**Supplementary Material**

# Matching-Adjusted Indirect Comparison of Long-term Efficacy of Deucravacitinib Versus Adalimumab for Moderate to Severe Plaque Psoriasis

April W. Armstrong, MD, MPH[1]; Sang Hee Park, MPH[2]; Vardhaman Patel, MS, PhD[2]; Malcolm Hogan, MSc[3]; Wei-Jhih Wang, PhD[4]; David Davidson, MS, PA-C[2]; Viktor Chirikov, MS, PhD[4]

[1]Keck School of Medicine, University of Southern California, Los Angeles, CA, USA; [2]US HEOR, Bristol Myers Squibb, Princeton, NJ, USA; [3]Syneos Health, Toronto, Canada; [4]OPEN Health Evidence & Access, Parsippany, NJ, USA

**Corresponding Author:**
Vardhaman Patel, MS, PhD
Senior Director, US HEOR
Bristol Myers Squibb
3410 Princeton Pike
Lawrenceville, NJ 08648
Tel: 414-801-1695
Email: Vardhaman.patel@bms.com

## SUPPLEMENTAL MATERIALS APPENDIX

## SUPPLEMENTAL METHODS

### Unanchored MAIC – Selection of variables for adjustment

We conducted an unanchored matching adjusted indirect comparison (MAIC), which is an indirect comparison between two treatments that does not rely on the presence of a common comparator (anchor) [1]. As described in the National Institute for Health and Care Excellence (NICE) Technical Document 18 on population adjustment [1], an unanchored MAIC requires much stronger assumptions than an anchored indirect comparison. It effectively assumes that absolute outcomes can be predicted from the covariates, which includes the assumption that all effect modifiers and prognostic factors are accounted for. Failure of this assumption leads to an unknown amount of bias in the unanchored estimate. Therefore, unanchored comparisons must include every effect modifier and prognostic variable, whereas in an anchored MAIC, only effect modifiers are required.

### Statistical Analysis

The deucravacitinib trial data were reweighted according to select patient characteristics, consistent with prior NICE recommendations [1]. NICE Technical Document 18 on population adjustment suggests that the choice of variables to be matched or weighted on should be carefully considered; including too many variables will reduce the effective sample size (ESS), which will negatively affect the precision of the estimate, but failure to include relevant variables will result in a biased estimate [1].

In unadjusted analyses where the POETYK PSO-LTE data were compared with the aggregate data for adalimumab, each patient was given a weight of 1 and the data were unchanged. In adjusted analyses, the POETYK PSO-LTE trial data were reweighted to match the baseline characteristics reported in the comparator trial, using the method of moments as described by Signorovitch et al. [2]. The weights give each patient more or less influence on the analysis and are the key to adjusting the deucravacitinib data to the comparator data.

1. Weighted means of key baseline characteristics in the POETYK PSO-LTE trial were made to exactly match those reported in the study being compared.
2. Each individual patient's weight was equal to their estimated odds of being in the comparator trial vs the POETYK PSO-LTE trial.

The weights were assumed to follow logistic regression model given by the equation below:

$$w_i = \exp(\alpha + x_i'\beta)$$

where $x_i'$ is the vector of baseline variables included for adjustment and $\alpha + x_i'\beta$ is a model for the log odds of being in the comparator trial vs the POETYK PSO-LTE trial.

As only summary statistics for baseline characteristics were available for the comparator, a method of moments estimator was used to estimate the parameters of the model. Parameter values were chosen such that baseline characteristics in the reweighted POETYK PSO-LTE trial population match those of the adalimumab population, when compared head to head.

The impact of reweighting is that there is less statistical information in the reweighted trial data and that is reflected in the ESS [1], defined as:

$$\text{ESS} = \frac{(\sum w_i)^2}{\sum w_i^2}$$

The maximum ESS is equal to the original trial size and occurs when the patient characteristics in POETYK PSO-LTE and the comparator are identical.

Whenever indicated and to improve the accuracy and precision of final parameter estimates, adjustment weights were incrementally truncated at certain thresholds of their distribution to reduce the occurrence of extreme weights (ie, generally higher than 5 to 6 or lower than 0.1), while still preserving the resulting balance in adjusted baseline characteristics, as previously recommended [3].

**References**


1. Phillippo DM, Ades AE, Dias S, Palmer S, Abrams KR, Welton NJ. NICE DSU technical support document 18: methods for population-adjusted indirect comparisons in submissions to NICE. National Institute for Health and Care Excellence, 2016. Available at: https://www.sheffield.ac.uk/media/34216/download?attachment. Accessed: 1 June 2023
2. Signorovitch JE, Sikirica V, Erder MH, Xie J, Lu M, Hodgkins PS, et al. Matching-adjusted indirect comparisons: a new tool for timely comparative effectiveness research. Value in Health. 2012;15(6):940-947.
3. Lee BK, Lessler J, Stuart EA. Weight trimming and propensity score weighting. PloS One. 2011;6(3):e18174.

**Supplemental Table 1. Unadjusted and adjusted response rates at Weeks 52 and 112 for deucravacitinib and adalimumab**

| | Adalimumab REVEAL OLE Group D | | Deucravacitinib POETYK PSO-LTE | | Mean Difference[a] (Sandwich SE 95% CI) | |
|---|---|---|---|---|---|---|
| **Week** | **52** | **112** | **52** | **112** | **52** | **112** |
| Unadjusted analysis | **N=345** | | **N=329** | | | |
| PASI 75, % | 64.0 | 54.0 | 69.9 | 71.7 | 5.9 (−1.2 to 13.0) | 17.7 (10.6 to 24.9) |
| PASI 90, % | 40.0 | 34.0 | 42.9 | 46.8 | 2.9 (−4.6 to 10.3) | 12.8 (5.5 to 20.2) |
| Base case[b] | **N=345** | | **ESS=147** | | | |
| PASI 75, % | 64.0 | 54.0 | 68.1 | 67.2 | 4.1 (−4.9 to 13.1) | 13.2 (4.0 to 22.5) |
| PASI 90, % | 40.0 | 34.0 | 39.4 | 41.3 | −0.6 (−10.0 to 8.9) | 7.3 (−2.0 to 16.7) |
| Sensitivity analysis 1[c] | **N=345** | | **ESS=86** | | | |
| PASI 75, % | 64.0 | 54.0 | 64.4 | 65.8 | 0.4 (−11.2 to 12.1) | 11.8 (0.1 to 23.5) |
| PASI 90, % | 40.0 | 34.0 | 39.3 | 36.8 | −0.7 (−12.0 to 10.6) | 2.8 (−8.0 to 13.6) |
| Sensitivity analysis 2[d] | **N=345** | | **ESS=238** | | | |
| PASI 75, % | 64.0 | 54.0 | 66.6 | 67.5 | 2.6 (−5.3 to 10.4) | 13.5 (5.5 to 21.5) |
| PASI 90, % | 40.0 | 34.0 | 36.9 | 40.9 | −3.1 (−11.1 to 4.9) | 6.9 (−1.1 to 14.9) |
| Sensitivity analysis 3[e] | **N=345** | | **ESS=221** | | | |
| PASI 75, % | 64.0 | 54.0 | 66.7 | 67.3 | 2.7 (−5.4 to 10.8) | 13.3 (5.1 to 21.5) |
| PASI 90, % | 40.0 | 34.0 | 35.6 | 40.9 | −4.4 (−12.4 to 3.7) | 6.9 (-1.3 to 15.0) |
| Sensitivity analysis 4[f] | **N=345** | | **ESS=150** | | | |
| PASI 75, % | 64.0 | 54.0 | 67.9 | 67.1 | 3.9 (−5.0 to 12.9) | 13.1 (3.9 to 22.4) |
| PASI 90, % | 40.0 | 34.0 | 39.2 | 41.6 | −0.8 (−10.2 to 8.5) | 7.6 (−1.8 to 16.9) |

[a]Mean difference between deucravacitinib and adalimumab.

[b]Adjusted for age, sex, race, weight, duration of PsO, baseline body surface area, baseline PASI, previous use of phototherapy/systemic nonbiologic/systemic biologic therapy, and PASI 75/90 response post-placebo at Week 16 postrandomization.

[c]Sensitivity analysis 1: Base case variables adjustment, with history of psoriatic arthritis and Physician Global Assessment scores added.

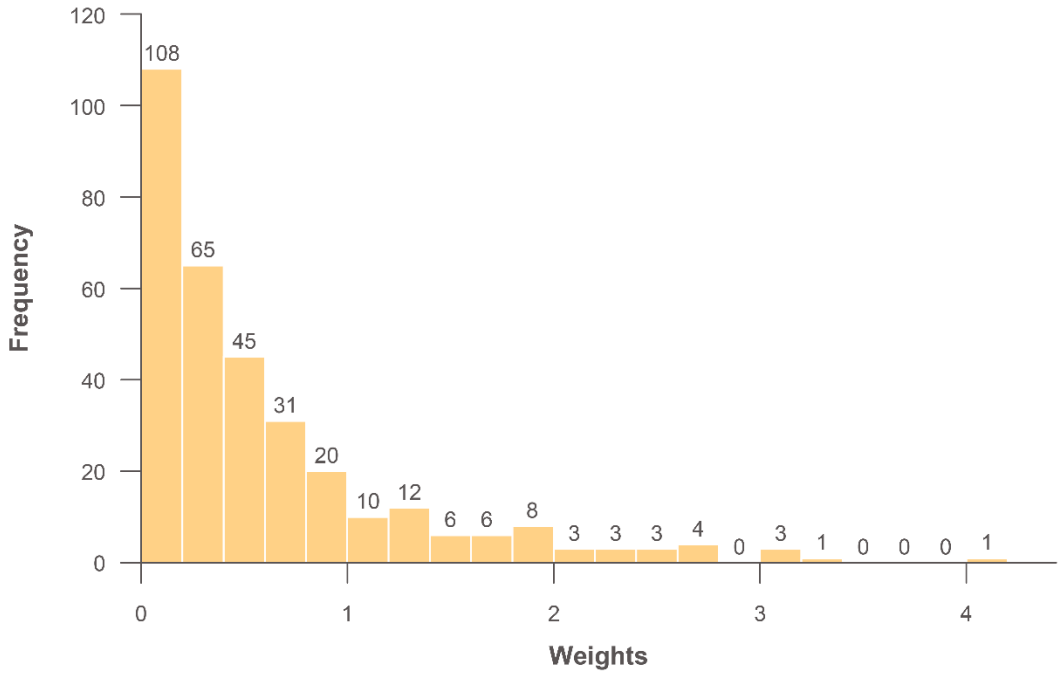
[d]Sensitivity analysis 2: Base case variables adjustment, with prior treatment history (ie, phototherapy/systemic nonbiologic/systemic biologic therapy) removed.

[e]Sensitivity analysis 3: Base case variables adjustment, with treatment history limited to the 12 months prior to study initiation.

[f]Sensitivity analysis 4: Base case variables adjustment, with truncation of extreme weights.

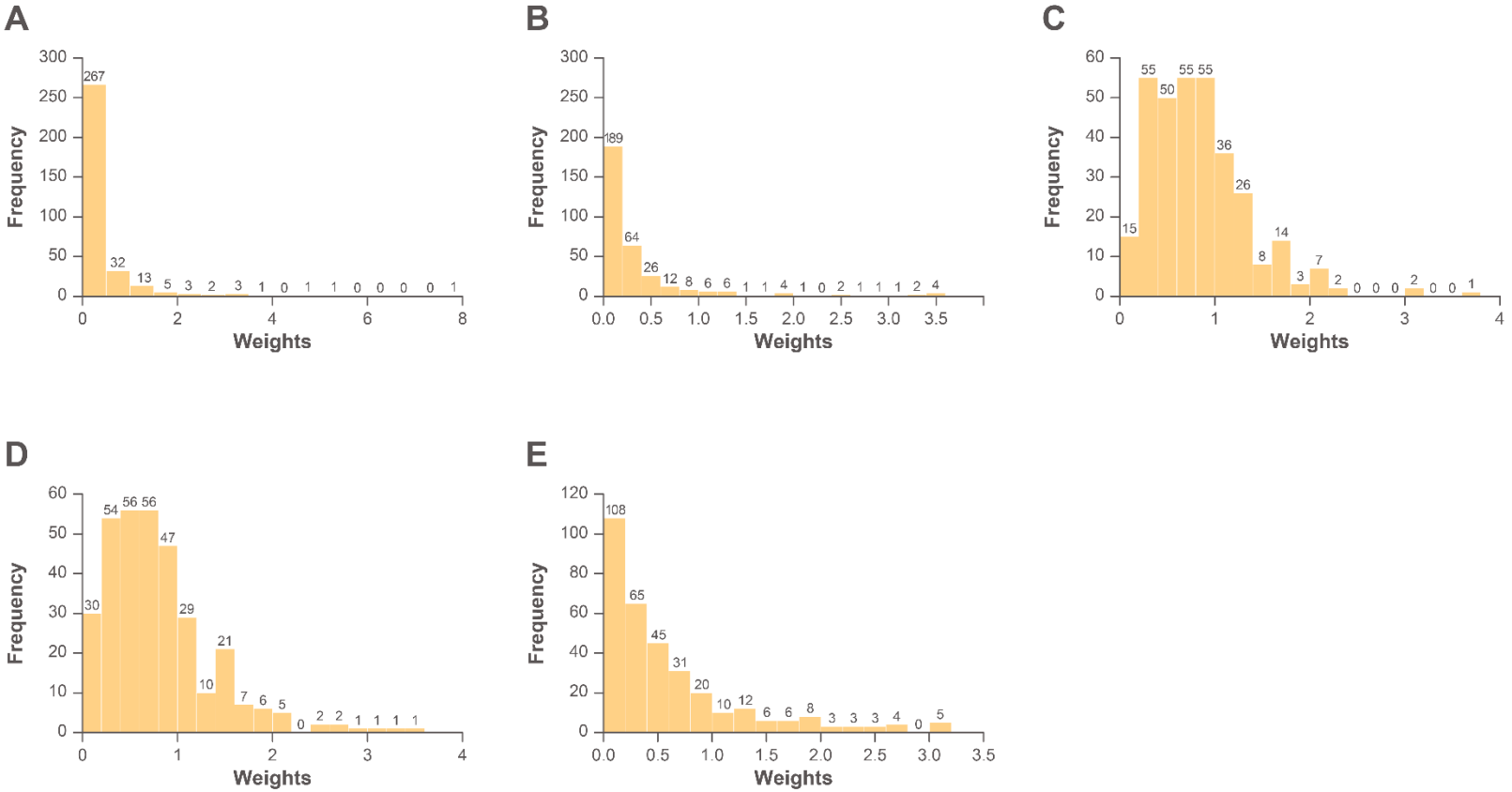
ESS, effective sample size; PASI, Psoriasis Area and Severity Index; PASI 75, ≥75% reduction from baseline in PASI score; PASI 90, ≥90% reduction from baseline in PASI score; PsO, plaque psoriasis; SE, standard error.

**Supplemental Figure 1. Base case: distribution of adjustment weights without truncation[a]**



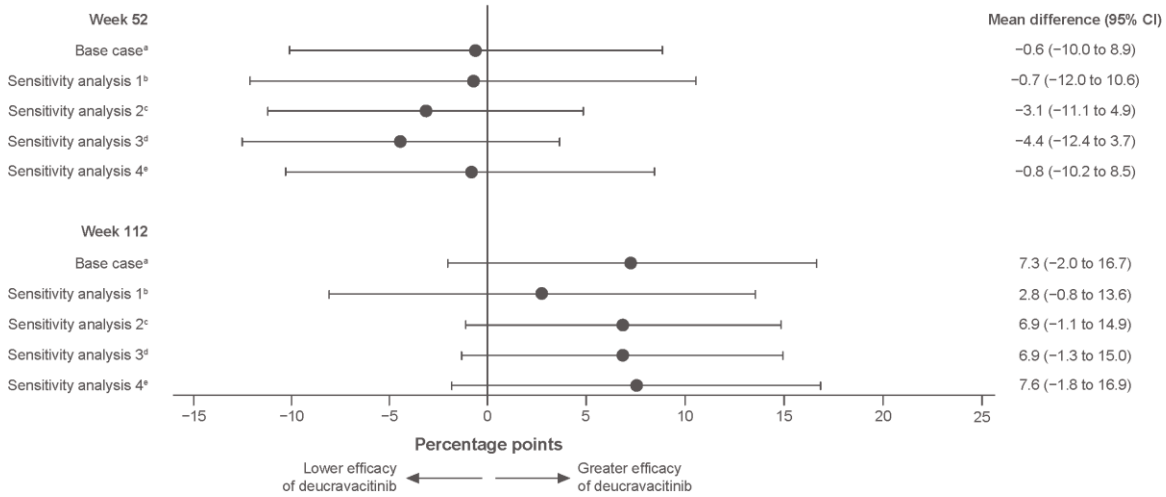

[a]Adjusted for age, sex, race, weight, duration of PsO, baseline body surface area, baseline PASI, previous use of phototherapy/systemic nonbiologic/systemic biologic therapy, and PASI 75/90 response post-placebo at Week 16 postrandomization.
PASI, Psoriasis Area and Severity Index; PASI 75, ≥75% reduction from baseline in PASI score; PASI 90, ≥90% reduction from baseline in PASI score; PsO, plaque psoriasis.

**Supplemental Figure 2. Distribution of adjustment weights in (A) Sensitivity analysis 1, before truncation of extreme weights,[a] (B) sensitivity analysis 1, after truncation of extreme weights,[a] (C) sensitivity analysis 2, without truncation,[b] (D) sensitivity analysis 3, without truncation,[c] and (E) sensitivity analysis 4, after truncation[e]**




[a]Sensitivity analysis 1: Base case variables adjustment, with history of psoriatic arthritis and Physician Global Assessment scores added.
[b]Sensitivity analysis 2: Base case variables adjustment, with prior treatment history (ie, phototherapy/systemic nonbiologic/systemic biologic therapy) removed.
[c]Sensitivity analysis 3: Base case variables adjustment, with treatment history limited to the 12 months prior to study initiation.
[d]Sensitivity analysis 4: Base case variables adjustment, with truncation of extreme weights.

**Supplemental Figure 3. Sensitivity analyses: mean difference in adjusted PASI 90 response rates at Weeks 52 and 112 between deucravacitinib and adalimumab**




[a]Adjusted for age, sex, race, weight, duration of PsO, baseline body surface area, baseline PASI, previous use of phototherapy/systemic nonbiologic/systemic biologic therapy, and PASI 75/90 response post-placebo at Week 16 since randomization.
[b]Sensitivity analysis 1: Base case variables adjustment, with history of psoriatic arthritis and PGA added. Adalimumab, n=345; deucravacitinib, ESS=86.
[c]Sensitivity analysis 2: Base case variables adjustment, with prior treatment history (ie, phototherapy/systemic non-biologic/systemic biologic therapy) removed. Adalimumab, n=345; deucravacitinib, ESS=238.
[d]Sensitivity analysis 3: Base case variables adjustment, with treatment history limited to the 12 months prior to study initiation. Adalimumab, n=345; deucravacitinib, ESS=221.
[e]Sensitivity analysis 4: Base case variables adjustment, with truncation of extreme weights. Adalimumab, n=345; deucravacitinib, ESS=150.
CI, confidence interval; ESS, effective sample size; PASI, Psoriasis Area and Severity Index; PASI 90, ≥90%

reduction from baseline in PASI score; PsO, plaque psoriasis.