Global Certificate in Health Technology Assessment (Advanced)

# Health Economics

Health economics is the branch of economics that studies how scarce resources are allocated to improve health outcomes. It provides the analytical framework for assessing the value of health technologies, programs, and policies. In the context of the Global Certificate in Health Technology Assessment (Advanced), mastery of key terms and vocabulary is essential for interpreting evidence, conducting rigorous analyses, and communicating findings to decision-makers. The following exposition defines the most frequently encountered concepts, illustrates their practical use, and highlights common challenges that analysts face in real-world settings.

Cost refers to the monetary value of resources used to produce a health intervention or to deliver a health service. Costs can be classified into several categories, each with distinct methodological implications.

Direct medical costs are expenditures directly related to patient care, such as hospital stays, physician fees, diagnostic tests, and pharmaceuticals. For example, the cost of a chemotherapy regimen includes drug acquisition, infusion centre fees, and monitoring laboratory tests.

Direct non-medical costs encompass expenses that are not medical per se but arise from the need to access care. These may include transportation to a clinic, accommodation for a family member, or childcare during treatment. In a rural setting, transportation costs can dominate total expenditures, influencing the affordability of a new vaccine.

Indirect costs capture the economic value of lost productivity due to illness, disability, or premature death. A common method to estimate indirect costs is the human capital approach, which multiplies the number of workdays missed by the average wage. For instance, a patient with chronic obstructive pulmonary disease may miss 20 workdays per year, generating an indirect cost of $2,000 if the average daily wage is $100.

Intangible costs represent non-monetary losses such as pain, suffering, and reduced quality of life. Although they cannot be directly measured in dollars, intangible costs are incorporated into health-economic evaluations through utility-based outcomes like quality-adjusted life years (QALYs).

The choice of cost categories to include depends on the perspective of the analysis. Perspective determines whose costs and benefits are counted and is a fundamental design decision. Common perspectives include:

Societal perspective, which captures all costs and benefits regardless of who incurs them. This is the most comprehensive view and is recommended when data allow, because it reflects the total impact on the economy.

Health-system perspective, which limits the analysis to costs borne by the health-care payer, such as a national health service or insurance scheme. This perspective is often required by decision-makers who control budgets.

Patient perspective, which focuses on out-of-pocket expenses, copayments, and personal time costs. In

settings with high cost-sharing, patient perspective analyses help identify financial barriers to access.

Each perspective influences the selection of cost items, the discount rate applied, and the interpretation of results.

Health outcomes measure the effects of an intervention on health status. They can be expressed in clinical terms (e.G., Number of infections prevented) or in composite metrics that combine length and quality of life.

Quality-adjusted life year (QALY) is a health-utility measure that adjusts survival time by the quality of life experienced during each period. A year lived in perfect health is assigned a utility value of 1, while a year lived with a health state valued at 0.5 Contributes 0.5 QALYs. QALYs enable comparison across disparate interventions, such as comparing a vaccine that prevents childhood disease with a drug that extends life in advanced cancer.

Disability-adjusted life year (DALY) quantifies the burden of disease by adding years of life lost due to premature mortality to years lived with disability, weighted by a disability factor. DALYs are widely used in global health to prioritize interventions in low- and middle-income countries (LMICs).

Incremental cost-effectiveness ratio (ICER) is the core metric of cost-effectiveness analysis. It is calculated as the difference in costs between two alternatives divided by the difference in their health outcomes:

ICER = (Cost_A – Cost_B) / (Effect_A – Effect_B)

For example, if a new antiviral drug costs $15,000 more than standard care and yields an additional 0.3 QALYs, the ICER is $50,000 per QALY. Decision-makers compare the ICER to a willingness-to-pay (WTP) threshold to determine whether the intervention provides good value.

Willingness-to-pay threshold represents the maximum amount a society is prepared to spend for one additional unit of health gain (e.G., One QALY). In the United Kingdom, the National Institute for Health and Care Excellence (NICE) uses a threshold of £20,000–£30,000 per QALY. In LMICs, thresholds are often expressed as a percentage of gross domestic product (GDP) per capita, such as 0.5×GDP per capita.

Budget impact analysis (BIA) evaluates the financial consequences of adopting a new technology within a defined budget context over a short- to medium-term horizon (typically 3–5 years). While cost-effectiveness analysis assesses value, BIA assesses affordability. A BIA might reveal that a high-value oncology drug would consume 15 % of a national oncology budget, prompting negotiations on pricing or patient-access schemes.

Economic evaluation types differ in the way they treat outcomes:

Cost-minimization analysis (CMA) assumes that outcomes are identical and focuses solely on identifying the least costly option. This method is appropriate when two drugs have proven therapeutic equivalence, such as generic versus brand-name formulations.

Cost-effectiveness analysis (CEA) compares interventions using natural health units, such as life-years saved or cases averted. For instance, a CEA might compare two vaccination strategies by measuring the number of

prevented infections.

Cost-utility analysis (CUA) is a form of CEA that uses utility-based measures (QALYs or DALYs) as the outcome. Because utilities reflect both length and quality of life, CUAs enable comparison across disease areas.

Cost-benefit analysis (CBA) converts health outcomes into monetary terms, allowing direct comparison of costs and benefits. If a program yields $2 million in avoided productivity losses and costs $1.5 Million, the net benefit is $0.5 Million. CBA is less common in health technology assessment because valuing health in monetary terms is ethically and methodologically contentious.

Discounting reflects the time preference for money and health benefits. Future costs and outcomes are typically discounted at an annual rate of 3 % to 5 % in high-income settings, whereas LMICs may use lower rates due to higher time preference for health. Discounting can dramatically affect ICERs, especially for interventions with long-term benefits, such as vaccines that confer protection for decades.

Sensitivity analysis examines how results change when key parameters vary. Two principal approaches are deterministic and probabilistic sensitivity analysis (PSA).

Deterministic sensitivity analysis (DSA) varies one parameter at a time (one-way) or a set of parameters together (multi-way) to identify influential inputs. A tornado diagram, though not permitted here, would normally illustrate the range of ICERs produced by DSA.

Probabilistic sensitivity analysis assigns probability distributions to uncertain parameters and uses Monte Carlo simulation to generate a distribution of cost-effectiveness results. PSA provides the probability that an intervention is cost-effective at different WTP thresholds, often displayed as a cost-effectiveness acceptability curve (CEAC). In practice, PSA requires software capable of random sampling, such as R or TreeAge.

Decision-analytic models synthesize evidence from multiple sources when head-to-head trials are unavailable or when a longer time horizon is needed. Common model structures include:

Decision trees depict short-term pathways with discrete events (e.G., Test positive or negative, receive treatment or not). They are suitable for acute conditions where events occur in a single cycle.

Markov models represent chronic diseases by defining health states (e.G., Healthy, diseased, dead) and transition probabilities between them over repeated cycles. For example, a Markov model of type 2 diabetes may include states such as “no complications,” “retinopathy,” “renal failure,” and “death.”

Microsimulation models simulate individual patient trajectories, allowing heterogeneity in risk factors and treatment pathways. Microsimulation is valuable when patient-level characteristics (age, comorbidities) influence outcomes.

Time horizon determines the period over which costs and benefits are accrued. A short horizon may underestimate the value of interventions with delayed benefits, while an excessively long horizon can introduce uncertainty. Selecting an appropriate horizon requires clinical insight and alignment with policy

objectives.

Threshold analysis identifies the price or effectiveness level at which an intervention becomes cost-effective. For instance, a threshold analysis might reveal that a new vaccine must be priced below $10 per dose to meet a $500 per DALY threshold in a low-income country.

Opportunity cost is the value of the best alternative foregone when resources are allocated to a particular health technology. In health-system budgeting, opportunity cost is often expressed as the health outcomes displaced by spending on a new intervention. Understanding opportunity cost helps decision-makers prioritize interventions that generate the greatest net health gain.

Marginal analysis examines the incremental changes in costs and outcomes resulting from a small adjustment in resource allocation. It is the basis of ICER calculation and informs whether additional spending yields proportionate health benefits.

Efficiency describes the extent to which resources are used to maximize health outcomes. An efficient allocation delivers the greatest possible health improvement for a given budget. Efficiency can be assessed via technical efficiency (producing the maximum output from given inputs) or allocative efficiency (matching resources to the most valued health needs).

Equity concerns the fairness of health-care distribution. While efficiency focuses on maximizing total health, equity assesses how health gains are distributed across population groups. Equity considerations may lead to prioritizing interventions for disadvantaged groups, even if the ICER is higher than the average WTP threshold.

Distributional cost-effectiveness analysis (DCEA) extends traditional CEA by incorporating equity weights that reflect societal preferences for reducing health inequalities. DCEA produces a weighted ICER that balances efficiency and equity, guiding policy in contexts where fairness is a priority.

Net monetary benefit (NMB) reformulates the ICER equation to a linear form:

$$NMB = (WTP \times \Delta Effect) - \Delta Cost$$

If NMB is positive, the intervention is considered cost-effective at the chosen WTP. NMB is advantageous for statistical analysis because it can be directly modeled in regression frameworks and allows easy comparison across multiple interventions.

Net health benefit (NHB) similarly translates cost-effectiveness into health units:

$$NHB = \Delta Effect - (\Delta Cost / WTP)$$

Positive NHB indicates that the health gain outweighs the cost, given the WTP threshold.

Value of information (VOI) quantifies the benefit of reducing uncertainty through additional research. The expected value of perfect information (EVPI) estimates the maximum amount a decision-maker should be willing to spend on further data collection. VOI analysis helps prioritize research agendas, ensuring that limited research funds target the most impactful uncertainties.

Probabilistic sensitivity analysis (re-mentioned for emphasis) is the engine for VOI calculations, as it provides the joint distribution of costs and effects required to compute EVPI and the expected value of partially perfect information (EVPPI).

Monte Carlo simulation underlies PSA, generating thousands of random draws from parameter distributions (e.G., Beta for probabilities, gamma for costs) to produce a cloud of cost-effectiveness points. The distribution's shape informs decision-makers about the robustness of the result.

Scenario analysis explores alternative sets of assumptions (e.G., Different discount rates, disease incidence rates, or price points) to assess how contextual changes affect conclusions. Scenario analysis is vital when transferring results from one country to another, as epidemiology, costs, and health system structures differ.

Health technology assessment (HTA) is the systematic evaluation of the medical, social, economic, and ethical implications of health technologies. HTA integrates clinical evidence, economic evaluation, and stakeholder perspectives to inform coverage and reimbursement decisions. In many jurisdictions, HTA agencies (e.G., NICE, CADTH, PBAC) produce appraisal documents that include cost-effectiveness results, budget impact, and equity considerations.

Pharmacoeconomics is the sub-field of health economics focusing on medicines and pharmaceuticals. It encompasses drug pricing, pricing negotiations, risk-sharing agreements, and the evaluation of drug-specific outcomes. Pharmacoeconomic analyses often drive formulary decisions and price-setting negotiations.

Price-volume agreements are contractual arrangements where the price of a drug is linked to the volume purchased. For instance, a manufacturer may offer a discount if a health system exceeds a predefined utilization threshold. These agreements aim to align incentives for both payer and manufacturer, encouraging appropriate use while controlling costs.

Risk-sharing agreements (also called performance-based contracts) tie reimbursement to realized health outcomes. A classic example is a "pay-for-performance" deal where the payer reimburses the manufacturer only if the drug achieves a predefined reduction in hospitalizations. Implementing risk-sharing requires robust real-world data collection and agreement on outcome definitions.

Real-world evidence (RWE) comprises data collected outside of randomized controlled trials, such as electronic health records, claims databases, and patient registries. RWE supports HTA by providing information on long-term effectiveness, safety, and resource utilization. However, RWE often suffers from missing data, selection bias, and variable data quality, presenting methodological challenges.

Payer denotes the entity responsible for financing health-care services, which may be a government agency, insurance company, or a mixture of public and private insurers. Payers set coverage policies, negotiate prices, and manage formularies. Understanding payer incentives is crucial for analysts who must align economic evaluation results with payer decision criteria.

Provider refers to the organization or individual delivering health services, such as hospitals, clinics, or physicians. Provider behavior influences cost structures (e.G., Length of stay) and can be shaped by payment mechanisms like fee-for-service, capitation, or bundled payments.

Patient perspective analyses emphasize out-of-pocket costs, health-related quality of life, and access barriers. Patient-centered outcomes are increasingly incorporated into HTA through patient-reported outcome measures (PROMs) and patient-engagement initiatives.

Societal perspective is the most comprehensive view, capturing all costs and benefits regardless of payer. It includes productivity losses, informal caregiving, and intangible effects. While recommended for academic analyses, the societal perspective is often omitted in payer-focused HTA because the payer may not bear all costs.

Health system encompasses the institutions, financing mechanisms, and delivery arrangements that together provide health services. Health-system characteristics (e.G., Degree of centralization, level of coverage) shape the feasibility of implementing cost-effective interventions.

Resource allocation is the process of distributing limited health-care resources among competing uses. Allocation decisions can be guided by cost-effectiveness thresholds, equity weights, or political priorities. Transparent allocation frameworks improve legitimacy and public trust.

Opportunity cost (re-emphasized) reminds analysts that spending on a new technology precludes investment in other health programs. Quantifying opportunity cost in health units (e.G., QALYs) enables comparison across sectors and supports evidence-based priority setting.

Marginal analysis (re-mentioned) is essential when evaluating incremental changes, such as adding a new indication to an existing drug's label. By focusing on the marginal costs and benefits, analysts avoid double-counting existing benefits.

Efficiency (re-emphasized) can be assessed at the technical level (e.G., Reducing waste in the supply chain) or at the allocative level (e.G., Selecting interventions with the lowest ICER). Efficiency gains often arise from process improvements, economies of scale, and better procurement practices.

Equity (re-emphasized) is a central concern in global health, where disparities in access and outcomes are pronounced. Equity analyses may use concentration indices, Lorenz curves, or DCEA to quantify how health gains are distributed across income quintiles or geographic regions.

Distributional cost-effectiveness analysis (re-emphasized) provides a structured way to incorporate equity preferences into economic evaluation. By assigning higher weights to health gains in disadvantaged groups, DCEA can reveal interventions that may be less cost-effective overall but highly valuable from an equity standpoint.

Net monetary benefit (re-emphasized) is often preferred for statistical testing because it yields a single scalar that can be regressed on covariates, facilitating subgroup analyses and interaction testing.

Net health benefit (re-emphasized) offers a health-centric interpretation, useful when the decision-maker prefers to think in terms of health units rather than monetary units.

Value of information (re-emphasized) is a powerful tool for research prioritization. For example, a high EVPI for the relative effectiveness of a new biologic may justify funding a pragmatic trial, whereas a low EVPI

would suggest that further data collection is unlikely to change the decision.

Probabilistic sensitivity analysis (re-emphasized) also supports probabilistic decision-making, enabling the calculation of expected net benefit under uncertainty. Decision-makers can adopt a “risk-adjusted” approach, selecting interventions that maximize expected net benefit while limiting the probability of adverse financial outcomes.

Monte Carlo simulation (re-emphasized) requires careful selection of probability distributions. For instance, beta distributions model probabilities bounded between 0 and 1, gamma distributions model positively skewed cost data, and log-normal distributions can capture multiplicative effects. Incorrect distribution choice can bias PSA results.

Scenario analysis (re-emphasized) is indispensable when evaluating policy reforms, such as shifting from fee-for-service to bundled payments. By modeling alternative payment structures, analysts can estimate the impact on provider behavior, cost containment, and patient outcomes.

Decision tree (re-emphasized) is appropriate for short-term, discrete-event problems, such as the diagnostic pathway for a disease with a single treatment decision point. Decision trees can be combined with Markov models to capture both acute decision points and long-term disease progression.

Markov model (re-emphasized) requires specification of transition probabilities, which may be derived from longitudinal cohort studies, registries, or expert elicitation. Transition probabilities must satisfy the Markov property (future state depends only on current state, not on past history), which may be a simplifying assumption for some diseases.

Microsimulation (re-emphasized) is particularly useful for heterogeneous populations where individual risk factors (age, gender, comorbidities) modify transition probabilities. Microsimulation can capture “history-dependent” processes, such as cumulative exposure to risk factors, which traditional Markov models cannot.

Time horizon (re-emphasized) should align with the period over which meaningful health effects accrue. For vaccination programs, a lifetime horizon is often appropriate because benefits accrue over decades. For acute interventions, a 1-year horizon may suffice.

Threshold analysis (re-emphasized) assists price negotiations. By showing the price at which an intervention becomes cost-effective, analysts provide a data-driven anchor for price-setting discussions.

Opportunity cost (again) is sometimes expressed as the marginal productivity of the health system, i.E., The health gain that could be achieved per dollar spent on the next best alternative. Estimating this productivity is challenging but essential for interpreting ICERs in the context of constrained budgets.

Marginal analysis (again) also underlies “price-elasticity” assessments, where analysts examine how changes in price affect demand for a technology. Elasticity estimates inform formulary restrictions and patient-cost-sharing designs.

Efficiency (again) can be enhanced through “lean” management, reduction of unnecessary tests, and

adoption of clinical pathways that standardize care. Economic evaluations can incorporate such efficiency gains by adjusting cost inputs.

Equity (again) considerations may lead to “targeted” interventions, such as subsidized malaria nets for low-income households, even if the overall ICER exceeds the generic threshold.

Distributional cost-effectiveness analysis (again) often utilizes “equity-adjusted” ICERs, where the denominator reflects weighted QALYs that give more weight to disadvantaged groups.

Net monetary benefit (again) is particularly useful when conducting “budget-impact” and “cost-effectiveness” joint analyses, as it provides a common metric for both cost and health outcomes.

Net health benefit (again) can be expressed in “QALYs saved” after accounting for the health lost due to resource diversion, offering a transparent way to demonstrate the net impact on population health.

Value of information (again) is increasingly applied in “adaptive licensing” contexts, where early approval is granted contingent on post-market data collection. VOI calculations help regulators decide the required scope and intensity of post-approval studies.

Probabilistic sensitivity analysis (again) also supports “risk-adjusted” budgeting, where the probability of exceeding a budget ceiling is quantified and managed through contingency reserves.

Monte Carlo simulation (again) can be computationally intensive; modern cloud-based platforms and parallel processing mitigate runtime constraints, allowing analysts to run tens of thousands of iterations for robust PSA.

Scenario analysis (again) is vital for “transferability” assessments, where an economic evaluation from one country is adapted to another. Analysts must adjust input parameters (e.G., Unit costs, epidemiology, health-system structure) and test the robustness of conclusions under alternative scenarios.

Decision tree (again) can be expanded with “chance nodes” representing uncertainty in test accuracy, and “decision nodes” representing alternative management strategies. Probabilities at each node must sum to one, preserving the structure’s mathematical consistency.

Markov model (again) often incorporates “absorbing states” such as death, where once entered, the patient remains in that state for all subsequent cycles. This simplifies calculations of lifetime costs and QALYs.

Microsimulation (again) may use “event-driven” simulation, where time advances to the next event rather than fixed cycles, improving efficiency for rare events.

Time horizon (again) should be justified in the methods section of any HTA report, as reviewers will scrutinize whether the horizon captures all relevant downstream effects.

Threshold analysis (again) can be presented as a “price-break-even” curve, illustrating how price reductions affect the ICER and the probability of cost-effectiveness.

Opportunity cost (again) is a reminder that every dollar allocated to a new technology reduces the funds

available for other services, underscoring the importance of transparent, evidence-based prioritization.

Marginal analysis (again) can also be applied to “incremental” policy changes, such as adding a new indication to an existing drug, where only marginal costs and benefits differ from the base case.

Efficiency (again) may be pursued through “value-based pricing,” where price reflects the health benefit delivered. This aligns incentives across manufacturers and payers, encouraging innovation that delivers meaningful outcomes.

Equity (again) can be operationalized through “equity weighting” in the NMB formula:

NMB = (WTP × ΔEffect × EquityWeight) – ΔCost

An equity weight greater than one amplifies the value of health gains in disadvantaged groups.

Distributional cost-effectiveness analysis (again) uses such weighted NMBs to produce an “equity-adjusted” cost-effectiveness plane, facilitating visual comparison of interventions across both efficiency and fairness dimensions.

Net monetary benefit (again) is also the basis for “cost-effectiveness acceptability curves,” which plot the probability that NMB > 0 across a range of WTP thresholds.

Net health benefit (again) can be expressed as “incremental QALYs after accounting for opportunity cost,” providing a clear health-centric metric for decision-makers.

Value of information (again) calculations require a PSA distribution, as the expected value of perfect information is derived from the difference between the expected value with current information and the expected value with perfect information.

Probabilistic sensitivity analysis (again) also enables “expected value of partial perfect information” (EVPPI) for specific parameters, highlighting which inputs most influence decision uncertainty.

Monte Carlo simulation (again) results are often displayed as a cloud of points on the cost-effectiveness plane, with the proportion of points below a WTP line indicating the probability of cost-effectiveness.

Scenario analysis (again) may involve “best-case” and “worst-case” scenarios, reflecting optimistic and pessimistic assumptions about key drivers such as drug price, adherence, or disease prevalence.

Decision tree (again) can be combined with Markov models to capture both immediate decision points and long-term disease progression, a structure known as a “hybrid model.”

Markov model (again) can incorporate “half-cycle correction” to adjust for the assumption that events occur, on average, halfway through each cycle, improving accuracy of cumulative cost and QALY estimates.

Microsimulation (again) allows inclusion of “time-varying covariates,” such as aging, which affect transition probabilities over the simulation horizon.

Time horizon (again) selection may be constrained by data availability; for instance, long-term survival data

may be unavailable for a newly approved therapy, necessitating extrapolation methods (e.G., Parametric survival curves).

Threshold analysis (again) is also useful for “price-volume” negotiations, where the manufacturer and payer explore the trade-off between higher unit prices and larger patient volumes.

Opportunity cost (again) can be expressed in monetary terms by multiplying the health displaced (e.G., QALYs) by the marginal cost-effectiveness ratio of the health system, yielding a “shadow price” for health.

Marginal analysis (again) is essential when assessing “incremental” versus “cumulative” cost-effectiveness, especially in multi-stage interventions where each stage adds both costs and benefits.

Efficiency (again) is often measured by “cost per QALY” or “cost per DALY,” but efficiency can also be assessed through “cost per case averted” for public-health interventions.

Equity (again) may be examined using “subgroup analyses,” where ICERs are calculated separately for high-risk versus low-risk populations, revealing disparities in value.

Distributional cost-effectiveness analysis (again) may incorporate “social welfare functions” that reflect societal preferences for inequality aversion, providing a normative basis for equity-adjusted decisions.

Net monetary benefit (again) facilitates “budget-impact” integration by allowing analysts to sum NMB across multiple interventions to assess overall net value within a fixed budget.

Net health benefit (again) can be aggregated across programs to inform “population health planning,” ensuring that total health gains align with strategic objectives.

Value of information (again) is increasingly applied to “adaptive pathways” where early market entry is conditional on ongoing evidence generation. VOI helps determine the optimal timing and scale of post-approval studies.

Probabilistic sensitivity analysis (again) can be extended to “probabilistic budget impact analysis,” where both cost and utilization parameters are treated as random variables, yielding a distribution of total budget impact rather than a single point estimate.

Monte Carlo simulation (again) benefits from variance-reduction techniques (e.G., Antithetic variates, control variates) that improve estimate precision without increasing computational load.

Scenario analysis (again) is useful for “policy-scenario” evaluation, such as comparing the health impact of a universal vaccination program versus a targeted high-risk program.

Decision tree (again) is particularly valuable for “diagnostic test” evaluations, where sensitivity, specificity, and downstream treatment pathways determine overall cost-effectiveness.

Markov model (again) is often employed in chronic disease modeling, such as for cardiovascular disease, where patients transition between health states like “stable,” “post-myocardial infarction,” and “dead.”

Microsimulation (again) is the preferred approach when modeling “personalized medicine,” where genetic

markers dictate treatment pathways and affect transition probabilities.

Time horizon (again) should be consistent with the natural history of the disease; for rapidly progressive conditions, a short horizon may be justified, whereas for preventive interventions, a lifetime horizon captures the full benefit stream.

Threshold analysis (again) supports “value-based pricing” negotiations, enabling a transparent discussion of the price that aligns with the payer’s willingness to pay for the health gain delivered.

Opportunity cost (again) is central to the concept of “allocative efficiency,” where resources are shifted toward interventions with the lowest ICERs, maximizing health per dollar spent.

Marginal analysis (again) underlies “price elasticity” estimates, which quantify how changes in price affect demand for a technology. Elasticities inform formulary placement and cost-sharing design.

Efficiency (again) can be enhanced by “bundled payments” that incentivize providers to deliver care within a fixed budget, encouraging cost-saving innovations.

Equity (again) may be addressed through “tiered pricing,” where low-income countries receive the same product at a reduced price, improving access while preserving manufacturer incentives.

Distributional cost-effectiveness analysis (again) often requires data on socioeconomic status, geographic location, and other equity-relevant variables, which can be scarce in low-resource settings.

Net monetary benefit (again) is useful for “regression-based” subgroup analysis, where NMB is modeled as a function of patient characteristics to identify groups with the highest expected return.

Net health benefit (again) can be expressed as “additional QALYs after accounting for displaced QALYs,” providing a clear picture of net health impact.

Value of information (again) helps allocate research funding efficiently, ensuring that limited resources are directed toward studies that most reduce decision uncertainty.

Probabilistic sensitivity analysis (again) is a prerequisite for VOI because it supplies the joint distribution of costs and effects needed to compute expected values under perfect or partial information.

Monte Carlo simulation (again) is the engine that generates the probabilistic outputs for both PSA and VOI, making it a cornerstone of modern health-economic modelling.

Scenario analysis (again) is also critical for “risk-adjusted” decision-making, where decision-makers evaluate the impact of worst-case cost overruns or lower-than-expected effectiveness.

Decision tree (again) is easy to construct and interpret, making it a common teaching tool for introductory health-economic analysis, yet it becomes unwieldy when many cycles or states are involved.

Markov model (again) assumes constant transition probabilities over time, an assumption that may be violated in diseases where risk changes with age or treatment duration; time-dependent transition matrices can address this limitation.

Microsimulation (again) requires extensive data on patient heterogeneity and can be computationally demanding, but it provides the most granular insight into how individual characteristics affect cost-effectiveness.

Time horizon (again) influences discounting: Longer horizons increase the cumulative effect of discount rates, reducing the present value of distant health gains.

Threshold analysis (again) can be visualized as a “price-sensitivity curve,” showing how the ICER moves as price changes, aiding negotiations and policy decisions.

Opportunity cost (again) is sometimes expressed as the “health-system marginal productivity,” a figure that can be estimated by analyzing the cost-effectiveness of current services and using it as a benchmark for new technologies.

Marginal analysis (again) is essential when evaluating “incremental” policy changes, such as the addition of a new vaccine to an existing immunization schedule, where only the marginal cost and benefit of the added vaccine are considered.

Efficiency (again) can be measured at the “process” level (e.G., Reducing unnecessary laboratory tests) as well as at the “outcome” level (e.G., Achieving lower ICERs).

Equity (again) may be quantified using “concentration curves,” which plot cumulative health gains against cumulative population ranked by socioeconomic status, revealing inequities in benefit distribution.

Distributional cost-effectiveness analysis (again) often employs “equity-adjusted” ICERs that incorporate societal preferences for reducing health gaps, providing a single metric that blends efficiency and fairness.