Eastern England SECURE DATA ENVIRONMENT

Part of the **NHS Research Secure Data Environment Network**

Health Innovation East

NHS

Understanding the potential need and scope for a Health Economic Assessment (HEA)

STAGE 1

Business Case / Project Proposal

STAGE 2

Understanding Scope for an HEA

STAGE 3

Health Economic Assessment

CAMBRIDGE UNIVERSITY Health Partners

Linking from Stage 1

In Stage 1, you considered Return on Investment (ROI) as a simple way to demonstrate value in your project proposal or business case. Stage 2 builds on that foundation by helping you decide whether a more detailed Health Economic Assessment (HEA) is needed. **This stage focuses on scoping:** clarifying the problem, exploring intervention options, and identifying the right type of analysis for your context. The goal is not to perform the analysis itself, but to prepare the ground so that, if required, a full HEA can be carried out effectively.

Ideally, the implementation of the intervention(s) in the ROI should be evaluated and information should be shared to add to the evidence base on the topic. In particular, experience of local implementation and evaluation of effectiveness in a real-world setting would be useful. **Assuming there is both the need for a health economic assessment and the desire from the client to fund one**; the feasibility of a health economic assessment should be scoped to understand the costs and outcomes of said intervention.

What is Economic Evaluation?

Economic evaluation uses structured methods to compare the costs and outcomes of different programmes or interventions. Outcomes might include disease cases averted, quality-adjusted life years (QALYs), or cost savings because of disease prevention.

Purposes of economic evaluation may include the following:

- ☑ To understand and to find ways of reducing programme costs;
- ☑ To monitor, record, or evaluate programme effectiveness, particularly in relation to programme costs;
- ☑ To inform decision makers about adoption/scaling decisions of a particular intervention or to examine the costs and health outcomes of alternative interventions.

Before a health economic assessment can commence, there are several steps that should be followed to ensure the **correct type of assessment** is pursued for said intervention:

1 **Framing: define the problem, intervention options, audience and purpose, time frame, and analytic horizon (PICO) of your economic evaluation.**

Problem:

- What is the problem to be analysed?
- What do we need to explain or answer?
- What questions need to be answered?

Intervention Options:

- What is the intervention, who is it for, where and how is it delivered (target population(s), delivery site(s), personnel, technology, and timing)?

Audience and Purpose:

- Who will use the results of the evaluation?
- How will the results be used?

Time Frame and Analytic Horizon:

- Is the time frame long enough to capture the full costs and effects of the programme? Including start-up, running, maintenance, seasonal variations, the intervention itself and potential unintended consequences?
- Is the analytic time horizon long enough to capture the full costs and effects of programmes?

2 Workshop session with all relevant stakeholders to work through either a logic model or theory of action

To understand the relevant inputs, activities, outputs, short term and long-term outcomes, assumptions, and external factors pertaining to a given intervention. This will help set the groundwork for which type of health economic assessment makes the most sense for the project. Additionally, the output from this workshop should help lay the foundation for the true objectives of the project, research questions, outcomes, perspective being taken, etc. An introduction to logic models is provided below.

3 Choose the type(s) of health economic assessments to conduct.

There are numerous types of assessments out there (as described below), so it is helpful to have a basic understanding ahead of making any decisions on which is most appropriate to pursue (if any).

4 Develop a Cost Inventory: Identify and categorise resources for a programme.

Choose one categorisation system or combine multiple systems to develop a cost inventory.

- Your categorisation system should include things like the line item (e.g., personnel, facilities, equipment, supplies, travel, incentives, etc.), levels of responsibility (national, regional, local), sources of funding (private for profit, private nonprofit, public, etc.), activity areas (central office, regional offices), and cost types (programme costs, participant costs, staff costs).

5 Evaluate the Resources Used

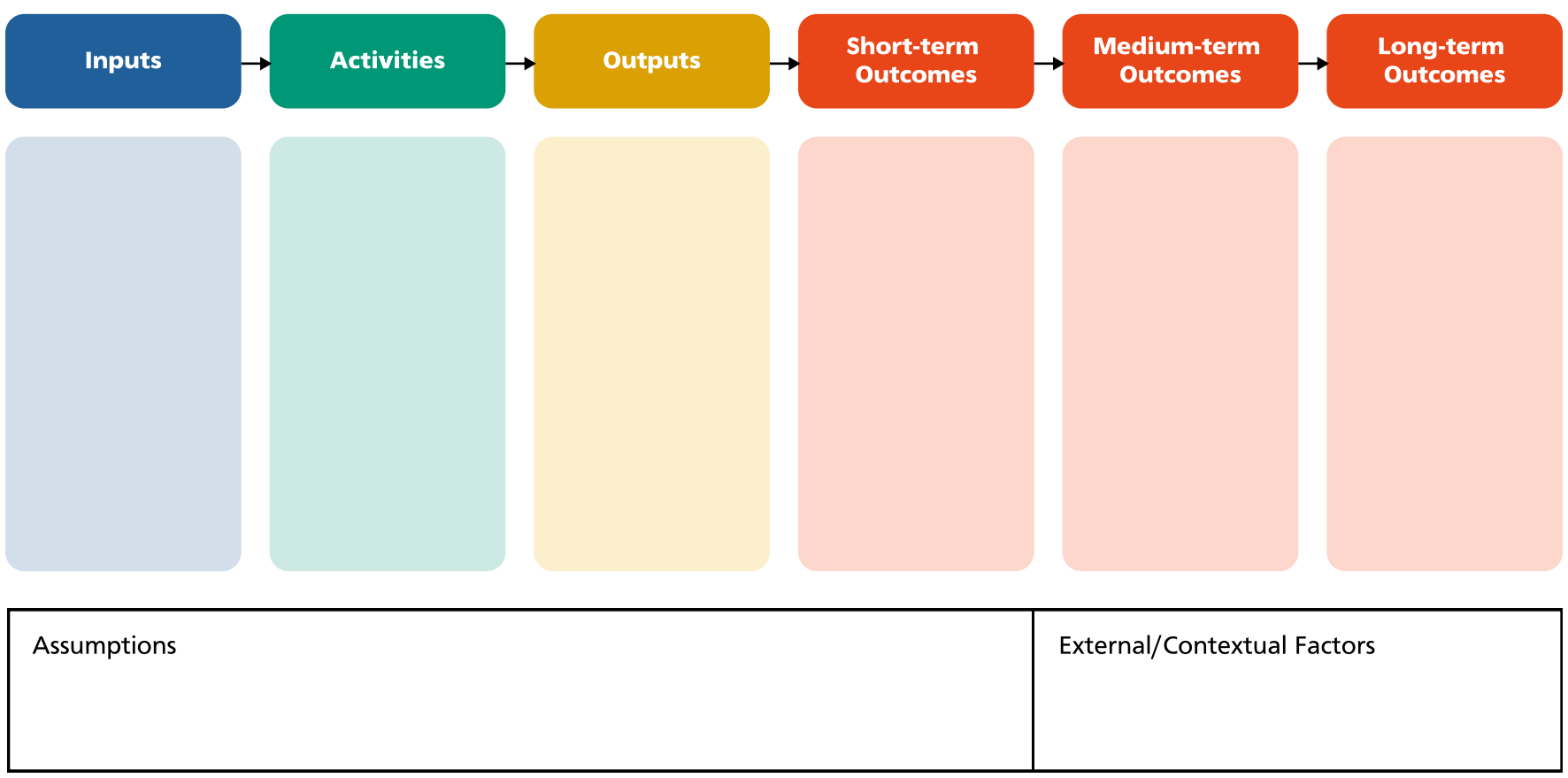
Using the categorisation system from **Step 2**, measure the quantity of the resources used and assign value to them. Examples of sources to assess the resources used include the following:

- Primary data collection that includes questionnaire surveys, observational surveys, medical records, accounting, and payroll systems.
- Published literature: a literature/evidence review to gather all relevant information and inputs for the chosen health economic assessment.

Introduction to Logic Models

Logic models help you map how resources **(inputs)** are turned into **activities, outputs, and outcomes.** They also make assumptions and external factors explicit. A well-designed logic model provides a shared picture for stakeholders and sets a foundation for choosing the right type of Health Economic Assessment. Logic models are meant to be ever-changing throughout the lifecycle of the intervention to reflect new evidence, lessons learned, and changes in context, resources, activities, or expectations.

A wire frame example of a generic logic model can be found below.



Each component or colour in the above figure has a specific role in the creation of a well-rounded logic model.

Inputs

Inputs are the resources that go into a programme or intervention. In other words, **what is invested**. They include financial, personnel, and in-kind resources from any source.

- For example, inputs could include various funding sources for your programme, your partners, staff time and technical assistance.

Activities

Activities are events undertaken by the programme or partners to produce desired outcomes; **what is done.**

- Examples of activities include training clinical staff, developing a new communications campaign relevant to the intervention, etc.

Outputs

Outputs are the direct, tangible results of activities. In other words, **what you get**. Outputs often serve as documentation of progress.

Outcomes

Outcomes are the desired results of the programme – **what is achieved**. Describing outcomes as short, medium, or long-term depends on the objective, the length of the programme, and expectations of the programme or intervention:

- **Short-term outcomes** are the immediate effects of the programme or intervention activities. They often focus on the knowledge and attitudes of the intended audience.
- **Medium-term outcomes** are behaviour, normative, and policy changes.
- **Long-term outcomes** refer to the desired results of the programme and can take years to accomplish. Long-term outcomes would include things like increase in blood pressure control in a specific population, increase in early treatment of a specific disease, etc.

Assumptions

Assumptions are the beliefs we have about the programme or intervention and the resources involved. They include the way we think the intervention will work – the "theory" we have used to develop the intervention.

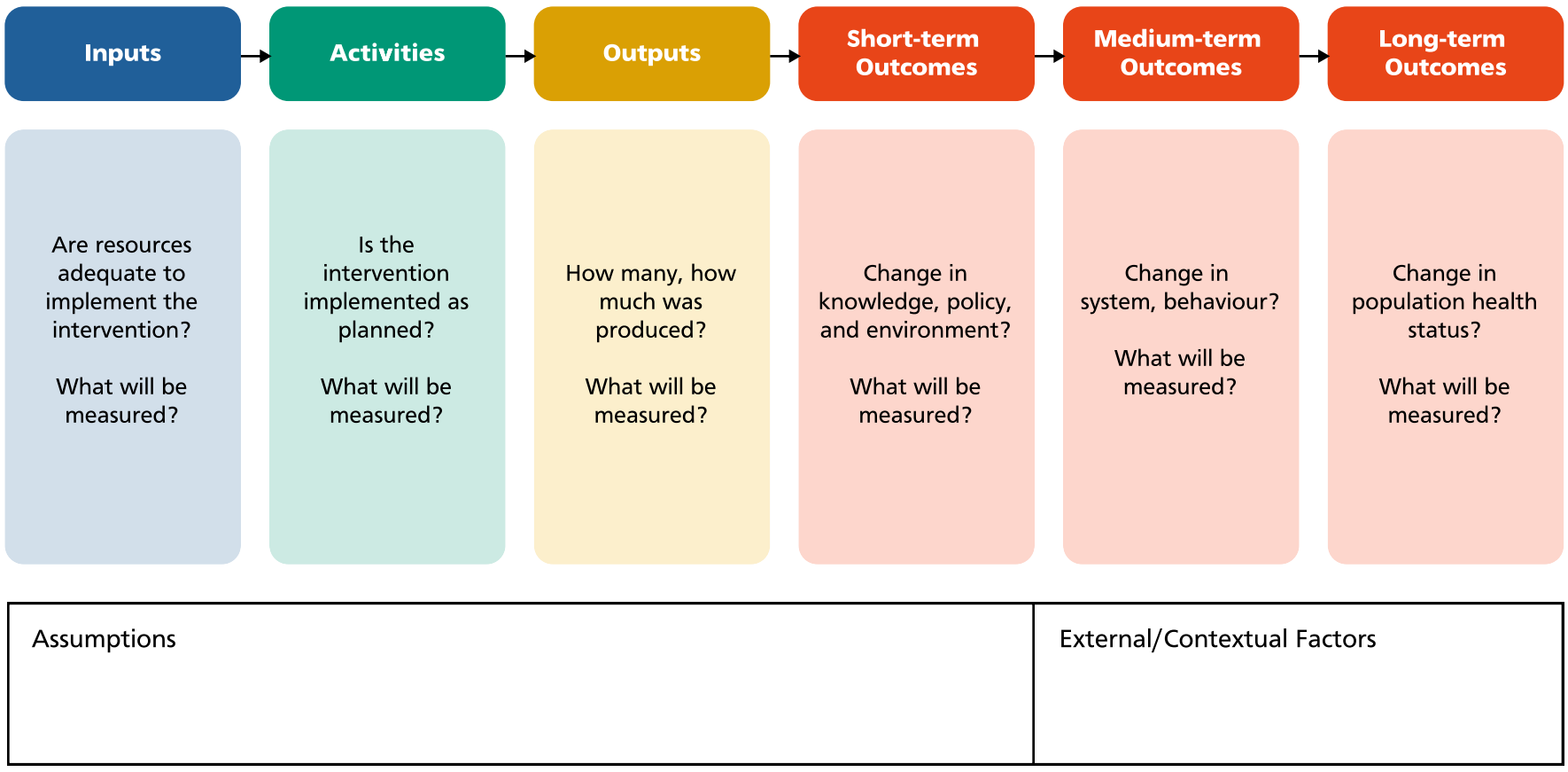
External/Contextual Factors

External/Contextual Factors describe the environment in which the programme exists and external factors that interact with and influence the programme or intervention. These factors may influence implementation, participation, and the achievement of outcomes. Contextual factors are the conditions over which we have little or no control that affect success.

In a logic model, arrows are drawn to **indicate the links between resources, activities, and outcomes.** A logic model is used to provide a rationale for the expected directionality between programme resources, activities, and outcomes. It explains how and why activities are expected to lead to outcomes in the order depicted.

A wire frame example of a generic logic model including **examples of questions you could ask** stakeholders to come up with each step along the pathway, can be found below:

Logic Model: Questions to ask



Types of health economic assessments:

Type of analysis	What it measures	When to use	Advantages	Disadvantages
Cost-Effectiveness Analysis (CEA)	Incremental cost per unit of health outcome (e.g., life years, QALYs, clinical events avoided).	When choosing between treatments based on their cost per disease-specific health outcome.	Helps allocate resources efficiently; disease-specific and often straightforward if clinical outcomes are clear.	Cannot compare across diseases due to different outcome units; may miss broader health-related benefits.
Cost-Utility Analysis (CUA)	Costs and outcomes measured using generic metrics combining quantity and quality of life.	When comparing across diverse interventions using a single common outcome measure.	Enables cross-condition comparisons using a common metric; includes both morbidity and mortality.	Subjective and potentially inaccurate quality of life measures; excludes non-health benefits.
Cost-Benefit Analysis (CBA)	Both costs and outcomes are expressed in monetary terms, based on willingness to pay.	When evaluating whether an intervention provides overall value for money, including non-health benefits.	Makes costs and benefits directly comparable; includes broader outcomes like productivity or wellbeing.	Valuing health in monetary terms is difficult and may vary with socioeconomic status; data collection on WTP is complex.
Cost-Consequence Analysis (CCA)	Multiple outcomes presented separately (health, non-health, positive, negative).	When evaluating complex interventions with multiple important outcomes.	Transparent; allows decision-makers to apply their own weights; captures wide-ranging effects.	Results are context-specific and subjective; less generalisable; open to selective interpretation.
Budget Impact Analysis (BIA)	Projected financial impact of adopting an intervention within a specific budget and population over time.	When assessing short-term affordability and budget planning for new interventions.	Directly informs budgeting and affordability; shows both incurred and saved costs.	Doesn't assess value for money; usually excludes non-monetisable clinical benefits.
Econometric analyses	Statistical estimation of causal relationships between variables (e.g., policy impact on outcomes).	When using observational data to understand causal impacts of interventions, policies, or behaviours; when estimating model inputs or forecasting outcomes.	Identifies causal relationships; useful where trials are infeasible; controls for bias; flexible with real-world data.	Not a standalone economic evaluation; depends on data quality.

Cost-effectiveness analysis (CEA):

A type of economic evaluation in which an **outcome is measured in incremental costs per incremental health unit**, such as life years gained, QALYs, or clinical events avoided. In other words, CEA measures effects in physical units of health outcomes.

Cost-effectiveness studies answer the question of how to allocate resources efficiently. They provide insights into the long-term value for money of new treatments, helping to determine their cost-effectiveness compared to the current standard of care. This is crucial for making informed decisions about which treatments provide the best health outcomes relative to their costs.

CEA results can help decision-makers who want to achieve a specific health objective. For example, a CEA study can help a health commissioner decide which technology to invest in to manage the most patients with Type-2 diabetes by identifying the technology that provides the lowest cost per managed diabetes case.

Advantages of CEA:

- It provides you an assessment of alternative options based on disease-specific measures of health effects (if clinical outcomes are relatively straightforward to measure).

Disadvantages of CEA:

- It can't inform broader resource allocation decisions across different diseases because health benefits will often be measured in different units (i.e., different clinical outcomes).
- Additionally, because it is restricted to clinical outcomes, you may miss broader health-related benefits.

Cost-utility analysis (CUA):

A specific type of CEA which evaluates two or more policy alternatives in terms of their relative costs and outcomes, where the outcomes are expressed by a generic measure of health status that considers both the effect on mortality and morbidity (e.g., QALYs, DALYs). In other words, it measures health effects in terms of both quantity (life years) and quality of life.

Advantages of CUA:

- Facilitates comparisons across different health interventions and policies by using a common unit of effect.

Disadvantages of CUA:

- Quality of life measures tend to be more subjective than clinical measures.
- General quality of life instruments can be less accurate at capturing subtle health effects, for example, effects on mental health.
- It does not capture non-health effects.

Cost-benefit analysis (CBA):

Evaluates two or more policy alternatives in terms of their relative costs and outcomes, where both the costs and outcomes are expressed in **monetary terms**.

In principle, it should value the interventions relevant costs and outcomes based on the preferences of those affected (i.e., the individuals' willingness to pay (WTP)). It can be useful when you want to evaluate whether your intervention is worth the investment compared with different interventions, or non-health benefits are an important component of the total effects of using the intervention.

CBA is sometimes compared with Return on Investment (ROI), however there are important differences between the two:

- CBA measures the net social welfare impact, while ROI measures profitability.
- CBA estimates the total benefits and costs to **society**, while ROI calculates the net benefits (or profits) to the **investor.**
- CBA includes externalities and opportunity costs, while ROI excludes them.
- CBA expresses the result as a net benefit or a benefit-cost ratio, while ROI expresses the results as a percentage.

Advantages of CBA:

- Decisions are explicit and transparent because costs and effects are measured in the same units.
- CBA studies can consider non-health benefits such as cost savings, productivity gains, and wellbeing and convenience.

Disadvantages of CBA:

- Collecting data on individuals' willingness to pay for a health gain is not straightforward.
- The value assigned to health or non-health benefits in monetary terms may differ according to individuals' characteristics, such as their socioeconomic status.

Cost-consequence analysis (CCA):

Evaluates two or more policy alternatives in terms of their relative costs and outcomes, where the outcomes are not summarised in a single measure, and **multiple outcomes of interest are reported.**

It includes all types of effects, including health, non-health, negative and positive effects, both to patients and to other stakeholders. It aims to give decision makers a comprehensive summary of the different costs and effects, so it tends to take a broad perspective.

Since CCA shows results for costs and effects separately, each decision maker (local and national health commissioners, budget holders, government agencies) can choose which costs and effects are most relevant to their local context and viewpoint. Therefore, this type of analysis is common in evaluating complex health care programmes, where there is **more than one outcome of interest to policymakers.**

Advantages of CUA:

- It provides a simple disaggregated summary of costs and effects of your intervention.
- Decision makers can choose the combination of costs and effects which are most relevant to their context, and they can apply their own weighting to the effects.
- It can include a broader range of effects than other analyses, such as user experience, patient wellbeing and satisfaction, and convenience of care.
- It's useful when you're evaluating a complex intervention that has multiple effects – for example health and non-health benefits – that would be difficult to combine into a single measure.

Disadvantages of CCA:

- Results may be less generalisable because the choice of relevant costs and effects and the weighting attached to them is often context specific.
- Interpretation of the results tends to be more subjective than other forms of economic evaluation, so there is scope for cherry-picking positive results.

Budget impact analysis (BIA):

An estimate of the projected cumulative resource expenditure for a particular intervention in a specific population over a period. BIA addresses the issue of affordability by answering the question of **whether a healthcare system (for example, the NHS) can afford to implement a new treatment or intervention within its existing budget constraints**. This analysis is essential for short-term financial planning and ensuring that new treatments can be adopted without exceeding available resources.

BIA has a distinct focus from other health economic evaluation methods. For example, it often takes the budget holder perspective and includes only costs and any savings that might accrue and evaluates **affordability** instead of value for money. The role of a budget impact analysis is not to set any sort of "cap" on spending, but to signal to the health system that special arrangements, such as prioritising treatment for the sickest, might need to be implemented to ensure sustainable introduction of the new technology.

Advantages of BIA:

- It helps you to understand both costs incurred and saved by implementing your intervention, and it gives an estimate of the impact of your intervention on the decision maker's budget.

Disadvantages of BIA:

- It cannot tell you whether your intervention is good value for money, and it usually excludes costs from changes in effects that can't be monetised, such as benefits captured by clinical measures.

Econometric Analysis:

The distinction between econometric analysis and health economic assessments (e.g., CEA, CUA, CCA) mentioned above is important because they serve **different purposes** in health economics research.

Econometric analyses in health economics serves to quantify relationships between health-related variables and socioeconomic or policy factors, enabling evidence-based decision-making in public health. These analyses allow researchers and policymakers to **assess the impact of interventions, identify causal relationships, and forecast the outcomes of health policies.**

By using statistical methods to control for confounding factors, econometrics helps isolate the effects of specific variables—such as income, education, or healthcare access—on health outcomes. This is particularly valuable in public health, where randomised controlled trials are often infeasible or unethical.

When to Use Econometric Analysis

Econometric analysis can be used to understand relationships between variables, for example, how a policy, intervention, or change in behaviour affects health outcomes, costs, or utilisation patterns. Therefore, it's helpful to do this type of analysis when:

1. You're analysing causal effects of interventions or policies (for example, how a smoking ban affects hospital admissions).
2. **You're using observational data** (e.g., administrative claims, registry data), and need to control for confounding, endogeneity, or selection bias.
3. You need to estimate parameters for use in a decision model (e.g., estimating treatment effectiveness from real-world data).
4. You're exploring heterogeneity in treatment effects across subgroups.
5. **You're interested in behavioural response** (e.g., how patients change utilisation after a change in medication access or adherence).

Example research questions:

- What is the effect of a new telemedicine policy on diabetes control?
- How does socioeconomic status impact access to primary care?
- What is the impact of expanded eligibility of GLP-1 therapies on weight-related hospital admissions in England?
- Did the introduction of the NHS Long Term Plan (2019) lead to a statistically significant improvement in public health outcomes (e.g., life expectancy, disease incidence)?

When to combine both econometric analysis and health economic assessment

In many studies, **econometric analysis is used to generate inputs for a health economic assessment**. For example:

- You might use econometrics to estimate the real-world effect of a diabetes intervention on HbA1c and hospitalisations, then use those estimates in a cost-effectiveness model.
- You might assess the impact of health policy reform using difference in differences, then feed the results into a budget impact analysis.

Other methodologies:

In addition to traditional cost-effectiveness, cost-utility analyses, and other health economic analysis mentioned above, other methods such as **return on investment (ROI)** analyses can be used to demonstrate the broader financial value of an intervention, particularly to non-health stakeholders. **Burden of disease studies** are also valuable, as they quantify the overall impact of a health issue in terms of morbidity, mortality, and economic costs, helping to prioritize interventions based on potential population-level benefits.

Return on Investment (ROI):

As mentioned in the first stage document, ROI is a performance measure used to evaluate the efficiency of a project or to compare the efficiency of several different projects. ROI measures the amount of return on a project relative to its cost. To calculate ROI, the return (net benefit: benefit minus cost) of a project is divided by the cost of the project, with the result expressed as a percentage[1].

- **The requirement of benefit to be expressed in monetary terms is the main reason that ROI (or cost-benefit analysis) is not used extensively in health technology assessment,** however it is used in other contexts such as planning large capital investments (new hospitals, units or services)[2].

Burden of disease (BOD):

A BOD study is a type of public health research that quantifies the impact of diseases, injury, and risk factors on a population. It assesses both mortality and morbidity, typically using standardised metrics such as:

- **Disability-Adjusted Life Years (DALYs):** combines years of life lost due to premature death (YLL) and years lived with disability (YLD). Further explanation of DALYs can be found in the Glossary.
- **Quality-Adjusted Life Years (QALYs):** used more in traditional health economic assessments (as mentioned above) to measure the value of health outcomes, combining quantity and quality of life. Further explanation of QALYs can be found in the Glossary.

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1 Return on Investment [online]. (2016). York; York Health Economics Consortium; 2016. https://yhec.co.uk/glossary/return-on-investment/

2 Ibid.

It typically has a few core components, such as gathering epidemiological data (prevalence, incidence, mortality, and duration of disease), severity weights (quantifying the level of disability associated with various conditions), standardized metrics (enabling comparisons across diseases, populations, and time), and attributable risk (identifying the contribution of risk factors (e.g. smoking, pollution)).

A BOD is a foundational element which provides essential data that supports evidence-based decisions (i.e., baseline data against which the impact of interventions are measured), helps prioritise investments by identifying the diseases and risk factors contributing the greatest burden, and strengthens the case for efficient, equitable, and impactful health interventions.

Summary

Stage 2 moves you from the high-level ROI thinking introduced in Stage 1 to a structured scoping process for a potential Health Economic Assessment. By framing your research question clearly, involving stakeholders, and understanding the types of analysis available, you can judge whether an HEA is needed and which approach would be most suitable.

Even if you decide not to commission a full assessment, working through these steps will strengthen your project design and funding case. If you do proceed, Stage 3 provides real-world examples of health economic analyses to illustrate how these methods are applied in practice.

Next Steps: How to get in touch for Health Economics Support

If you're exploring the impact of a healthcare intervention and would like to understand its economic value—whether through a basic return on investment (ROI) estimate or a more formal health economic analysis—we can help.

We specialise in supporting academic researchers by using high-quality NHS secondary care data, accessed within the secure data environment (SDE) for the East of England, to deliver meaningful and rigorous evaluations. You don't need to have a background in health economics—we're here to translate your research goals into economic questions and guide you through the process.

Avenues of Support

We offer a flexible range of support, depending on where you are in your research and what kind of economic input you need.

1 If you're applying for a funding call

and need **a quick, high-level return on investment (ROI) estimate** to include in your application or case for support, we can typically turn this around from **4-6 weeks**, depending on the complexity of the intervention and the data available.

- This kind of estimate is often based on published evidence, simple modelling assumptions, and local data where possible, providing enough rigour to strengthen a funding bid without requiring a full economic analysis.

2 For more in-depth support

such as **scoping or delivering a formal health economic assessment**, we can offer a range of tailored options.

- This might include identifying appropriate comparators, mapping out patient pathways using local data, and advising on appropriate modelling approaches (e.g. cost-effectiveness, budget impact).
- These projects are more bespoke and often evolve alongside your research, so timelines can vary. Typically from **6–8 weeks for a scoping piece**, to **4–6 months or more** for a full health economic evaluation depending on data access, methods, and study complexity.
- We're happy to collaborate on funding proposals, contribute to research design, or be involved as co-applicants or project partners where appropriate.

Please get in touch to discuss your needs. We're happy to provide advice on the most appropriate level of input and offer a clearer estimate once we understand your project in more detail.

We can be best reached at:
healthinformatics@healthinnovationeast.co.uk

Glossary

Incremental cost effectiveness ratio (ICER): ICERs help to determine whether the additional benefit of a treatment is worth the additional costs compared to an alternative option. The ICER represents the additional cost for each additional unit of effectiveness (e.g., an additional QALY) gained from one intervention over another.

- A lower ICER suggests that a treatment is more cost-effective, meaning it provides more benefit per unit of cost.
- A higher ICER suggests that the treatment is more expensive for the additional benefit it provides.

$$ICER = \frac{Cost\ of\ Intervention\ A - Cost\ of\ Intervention\ B}{Effectiveness\ of\ Intervention\ A - Effectiveness\ of\ Intervention\ B}$$

Example:

Imagine two treatments for a disease:
Treatment A costs $50,000 and provides 2.5 QALYs.
Treatment B costs $30,000 and provides 2 QALYs.

Using the ICER formula:

$$ICER = \frac{50{,}000-30{,}000}{2.5-2} = \frac{20{,}000}{0.5} = 40{,}000$$

Meaning: the ICER is GBP 40,000 per additional QALY gained by using Treatment A instead of Treatment B.

Quality adjusted life year (QALY): attempts to combine the effects of an intervention on both mortality (how long people live for) and morbidity (how well people are). One QALY represents one year of life in full health. It helps to compare options by considering both survival and quality of life, and to prioritize treatments or public health programmes based on the greatest health gain per dollar spent. To calculate QALYs, you will need to measure life years and HRQoL.

Example: If a new treatment gives a patient 5 extra years of life at a quality of 0.8 (80% of full health):

$$QALYs = 5 \times 0.8 = 4.0$$

Disability adjusted life year (DALY): a measure used in public health to assess the overall burden of disease. A DALY represents one lost year of "healthy" life due to either premature death or living with illness or disability. DALYs are used in public health prioritization, to compare the burden of different diseases and conditions, while helping governments and NGOs decide how to allocate health resources effectively.

Example: If someone dies at age 40 and the life expectancy is 80, that's 40 years of life lost (YLL). If they lived for 10 further years with a disability that has a weight of 0.5, that's 5 years lived with a disability (YLD). Therefore, **total DALYs would be 40 + 5 = 45 DALYs lost.**

Life years are estimates of how far an intervention extends life.

Health related quality of life (HRQoL) reflects an individual's perceptions of their own health, shown as specific health states or dimensions. There are many ways to measure HRQoL, the most widely used are generic measures such as the EQ-5D and the SF-36.

EQ-5D: a patient questionnaire developed by EuroQol for use in clinical and economic appraisal and population health surveys representing a measure for health-related quality of life[1]. It consists of two parts: a descriptive system and a visual analogue scale (VAS).

- The descriptive system comprises five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has 5 levels: no problems, slight problems, moderate problems, severe problems, and extreme problems.
- The EQ VAS (visual analogue scale) records the patient's self-rated health on a vertical visual analogue scale where the endpoints are labelled 'The best health you can imagine' and 'The worst health you can imagine'. The VAS can be used as a quantitative measure of health outcome that reflects the patient's own judgement.

SF-36: a short form health survey comprised of 36 items, developed by RAND[2].

- It assesses 8 health concepts: limitations in physical activities because of health problems, limitations in social activities because of physical or emotional problems, limitations in usual role activities because of physical health problems, bodily pain; general mental health (psychological distress and well-being); limitations in usual role activities because of emotional problems; vitality (energy and fatigue); and general health perceptions.
- It asks for participants to reply to questions according to how they have felt over the previous week using Likert-type scales.

1 EQ-5D-5L - EuroQol
2 36-Item Short Form Survey (SF-36) | RAND

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