

Evaluating the Cost-Effectiveness of Tumor-Treating Fields in Combination With Temozolomide for Glioblastoma in Singapore

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Background

- Glioblastoma (GBM) is the most common and aggressive primary brain tumor in adults, with a median overall survival (OS) of ~15–18 months despite optimal standard therapy.¹
- Standard of care includes maximal safe surgical resection, radiotherapy, and maintenance temozolomide (TMZ) chemotherapy.¹
- Tumor-Treating Fields (TTFields) are a non-invasive, loco-regional therapy delivering low-intensity, alternating electric fields that disrupt cancer cell division and tumor growth.¹
- The EF-14 randomized clinical trial showed that TTFields + TMZ significantly improved median progression-free survival (PFS) and OS compared to TMZ alone:
- No prior cost-effectiveness analysis for TTFields in Singapore’s healthcare setting has been published.

Objective

Evaluate the cost-effectiveness of TTFields + TMZ versus TMZ alone in newly diagnosed GBM from the perspective of the Singapore healthcare payer.

Methods

- Model type:** Partitioned survival model with three health states: (1)Progression-Free Survival (PFS), (2)Progressive Disease (PD) and (3)Death²
- Time horizon:** 40 years (lifetime).
- Overall Survival (OS) modeling:** 3-phase approach³: EF-14 trial Kaplan-Meier OS data (0–5 years), Conditional survival estimates from epidemiological data (years 5–15) and Background mortality from Singapore life tables (≥15 years)
- PFS modeling:** Extrapolated using Weibull distribution fitted to EF-14 PFS data.
- Clinical inputs:** EF-14 trial data for treatment efficacy.¹
- Costs:** TTFields device, TMZ, routine monitoring, and adverse event management from Singapore Healthcare Resource Sheet (2023).
- Utilities:** Sourced from published literature for GBM patients by health state (Guzauskas, 2019).
- Discount rate:** 3% per year for costs and outcomes.

Results

Base-case outcomes: +1.23 life-years gained, +0.94 QALYs, incremental cost SGD 246,240; ICER within 2–3× Singapore GDP per capita threshold (WHO guideline).

Clinical benefit: TTFields + TMZ extends both PFS and OS, providing sustained quality-of-life gains in the progression-free state.

Key sensitivity findings: Cost-effectiveness is most sensitive to: TTFields treatment duration and Health state utility values.

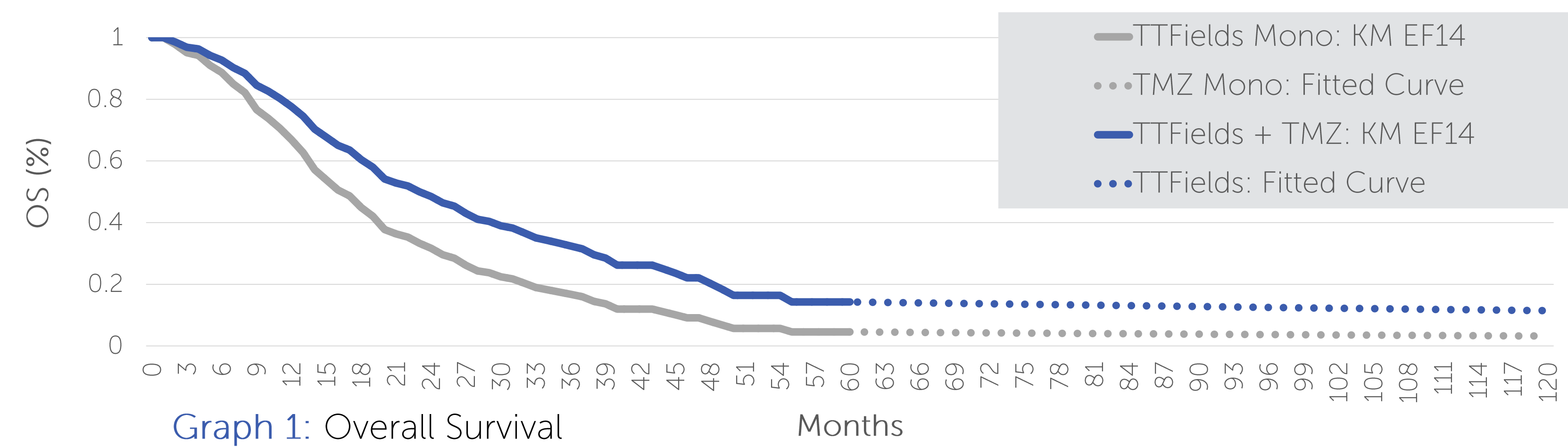
Robustness: Across plausible parameter ranges, ICER remained within thresholds commonly considered cost-effective in Singapore.

Conclusion

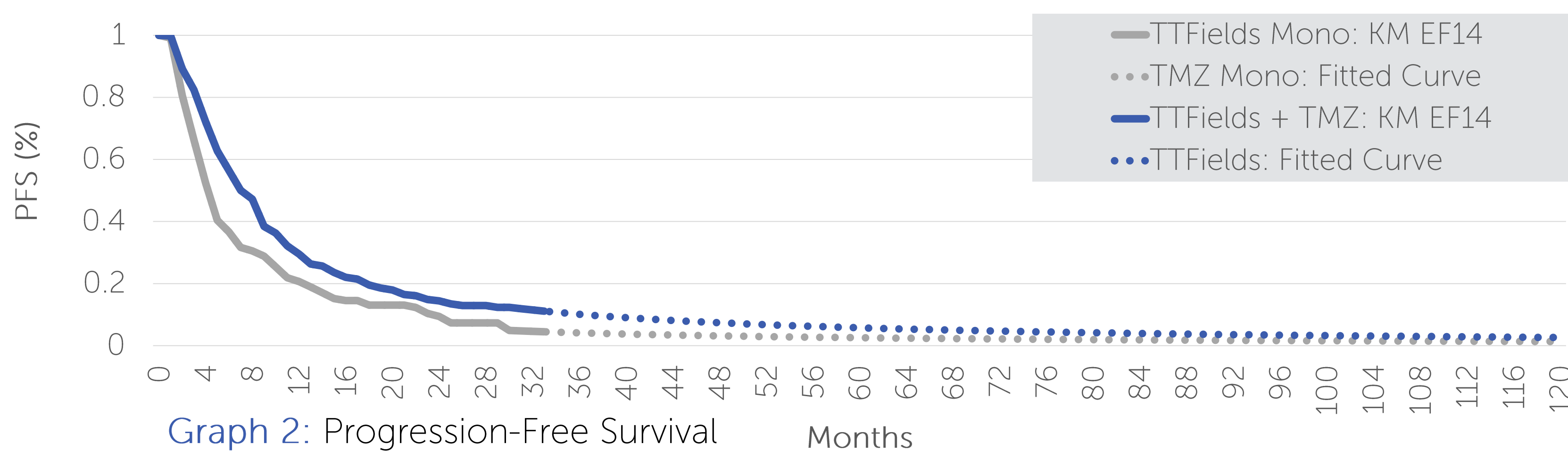
- TTFields + TMZ provides clinically meaningful survival and QALY gains for newly diagnosed GBM patients in Singapore.
- Under current pricing and clinical assumptions, TTFields + TMZ is **cost-effective** relative to TMZ alone when evaluated against WHO-recommended willingness-to-pay thresholds.
- Supports consideration of TTFields in Singapore’s GBM treatment landscape and highlights the importance of innovative access strategies to improve patient outcomes.

Variable	Base Case	Source
General Inputs		
Age	56	Stupp et al. 2017
Horizon	30	Stupp et al. 2017
Discount	3%	ACE framework
Utility Inputs		
Utility: PFS	0.85	Garside et al. 2007
Utility: Progressed Disease	0.73	Garside et al. 2007
Costs		
TTFields + TMZ		
Cost of Optune per month	S\$28,600	Novocure
Time on Treatment - TTFields	8.2 months	Stupp et al. 2017
TMZ Monotherapy		
Cost, per mg	S\$0.03	Novocure
TMZ dose/day per mg/m²	150 mg	Novocure
Time on Treatment - TMZ	7.2 months	Stupp et al. 2017
Adverse Events		
Pulmonary Embolism	S\$5,726	Clinician and Pharmacist input
Seizure	S\$6,503	Clinician and Pharmacist input
Infections	S\$7,509	ACE Singapore Healthcare Resource Sheet
Leukopenia or Lymphopenia	S\$7,066	ACE Singapore Healthcare Resource Sheet
General Disorders*	S\$0	Clinician and Pharmacist input
Thrombocytopenia	S\$5,478	ACE Singapore Healthcare Resource Sheet

Table 1: Clinical and costs inputs



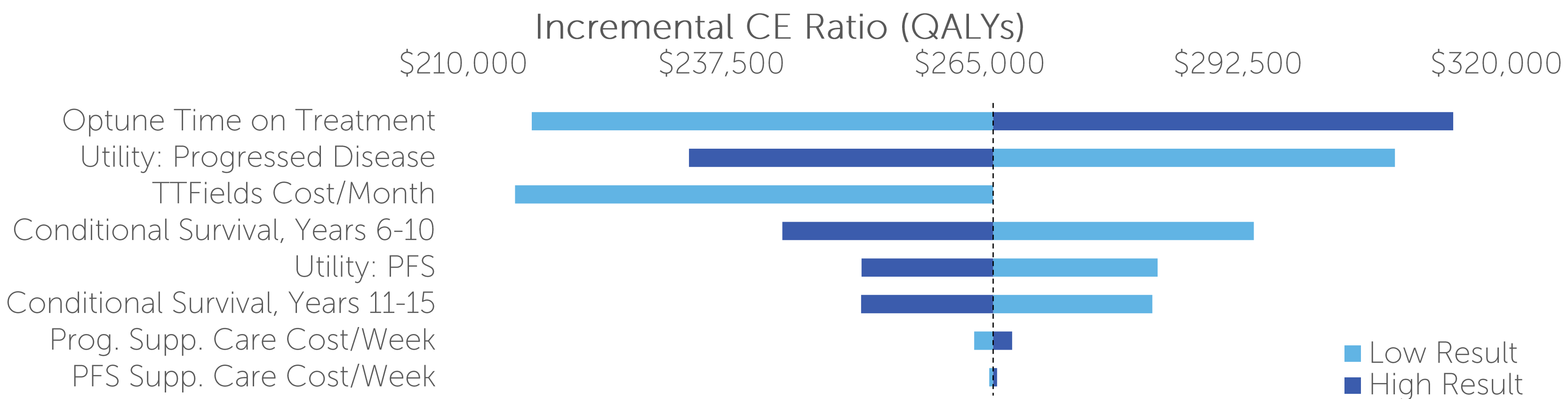
Graph 1: Overall Survival



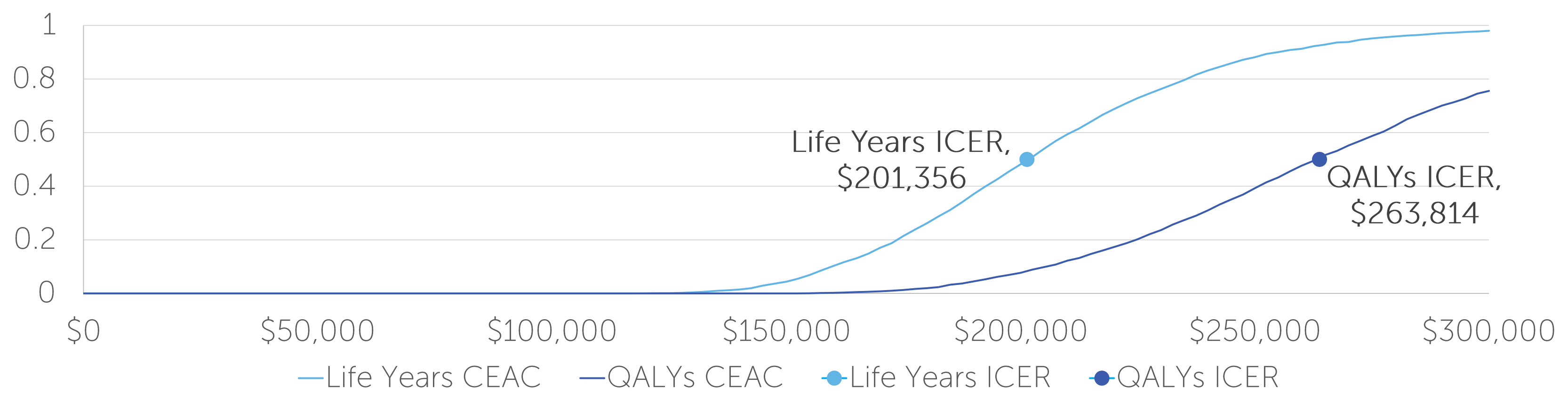
Graph 2: Progression-Free Survival

	TTFields + TMZ	TMZ Monotherapy	Δ
Total Cost	S\$269,435	S\$23,563	S\$245,871
Drug Costs	S\$234,865	S\$382	S\$234,483
PFS & AE	S\$8,025	S\$5,985	S\$2,040
Prog	S\$23,646	S\$14,182	S\$9,464
EoL	S\$2,899	S\$3,014	-S\$116
Life Years	3.29	2.07	1.22
Cost/LY Gained	--	--	S\$201,356
QALYs	2.53	1.60	0.93
ICER	--	--	S\$263,814

Table 2: Base case results



Graph 3: One-way sensitivity analysis | Tornado diagram



Graph 4: Cost-Effectiveness Acceptability Curve

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