence base remained concentrated in reproductive, maternal, newborn, and child health and major infectious disease interventions, with persistent evidence gaps for non-communicable disease, mental health, and adult chronic disease management interventions increasingly central to UHC benefit packages in aging middle-income populations [20]. Modelling work estimating the aggregate resource requirements for an essential UHC benefit package informed by this evidence base projected that closing the coverage gap across a broad set of LMICs would require substantial increases in per-capita health expenditure, with financing gaps concentrated in lower-middle-income rather than upper-middle-income settings, and cautioned that intervention-level cost-effectiveness rankings alone cannot determine system-level affordability without accounting for aggregate fiscal space and health workforce capacity constraints [11,12,21].

Finally, extended cost-effectiveness analysis (ECEA) has emerged as the most conceptually complete framework for evaluating UHC financing decisions specifically, because it jointly quantifies health gains, financial risk protection (poverty cases averted, catastrophic expenditure cases averted), private expenditure averted, and the distribution of these benefits across income quintiles — dimensions that standard cost-effectiveness analysis, focused narrowly on health gain per dollar, does not capture [9]. Commentary accompanying the framework's early application has emphasized its particular relevance to prioritizing the sequence of UHC benefit package expansion, since ECEA can identify interventions that, while not the most health-maximizing in a narrow sense, deliver disproportionate financial protection benefits to the poorest population segments — a consideration central to the equity objectives that motivate UHC expansion in the first place [22].

Discussion

Several cross-cutting conclusions emerge from this synthesis. First, the empirical evidence, though heterogeneous in design and outcome metrics, consistently supports the proposition that UHC expansion in middle-income countries generates meaningful financial risk protection — reflected in reduced out-of-pocket expenditure shares, reduced catastrophic health expenditure incidence, and reduced medical impoverishment — across virtually every national program examined, from Thailand's UCS [6] to Mexico's Seguro Popular [8,7] to Turkey's General Health Insurance scheme [16]. Financial protection gains, moreover, tend to be more immediate and more consistently documented across the literature than aggregate population health improvements, which typically require longer follow-up periods and are more susceptible to confounding by concurrent supply-side and socioeconomic trends.

Second, the comparative evidence indicates that financing architecture strongly conditions cost-effectiveness outcomes independent of nominal coverage breadth. Mandatory, general-revenue-financed models with minimal reliance on informal-sector premium contributions (Thailand, Turkey, and Malaysia among the Southeast Asian comparators) consistently achieve near-universal population coverage and larger financial protection gains than voluntary, contributory community-based or informal-sector insurance models (Cambodia's informal-worker scheme, and to a lesser extent Ghana's NHIS and Rwanda's Mutuelles), which face structural challenges of adverse selection, narrow revenue bases, and incomplete enrollment [19,14,13,15]. This pattern reinforces the health-financing consensus that voluntary insurance mechanisms are an intrinsically limited vehicle for achieving population-wide financial protection, regardless of the technical cost-effectiveness of the underlying benefit package.

Selected cost-effectiveness and financial-protection evidence for major universal health coverage expansion programs in middle-income countries.

Country / scheme	Financing model	Key cost-effectiveness or financial-protection finding	Source
Thailand (Universal Coverage Scheme)	Tax-funded, general revenue, capitation-based purchasing	Out-of-pocket share fell from ~45% (1994) to <15% (2010); institutionalized cost-per-DALY threshold for benefit package decisions	Tangcharoensathien et al. 2014
Mexico (Seguro Popular)	Subsidized public insurance, income-graduated contributions	Randomized assessment: reduced catastrophic/out-of-pocket spending, increased preventive care use; modest health-outcome gains relative to financial-protection gains	King et al. 2009; Knaul et al. 2012
Indonesia (JKN)	Single national social health insurance risk pool (>200 million enrolled)	Life expectancy rose 48→69 years, infant mortality fell 76→23/1,000; scale-driven fiscal shortfalls despite per-intervention cost-effectiveness	Agustina et al. 2019
Rwanda (Mutuelles de Santé)	Community-based health insurance, flat-rate premiums	>90% population enrollment within a decade; increased maternal/child service use; limited benefit depth from narrow revenue base	Lu et al. 2012
Ghana (NHIS)	Hybrid: payroll tax, VAT levy, informal-sector premiums	Improved utilization and maternal outcomes, but cost escalation, broad exemptions, and delayed reimbursement threaten sustainability	Alhassan et al. 2016; Odonkor et al. 2023

Country / scheme	Financing model	Key cost-effectiveness or financial-protection finding	Source
Turkey (Health Transformation Program)	Unified single-payer General Health Insurance + primary care expansion	Substantial equity gains in utilization and financial protection, attributed to pairing coverage expansion with supply-side investment	Atun et al. 2013
Southeast Asia (informal-sector schemes)	Mixed: mandatory general-revenue (Thailand, Malaysia) vs. voluntary contributory (Cambodia)	Mandatory, subsidized schemes reached ~100% informal-worker registration; voluntary schemes reached as little as 5% coverage	Kaiser et al. 2023

Third, the methodological literature on cost-effectiveness thresholds has undergone substantial revision over the review period, moving away from the historically dominant GDP-per-capita heuristic toward empirically derived, country-specific threshold estimates that are frequently lower than previously assumed [4,5]. This revision has direct and underappreciated implications for the middle-income country UHC literature: many benefit package decisions and program evaluations conducted during the 2000s and 2010s relied on the older, more permissive threshold convention, potentially overstating the cost-effectiveness of some included interventions and understating the opportunity cost of benefit package breadth relative to depth. Future program evaluations would benefit from applying the newer, empirically grounded threshold methodology, and from more systematic use of extended cost-effectiveness analysis to capture the financial protection dimension that dominates the observed benefits of UHC expansion in this literature [9,22].

Fourth, a recurring supply-side constraint — inadequate provider capacity, workforce shortages, and quality-of-care deficits — limits the translation of insurance coverage into realized health gains across multiple country contexts, most explicitly documented in Mexico [7] and implicitly evident in Indonesia's persistent urban–rural and Java–outer-island disparities [10]. This constraint suggests that the cost-effectiveness of UHC expansion cannot be assessed purely as a financing or insurance-design question; it is jointly determined by the adequacy of concurrent investment in the health service delivery platform, a point reinforced by DCP3's system-level resource-requirement modelling [11,21] and by Turkey's comparatively favorable experience of pairing insurance consolidation with primary care expansion [16].

This review has several limitations. The narrative synthesis approach, necessitated by profound heterogeneity in study designs and outcome metrics across the reviewed literature, precludes formal quantitative pooling of ICERs or cost-per-DALY estimates across country programs. Much of the country-level evidence relies on observational, pre-post, or quasi-experimental designs rather than randomized evaluation, with the Mexican Seguro Popular rollout representing an unusual exception [8]; causal attribution of health outcome improvements to UHC financing reform, as opposed to concurrent economic growth, supply-side investment, or secular epidemiological trends, therefore remains imperfect across most of the reviewed studies. Finally, the evidence base is geographically uneven, with substantially denser coverage of Southeast Asian and Latin American experiences than of Sub-Saharan African or Middle Eastern middle-income country contexts, limiting the generalizability of conclusions to underrepresented regions.

Conclusion

The accumulated evidence from major middle-income country UHC expansions — Thailand, Mexico, Indonesia, Rwanda, Ghana, Turkey, and a broader set of Latin American and Southeast Asian reforms — indicates that coverage expansion generates substantial and reasonably consistent gains in financial risk protection, alongside more variable and slower-materializing improvements in population health outcomes, with the magnitude and cost-effectiveness of these gains strongly conditioned by financing architecture (mandatory versus voluntary, general-revenue versus contributory) and by the adequacy of concurrent supply-side investment. Methodologically, the field has moved toward more empirically grounded cost-effectiveness thresholds and toward extended cost-effectiveness analysis frameworks better suited to capturing the joint health and financial protection objectives that motivate UHC policy. Continued progress toward evidence-based UHC expansion in middle-income countries will depend on wider adoption of these refined methodological tools, more rigorous (ideally quasi-experimental or experimental) evaluation designs, and closing persistent evidence gaps in non-communicable disease and Sub-Saharan African program contexts.

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