

# Healthcare Costs Comparison of Dupilumab vs. Omalizumab, Benralizumab, and Mepolizumab in Patients with Moderate-to-Severe Asthma: A US Payer Perspective

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## Background

- Asthma is a chronic respiratory disease affecting more than 27 million people in the United States (US).<sup>1</sup> Patients with moderate-to-severe asthma are more likely to experience asthma-related exacerbations, which impact healthcare expenses.<sup>2</sup>
- In the US, dupilumab is indicated for patients with moderate-to-severe asthma characterized by an eosinophilic phenotype,<sup>3</sup> whereas benralizumab and mepolizumab are approved for severe asthma with an eosinophilic phenotype,<sup>4,5</sup> Omalizumab is indicated in persistent allergic asthma.<sup>6</sup>
- Although multiple biologics are approved for the treatment of moderate-to-severe asthma, there is a lack of comparative analysis on the exacerbation-related healthcare costs (HCs) associated with these biologics.

# DUPIUMAB



## Objective

- To evaluate exacerbation-related healthcare costs (HCs) associated with dupilumab vs. benralizumab, omalizumab, or mepolizumab in patients (aged ≥12 years) with moderate-to-severe asthma, over a year from a US payer perspective.

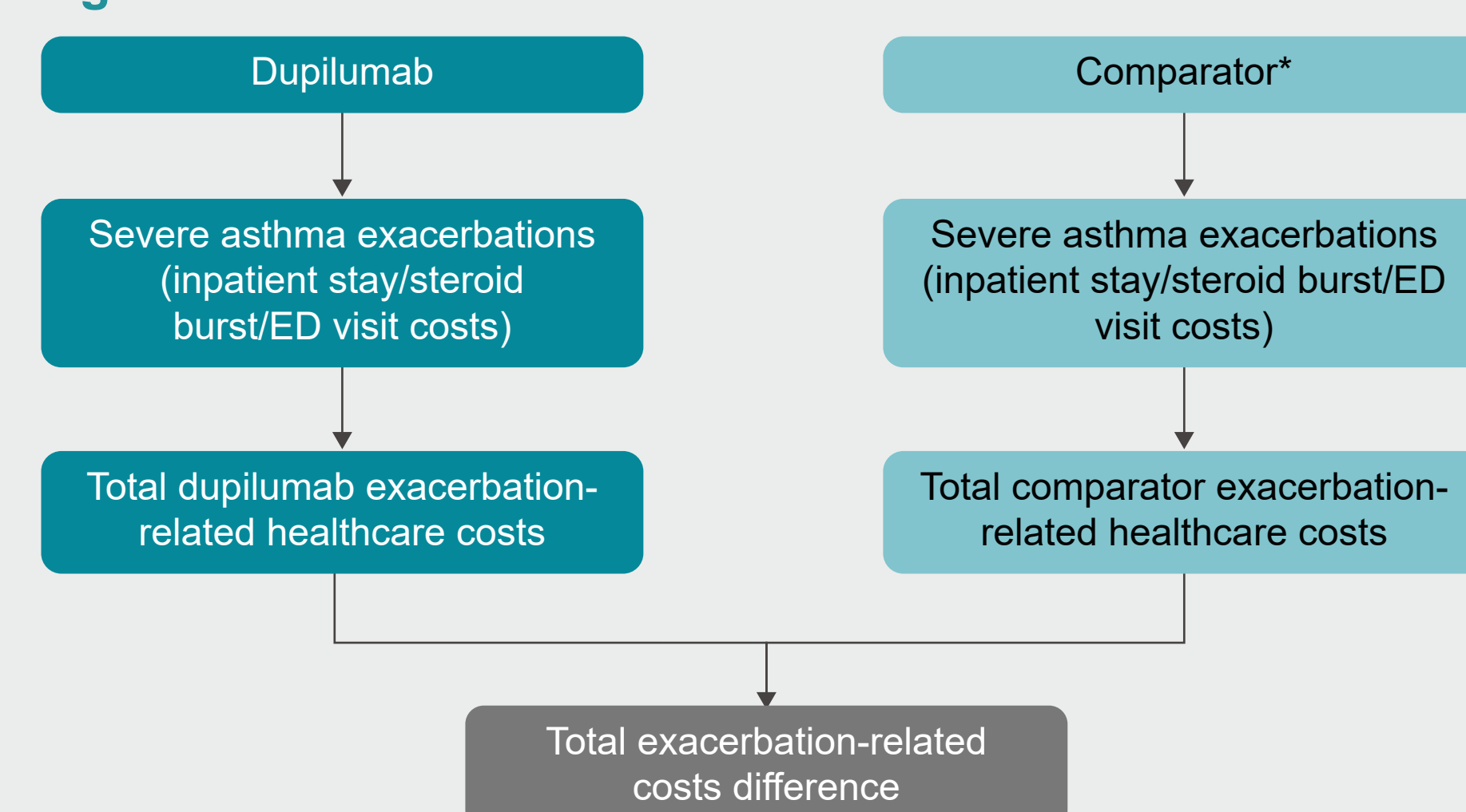
## Conclusions

- The findings from this cost-comparison analysis suggest that treatment with dupilumab is associated with lower exacerbation-related HCs than those of omalizumab, benralizumab, or mepolizumab in patients with moderate-to-severe asthma. Scenario analyses that include SCS-related pharmacy and AE management costs further confirm these findings.
- The results should be interpreted cautiously, given that the estimates of rate reduction were derived from a single study. Future studies are warranted by considering the estimates from other comparative effectiveness studies.

### Model overview

- An Excel-based economic model was developed to compare exacerbation-related HCs associated with the treatment with dupilumab against those with benralizumab, omalizumab, or mepolizumab, without taking the biologic therapy cost into consideration (Figure 1).
- The HCs of biologics were evaluated by multiplying the annualized rates of severe asthma exacerbations, as derived from the US ADVANTAGE study,<sup>3</sup> and unit costs sourced from existing literature, which was complemented by a Monte Carlo simulation to account for variability and uncertainty in the parameters.

Figure 1. Economic model overview



<sup>SoC</sup>omalizumab/benralizumab/mepolizumab.  
ED, emergency department; SoC, standard of care.

### Model inputs – clinical and cost inputs

#### Clinical inputs

- The annualized rate of severe asthma exacerbations and systemic corticosteroid (SCS) use were obtained from the US-ADVANTAGE real-world study<sup>3</sup>—a retrospective chart review that compared the effectiveness of dupilumab with omalizumab, benralizumab, and mepolizumab in reducing exacerbation rates and oral corticosteroid prescriptions among patients with asthma in the US (Table 1). The analysis employed the inverse probability of treatment weighting method to balance the baseline demographic and clinical characteristics between the treatment groups.<sup>3</sup>
- The proportion of patients experiencing asthma exacerbations leading to inpatient stay, steroid burst, and emergency department (ED) visits were obtained from the previously published literature.<sup>7</sup>

#### Cost inputs

- Mean inpatient stay, steroid burst, and ED visit costs associated with severe asthma exacerbation were based on previously published studies<sup>8,9</sup> (Table 2).
- Costs of SCS use were sourced from the wholesale acquisition cost from Micromedex Red Book<sup>10</sup> and inflated to 2023 US dollars. Due to a lack of distribution data, SCS use was assumed to be equally distributed among patients (one-third each for oral prednisolone, dexamethasone, and hydrocortisone).
- The SCS-related annualized adverse event (AE) management cost was derived from published literature.<sup>11</sup>

## Methods and Results

Table 1. Annualized rates of severe asthma exacerbations and SCS use (per-patient year)

Population	Severe asthma exacerbations <sup>a,b</sup>			SCS use <sup>b</sup>		
	SoC <sup>c</sup>	Dupilumab	IRR (95% CI)	SoC <sup>c</sup>	Dupilumab	IRR (95% CI)
All patients	1.80	1.01	0.50 (0.45, 0.55)	5.49	2.96	0.52 (0.39, 0.67)
Patients with ≥1 severe asthma exacerbation	3.16	1.82	0.49 (0.45, 0.53)	7.20	3.55	0.49 (0.45, 0.53)
Patients with ≥2 severe asthma exacerbations	4.07	2.34	0.52 (0.48, 0.56)	9.02	4.31	0.52 (0.48, 0.56)
Treatment	Baseline	At 1 year	IRR (95% CI)	Baseline	At 1 year	IRR (95% CI)
<b>Dupilumab vs. omalizumab (≥1 severe asthma exacerbation)</b>						
Dupilumab (N = 1,206)	3.10	1.54	0.69 (0.61, 0.79)	8.63	5.02	0.79 (0.69, 0.90)
Omalizumab (N = 702)	2.49	1.91		7.27	5.30	
<b>Dupilumab vs. benralizumab (≥2 severe asthma exacerbations)</b>						
Dupilumab (N = 825)	4.08 <sup>c</sup>	1.89	0.76 (0.67, 0.86)	10.33	5.85	0.84 (0.73, 0.97)
Benralizumab (N = 461)	3.90	2.30		10.77	6.42	
<b>Dupilumab vs. mepolizumab (≥2 severe asthma exacerbations)</b>						
Dupilumab (N = 825)	3.97 <sup>c</sup>	1.79	0.72 (0.63, 0.82)	9.95	5.68	0.75 (0.65, 0.87)
Mepolizumab (N = 451)	4.35	2.48		11.78	7.42	

<sup>a</sup>SoC data were only used for calculating the annualized exacerbations and SCS-use rate for different biologics. <sup>b</sup>Severe asthma exacerbation was defined as either (i) outpatient or ED visits with an asthma diagnosis and at least one prescription of SCS within 5 days before or after the encounter or (ii) inpatient visits with an asthma diagnosis. <sup>c</sup>The calculation of annualized exacerbation and SCS rates for dupilumab and other biologics was performed using the following formulas: The annual exacerbation rate for dupilumab is derived by multiplying the annual SoC exacerbation rate by the IRR of dupilumab compared with SoC. The annual exacerbation rate for other biologics is obtained by dividing the annual dupilumab exacerbation rate by the IRR of dupilumab versus other biologics. The annual SCS-use rate for dupilumab is derived by multiplying the annual SoC SCS-use rate by the IRR of dupilumab compared with SoC. The annual SCS-use rate for other biologics is obtained by dividing the annual dupilumab SCS-use rate by the IRR of dupilumab versus other biologics. <sup>d</sup>We conducted doubly robust inverse probability of treatment-weighted negative binomial regression analyses to assess asthma exacerbations and SCS prescriptions. Each patient was weighted by the inverse of the probability of receiving dupilumab treatment, considering baseline covariates that varied based on the select comparison (e.g., dupilumab vs. omalizumab, dupilumab vs. benralizumab, or dupilumab vs. mepolizumab). CI, confidence interval; ED, emergency department; IRR, incidence rate ratio; OCS, oral corticosteroid; SCS, systemic corticosteroid; SoC, standard of care.

Table 2. HCRU costs per exacerbation<sup>8,9</sup>

Exacerbation-related costs	Unit cost	Proportion of patients (%)
Inpatient stay	\$11,801	14
Steroid burst	\$2,005	77
ED visit	\$2,701	9

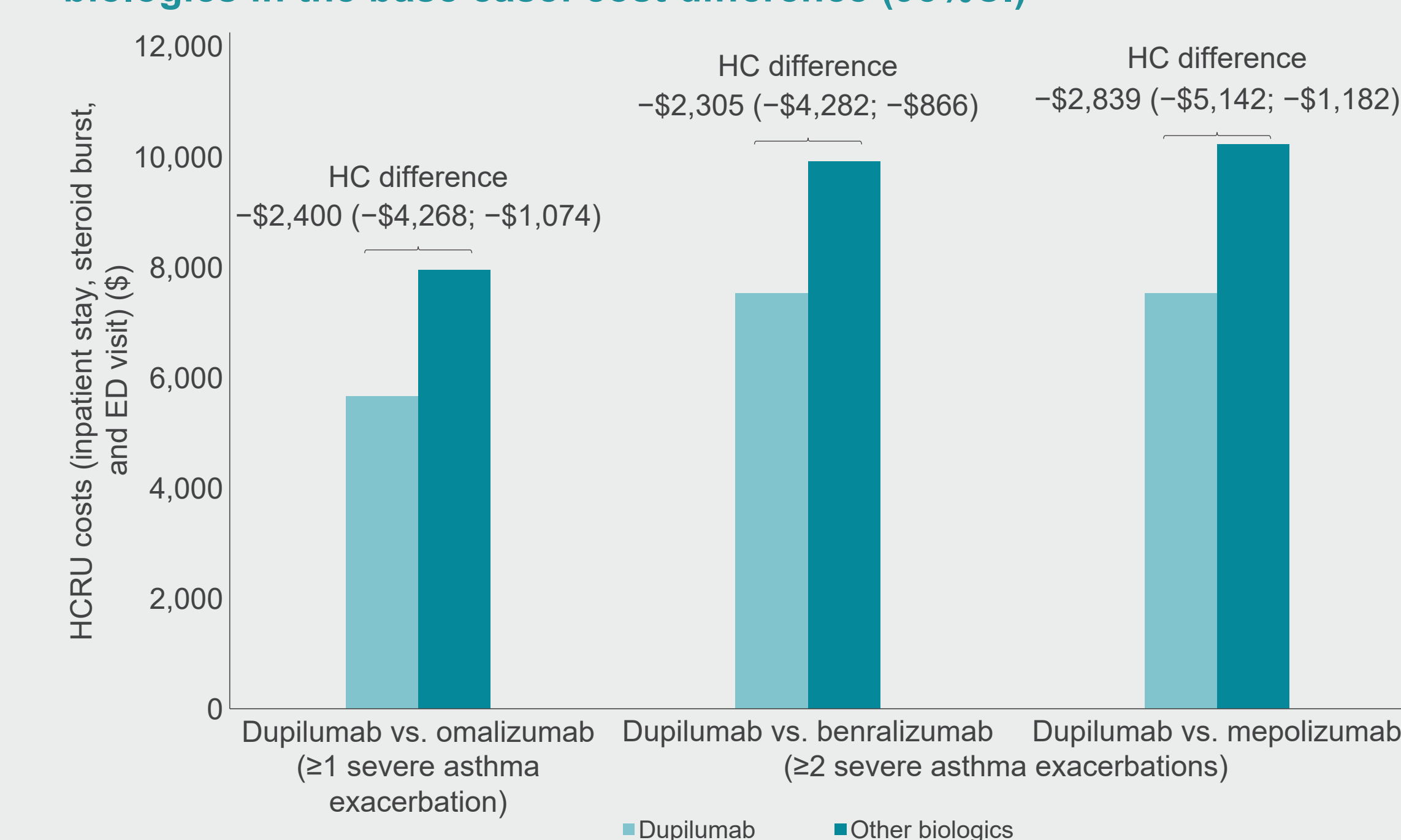
ED, emergency department; HCRU, healthcare resource utilization.

### Model analysis

- The per-patient year (PPY) cost of severe asthma exacerbations related to inpatient stay, steroid burst, and ED visit was calculated.
- In the base case, net cost differences were determined by comparing inpatient stay, steroid burst, and ED visit costs in patients with ≥1 (dupilumab vs. omalizumab) and ≥2 (dupilumab vs. benralizumab or mepolizumab) asthma exacerbations in the past year.
- Scenario analyses included pharmacy costs of SCS and SCS-related AE management costs.
- One-way sensitivity analyses (OWSA) and Monte Carlo simulations of key parameters were conducted.
- Monte Carlo simulations for 5,000 iterations were performed to obtain a statistical comparison of the cost difference after simulating the 95% confidence interval (CI) of the incidence rate ratio (IRR) estimates reported from the US-ADVANTAGE study.<sup>3</sup>

- Dupilumab demonstrated lower HCs PPY in the base case, with a cost difference (95% CI) of \$2,400 (\$1,074; \$4,268) vs. omalizumab, \$2,305 (\$866; \$4,282) vs. benralizumab, and \$2,839 (\$1,182; \$5,142) vs. mepolizumab (Figure 2).

Figure 2. Healthcare costs associated with dupilumab vs. other biologics in the base case: cost difference (95%CI)



ED, emergency department; HC, healthcare cost; HCRU, healthcare resource utilization.

- Additional cost reductions were observed for dupilumab in the scenario analyses (cost differences: \$2,566 vs. omalizumab; \$2,439 vs. benralizumab; and \$3,073 vs. mepolizumab) (Table 3).

Table 3. Healthcare costs associated with dupilumab vs. other biologics in scenario analyses

	Dupilumab vs. omalizumab (≥1 severe asthma exacerbation)		Dupilumab vs. benralizumab (≥2 severe asthma exacerbations)		Dupilumab vs. mepolizumab (≥2 severe asthma exacerbations)	
	Dupilumab	Omalizumab	Dupilumab	Benralizumab	Dupilumab	Mepolizumab
HCRU cost <sup>a</sup>	\$5,341	\$7,740	\$7,300	\$9,605	\$7,300	\$10,139
SCS-related costs (pharmacy and AE management costs)	\$626	\$793	\$701	\$835	\$701	\$936
Total cost	\$5,967	\$8,533	\$8,002	\$10,440	\$8,002	\$11,074
Cost difference	-\$2,566		-\$2,439		-\$3,073	
PSA results (95% CI)	-2,651 (-4,566, -1,224)		-2,509 (-4,385, -1,013)		-3,192 (-5,577, -1,396)	

<sup>a</sup>Total HCRU cost was calculated based on the formula: Total HCRU cost = Inpatient stay cost + Steroid burst cost + ED visit cost. Inpatient stay cost = Annual exacerbation rate × Percentage of asthma exacerbations leading to hospitalization × Length of stay per hospitalization × (Cost/day + exacerbation management drug cost). Steroid burst cost = Annual exacerbation rate × Percentage of asthma exacerbations leading to steroid burst × Frequency of steroid burst per exacerbation × Cost/steroid burst × length of exacerbation × exacerbation management drug cost. ED visit cost = Annual exacerbation rate × Percentage of asthma exacerbations leading to ED visits × Number of visits/exacerbation × Cost/visit × length of exacerbation × exacerbation management drug cost.

AE, adverse event; CI, confidence interval; ED, emergency department; HCRU, healthcare resource utilization; SCS, systemic corticosteroid; PSA, probabilistic sensitivity analysis.

- OWSA estimates showed that the base case HC difference was more sensitive to changes in exacerbation IRRs.
- The results from the Monte Carlo simulations further showed lower exacerbation-related HCs for dupilumab than that with other biologics, confirming the robustness of the results (Table 3).

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