Economic Modelling in Systemic Lupus Erythematosus and Lupus Nephritis: A Systematic Appraisal of Published Model Structures and Evidence Bases

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1 BACKGROUND

Systemic Lupus Erythematosus (SLE) is a chronic, heterogeneous multisystem autoimmune disease, causing relapses, irreversible organ damage and substantial patient burden.[1]

- **Evidence to 2018:** Gavan *et al.* identified six published economic models including decision trees, Markov and patient-level simulations. They reported inconsistent populations, comparators, utilities/costs and heterogeneity limited transferability.[1]
- **Since 2018.** Belimumab, voclosporin and anifrolumab have expanded care in SLE and lupus nephritis (LN), increasing the need for economic modelling.[2-4]

GAP: Lupus models are necessarily complex, and there is as yet no single established and preferred method. With new models being published frequently, there is a need for an updated 'state of the art' assessment on economic modelling in lupus.

2 OBJECTIVE

To systematically characterize the SLE economic modelling studies for model types, interventions, and disease features represented and identify gaps to guide future model development.

3 METHODS

Building on a previously published systematic review of decision-analytic economic evaluations in SLE[1], the literature search was updated to January 2026 using predefined inclusion criteria. Technical model specifications, including population, intervention, comparator, perspective, model type, health states, events, and evidence sources were extracted in a predefined excel extraction sheet.

Full decision-analytic model-based economic evaluations (CEA, CUA, CBA) in SLE and/or LN, in English-language were included.

4 RESULTS

The review by Gavan et al. included 6 studies.[1] The updated systematic review identified 17 additional full text studies for inclusion, published since 2018. **In total 23 studies** were included in the review.

SLE MODELLING

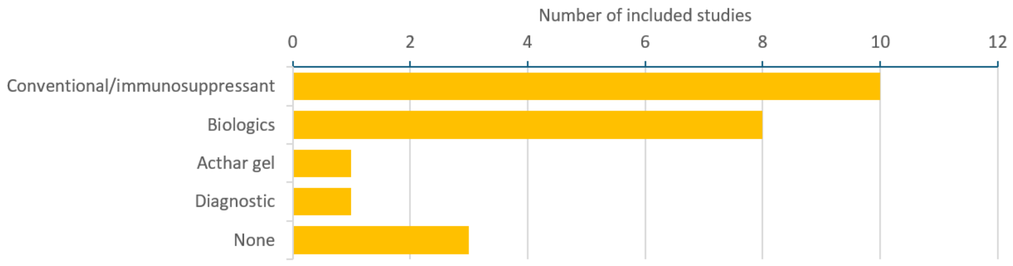


Figure 1: Distribution of intervention types in SLE economic modelling studies

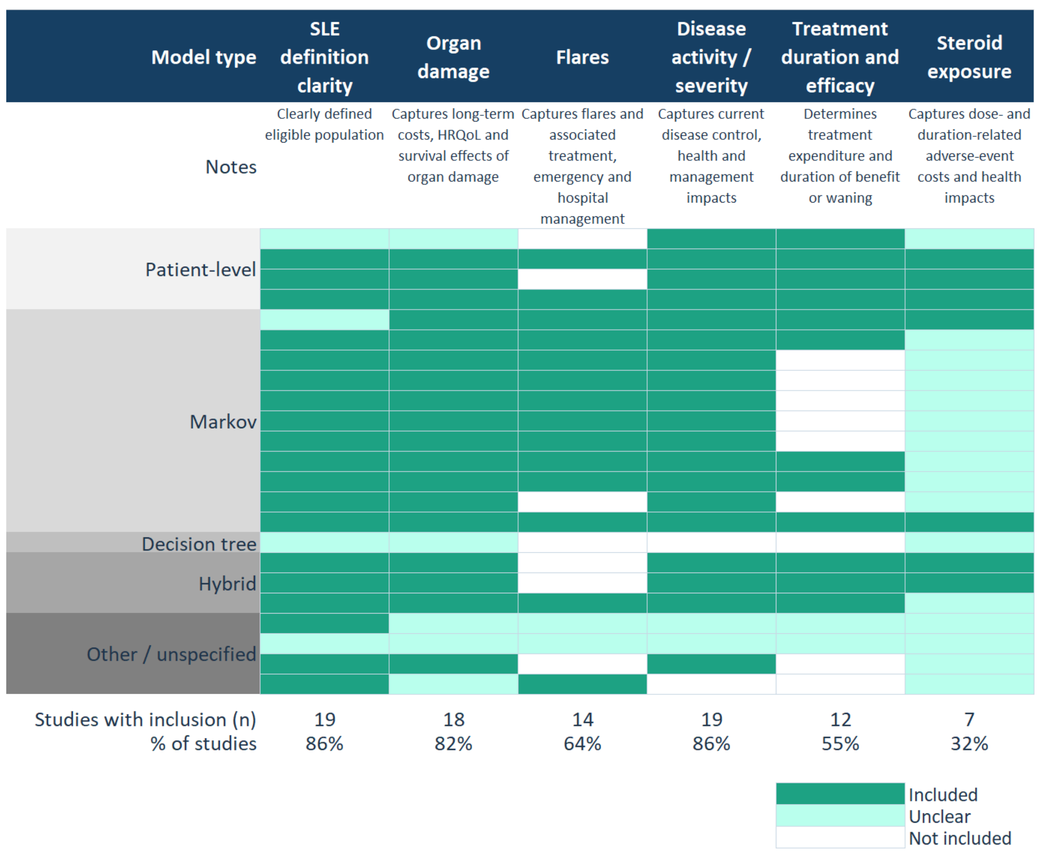
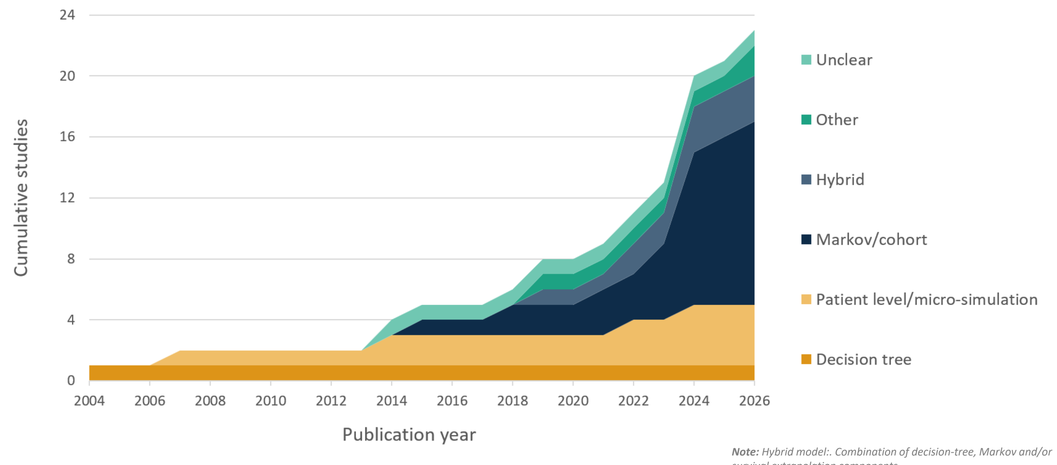


Figure 2: Qualitative synthesis of disease and treatment characteristics included in SLE economic modelling studies



Note: *Hybrid model:. Combination of decision-tree, Markov and/or survival extrapolation components.*

Figure 3: Trends in modelling approaches in SLE over time

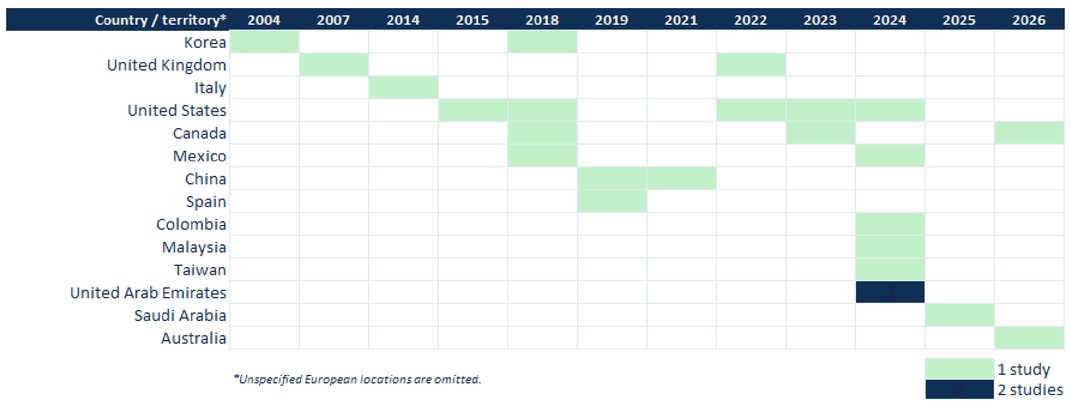


Figure 4: Country footprint of SLE modelling studies over time

LUPUS NEPHRITIS MODELLING

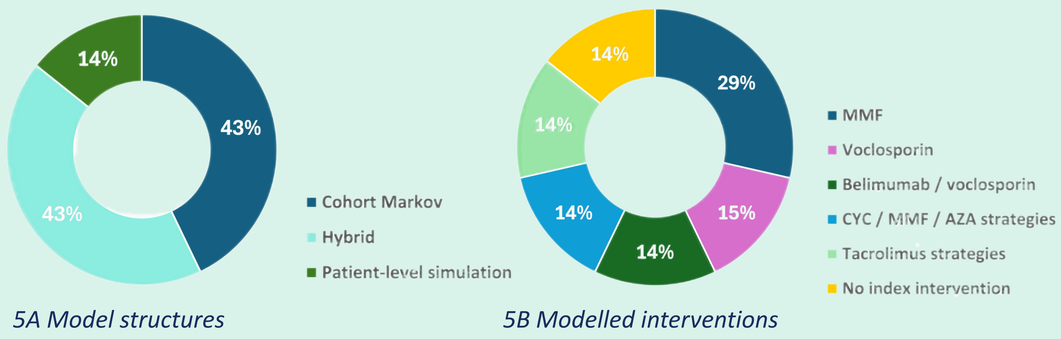


Figure 5: Distribution of modelling types and interventions in Nephritis Economic Modelling Studies

5 RESULTS

- Conventional/immunosuppressant regimens (usual care) were the most modelled SLE intervention (10 studies), followed by biologics (**Fig. 1**).
- Disease activity/severity was the most modelled SLE parameter (19 studies; 86%), followed by organ damage (18; 82%) and flares (14; 64%) while steroid exposure was formally captured in only 32 % of studies (**Fig. 2**).
- Publication activity was globally accelerated after 2018, when 17 of 23 included studies were published and 8 of 14 countries first appeared from 2019 onward (**Fig. 3; Fig. 4**).
- Both cohort Markov and hybrid approaches were commonly used in **Lupus Nephritis modelling**. Patient-level simulation remained uncommon (**Fig. 5**).

6 DISCUSSION: Future modelling considerations

- SLE: Validated, evidence based, patient-level, history-dependent, multi-organ models would be valuable to capture heterogeneity and long-term disease. Real-world evidence is extremely important to support this.
- LN: Models with patient-level or history-dependent structures linking recurrent renal/non-renal flares, remission/relapse, multi-organ damage and lifetime steroid exposure would be valuable to capture impacts of future treatments.
- **Limitations.** The targeted approach may miss publications, and unreported features are not necessarily absent from models.

7 CONCLUSION

SLE/LN models remain heterogeneous, inconsistently represent disease features, and focus on isolated outcomes without linking systemic activity, renal progression and cumulative treatment effects in long term treatment regimen.

KEY MESSAGE

"Despite the publication of 17 new decision analytic modelling studies since 2018, there remains no agreed, single, optimum modelling approach to capture disease and treatment attributes in lupus."

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