

Quo vadis Health Years in Total (HYT): A comparison of HYT and QALYs in HER2+ Breast Cancer

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Background

- Although a foundation for health economic evaluations, the shortcomings of the quality-adjusted life years (QALY) are well documented. Health Years in Total (HYT) have recently been proposed as an alternative metric to avoid the QALY's discriminatory characteristic against patients with lower quality of life (QoL).¹
- This research aims to assess the impact of incorporating HYT in two breast cancer settings.

QALY's two potential sources of discrimination

- QALYs have the potential to be discriminatory towards patients with lower QoL and life expectancy

- Baseline QoL:** Comparing two interventions (A and B) that both yield the same increase in survival and QoL (e.g. 1 life-year and 0.2 in QoL). However, QoL under no treatment is lower for A than B. While it seems like the absolute value addition is similar in both cases, the incremental QALYs are higher for intervention B (see table to the right).

- Baseline age:** QoL usually decreases with age, so older populations represent a variation of the type described above. Additionally, survival gains, e.g. in the case of cures, translate into smaller QALY gains for older populations since due to shorter life expectancy these survival gains are preserved for a shorter period.

Comparison	LY	QALY weight	QALY	Δ QALY
A	1	0.4	0.4	0.8
No treatment	2	0.6	1.2	
B	1	0.7	0.7	1.1
No treatment	2	0.9	1.8	

Methods

- Two published health economic models comparing treatment with Trastuzumab-emtansine (TDM1) to the current standards of care in adjuvant and metastatic HER2+ breast cancer were adapted to include the HYT metric.^{2,3}
- Differences between QALYs and HYT were compared, including sensitivity analyses varying the baseline age of patients and utility values.

Results: Basecase

Table 1. Incremental QALY/HYT and related ICERs

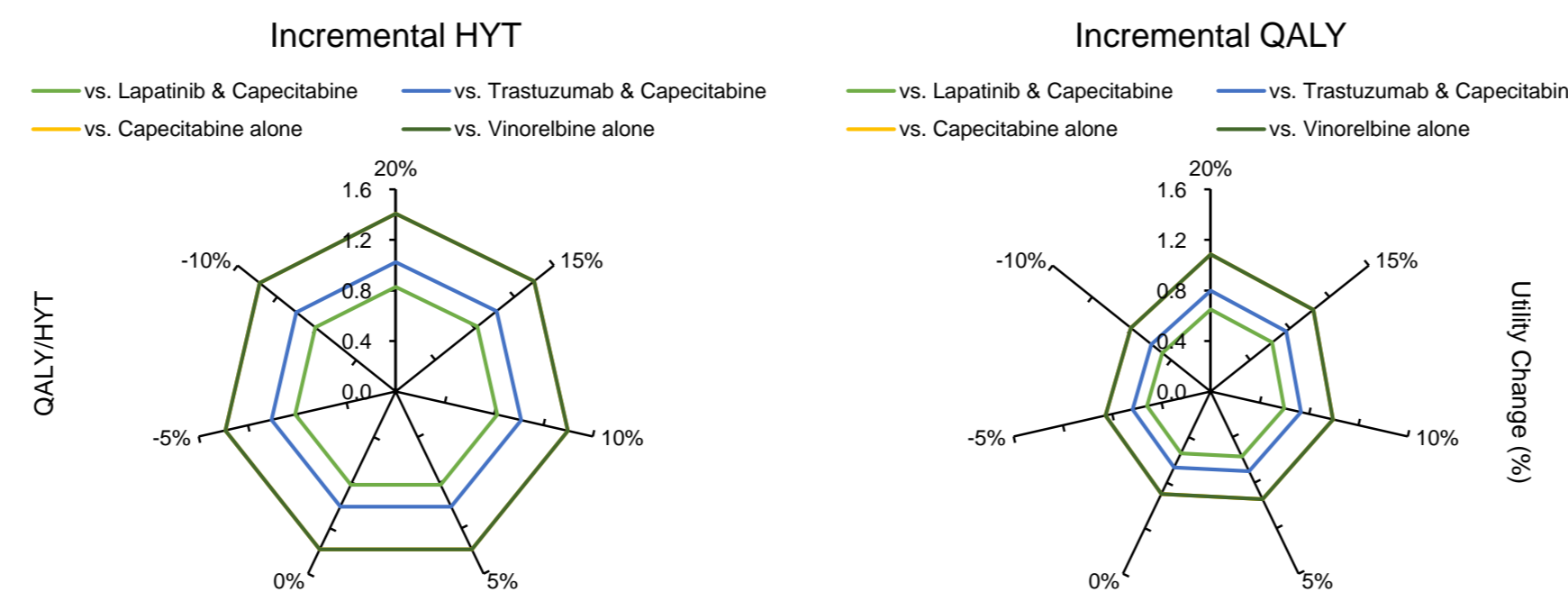
	QALYs	HYTs	ICER - \$/QALY	ICER - \$/HYT	ICER - \$/HYT adjusted	Adjustment factor *
Adjuvant						
TDM1 vs. SoC	2.57	2.73	dominant	dominant	dominant	-
Metastatic						
TDM1 vs. Lapatinib & Capecitabine	0.54	0.82	80,660	53,584	82,629	0.65
TDM1 vs. Trastuzumab & Capecitabine	0.67	1.01	56,900	37,502	55,667	0.67
TDM1 vs. Capecitabine alone	0.90	1.39	67,963	44,130	66,437	0.66
TDM1 vs. Vinorelbine alone	0.90	1.39	62,963	40,884	61,115	0.67

HYT, health years in total; ICER, incremental cost effectiveness ratio; SoC, standard of care; TDM1, trastuzumab-emtansine; QALY, quality-adjusted life year

* Using the adjustment factor in Basu et al. 2020: QALY threshold of \$50,000 (\$150,000) are equivalent to HYT thresholds of \$34,000 (\$89,000) respectively.¹ Steps in between were derived by interpolation.

Results: Varying baseline utility level

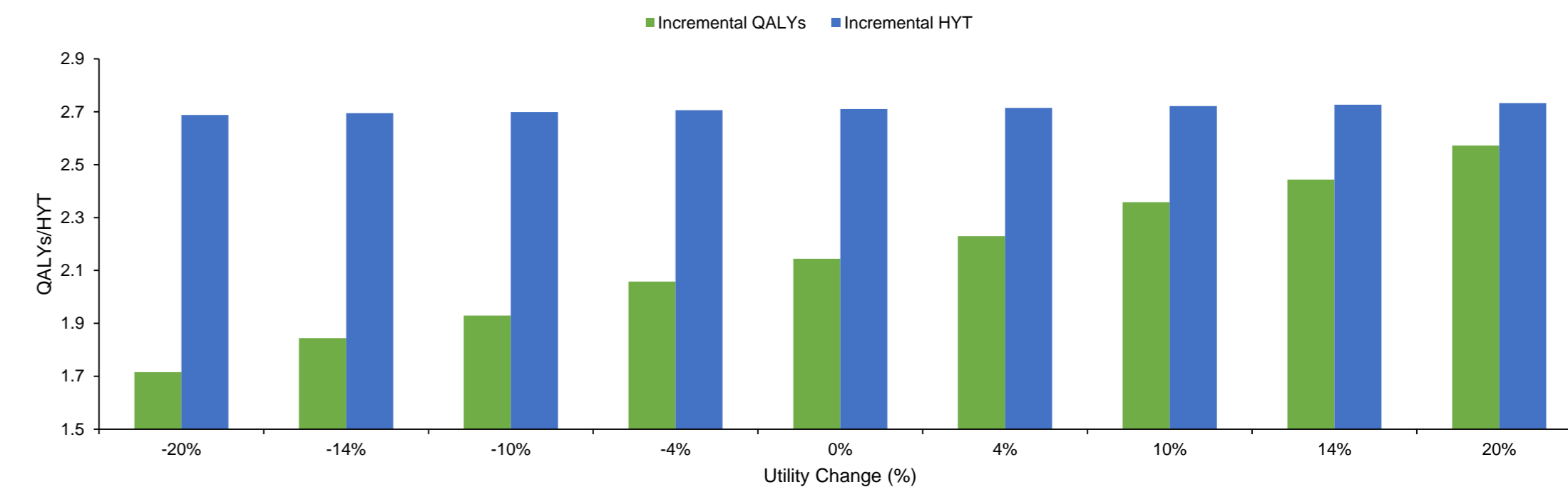
Fig 1. Incremental QALY/HYT of TDM1 vs comparators varying utility values in metastatic setting



Results: Varying baseline utility level (continued)

- The incremental number of QALYs changes substantially as baseline utility levels are varied by ±20 % while incremental HYT are stable in metastatic as well as adjuvant setting.
- The ranking of treatment alternatives does not change in both settings using either metric.

Fig 2. Incremental QALY/HYT of TDM1 vs comparators varying utility values in adjuvant setting



Results: Varying baseline age

- Increasing or decreasing baseline age in the metastatic setting does not have a meaningful effect on the total number of QALYs/HYTs and consequently on either incremental QALYs or HYTs as well. The underlying disease related mortality is always dominating background mortality.
- In the adjuvant setting, the incremental number of QALYs and HYTs decreases substantially with increasing baseline age. The decrease is slightly lower for HYT, highlighting the desired compensating effect. However, the effect is only marginal most likely not leading to different clinical evaluations.

Fig 3. Incremental QALY/HYT of TDM1 vs comparators varying baseline age in metastatic setting

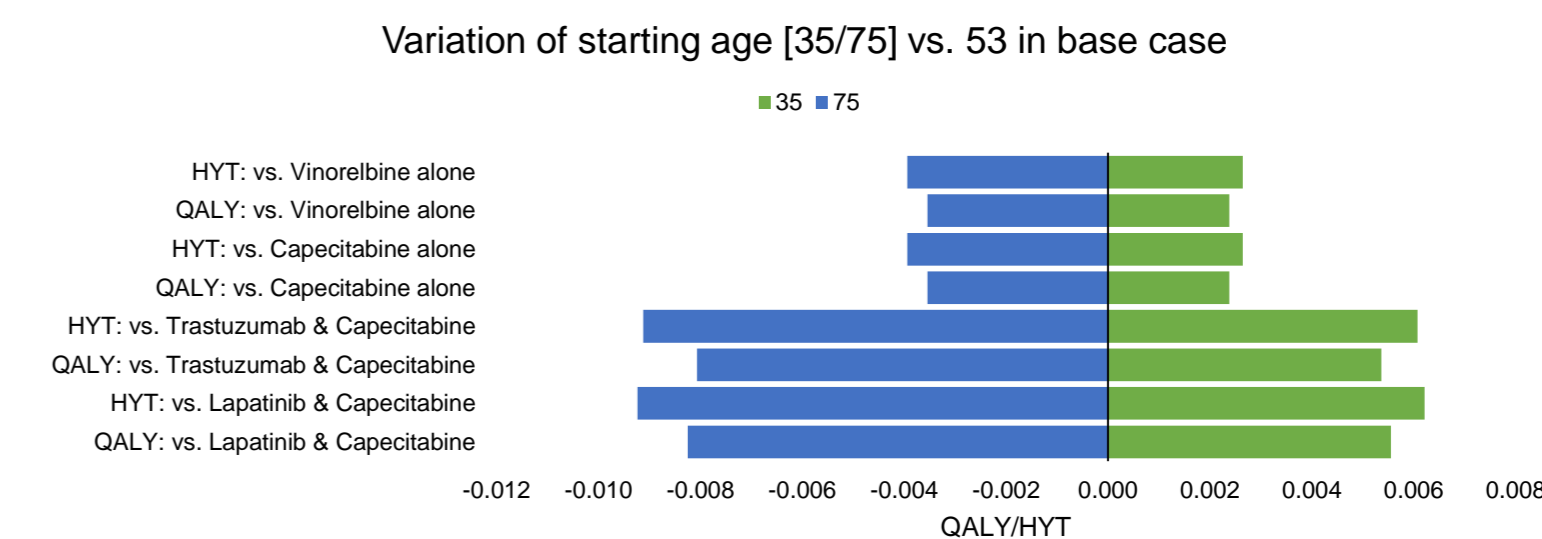
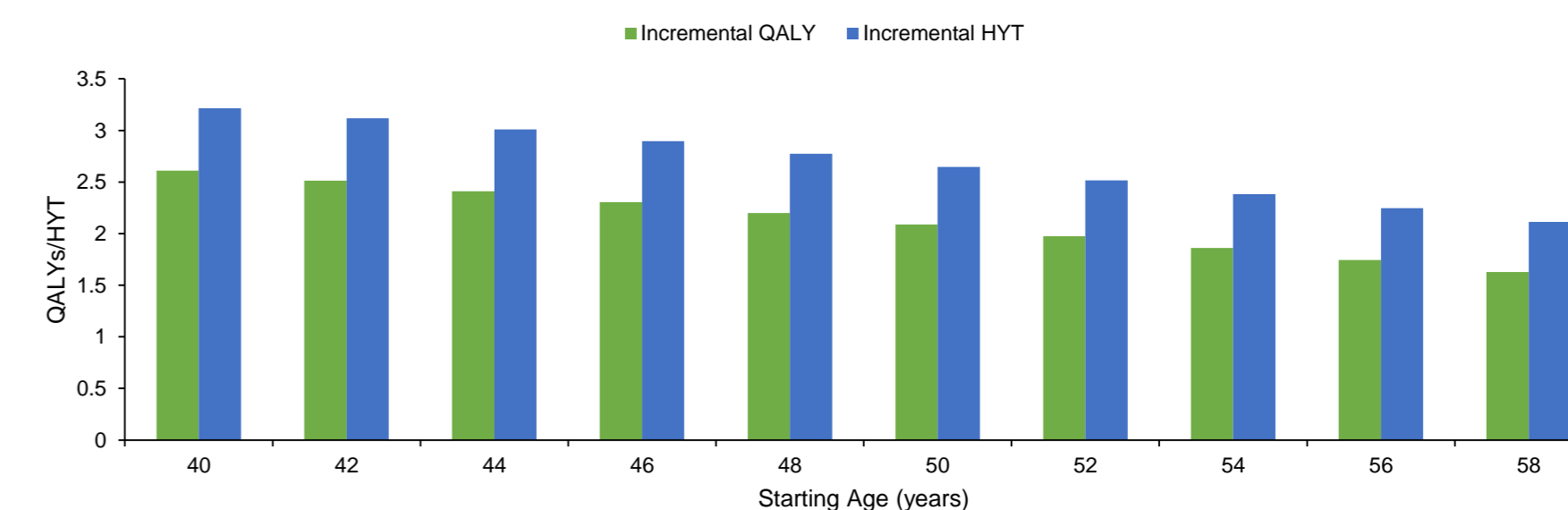


Fig 4. Incremental QALY/HYT of TDM1 vs comparators varying baseline age in adjuvant setting



Summary



Health Years in Total (HYT) have recently been proposed as an alternative metric to avoid the QALY's discriminatory characteristic against patients with lower quality of life.



Two published health economic models in metastatic and adjuvant breast cancer settings were adapted to also include the HYT metric. Differences between QALYs and HYT were compared.



In the adjuvant setting the intervention was estimated to result in an increase of 2.57 QALYs and 2.73 HYT. In the metastatic setting, improvements ranged from 0.54 to 0.9 QALYs and 0.84 to 1.39 HYT depending on the comparator.



The results indicate that using HYT rather than QALYs would not have changed the decision as to which treatments deliver the most clinical gains.



Conclusions



The results indicate that using HYT rather than QALYs would not have changed the decision in the two oncology settings analysis as to which treatments deliver the most clinical gains. However, they confirm that HYT are less sensitive to differences in baseline quality of life caused by e.g. disease severity or older populations.



Further analyses should seek to reassess the impact of the variations in the HYT metric versus the QALY in disease areas where treatment efficacy is less influenced by mortality gains.

References

- Basu, A et al., Health Years in Total: A New Health Objective Function for Cost-Effectiveness Analysis. Value in Health. 2020;23(1):96-103
- Squires et al., Trastuzumab Emtansine for Treating HER2-Positive, Unresectable, Locally Advanced or Metastatic Breast Cancer After Treatment with Trastuzumab and a Taxane: An Evidence Review Group Perspective of a NICE Single Technology Appraisal. Pharmacoeconomics. 2016;34(7):673-80
- Younis et al., Economic evaluation of adjuvant trastuzumab emtansine in patients with HER2-positive early breast cancer and residual invasive disease after neoadjuvant taxane and trastuzumab-based treatment in Canada. Curr Oncol. 2020;27(6):e578-e589

Disclosures

All authors are employees of F. Hoffmann-La Roche Ltd.