# Economic Burden and Healthcare Resource Utilization in Patients with Psoriatic Arthritis (PsA): A systematic literature review

Stefan Varga,[1] Satnam Walia,[2] Carla Zema,[1] Divya Pushkarna,[2] Stephanie Dahan,[1] Mir Sohail Fazeli,[2] Jiyoon Choi,[1] Joseph F. Merola[3]

[1]Bristol Myers Squibb, Princeton, NJ, USA, [2]Evidinno Outcomes Research Inc,. Vancouver, BC, Canada, [3]UT Southwestern Medical Center, Dallas, TX, USA

## Background

- PsA is a chronic inflammatory musculoskeletal disease associated with psoriasis and has a heterogeneous disease presentation including peripheral arthritis, enthesitis, dactylitis, spondylitis, and nail lesions.[1]
- The prevalence of diagnosed PsA ranges from 0.1% to 1.0% in the global population, with undiagnosed cases estimated at 10.1%. Furthermore, 19.7% of individuals with psoriasis are affected by PsA, according to recent epidemiological studies.[2,3,4]
- A US-based study pointed out that individuals with PsA may have a higher risk of mortality compared to the general population. This increased risk is potentially due to the high overall burden of comorbidities associated with PsA.[5]
- Due to its chronic nature and associated comorbidities, PsA is associated with substantial healthcare costs and healthcare resource use, which increases with disease severity and progression.[5]
- Hence, there is a necessity to understand the economic implications of PsA to facilitate identification of patients and development of enhanced management strategies for this condition.

## Objectives

- To conduct a systematic literature review (SLR) aiming to evaluate and comprehend the current economic burden and healthcare resource utilization (HCRU) among PsA patients.

## Methods

- An SLR was conducted by searching MEDLINE®, Embase, NHS Economic Evaluation Database (NHS EED), and EconLit databases from inception to August 11, 2022. Studies were identified using a predefined PICO criterion. Review and data extraction were performed by two independent investigators. Results were reported according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.[6]
- Grey literature (materials and research produced by organizations outside of the traditional commercial or academic publishing [e.g., MEDLINE®/PubMed and distribution channels) searches were conducted by searching Embase (via OvidSP) to identify abstracts from the relevant conference proceedings from the past two (2020-2022) years.
- Inclusion was based on the following PICOS criteria:
  - Population: Adults with psoriatic arthritis.
  - Interventions: Any or none.
  - Comparators: Any or none.
  - Outcomes: Direct costs, Indirect costs & Healthcare resource utilization.
  - Study design: Observational studies (Cohort studies, case-control, cross-sectional studies).
- Data extraction and quality assessment (using the NICE single technology appraisal (STA) template developed for economic evaluations tool)[7] of the included studies were undertaken by two independent reviewers. Any discrepancies were resolved by a third investigator.

## Results

**Study selection and characteristics**

- A total of 2,872 abstracts were identified through the SLR. Of these, 1,777 were found through Embase, 1,080 through MEDLINE®, 10 through NHS EED, and 5 through EconLit.
- After screening 161 articles, 86 publications (84 studies) were included for qualitative synthesis.
- Of the 84 primary studies, 66 were retrospective cohort studies, 12 were cross-sectional studies, and 6 were prospective cohort studies.
- Most of the studies (n = 47) were conducted in North America, followed by Europe (n = 28), Asia (n = 4), multi-country studies involving North America and Europe (n = 4), and South America (n = 1).
- Majority of the studies (n = 46) were carried out in the US, followed by Germany (n = 7) and other countries (n = 31).
- Sixty-two studies reported the costs from a payer perspective; whereas 22 studies reported costs from a societal perspective.
- Sample size was reported by 79 studies ranging from 33[8] to 35,061[9]
- Fifty-six studies reported mean age of participants which ranged from 41.6 years[10] to 60.8 years.[11]
- The percentage of female participants was reported across 64 studies which ranged from 6.6%[12] to 72.3%.[13]
- The racial background of the participants was documented in 8 studies. Most participants recruited across these studies were Whites/Caucasians (range: 66.4[14] - 96[15]), followed by Hispanics (range: 4.9[16] - 10.4[14]), Others (range: 0.6[16] - 12.5[14]), Blacks (range: 0.5[15] - 8.8[17]) and Asians (range: 1.4[16] - 4.1[14]).
- The most commonly reported treatments for this condition included topical, oral, and systemic corticosteroids, DMARDs, painkillers, and phototherapy.
- The evidence base for the SLR was stratified into three stratas: direct costs, indirect costs, and healthcare resource utilization. Among the 84 primary studies included, 59 studies reported direct costs, 30 studies reported indirect costs and 31 studies reported HCRU. Some of the studies reported overlapping evidence.

**Direct costs**

- Of the studies that provided evidence on direct costs, 35 studies reported total direct costs, 21 studies reported inpatient costs, 30 studies reported outpatient costs and 51 studies reported other costs (emergency department costs and pharmacy costs). The evidence was overlapping among the studies.
- Among the studies reporting total direct costs, eight studies in the US and seven studies in European countries provided the mean total direct costs associated with PsA per patient per year (pppy), as shown in **Table 1**.
- Among the studies providing data for direct inpatient costs, US-based studies reported mean pppy inpatient costs ranging from $28 pppy[13] in the 4th year of follow-up for PsA patients to $40,704 pppy[15] for patients receiving apremilast.
- Outpatient costs in US-based studies varied from $1,131 pppy in the index period to $17,421 pppy in the post-index period (the index date was defined as the first PsA diagnosis date).[17] Additionally, for the studies reporting data in Euro (€) the mean outpatient costs varied from €1.7 pppy[18] in the first year to €1,074 pppy[19] over the period of 10 years.

**Table 1**: Mean total direct cost per patient per year (pppy) across the included studies.

| Author & year (Country) | Sample size | Observation period | Mean Cost |
|---|---|---|---|
| **US** | | | |
| Feldman 2015[8] (US) | 1,230 | 1 year | $27,123 |
| Bonafede 2017[20] (US) | 677 | NR | Etanercept: $2,052 |
| | 119 | NR | Ustekinumab: $4,312 |
| Feldman 2019[15] (US) | 381 | 1 year | Apremilast: $44,277 |
| | 761 | 1 year | Biologic: $54,443 |
| Kaplan 2021[21] (US) | 471 | 1 year | Apremilast: $39,854 |
| | 804 | 1 year | TNFi: $57,243 |
| | 86 | 1 year | iLi: $65,867 |
| Merola 2021[14] (US) | 21,428 | NR | $29,742 |
| | 21,428 | 1 year | $28,104 |
| | 21,428 | 2 years | $29,077 |
| | 21,428 | 3 years | $30,317 |
| | 21,428 | 4 years | $33,921 |
| | 21,428 | 5 years | $34,463 |
| Prince 2021[13] (US) | 3,584 | 1 year | $21,992 |
| | 2,931 | 2 years | $21,978 |
| | 2,387 | 3 years | $22,869 |
| | 1,687 | 4 years | $21,581 |
| | 1,135 | 5 years | $21,642 |
| Elaine Husni 2022[22] (US) | 534 | NR | Apremilast: $17,871 |
| | 1,852 | NR | Methotrexate: $10,683 |
| **EU countries** | | | |
| Brodszky 2009[23] (Hungary) | 183 | 1 year | €5,574 |
| Tsifetaki 2015[18] (Greece) | 92 | NR | €8,097 |
| Kristensen 2017[19] (Denmark) | 10,525 | 10 years | €4,336 |
| Esposti 2019[24] (Italy) | NR | 1 year | csDMARD: €1,966.4 |
| | NR | 1 year | bDMARD: €13,914 |
| Mars 2019[25] (Finland) | 213 | 1 year | €3,816 |
| Martinez-Lopez-de-Castro 2020[26] (Spain) | 100 | 1 year | Anti-TNF-alpha: €12,075 |
| | 100 | 1 year | Non-anti-TNF-alpha: €16,255 |
| Perrone 2020[27] (Italy) | 749 | 1 year | Adalimumab: €12,115.20 |
| | 55 | 1 year | Certolizumab: €9,726.90 |
| | 661 | 1 year | Etanercept: €10,888.10 |
| | 149 | 1 year | Golimumab: €12,191.90 |
| | 130 | 1 year | Infliximab: €10,177.50 |
| | 104 | 1 year | Ustekinumab: €14,993.70 |

EU: European countries; ILi: Interleukin inhibitor; NR: Not reported; PPPY: Per patient per year; US, United States; TNFi: Tumor necrosis factor inhibitor

- In terms of other costs, the emergency department costs observed across studies conducted in the US exhibited a range from $41 pppy[12] for individuals receiving non-TNFi biologics to $1,292 pppy for discontinuers of biologics.[11] Concurrently, pharmacy expenses across these US studies showed variability, spanning from $1,435 pppy[16] for patients undergoing apremilast treatment over 18 months to $57,038 pppy[21] for those receiving interleukin inhibitor (ILi) therapy.

**Indirect costs**

- Evidence regarding indirect costs was provided by 30 studies. Among these, six studies presented data consisting of total indirect costs, while 10 studies detailed indirect costs linked to sick leaves. Additionally, five studies examined costs associated with disability, and productivity limitations were discussed by 17 studies utilizing the WPAI scale (Work Productivity and Activity Impairment), with one study employing the WLQ (Work Limitation Questionnaire).
- The aggregate data on indirect costs were provided by five distinct studies, each originating from Germany, Hungary, Poland, Italy, and Norway, respectively. These studies exhibited a broad temporal scope, spanning from baseline assessments to a duration of five years, as presented in **Table 2**.

**Table 2.** Mean indirect total costs and costs associated with sick leaves and disability across included studies.

| Author & Year (Country) | Sample size | Observation period | Cost |
|---|---|---|---|
| **Indirect total costs (PPPY)** | | | |
| Huscher 2006[28] (Germany) | 908 | NR | HCA: €11,075 |
| | 908 | NR | FCA: €5,570 |
| Brodszky 2009[23] (Hungary) | 183 | 1 year | €2,904 |
| Kvamme 2012[29] (Norway) | 311 | 0-6 months | SD: €17,347# |
| | 311 | 6-12 months | SD: €16,404# |
| | 311 | 12-24 months | SD: €15,382# |
| | 63 | 0-6 months | BD: €32,079# |
| | 63 | 6-12 months | BD: €25,665# |
| | 63 | 12-24 months | BD: €26,712# |
| Kawalec 2016[30] (Poland) | 50 | 1 year | €318.0# |
| Olivieri 2016[31] (Italy) | 107 | Baseline | €133.4@ |
| | 52 | 1 year | €33.7@ |
| | 55 | 5 years | €11.6@ |
| **Indirect cost associated with sick leaves (PPPY)** | | | |
| Huscher 2006[28] (Germany) | 908 | NR | €1,374 |
| Brodszky 2009[23] (Hungary) | 183 | 1 year | €161 |
| Zhu 2010[32] (Hong Kong) | 63 | NR | $1,039# |
| Kristensen 2017[19] (Denmark) | 10,525 | 10 years | €790 |
| Orbai 2021[33] (US) | 33,570 | 1 year | $26.7 |
| Sewerin 2021[34] (Germany) | 348 | Pre-Index | €649# |
| | 348 | Post-Index | €303# |
| **Indirect cost associated with Disability (PPPY)** | | | |
| Huscher 2006[28] (Germany) | 908 | NR | €6,545* |
| | 908 | NR | €1,040^ |
| Brodszky 2009[23] (Hungary) | 183 | 1 | €2,742 |
| Orbai 2020[35] (US) | 6,240 | 1 | $654 |
| Husni 2021[36] (US) | 1,244 | 1 | $896.5# |
| Orbai 2021[33] (US) | 4,096 | 1 | $725 |
| | 4,096 | 2 | $503 |
| | 4,096 | 3 | $442 |
| | 4,096 | 4 | $710 |
| | 4,096 | 5 | $590 |

BD: Biological DMARDs; FCA: Friction Cost Approach; HCA: Human Capital Approach ; Index date: The first observed bDMARD prescription (i.e., the date it was dispensed) was designated as the index date; NR: Not reported; PP: Per person: #; PPPY: Per person per year; PPPM: Per person per month: @; PY: Person year; SD: Synthetic DMARDs; US, United States;*: Calculated using the human capital approach by the author; ^: Calculated using the friction costs approach by the author

- The indirect costs linked to sick leaves attributed to PsA were documented in two studies conducted in Germany, with one study each originating from Hungary, Denmark, Hong Kong, and the US. The German-based study reported an indirect cost of €649 per patient (pp) pre-index and €303 pp post-index, wherein the index date was defined as the initial observed dispensing date.[34] The indirect costs are summarized in **Table 2**.
- In terms of indirect costs due to disability arising from psoriatic arthritis, notable reporting predominance was observed across three studies conducted in the US, followed by one study each presenting data from Germany and Hungary. Among these, one US-based study sourced data from the IBM MarketScan Commercial and Health and Productivity Management Database, providing insights into the average indirect costs associated with short-term disability leave pppy.[33] The data have been presented in **Table 2**.

**Healthcare resource utilization (HCRU)**

- Thirty-one studies contributed to HCRU for PsA patients, among these, inpatient HCRU was reported by 23 studies, outpatient HCRU by 25 studies, emergency department HCRU by 10 studies, rheumatologist HCRU by seven studies, and dermatologist HCRU by five studies.
- In studies reporting inpatient HCRU, the mean length of hospitalization stay for PsA patients ranged from 0.6 days pp[9] to 11.1 days pp[10] as presented in **Table 3**.

**Table 3.** Mean inpatient HCRU among PsA patients.

| Author & Year (Country) | Sample size | Observation period | Length of hospital stay (days) |
|---|---|---|---|
| Zhu 2010[32] (Hong Kong) | 125 | 1 year | 1.7* |
| Feldman 2015[8] (US) | 1,230 | 1 month | 1.1# |
| Merola 2018[9] (US) | 35,061 | 1 month | 0.6* |
| Guraya 2020[37] (US) | 77,980 | NR | 4.9# |
| Kim 2020[10] (Korea) | NR | 2012 | 9.1* |
| | NR | 2016 | 11.1* |
| Murugesan 2021[38] (US) | 50,700 | 2012 | 4.7 |
| | 179,400 | 2017 | 4.9 |

DPP: Days per person: *; DPS: Days per stay: #; US: United States

- The evidence pertaining to outpatient HCRU was reported by seven studies among which five studies reported mean outpatient visits as shown in **Table 4**.
- The median annual outpatient admissions ranged from 12.6 pppy[39] to 28.6 pppy.[11]
- Additionally, the mean outpatient visits per patient per year among the included evidence ranged from 7 pppy[10] to 19.3 pppy[8] as shown above in **Table 4**.
- In terms of emergency department HCRU, the annual emergency department visits among PsA patients ranged from 0.3 pppy[26] to 1.8 pppy.[5]
- Adding to the evidence, the mean number of emergency department visits ranged from 0.4 pp[9] to 0.6 pp[13] as reported in **Table 4**.

**Table 4.** Mean outpatient visits and mean emergency department visits among PsA. patients

| Author & year (Country) | Sample size | Observation period | Visits |
|---|---|---|---|
| **Number of outpatient visits/ admissions (VPP)** | | | |
| Feldman 2015[8] (US) | 1,230 | 1 year | 19.3# |
| Merola 2018[9] (US) | 35,061 | 1 year | 18.6 |
| Kim 2020[10] (Korea) | NR | 2012 | 7.1# |
| | NR | 2016 | 7# |
| Prince 2021[13] (US) | 4,430 | NR | 45.3 |
| Inui 2021[39] (Japan)* | 639 | 1 year | 12.6# |
| Hur 2021[11] (US)* | 2,560 | 1 year | 28.6# |
| Sewerin 2021[34] (Germany) | 348 | Pre-index | 20.6 |
| | 348 | Post-index | 19.0 |
| **Emergency department visits (VPP)** | | | |
| Zhu 2010[32] (Hong Kong) | 125 | 1 year | 0.5# |
| Feldman 2015[8] (US) | 1,230 | 1 year | 0.4# |
| Greenberg 2016[5] (US) | 10,832 | 1 year | 1.8# |
| Merola 2018[9] (US) | 35,061 | 1 year | 0.4 |
| Martinez-Lopez-de-Castro 2020[26] (Spain) | 100 | 1 year | 0.3# |
| Prince 2021[13] (US) | 4,430 | Baseline | 0.6 |
| Merola 2021[14] (US) | 21,428 | 1 year | 1.2# |

APPPY: Admissions per persons per year: #; Index date: The first observed bDMARD prescription (i.e., the date it was dispensed) was designated as the index date; US: United States; VPP: Visits per persons; VPPPY: Visits per persons per year: #; *Note: The data for Inui 2021 and Hur 2021 have been reported as median value.

## Conclusions

- Overall, direct costs were the major cost drivers with inpatient costs and outpatient costs being the critical components. Indirect costs remained a silent contributor to the economic burden, highlighting the productivity limitations incurred due to PsA.
- There is a lack of published data on the economic burden faced by caregivers and the costs associated with managing home care. The combined impact of inpatient costs, outpatient expenses and medication costs emphasizes the continuing need for focused interventions.

## Acknowledgments

- This SLR was funded by Bristol Myers Squibb
- SV, SD and JC report employment with BMS. CZ is a contractor with BMS. SW, DP and MSF report employment with Evidinno. JFM is a consultant and/or investigator: AbbVie, Amgen, Biogen, Bristol Myers Squibb, Dermavant, Janssen, Leo Pharma, Lilly, Novartis, Pfizer, Regeneron, Sanofi, Sun Pharma, and UCB

The references have been integrated into a supplementary document and is accessible online.

Presented at ISPOR 2024; May 5-8, 2024; Atlanta, GA

Jiyoon.Choi@bms.com