

# Modelling Treatment Duration in Psoriasis: Examining Extrapolation Approaches and Implications

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## Objectives

Modeling treatment duration (TD) is crucial for cost-effectiveness and budget impact analyses in chronic diseases. Markov models assume constant treatment interruption risks, implying that all patients eventually drop out of treatment, which may not be realistic. We examined TD extrapolation approaches for moderate to severe psoriasis (MSP) and proposed a decision framework.

## Methods

Exponential distributions were fitted to real-world TD data to model TD for biotherapies in French MSP patients. Although median TD was short (1.5 years), 12-year follow-up available for Infliximab showed a plateau with 6.7% of patients still on treatment after 10 years. Thus, a plateau parameter was introduced to cap the discontinuation rate. This raised the question of the magnitude of the plateau for other biotherapies. We tested two potential approaches and compared their impact on the modelled TD for Infliximab and Interleukine(IL)-23: 1) plateau is treatment-response-dependent and response HR (table 1) were applied to the plateau to estimate plateaus' levels for IL-23; 2) plateau is patient- or practitioner-dependent with a similar level across treatments.

## Results

Modelling without accounting for the plateau yielded median TD of 1,4 years for Infliximab, with <1% patients on treatment at 10 years. Accounting for the plateau led to accurate TD (median = 1.5 years, 6.9%/6.2% on treatment at 10/20 years) (table 2).

Not accounting for TD plateau, modelled IL-23 median TD was 3.68 years and 15%/2.3% of patients were on treatment at 10/20 years. Approaches 1 and 2 respectively increased median TD (%patients treated at 10/20 years) of +0.8 (27%/16%) and +0.4 years (21%/8%).

## Discussion

The extrapolation of treatment duration or survival is crucial in Markov models. Having a method that maintains exponential extrapolation allows accurate simulation of therapeutic strategies. However, caution is needed regarding comparison data and plateau nature, necessitating expert input. Study limitations may arise from non-exponential distribution modeling, making integration into a Markov model challenging.

## Conclusions

Accurate extrapolation of TD with Markov models may require adaptations to avoid underestimating TD, likely to bias cost-effectiveness or budget impact results. Addressing this issue raises the question of the determinants of treatment-maintenance that should be addressed through face validation of model estimates, expert opinion, or biological plausibility.

Figure 1. Exponential approximation of Infliximab efficacy data

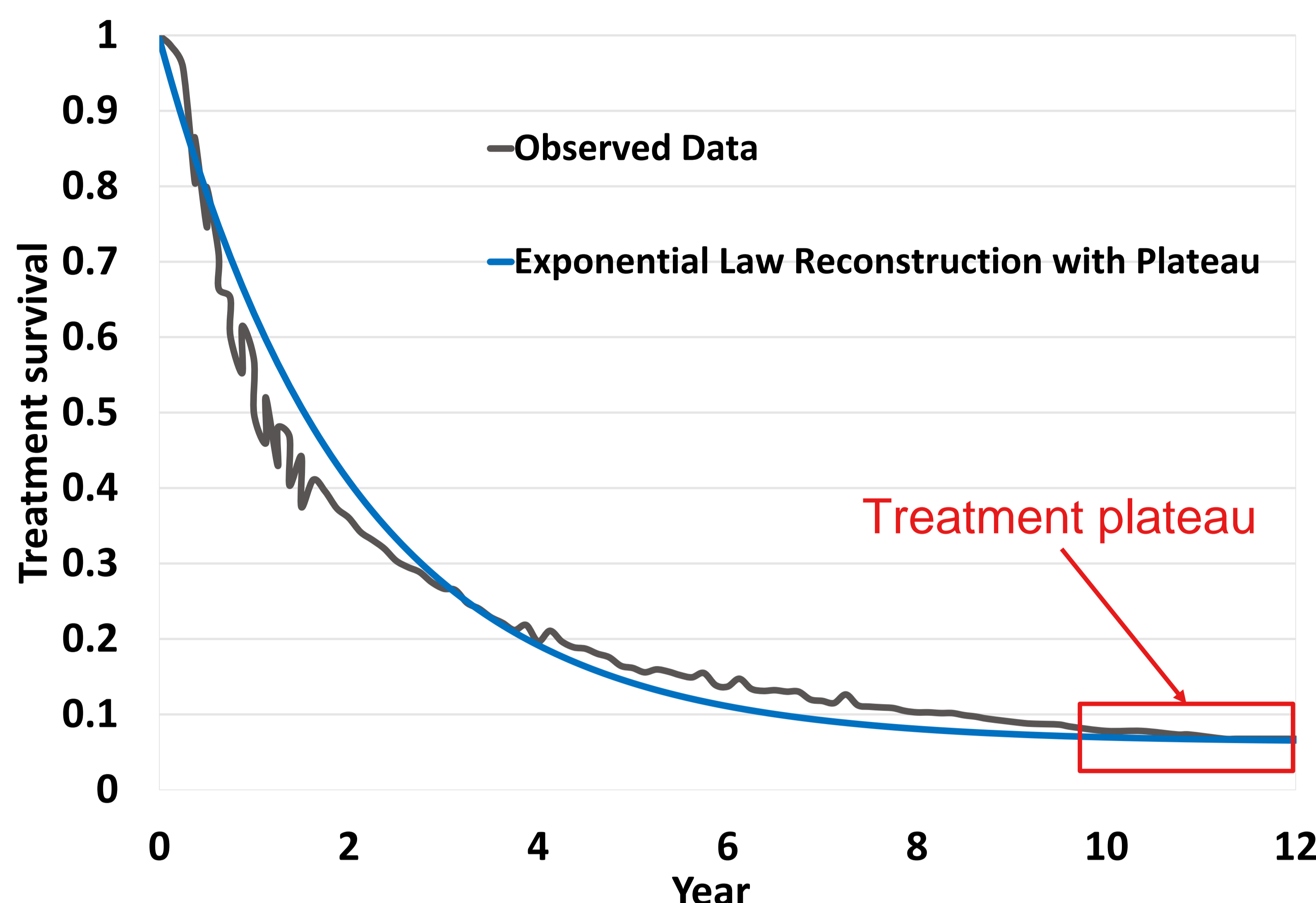


Table 1. HR on duration of response

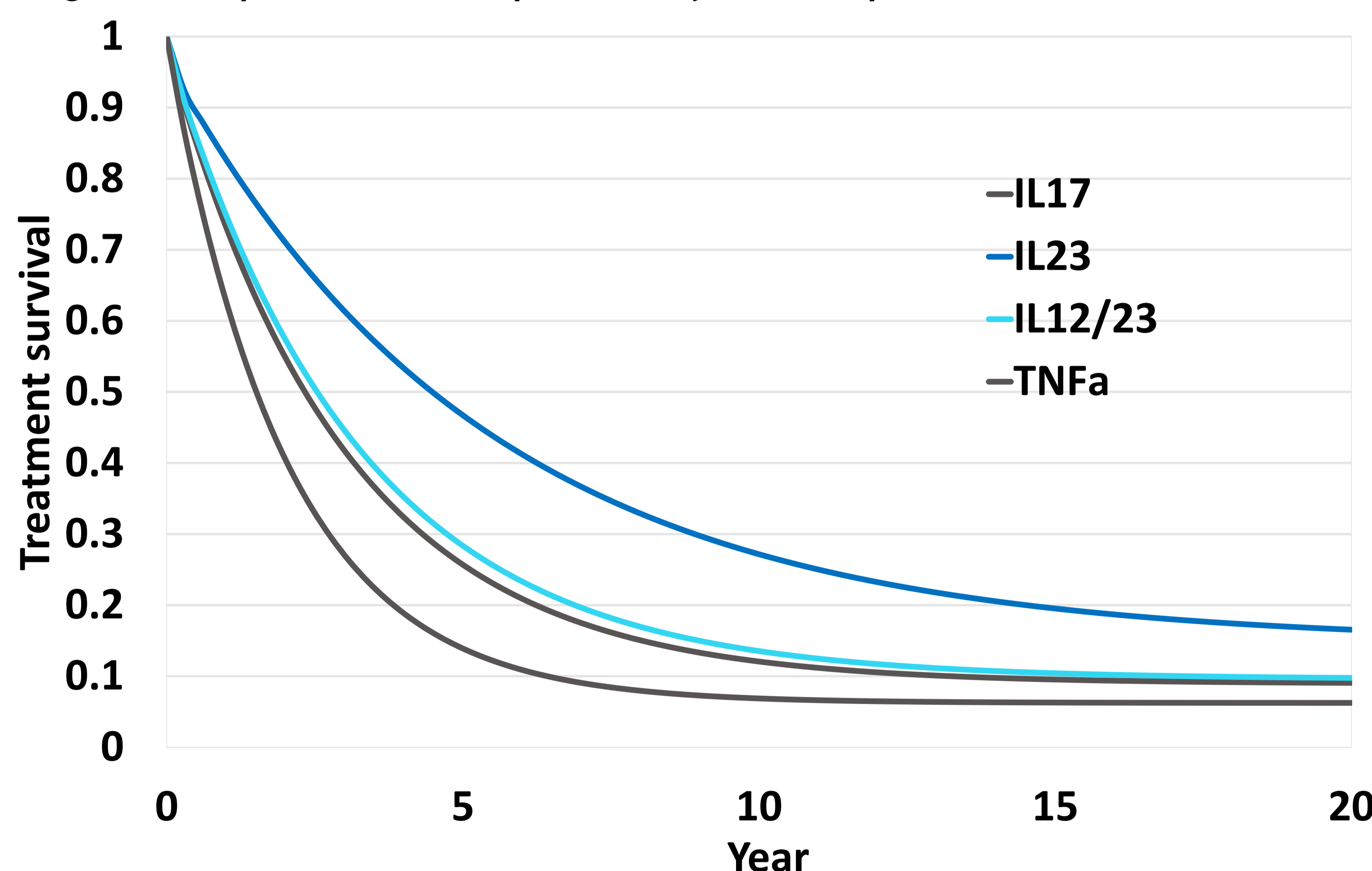
Treatment	HR
IL17	0.68
IL23	0.38
IL12/23	0.63
TNFa	1.01

Table 2. Treatment extrapolation duration over time

Treatment	Year					Median (year)
	1	2	5	10	20	
IL17	73%	55%	26%	12%	10%	2,33
IL23	83%	71%	47%	27%	18%	4,48
IL12/23	75%	57%	28%	14%	11%	2,54
TNFa	63%	41%	14%	7%	7%	1,51

Considering a treatment efficacy origin for the plateau effect according to the experts and using HR from meta-analysis provide a strong extrapolation with long-term patient consideration for new biotherapies.

Figure 2. Exponential extrapolation of Biotherapies with HR



## Main findings

- Problematic:** Extrapolation need for new treatments with short follow-up in cost-effectiveness model
- Method:** Meta-analysis to compare new treatments efficacy with long follow-up treatment
- Result:** Exponential extrapolation with long-term patient consideration