9 Results of Cost-Utility Analysis

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Key Recommendation: The results of cost-utility analysis should be reported as incremental utility-cost ratios (IUCRs), defined as incremental QALY gains per unit net costs. IUCRs reflect the opportunity cost of investment decisions when operating within a fixed budget, and should be expressed as a point estimate of QALYs per $1 million of the total budget invested, followed by the likely range over which the QALYs per $1 million is likely to vary. Incremental cost-utility ratios (ICURs) can be reported alongside IUCRs.

9.1 Cost-utility and utility-cost ratios

The results of cost-utility analyses can be expressed as incremental utility-cost ratios (IUCRs) which are the incremental QALY gains per unit net cost, or as more traditional incremental costs per QALYs gained (ICURs).

PHARMAC prefers the IUCR measure, expressed as QALYs per $1 million of the total budget invested. For a base-case assessment, the IUCR is the incremental QALYs gained per incremental $1 million net expenditure, where 'incremental' is defined as the difference between the value for the proposed treatment and the value for the comparator.

The QALYs gained per $1 million spend emphasises health gain and value for money. This better represents the order and emphasis of PHARMAC's statutory objective to secure the best health outcomes within the funds provided. It also shifts the focus from cost-effectiveness thresholds to opportunity costs, the forgone gains within a set budget (57 (https://www.pharmac.govt.nz/medicines/how-medicines-are-funded/economic-analysis/pfpa/references/#ref57)). In addition, this measure is more useful for comparing the value of one pharmaceutical with another, due to the non-linear relationship between QALYs per $1 million and cost per QALY.

IUCRs are directly interchangeable with, and in effect the inverse of, cost per QALY results, which are very similar to net benefits/incremental net-health benefits (INHB) approaches (58-61 (https://www.pharmac.govt.nz/medicines/how-medicines-are-funded/economic-analysis/pfpa/references/#ref58)), which have mathematical advantages over cost per QALY (60 (https://www.pharmac.govt.nz/medicines/how-medicines-are-funded/economic-analysis/pfpa/references/#ref60), 61 (https://www.pharmac.govt.nz/medicines/how-medicines-are-funded/economic-analysis/pfpa/references/#ref61)).

Utility-cost ratios should be based on incremental results (ie the difference in QALYs gained and net costs to the health sector between the new pharmaceutical compared with current treatment) rather than on totals or averages, as this provides us with information on the amount of additional benefit that would be gained from the additional costs. The base-case incremental utility-cost ratio is calculated by taking the difference between the effectiveness of the two treatments, divided by the difference in their costs.

The incremental QALYs per $1 million cost result is calculated as follows:

Incremental QALY/$1M = discounted incremental QALYs / discounted incremental costs × 1,000,000

= ((net QALYs of intervention) – (net QALYs of comparator), discounted) / (net costs of intervention) – (net costs of comparator), discounted) × 1 million

9.2 Weighting of results from multiple models

Cost-utility results can be aggregated across multiple subgroups, such as different indications or different comparators.

However, directly weighting the cost-effectiveness estimates for each sub-group is not appropriate. Instead, the aggregate cost-effectiveness should be calculated by separately weighting the average net cost and the weighted average net QALY gain, then dividing one by the other.

9.3 Interpretation of Results

The results of a cost-utility analysis fall into one of four categories, defined by the incremental gain in effectiveness *E and the incremental change in costs C*.(62 (https://www.pharmac.govt.nz/medicines/how-medicines-are-funded/economic-analysis/pfpa/references/#ref62))

In general if:

$\Delta E > 0; \Delta C < 0$	proposal is dominant: more effective and less costly than comparator
$\Delta E < 0; \Delta C > 0$	proposal is dominated: proposal is less effective and more costly
$\Delta E < 0; \Delta C < 0$	trade-off
$\Delta E > 0; \Delta C > 0$	trade-off

where: Δ = change; E = effectiveness; C = costs.

In the two cases where the cost-utility ratio is positive, its value can inform choices between the two alternatives.

9.4 Presentation of Results

When presenting the results of the analysis, the overall incremental QALYs per $1 million cost result should be reported as a point estimate, followed by a likely range over which the QALYs per cost could vary.

It is important that the key sources of uncertainty that have the greatest impact on the results of the analysis are clearly identified when reporting the QALYs per cost result. For further details on testing for uncertainty in the analysis, please refer to Chapter 10 on sensitivity analysis.

The method traditionally used when calculating and presenting the results of an analysis is ICURs or ICERs, the incremental cost per QALY. This long-established metric was reported by PHARMAC in the past and is still the unit typically reported for most cost-utility analyses internationally. ICURs are in effect the inverse of IUCR results. To make the results easier to read, ICUR results should be reported alongside the IUCR QALYs per $1 million results.

QALY and cost information should be reported as outlined in Table 12. Costs and savings should be reported separately, and estimates should be based on the time horizon of the analysis.

Table 12: Reporting of Cost-Utility Analysis Results

	Reporting Details
Quality-adjusted life years	Discounted normal life expectancy of target population without the proposed intervention.
	Discounted increase in expected life expectancy from proposed intervention.
	Discounted expected quality of life gain from proposed intervention.
	Discounted expected quality of life loss from proposed intervention (eg due to adverse events).
	Discounted total quality-adjusted life expectancy of proposed intervention and comparator, with net QALY gains.
Costs and savings	Discounted costs and savings to the Pharmaceutical Schedule of a funding decision.
	Discounted real costs and savings to DHBs (over lifetime and 5 years).
	Discounted nominal costs and savings to DHBs (over lifetime and 5 years).
	Discounted direct costs and savings to patients.
	Discounted total and net costs of both regimen and comparator.

An outline of how the results should be presented is included in Chapter 11. An outline of how PHARMAC uses these results is presented in Chapter 2.

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