Expanding Cost-Effectiveness Analysis to Demonstrate Population-Level Treatment Impact on Patients and Society

Katherine L. Rosettie, Fadoua El Moustaid

Genentech, Inc., South San Francisco, CA, USA

BACKGROUND

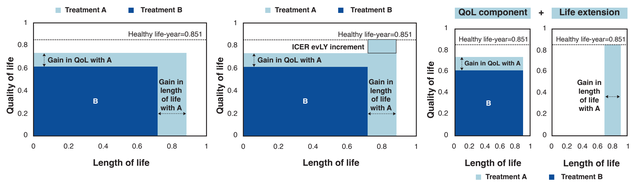
- Quality of life (QoL) metrics—quality-adjusted life-years (QALYs), equal value life-years (evLYs) and healthy years in total (HYT)—differ in capturing length and quality of life and have important strengths and limitations (**Table 1**)
- QoL metrics add value to conventional cost-effectiveness analysis (CEA) by allowing for the quantification of patients' length and quality of life; however, these metrics do not capture the full value of treatments
- Population-level models, also called treatment impact models, estimate the overall impact of treatments on patients population and society as a whole, by creatively capturing outcomes to demonstrate the value of treatments beyond LYs, QoL metrics and direct costss
- Adopting a population-level approach may link treatment impacts to broader factors observable above the individual patient level, allowing for the generation of value messages that resonate with a broader range of stakeholders

OBJECTIVE

- To characterize differences and similarities in QoL metrics (QALY, evLY, HYT) and introduce population-level models to determine treatment value to patients and society

INTRODUCTION

Table 1. Methodology, Strengths and Limitations of Existing QoL Metrics

QoL metrics[1]	QALY (range, 0-1)	evLY (range, 0–1)	HYT (range, 0–2)[2]
Description	Measure of disease burden based on quantity of life and QoL	Values all gains in life-years at the full value of a healthy life-year	Separates QoL impacts from life expectancy impacts through an additive model
Length of life	Life extension is valued at the QoL of the health state, which varies depending on the state	Considers life expectancy as if everyone's well-being is perfect (i.e. QoL = 0.851 for general US)	Considers life expectancy as if everyone's well-being is perfect (i.e. QoL = 0.851 for general US)
QoL	Improvements in QoL are included based on the health state in question	Improvements in QoL are included for period of baseline survival only	Considers QoL as if everyone's length of life is the same (i.e. maximum life expectancy under any treatment)
Calculation			
Strengths	Widely used across HTAs and throughout literature; simple to compute; relatively easy to communicate	Values all gains in life-years at the full value of a healthy life, such that regardless of age, disability or illness, all life-year gains are valued equally	Allows patients with lower QoL to fully benefit from interventions that extend life expectancy
Limitations	Values life extension less in some groups, including those with severe disease and older individuals	Potential communication challenges; undervalues interventions that both extend life and improve QoL	Potential communication challenges; limited examples in practice (not widely used)

evLY, equal value life-year; HTA, health technology assessment; HYT, healthy years in total; ICER, incremental cost-effectiveness ratio; QALY, quality-adjusted life-year; QoL, quality of life.

METHODS

- Scenarios with different gains and losses in health utility and LYs were used to estimate QALY, evLY, HYT and corresponding incremental cost-effectiveness ratios (ICERs) to compare hypothetical treatments A and B
- Three product archetype scenarios were estimated:
  - QoL gain and LYs gain
  - QoL gain and no LYs gain
  - LYs gain and no QoL gain
- Under these scenarios, we evaluated whether the metric choice affects the cost-effectiveness conclusion vs standard of care using the appropriate willingness-to-pay (WTP) thresholds (**Table 2**)

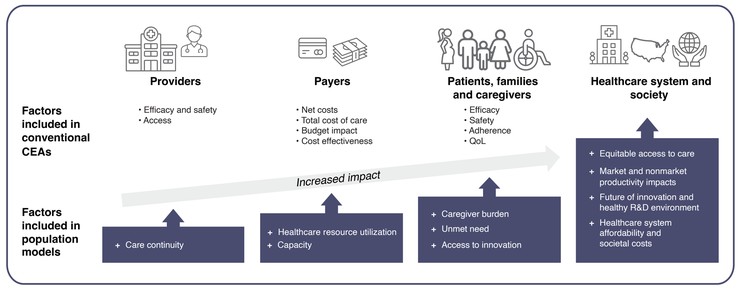
Table 2. WTP Thresholds for Each Metric Choice

Metric	WTP threshold	Difference in WTP threshold relative to QALY
QALY	$100,000[3]	NA
evLY	$84,000[4]	–16%
HYT	$72,000[2]	–28%

evLY, equal value life-year; HYT, healthy years in total; NA, not applicable; QALY, quality-adjusted life-year; WTP, willingness to pay.

- A population approach can integrate broader factors beyond the individual patient level to the value of treatments (**Figure 1**)

Figure 1. Factors Integrated in Conventional CEAs and Population Models



CEA, cost-effectiveness analysis; QoL, quality of life; R&D, research and development.

RESULTS

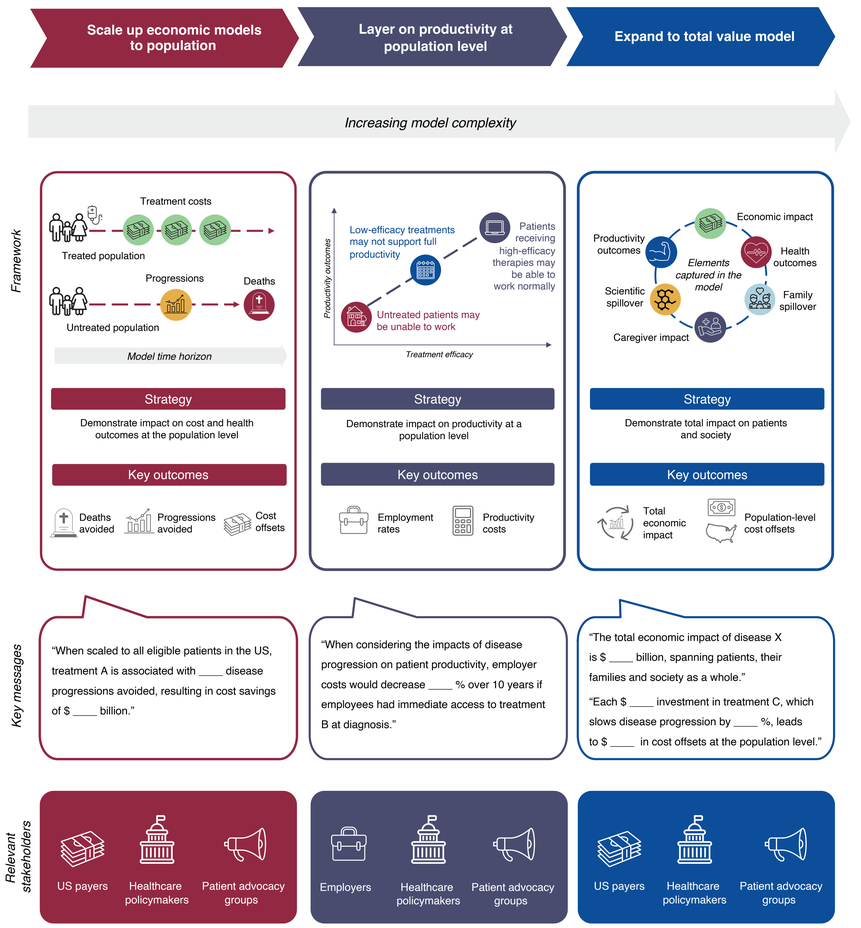
- Across three common product archetypes, conclusions about cost-effectiveness were consistent irrespective of the metric used (**Table 3**)

Table 3. Cost-Effectiveness Outcomes Across Three QoL Metrics

WTP threshold	QALY		evLY		HYT	
	$100,000		$84,000		$72,000	
Scenario	Incremental QALY	ICER[a]	Incremental QALY	ICER[a]	Incremental QALY	ICER[a]
QOL and LYs gains	0.50	$100,000	0.63	$79,936	0.68	$74,019
QOL gain only	0.20	$250,000	0.20	$250,000	0.20	$250,000
LYs gain only	0.25	$200,000	0.43	$117,509	0.43	$117,509

evLY, equal value life-year; HYT, healthy years in total; ICER, incremental cost-effectiveness ratio; LY, life-year; QALY, quality-adjusted life-year; QOL, quality of life; WTP, willingness to pay.
[a]Green shading indicates that the ICER is cost-effective for that scenario and metric; red shading indicates that the ICER is not cost-effective for that scenario and metric.

Figure 2. Population Modeling Applied in Example Strategic Contexts



CONCLUSIONS

- Additional health and economic outcomes, such as disease progressions/deaths avoided, cost offsets for subsequent treatments and productivity losses, can be generated when when population-level models are adopted
- QALY alternatives, including evLY and HYT, and population models can be used to complement the more conventional CEA approach that anchors to QALYs and ICERs
- This expanded CEA methodology can yield deeper insights into the societal impact of treatments and inform population-based decision-making

REFERENCES

1. O'Day K, et al. *ISPOR Value Outcomes Spotlight* 2021;7:26–28.
2. Basu A, et al. *Value Health* 2020;23:96–103.
3. Vanness D, et al. *Ann Intern Med* 2021;174:25–32.
4. Campbell J, et al. *Pharmacoeconomics* 2023;41:1175–1182.

Presented at ISPOR 2024; May 5–8, 2024; Atlanta, GA, USA

DISCLOSURES

K.L. Rosettie and **F. El Moustaid** are employees of Genentech, Inc., and shareholders of F. Hoffmann-La Roche Ltd

This study is sponsored by Genentech, Inc., South San Francisco, CA, USA. Writing and editorial assistance was provided by Nucleus Global, and funded by Genentech, Inc., South San Francisco, CA, USA.

Scan QR code or click link to download a PDF
https://ter.li/xpfvqk