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ARTICLE



# Cost-effectiveness of tildrakizumab for the treatment of moderate-to-severe psoriasis in the United States

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**ABSTRACT**

**Objective:** To evaluate the relative cost-effectiveness of tildrakizumab and other biologic and targeted systemic treatments compared with a mix of topical therapies, phototherapies, and other conventional systemic therapies as first-line treatment for moderate-to-severe plaque psoriasis from a United States payer's perspective.

**Methods:** A Markov model consisting of health states based on Psoriasis Area Severity Index (PASI) response rate categories and death was developed. The probabilities of achieving PASI responses were derived from a network meta-analysis based on published efficacy data. Health care costs and effectiveness measured in quality-adjusted life-years (QALYs) were estimated. Incremental costs per QALY gained of each biologic/targeted first-line treatment versus a mix of conventional treatments were compared to provide relative cost-effectiveness among biologic and targeted first-line treatments.

**Results:** Over 10 years, the incremental cost per QALY gained compared with a mix of topical therapies, phototherapies, and other oral systemic therapies was lowest for brodalumab, infliximab, apremilast, and tildrakizumab, followed by secukinumab, ixekizumab, guselkumab, adalimumab, ustekinumab, and etanercept. The position of tildrakizumab relative to the other treatments remained the same across multiple scenarios.

**Conclusions:** Tildrakizumab is among the most cost-effective first-line therapies for moderate-to-severe plaque psoriasis and is more cost-effective than secukinumab, ixekizumab, guselkumab, adalimumab, ustekinumab, and etanercept.

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**KEYWORDS**
Cost-effectiveness; tildrakizumab; plaque psoriasis; United States

## Introduction

Psoriasis is a chronic immune-mediated skin disorder, affecting approximately 1–3% of the population worldwide (1). It is estimated that 3.2% of adults in the United States (US) are living with psoriasis (2), and about 20% are affected by moderate-to-severe plaque psoriasis (> 3% of the body surface area affected) (3–5). Moderate-to-severe psoriasis has a negative impact on patients' quality of life, and incurs substantial health care resources (6,7) including indirect costs such as productivity loss to patients and society (7). According to a recent claim-based study in the US (8), the total direct health care costs incurred by a patient with moderate-to-severe psoriasis was estimated to be $21,481 per year (2014 unit costs). A US observational study also reported a similar estimate of direct medical costs and an estimated $2101 of indirect costs every 6 months (2012 unit costs) (9). Furthermore, psoriasis is a systemic condition commonly associated with comorbidities such as diabetes, cardiovascular disease, psoriatic arthritis, obesity, and depression (10,11), which further increases the burden of illness (12).

Treatment guidelines for moderate-to-severe psoriasis generally recommend using phototherapy, traditional systemic treatments (e.g. methotrexate, cyclosporine, acitretin), and newer systemic treatments including biologics and apremilast (13–16). Phototherapy as a conventional treatment for moderate-to-severe plaque psoriasis is effective but lacks the immunosuppressive property of the systemic treatments (16,17). Traditional systemic agents have been used in psoriasis for decades; however, the efficacy is modest for many of these agents, and they can be associated with side effects such as hepatotoxicity, hypertension, lymphoma, skin cancer, and elevated triglycerides (18). Newer systemic treatments, such as biologics and advanced oral agents, provide better efficacy and potentially lower toxicity (19–21). Thus, these treatments are increasingly being used to treat moderate-to-severe plaque psoriasis; however, they are also associated with higher treatment costs. The relative cost-effectiveness among newer systemic treatments is important, as it can be used to help inform treatment and reimbursement decisions (22,23).

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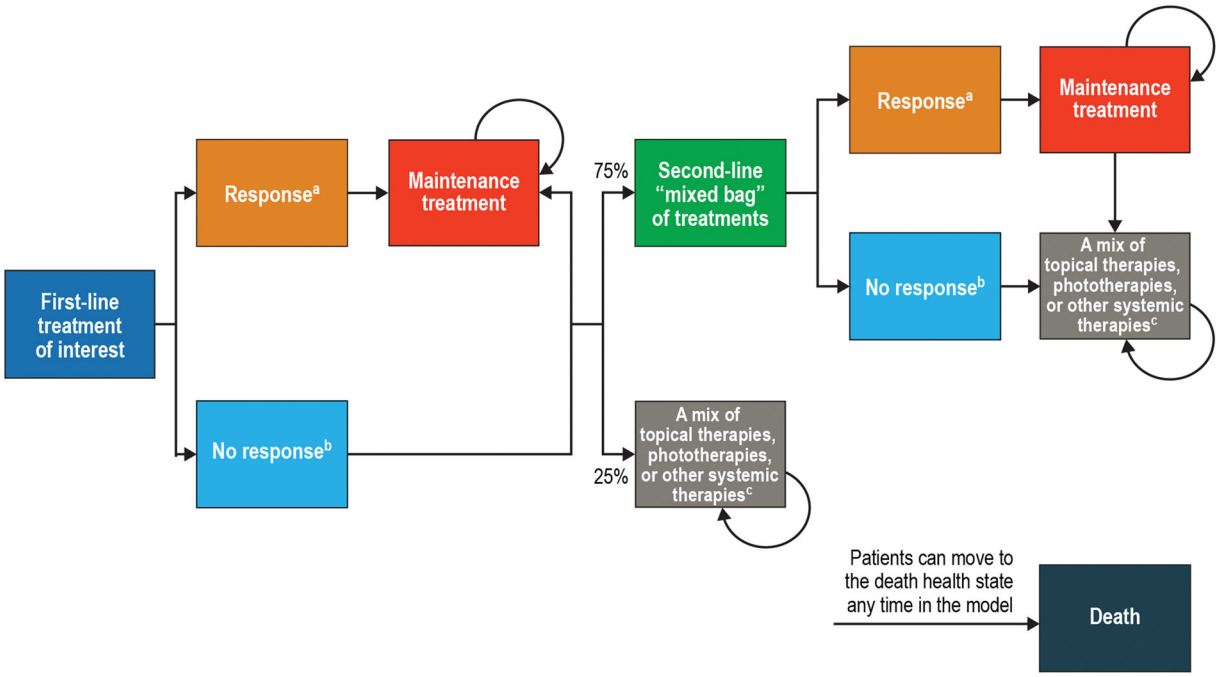


**Figure 1.** Cost-effectiveness model structure diagram. [a]Response refers to PASI 75–100 response (i.e. at least a 75% reduction in PASI score from baseline). [b]No response refers to PASI 0–74 response (i.e. 0–74% reduction in PASI score from baseline). [c]Topical therapies include over-the-counter topicals, corticosteroids, and noncorticosteroids. Phototherapies use ultraviolet (UV) light to treat psoriasis and include UVB phototherapy, laser UVB phototherapy, psoralen and UVA radiation therapy, and sunlight. Other oral systemic therapies refer to systemic therapies other than biologics or apremilast, such as acitretin, cyclosporin, and methotrexate.

Tildrakizumab, a high-affinity, humanized, IgG1κ, anti–interleukin (IL) −23 monoclonal antibody, received US Food and Drug Administration approval for treating adults with moderate-to-severe psoriasis in March 2018. Two phase 3 trials have demonstrated its efficacy, safety, and tolerability compared with placebo and etanercept (24). Despite the recent economic analyses conducted by the Institute for Clinical and Economic Review for psoriasis treatments (22,23,25), the cost-effectiveness of tildrakizumab compared with other newer systemic treatments has not been assessed. The objective of the current study was to evaluate the relative cost-effectiveness of tildrakizumab and other biologic and targeted systemic treatments (adalimumab, apremilast, brodalumab, etanercept, guselkumab, infliximab, ixekizumab, secukinumab, and ustekinumab) compared with a mix of topical therapies, phototherapies, and other conventional systemic therapies (e.g. acitretin, cyclosporin, and methotrexate) for the treatment of patients with moderate-to-severe plaque psoriasis as the first-line treatment from a US payer's perspective.

## Materials and methods

### *Model approach*

A Markov model was developed to reflect the disease course of plaque psoriasis and treatment effect of newer systemic treatments compared with a mix of topical therapies, phototherapies, and other oral systemic therapies. The model was used to estimate overall costs and patients' quality-adjusted life-years (QALYs) for each first-line treatment compared with a mix of topical therapies, phototherapies, and other oral systemic therapies, and results were summarized using incremental costs per QALY gained.

A 10-year time horizon was adopted in line with previous psoriasis models (23,26–28). Patients (45 years of age with an average weight of 90 kg) received the therapies evaluated in this analysis as a first-line treatment upon entering the model (Figure 1). Treatment response was evaluated after the treatment initiation period (10 weeks for infliximab; 12 weeks for brodalumab, etanercept, guselkumab, ixekizumab, secukinumab, tildrakizumab, ustekinumab; and 16 weeks for adalimumab, and apremilast) and every 4 weeks during the maintenance period. Response was categorized into four health states based on Psoriasis Area Severity Index (PASI) response (representing the percentage of improvement from baseline): PASI 0–49, PASI 50–74, PASI 75–89, and PASI 90–100. Patients' health-related utility values differed depending on their PASI responses, which were used to estimate the total QALYs over time. Responders (defined as those who achieved a PASI 75–100 response) stayed on the same treatment for maintenance, and patients remained on the same PASI response health state during the maintenance period. Nonresponders (defined as those who achieved a PASI 0–74 response) discontinued the first-line treatment. In the base-case analysis, 75% of nonresponders received a second-line treatment (a mixed bag of equally weighted newer systemic treatments that were included in the model), and the remaining 25% of the nonresponders switched to a mix of topical therapies, phototherapies, and other oral systemic therapies after discontinuation of the first-line treatment. Those receiving second-line treatment progressed to a mix of topical therapies, phototherapies, and other oral systemic therapies if they failed to achieve PASI 75 response. Responders remaining on the first- or the second-line treatment after the initiation period could withdraw from treatment at treatment-specific discontinuation rates over time. In the model, patients can receive at most two lines of biologic/targeted treatment, which aligns with the design of the psoriasis models developed by the Institute for Clinical and Economic Review (23,26). Death could occur at any time during the modeled time horizon, and the probability of

death was based on the US general population age-specific mortality rates (29). Provided that there is a lack of evidence in whether there is a significantly elevated mortality risk for patients with psoriasis and whether there is a meaningful difference in treatment-specific mortality rates, disease-specific, and treatment-specific mortality were not included in the model.

## Data inputs

### Treatment efficacy measured by PASI response

In the base-case analysis, the probabilities of achieving different PASI response health states by the end of the initiation period (Supplementary Appendix A) were derived from a network meta-analysis based on published efficacy data (30). Consistent with previous cost-effectiveness models in psoriasis (22,23), it was assumed that the treatments would have reduced efficacy when used as second line. Thus, the probability of patients achieving PASI 75-100 with the 'mixed bag' of the second-line treatment was the average of all first-line treatments reduced by 10% (i.e. a 5% decrease in the PASI 75–89 and a 5% decrease in the PASI 90–100 categories and likewise a 5% increase in the PASI 0–49 and a 5% increase in the PASI 50–74 categories).

### Treatment discontinuation

The probability of discontinuing first-line treatments in the model was treatment specific to account for the different levels of tolerability of psoriasis treatments. The model further allowed for different treatment discontinuation rates to be incorporated during and after the first year of treatment. The annual discontinuation rates incorporated for the first year after the treatment initiation period were 0.27, 0.35, and 0.16 for adalimumab, etanercept, and ustekinumab, respectively; these were based on a retrospective cross-sectional study of claims database analysis in the US (31). The current model assumed that the discontinuation rate of infliximab was 0.30 (higher than that of adalimumab but lower than that of etanercept), the discontinuation rate of apremilast was the same as that of etanercept (0.35), and the remaining treatments had the same discontinuation rate as that of ustekinumab (0.16). The treatment discontinuation rates after the first year were based on results from a psoriasis registry (32): 0.15 for adalimumab, etanercept, and infliximab; and 0.05 for ustekinumab. For treatments whose discontinuation rates after the first year were not available in the literature, the analysis assumed that these were the same as that for ustekinumab.

### Utilities

The base-case utilities per health state were derived from a technology appraisal for secukinumab to the National Institute for Health and Care Excellence (33). In that appraisal, utility weights per PASI response were estimated based on EuroQoL-5D data collected in five randomized controlled trials of secukinumab: 0.751 for PASI 0–49, 0.835 for PASI 50–74, 0.868 for PASI 75–89, 0.906 for PASI 90–100, and 0.642 for patients receiving a mix of topical therapies, phototherapies, and other oral systemic therapies. For patients receiving second-line treatment, a weighted average utility value of 0.855 (estimated by the model) was used for the base-case analysis.

### Costs

The base-case analysis included only direct medical costs: drug acquisition and administration costs, laboratory test costs (latent tuberculosis screen, active tuberculosis screen, complete blood count, hepatitis B screen, liver function test, and renal function test), and clinic visit costs. Costs were inflated to 2018 $USD. Drug acquisition costs for biologic and targeted treatments were calculated by number of doses per prescribing information multiplied by the 2019 US wholesale acquisition costs (34). The estimation of the drug acquisition costs included loading doses/titration as well as maintenance treatment for all intervention treatments. Co-pays or coinsurance were not included in the analysis. As market shares for biosimilars were not available, biosimilars were not included in the analysis. Drug acquisition costs for a mix of conventional treatments were estimated based on a US claim-based study in 2003 (35). Administration unit costs were estimated based on the physician fee schedule from Centers for Medicare and Medicaid Services (CMS) (36): $172 per administration for infliximab, $26 per administration for tildrakizumab, and $26 for the first administration for other subcutaneous drugs based on the assumption that patients on these subcutaneous drugs self-administered the subsequent doses at home. The model estimated the laboratory test costs based on the requirements per prescribing information and the unit costs of these tests (Supplementary Appendix A). Four clinic visits per year were included in the analysis. Unit costs of drug administration, laboratory tests, and clinic visits were derived from the CMS physician fee schedule (36). Costs of managing adverse events (AEs) were expected to have limited impact on the results due to similar AE profiles across the biologic and targeted systemic treatments and therefore were not included in the base-case analysis.

## Scenario analyses and sensitivity analyses

Alternative scenario analyses were performed to explore how uncertainties associated with key model parameters influenced the results. Uncertainty of PASI response was explored: using the network meta-analysis results from a 2018 review conducted by the Institute for Clinical and Economic Review (22). Uncertainty of treatment pathway was explored by assuming that 50% of nonresponders received a second-line therapy and the remaining 50% received a mix of topical therapies, phototherapies, and other oral systemic therapies. Uncertainty of utilities was explored using utility weights based on the utility data derived from three ixekizumab trials (37). Uncertainty of costs was assessed in three scenarios: (1) including the costs of managing AEs (i.e. hospitalizations due to severe infection, nonmelanoma skin cancer, and malignancies other than nonmelanoma skin cancer); (2) including productivity gain associated with PASI $\geq$ 75 response; and (3) varying the cost for a mix of topical therapies, phototherapies, and other oral systemic therapies by ±20%. Further information around data inputs and assumptions for the scenario analyses is presented in Supplementary Appendix A.

To investigate uncertainties regarding individual model inputs, probabilistic sensitivity analysis (PSA) and one-way sensitivity analysis (OWSA) were conducted for key comparisons of interest: ixekizumab versus tildrakizumab, ustekinumab versus tildrakizumab, and guselkumab versus tildrakizumab. Ixekizumab was selected due to its good QALY benefit among the newly available biologic therapies and apremilast (30,38). Guselkumab (IL-23 inhibitor) and ustekinumab (IL-12/-23 inhibitor) were selected because they have similar mechanism of action as tildrakizumab (IL-23 inhibitor). PSA was performed by varying all model inputs simultaneously, using 1,000 runs of Monte Carlo simulation with values for each model input randomly drawn from the appropriate probability distribution for each iteration

Table 1. Base-case cost-effectiveness results: 10-year time horizon.

| Treatment | Average annual drug costs[a] | | Base-case CE results over 10 years | | |
|---|---|---|---|---|---|
| | Year 1 | Year 2+ | Total Costs[a] | Total QALYs | ICER[b] (Cost/QALY Gained) |
| A mix of topical therapies, phototherapies, and other oral systemic therapies[c] | $10,422 | $10,422 | $90,347 | 5.67 | – |
| Brodalumab | $47,250 | $45,500 | $325,050 | 7.05 | $1,70,617 |
| Infliximab | $46,713 | $37,954 | $268,426 | 6.63 | $1,85,156 |
| Apremilast | $41,286 | $41,342 | $232,654 | 6.28 | $2,35,514 |
| Tildrakizumab | $66,280 | $57,001 | $357,355 | 6.78 | $2,41,433 |
| Secukinumab | $82,863 | $67,326 | $451,286 | 7.03 | $2,65,280 |
| Ixekizumab | $91,256 | $69,784 | $486,804 | 7.12 | $2,73,676 |
| Guselkumab | $76,016 | $70,586 | $440,978 | 6.94 | $2,77,347 |
| Adalimumab | $69,850 | $67,263 | $326,726 | 6.50 | $2,86,589 |
| Ustekinumab (50% 45 mg, 50% 90 mg)[d] | $82,517 | $70,965 | $443,415 | 6.90 | $2,88,841 |
| Etanercept | $82,785 | $67,263 | $312,538 | 6.38 | $3,14,538 |

CE: cost-effectiveness; ICER: incremental cost-effectiveness ratio; QALY: quality-adjusted life-year.
[a]The average annual drug costs were estimated based on number of doses per prescribing information and wholesale acquisition cost, without inclusion of co-pay, coinsurance, or discount. For biologics and apremilast, the drug costs in year 1 were higher than subsequent years because more frequent doses were required during treatment initiation.
[b]The incremental cost-effectiveness ratio of each first-line treatment compared with a mix of topical therapies, phototherapies, and other oral systemic therapies.
[c]Topical therapies included over-the-counter topicals, corticosteroids, and noncorticosteroids. Phototherapies use ultraviolet (UV) light to treat psoriasis and include UVB phototherapy, laser UVB phototherapy, psoralen and UVA radiation therapy, and sunlight. Other oral systemic therapies refer to systemic therapies other than biologics or apremilast, such as acitretin, cyclosporin, and methotrexate.
[d]For patients receiving ustekinumab, it was assumed that 50% received 90 mg, and the remaining 50% received 45 mg.

as recommended by Briggs (39). OWSA was performed by varying input parameters individually based on the upper and lower bounds of the uncertainty ranges.

## Results

### Base-case analysis

Drug costs accounted for over 99% of the total cost across all treatment strategies starting with a newer systemic therapy, thus constituting the key cost driver in the model. Because of the chronic nature of the disease, drug costs incurred during the treatment maintenance period were substantial. Among all the newer systemic treatments, infliximab, apremilast, brodalumab, and tildrakizumab had the lowest average annual drug costs in the maintenance period, followed by etanercept, adalimumab, secukinumab, ixekizumab, guselkumab, and ustekinumab (Table 1). Over a 10-year time horizon, treatment strategies starting with a newer systemic therapy incurred total direct medical costs between $2,32,654 and $4,86,804. Overall, apremilast, infliximab, and etanercept had the lowest total costs, followed by brodalumab, adalimumab, and tildrakizumab, while guselkumab, ustekinumab, secukinumab, and ixekizumab had the highest total costs.

In the base-case analysis over 10 years, using ixekizumab, brodalumab, and secukinumab as first-line treatment provided the most QALYs (7.12, 7.05, and 7.03 QALYs, respectively), followed by guselkumab, ustekinumab, and tildrakizumab. Among all the first-line treatments, apremilast, etanercept, adalimumab, and infliximab provided the lowest QALYs, resulting in less than 1 QALY gained compared with a mix of topical therapies, phototherapies, and other oral systemic therapies.

Over 10 years, the incremental cost per QALY gained compared with a mix of topical therapies, phototherapies, and other oral systemic therapies was lowest for brodalumab, followed by infliximab, apremilast, tildrakizumab, secukinumab, ixekizumab, guselkumab, adalimumab, ustekinumab, and etanercept.

### Scenario analyses

The incremental cost-effectiveness ratios (ICERs) from all scenario analyses varied by an average of less than ± 10% compared with the base-case results (Figure 2 and Supplementary Appendix B). The relative rankings based on the ICERs of first-line treatments were similar across all scenarios. Changes in the ranking occurred only among ixekizumab, guselkumab, adalimumab, and ustekinumab. Tildrakizumab was among the treatments providing the lowest ICERs (remained the fourth lowest after brodalumab, infliximab, and apremilast) across all the scenarios.

### Sensitivity analyses

The cost-effectiveness acceptability curves generated by the PSAs showed that ixekizumab, ustekinumab, and guselkumab had a low probability of being cost-effective compared with tildrakizumab at a willingness-to-pay threshold of $1,50,000 per QALY gained (1.40% for ixekizumab, 0.00% for ustekinumab, and 0.10% for guselkumab) (Figure 3).

Figure 4 presents the OWSA result for ixekizumab versus tildrakizumab *via* the tornado diagram (tornado diagrams for analyses of ustekinumab versus tildrakizumab and guselkumab versus tildrakizumab were not shown). All the results were most sensitive to utility parameters, time horizon, and treatment efficacy.

## Discussion

The current evaluation of the cost-effectiveness of biologics and apremilast as the first-line therapy for patients with moderate-to-severe plaque psoriasis can inform clinicians, payers, as well as policy makers when making decisions for prescription, reimbursement, and practice guideline development. Our analysis compared the newer systemic treatments (biologics and apremilast) approved for treating moderate-to-severe plaque psoriasis in the US up to March 2018 and evaluated the

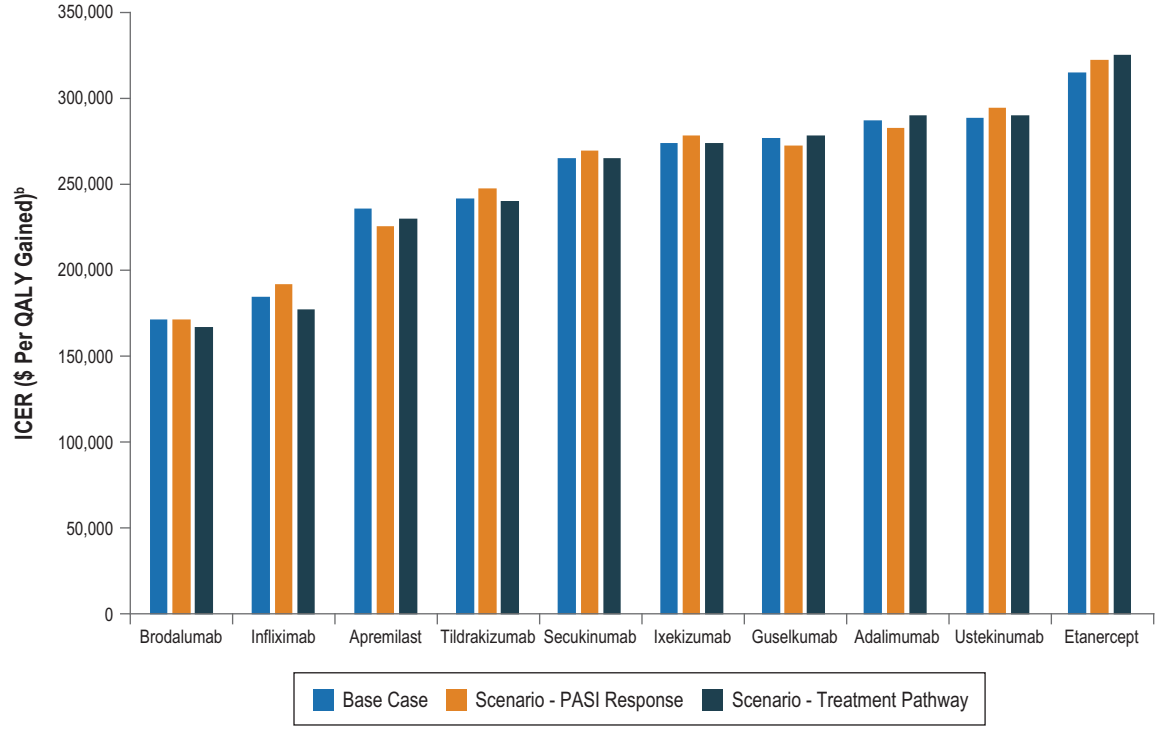


**Figure 2.** Scenario analyses results: PASI response and treatment pathway[a]. ICER: incremental cost-effectiveness ratio; PASI: Psoriasis Area Severity Index; QALY: quality-adjusted life-year. [a]Two scenarios were examined to explore the uncertainties around PASI response and treatment pathway: Scenario – PASI Response modeled PASI response based on the network meta-analysis results from the 2018 review conducted by the Institute for Clinical and Economic Review (22); Scenario –Treatment Pathway assumed that 50% of nonresponders received a second-line treatment and that the remaining 50% received a mix of topical therapies, phototherapies, and other oral systemic therapies after discontinuing the first-line treatment. [b]ICER of first-line treatments compared with a mix of topical therapy, phototherapy, and other systemic therapy.

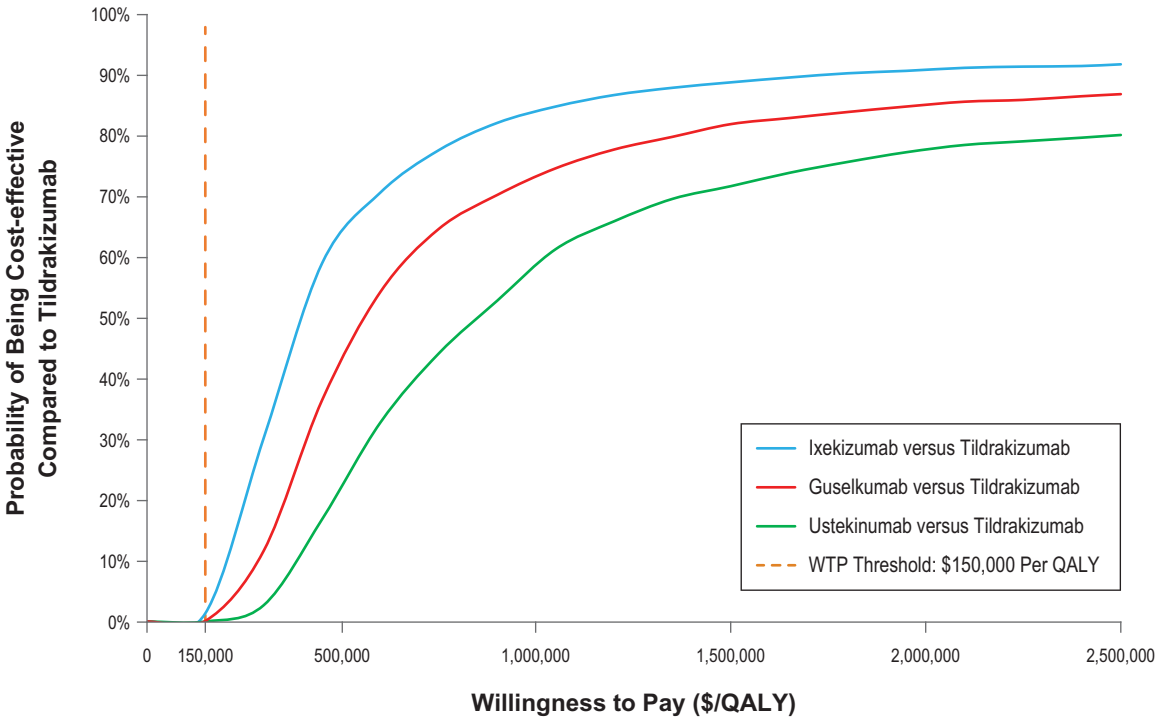


**Figure 3.** Cost-effectiveness acceptability curve: Ustekinumab/Guselkumab/Ixekizumab versus Tildrakizumab[a]. QALY: quality-adjusted life-year; WTP: willingness-to-pay. [a]Cost-effectiveness acceptability curves generated by the probabilistic sensitivity analyses conducted from three comparisons (i.e. ustekinumab versus tildrakizumab, guselkumab versus tildrakizumab, and ixekizumab versus tildrakizumab), respectively.

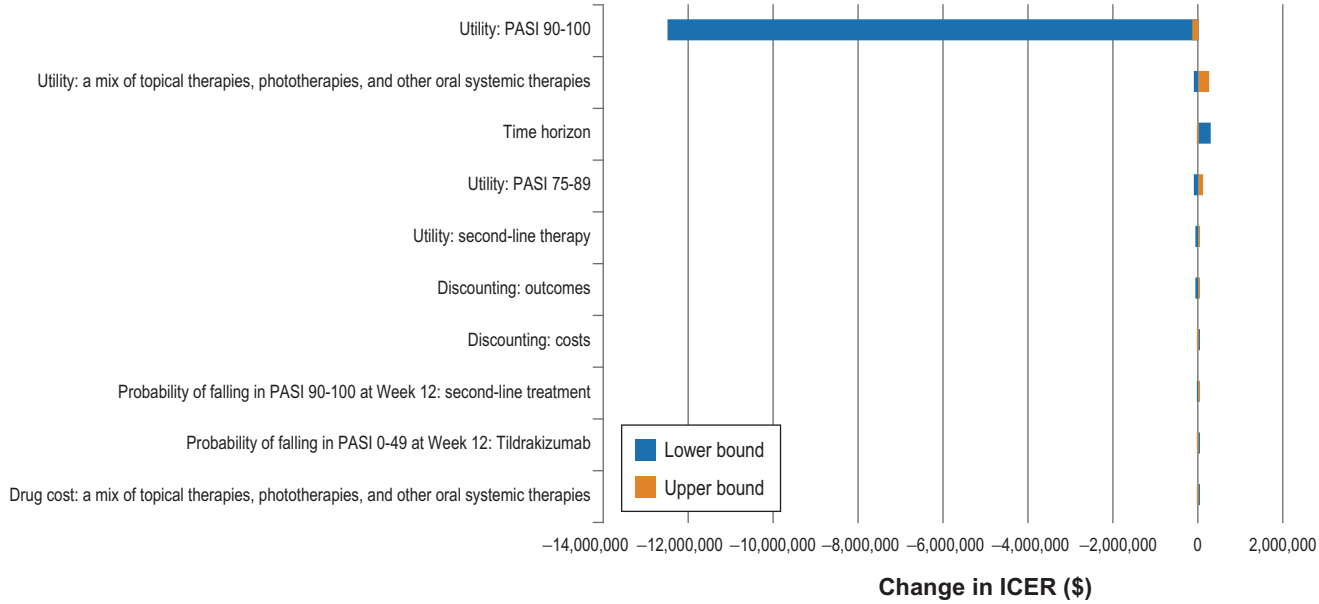


**Figure 4.** Tornado diagram: Ixekizumab versus Tildrakizumab. ICER: incremental cost-effectiveness ratio; PASI: Psoriasis Area Severity Index. *Note*: For parameters where uncertainty data were available, the upper and lower bounds used 95% confidence intervals. For the other parameters, the upper and lower bounds were defined either by varying the mean values by ± 20% or by user-defined ranges (for parameters such as time horizon and discounting rates).

cost-effectiveness of tildrakizumab following its recent Food and Drug Administration approval, thus providing a more comprehensive economic review than previous studies (22,23,40–49).

Across different scenario analyses, tildrakizumab consistently was among the most cost-effective treatments and provided lower cost per QALY gained than secukinumab, ixekizumab, guselkumab, adalimumab, ustekinumab, and etanercept. This was primarily due to tildrakizumab having the fourth-lowest drug cost during its maintenance period (following infliximab, apremilast, and brodalumab) and responders staying on treatment longer than those on many of the other first-line treatments (i.e. adalimumab, apremilast, etanercept, and infliximab).

The robustness of the study findings is demonstrated by the fact that they were mostly consistent with those from an update on a clinical and economic review of psoriasis treatment conducted in the US by the Institute of Clinical and Economic Review in 2018 (refer to the 2018 review thereafter) (22) and a published cost-effectiveness analysis of newer systemic therapies by Hendrix et al. (23). Across all analyses, apremilast, infliximab, and etanercept had the lowest total costs, while ixekizumab, ustekinumab, and guselkumab had the highest total costs. The relative rankings in terms of overall costs for adalimumab, brodalumab, and secukinumab were different across studies. This was mainly due to the different assumptions made for drug acquisition costs: no drug price discounts (e.g. co-pay or coinsurance) were applied in our study, while assumptions of class-specific discounts were incorporated in the other two studies (22,23). The estimation of total QALYs over 10 years were generally consistent across these analyses: 6.28–7.12 in our study; 6.40–7.21, and 6.79–7.40 in Hendrix et al. (23) and the 2018 review (22), respectively. The relative rankings based on total QALYs were consistent between our study and study conducted by Hendrix et al. (23). Tildrakizumab was not included in the cost-effective analysis reported in the 2018 review due to unavailability of its price; ixekizumab, brodalumab, secukinumab, and guselkumab were ranked the top four in terms of total QALYs. The relative rankings of ICERs among the first-line treatments were similar across studies. Overall, brodalumab, infliximab, apremilast, and secukinumab had the lowest cost per QALY gained among these new systemic treatments for moderate-to-severe plaque psoriasis. Although ixekizumab produced the highest total QALYs, its ICER was positioned after secukinumab due to higher drug acquisition costs. The treatments with the least favorable ICER rankings across all studies were etanercept, ustekinumab, and adalimumab.

In our analysis, patients who failed to respond to the first-line treatment or lose response later in the course switched either to a second-line treatment or to a mix of topical therapies, phototherapies, and other oral systemic therapies. In real-world practice, clinicians may attempt a dose escalation above the recommended dosage (31,50). Dose escalation would have a significant impact on the analysis results given that drug costs was the key driver of the comparative cost-effectiveness; however, the impact was not considered in the current study due to data limitation. Dosing escalation has been highlighted as an important area for future research.

## Limitations

The current analysis had several limitations. First, the study did not fully model treatment sequencing because limited evidence was available to understand the efficacy of second-line treatment or certain treatment sequences (22). A mixed bag of biologic and targeted treatment was modeled to minimize uncertainties related to treatment effect of the individual treatments when used in sequence (22). Further, the model only considered up to two lines of biologic and targeted treatments. Both of these assumptions are not aligned with how patients are treated in clinical practice. Given the paucity of data on treatment sequencing, it was in line with previous publications (23,26–28) seen to be a reasonable assumption not introducing unnecessary uncertainty in the results of first-line therapy from the subsequent lines of treatment. Similarly, given the chronic nature of the disease, a longer model time horizon could be

warranted to capture lifetime impact of disease. However, limited information is available about long-term outcomes of the treatments, and long-term extrapolation of the treatment response would be very uncertain. Thus, a 10-year time horizon was implemented in line with previous psoriasis models (23,26–28). Finally, the health-state utility weights were assumed to be the same as the base-case values from the 2016 ICER report to maximize the comparability of our study. It is worth mentioning that these utility values were derived based on United Kingdom tariffs, which might not be suitable to represent the utility values for the US patient population.

The OWSA further proved that the analysis results were not sensitive to any of the parameters related to the second-line treatment. Thus, we consider the current approach appropriate and conservative given the lack of evidence and guidance regarding treatment patterns and evidence of treatment effect for sequencing of treatments. Second, there was a lack of data on long-term PASI response that prevented us from modeling the long-term transitions between PASI response health states. Therefore, our analysis assumed that patients on treatment would sustain their initial treatment response for the rest of the modeling time unless patients discontinued the treatment or died.

## Conclusions

Brodalumab, infliximab, apremilast, and tildrakizumab were the most cost-effective as first-line treatment for moderate-to-severe plaque psoriasis. Tildrakizumab was more cost-effective than secukinumab, ixekizumab, guselkumab, adalimumab, ustekinumab, or etanercept. The results were robust throughout multiple scenario analyses and sensitivity analyses.

## Acknowledgments

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## Disclosure statement

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## Author contributions

XJ, YZ, JC, and THB were responsible for conception and design of the research. Economic modeling was carried out by XJ, JC, and THB; acquisition of data was carried out by YZ, XJ, and JC; XJ, YZ, JC, and THB were responsible for development of the draft manuscript; all authors were responsible for critical revision of the manuscript for important intellectual content.

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