VALUE-BASED DERMATOLOGY:

Reducing biologics costs in psoriasis & eczema management

Rising Costs, Rising Challenges: Understand the escalating financial burden biologics place on health plans, employers, and patients in managing psoriasis and eczema.

Barriers to Better Care: Explore systemic challenges in dermatology that hinder the adoption of effective, cost-efficient treatments.

Introducing Zest Health: Value-Based dermatology care that reduces skin-indicated pharmacy costs with innovative solutions while improving patient outcomes.

Table of contents

Current landscape of biologic therapy in dermatologic disease 3

Economics of increasing biologic costs 4

Structural determinants of U.S. dermatology care expenditures 5

Dose reduction (DR) as a sustainable and patient-centered approach in dermatology 7

Economic implications for health plans and employers 10

The Zest approach 12

1

Current landscape of biologic therapy in dermatologic disease

According to the American Academy of Dermatology, eczema affects approximately 28 million people in the United States, while psoriasis impacts 8 million adults, **together, comprising nearly 10% of the population.** These chronic inflammatory conditions place significant economic strain on patients and the entire healthcare system. In the United States, psoriasis alone accounted for over $24 billion in direct pharmacy costs in 2023, with the eczema treatment market projected to reach a similar figure of $24 billion by 2030. The introduction of biologic drugs, advanced therapies that target specific immune responses, has provided new hope for patients by delivering more effective relief than traditional treatments. However, these therapies come with a substantial cost burden, averaging tens of thousands of dollars per patient annually.

The development and widespread formulary adoption of biologic therapies have been the primary drivers of this surge in pharmacy spending. However, despite their widespread use, dermatology has lagged behind other specialty care areas, such as oncology and cardiology, in implementing cost-saving measures. This gap leaves patients and payers to bear unsustainable financial burdens.

In oncology, biosimilar adoption has delivered $36 billion in cumulative U.S. healthcare savings, with $18 billion attributed to just three cancer drugs. Dose optimization strategies, like extending nivolumab dosing intervals, save up to $100,000 per patient annually without compromising efficacy. Similarly, cardiology's success with generic drug utilization and preventative care has driven billions in annual savings, while innovations like remote patient monitoring have reduced hospital readmissions and associated expenses.

In contrast, dermatology biologics remain costly, with slow adoption of biosimilars and limited use of strategic treatment breaks. System-wide challenges compound these issues, including outdated billing models, a disconnect between dermatology providers and the financial impact of prescribing decisions, and barriers to access for affordable medical expertise. Together, these factors create a complex and unsustainable care ecosystem.

Given the chronic and episodic nature of these conditions, it is imperative for forward-thinking healthcare innovators to prioritize care models that reduce costs while maintaining excellent patient outcomes. By leveraging intelligent biosimilar adoption and dose reduction strategies through patient-centered approaches, Zest Health has unlocked a significant opportunity to reshape this challenging economic landscape. The need for transformative action has never been more urgent.

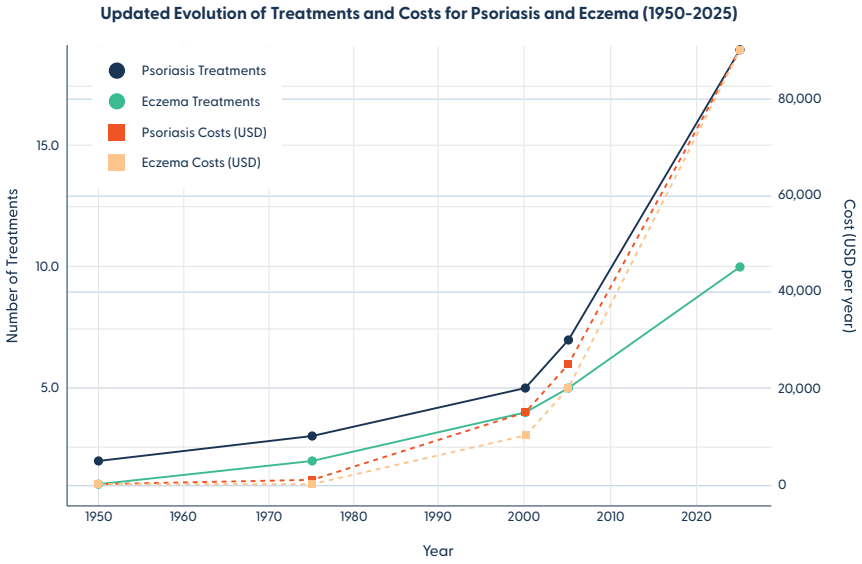
In 2023, psoriasis placed a significant financial strain on payers and employers, with direct pharmacy costs exceeding **$24 billion.**

2

Economics of increasing biologic costs

As chronic and incurable diseases, eczema and psoriasis have historically been challenging to treat effectively. In the past, treatments like methotrexate and cyclosporin were used to suppress the immune system broadly, but these drugs carry significant risks, including impacts on cardiovascular, renal, and hepatic systems, requiring frequent blood work and monitoring.

The discovery of immune specific pathways driving these conditions has revolutionized the therapeutic space, sparking a surge in pharmaceutical interest and drug development. From 2003 to 2009, only five FDA-approved biologics were available for psoriasis, with none for eczema. Since 2015, the landscape has shifted dramatically, with 19 biologics (including biosimilars) gaining FDA approval, including the first biologic for eczema, Dupixent, in 2017.



Today, there are multiple targeted pathways for biologic drug development, offering safer and more effective alternatives to older treatments. Owing to the safety, ease of formulary accessibility and patient demand for use, there has been rapid prescriber adoption of biologics over the last decade as preferred treatments even when there are affordable, clinically indicated alternatives.

The annual expenditure on biologics for psoriasis and eczema is projected to reach **$50 billion** within the next few years.

According to a 2017 study by the RAND Corporation, biologics accounted for a disproportionate share of prescription drug expenditures. Despite comprising only 2% of U.S. prescriptions by volume, these complex therapies contributed to 37% of net spending on prescription drugs. Although the annual drug costs for eczema treatments lag behind psoriasis by five to ten years, the blockbuster success of Dupixent positions it to surpass the revenue generated by psoriasis-indicated biologics to date. Dupixent's success is a harbinger for growing demand and the reciprocal increase in treatment costs as there is maturation of the eczema drug development market. Together the annual expenditure on biologics for eczema and psoriasis is projected to reach $50 billion within the next few years.

3

Structural determinants of U.S. dermatology care expenditures

Biologics have delivered the possibility of long-term remission in eczema and psoriasis, which was rarely possible with legacy treatment options. Despite these pharmacologic advancements, treatment paradigms have not incorporated clinical guidance for ceasing biologic therapy in patients who achieve remission. Notably, no current guidelines from U.S. dermatology societies address this critical issue. Yet, in routine clinical practice, therapy interruptions and discontinuations are common, driven by factors such as financial constraints, changes in insurance formularies, life circumstances, family planning considerations, and concerns about long-term safety.

In contrast, the international dermatology community has taken a more proactive approach, implementing dose reduction strategies for biologic therapies as early as 2013. This disparity underscores the need for a more unified and strategic approach within the U.S. to address these challenges effectively.

A 2021 survey by van Muijen et al., involving psoriasis experts from 22 countries affiliated with the International Psoriasis Council, found that 70% had implemented dose reduction strategies. The most frequently cited motivations for these practices were cost savings, safety considerations, and patient requests. These findings were reaffirmed by Gleeson et al. in 2024, who surveyed British clinicians and patients on "as-needed" biologic dosing. Support for this approach was strong, with 78% of clinicians and 67% of patients endorsing it.

A shortage of U.S. dermatologists exacerbates these systemic challenges. As of May 2023, more than 70% of U.S. populated areas have fewer than four dermatologists per 100,000 individuals—a ratio deemed necessary to ensure adequate dermatologic care.

This disparity further underscores the barriers to timely and effective treatment for patients. Additionally, nearly 20% of U.S. zip codes lack a practicing dermatologist with fewer than 10% of dermatologists practicing in rural regions. Furthermore, there has been a notable decline in the number of dermatologists in solo practice, dropping from 26.1% in 2012 to 15.6% in 2020.

Much of this consolidation has come from the increasing influence of private equity (PE) in dermatology. As Gondi et al. highlights, dermatologists make up approximately 1% of U.S. physicians, whereas dermatology practices account for 15% of private equity acquisitions. In a 2021 analysis of commercial claims from the Health Care Cost Institute between 2012 and 2017, Braun et al. found that PE practices employed a higher ratio of advanced practitioners to dermatologists relative to non-PE owned practices.

Given PE's focus on streamlined operations it was an unsurprising finding that **dermatologists in PE-owned groups saw up to 17% higher volume compared to non-PE dermatologists.** The misaligned incentives in a fee-for-service model leads to deprioritization of offering chronic medical dermatology treatment, in favor of less complex, high-volume services such as cash-based cosmetic treatments and minor procedures like skin biopsies.

Together this low accessibility for chronic care management has fostered an environment where biologics are utilized to bridge this care gap. Instead of patients benefiting from remittive relief, they are maintained on these high cost agents as a defense against inaccessibility for chronic care management.

A payment model that closely aligns care access, patient outcomes and financial stewardship of treatment resources incentivizes a healthier interplay between payers and service providers, which is beneficial to stakeholders across the ecosystem.

Premature Treatment

Poor access to care causes episodic flares to fester, increasing the urgency for immediate relief. Prescribers lose critical time in the treatment window missing the opportunity to prescribe effective lower-cost treatments. Given the lack of infrastructure to support treatment adherence many prescribers use peak-intensity moments in a patient's flare cycle to justify biologic initiation.

Excessive Use

Biologics are sometimes prescribed for patients with mild disease, where the clinical justification for such high-cost treatment is opaque. For example, patients with persistent localized psoriasis in easily treatable areas, are better suited for topical adherence support rather than escalation of treatment intensity, but these programs are lacking in the traditional dermatology care models.

Chronic Over-Prescriptions

Patients prescribed biologics often remain on these treatments chronically and reflexively. Initiation of a biologic is a patient's gateway to ongoing high-cost treatment access. Prescribers rarely re-visit biologic indications except when required by prior authorization and only in-so-far as to green light continued use or a forced switch to the preferred formulary alternative. This long-term use suppresses improvements from lifestyle changes, like weight loss or smoking cessation, and natural remittive fluctuations over the course of the disease. Furthermore, continuous use disincentivizes patients to put effort toward lifestyle changes with the false belief there is limited benefit from such interventions and that the systemic treatment is sufficient.

4

Dose reduction (DR) as a sustainable and patient-centered approach in dermatology

Recent literature highlights a growing body of evidence supporting dose reduction (DR) as an effective, safe, and patient-preferred strategy for managing chronic dermatological conditions like eczema and psoriasis. This approach not only maintains clinical efficacy but also addresses concerns related to treatment sustainability and patient quality of life. DR offers significant opportunities for cost savings while maintaining long-term disease control, aligning with Zest's clinical paradigm and commitment to innovative, value-based care.

Psoriasis: robust evidence for DR in biologic therapies

The March 2024 review by van Riel et al. in Frontiers in Pharmacology highlights DR's clinical efficacy, safety, and cost-saving potential. Key findings include:

- **CONDOR Trial (2020):** 59% of patients maintained DR for one year, with 69% of those patients sustaining it for two years. Among relapsed patients, 80% regained response upon resuming the last effective dose, with no QoL differences compared to standard dosing.
  The study emphasizes stringent eligibility criteria such as low disease activity (PASI <5 or PGA <1) and minimal QoL impact (DLQI <5), both core to Zest's DR approach.
- **Di Altobrondo et al. (2022):** Over 102 months, only 27% of DR patients relapsed, and 96% regained their initial response after resuming standard dosing.
  Patient satisfaction with DR was high, with only 2 of 96 expressing dissatisfaction.

Newer biologics, such as IL-17 and IL-23 inhibitors, also show promise:

- **Blauvelt et al. (2020):** 61.3% of risankizumab patients maintained remission for 52 weeks after transitioning to placebo.
- **GUIDE Trial (2024):** Extended guselkumab dosing (16 weeks) was non-inferior to 8-week dosing in complete responders.

These findings confirm the durability of DR with newer agents, consistent with Zest's outcomes. The upcoming BeNeBio trial (2025) is expected to further validate DR in psoriasis care.

> As we confront the escalating costs of biologic treatments for conditions like psoriasis and eczema, it's crucial to recognize that the current trajectory of biologic spending is unsustainable. While biologics have revolutionized care, we must prioritize evidence-based practices that incorporate a broader spectrum of treatment options. This includes educating providers, patients, and health plans about effective, lower-cost interventions that can address the complex causes of these chronic conditions. Our goal should be to ensure equitable access to care without compromising the quality of treatment or the financial viability of our healthcare systems.
>
> **Dr. Rachel Day, FAAD**
> Chief Medical Officer

Eczema: emerging support for DR

Although evidence for DR in eczema is still developing, promising data from biologics like dupilumab underscore its potential:

- **LIBERTY AD SOLO 1 and 2 Trials (2020):** 43.9% of patients maintained remission on 4-week dosing and 32.8% on 8-week dosing, compared to 54% on standard 2-week dosing.
- **Spekhorst et al. (2022):** A patient-centered DR model using absolute EASI scores and gradual dose adjustments achieved 93.3% disease control at extended intervals (6–8 weeks).
- **Shen et al. (2024):** Half of dupilumab patients surveyed preferred to discontinue treatment once their disease was well-controlled, emphasizing the demand for individualized care.

Zest embraces these principles by integrating frequent check-ins and patient-centered adjustments, delivering flexible and responsive care. This approach ensures that DR opportunities are optimized while maintaining treatment efficacy and addressing individual patient needs.

Skyrizi, Dupixent, and Rinvoq accounted for over **$1.5 billion in marketing spend in 2023**, highlighting how aggressive promotional strategies are steering patients toward expensive biologics rather than more cost-effective treatment options.

The future of DR: a new standard in dermatology

As DR evidence grows, particularly for IL-23 inhibitors, Zest continues to lead in adopting data-driven, value-based practices. With ongoing research, including the BeNeBio trial, DR is poised to become a cornerstone of sustainable dermatology, balancing patient outcomes, safety, and cost efficiency.

Market forces and industry influences on biologic therapy costs

The soaring costs of biologics for conditions such as psoriasis and eczema can be attributed to several key factors, with one of the most significant being the pricing strategies employed by pharmaceutical manufacturers.

A 2017 report from the National Psoriasis Foundation highlights the substantial rise in the costs of biologic therapies. This escalation is partly attributable to pharmaceutical manufacturers' efforts to recover significant investments in research and development. However, the primary factor driving these costs is shadow pricing—a strategy where drug prices are set relative to competitors' pricing rather than being based on production costs or the clinical value of the therapy to patients.

Whereas competition may drive down prices in other fields, **dermatology biologic prices have only increased** despite consistent new entrants.

This practice has contributed significantly to the growing financial burden on healthcare systems and patients alike. New drugs entering the market often benchmark their prices against existing treatments, particularly if they are in the same therapeutic class.

A 2024 study published in JAMA Dermatology examining AbbVie's pricing strategies for Humira (adalimumab) revealed Humira prices increased almost identically with prices of etanercept (Enbrel), a drug manufactured by Amgen but in the same therapeutic category. Whereas competition may drive down prices in other fields, dermatology biologic prices have only increased despite consistent new entrants.

Interestingly, this has even extended to the immunomodulator orals, which presumably have significantly lower costs to produce. From 2013 to 2022, there was a standard **$60,000 to $100,000 annual cost for any new entrant systemic treatment in eczema or psoriasis with a 13.7% compound annual growth.**

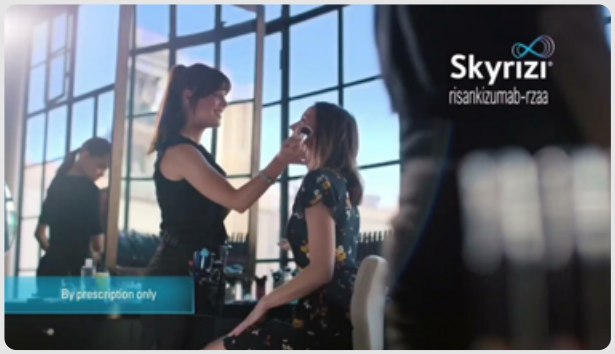
If Otezla's FDA approval for mild disease severity is any indication to where the market is headed, we anticipate other high cost orals to follow suit exponentially increasing the risk of high cost of care in a traditionally low risk, low cost member pool. The American Academy of Dermatology has noted that these pricing structures not only affect patient access but also place significant financial burdens on healthcare systems.

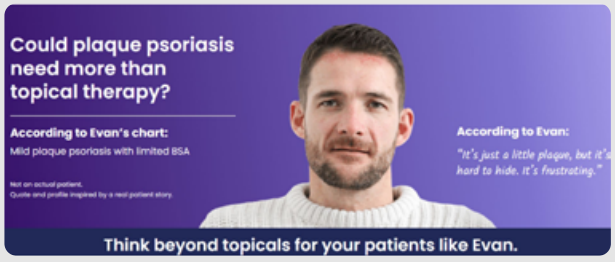
Another influence of Big Pharma that cannot be overlooked is direct-to-consumer advertising. Pharmaceutical companies invest heavily in marketing their biologics. This substantial investment is not merely aimed at boosting brand awareness; it directly influences patient inquiries and preferences.

A recent study from the American Medical Association found "76% [of patients] said they were likely to ask a health care provider about advertised drugs; 26% said they had already done so." They also market directly to dermatology providers through traveling drug representatives that breed good will with practices by bringing lunches or sponsoring speaker dinners.

Through building patient affinity with direct-to-consumer advertising while promoting clinical effectiveness to providers, pharma companies connect patients desperate for relief with providers overwhelmed by high-volume practice environments. This leads to overuse of these high-cost treatments, even when more cost-effective alternatives may be appropriate.

Biologics Advertisements





5

Economic implications for health plans and employers

The aggressive marketing strategies employed by pharmaceutical companies have dramatically increased the utilization of biologics, positioning these treatments as the fastest-growing segment of specialty drugs. As the healthcare landscape evolves, the financial implications of specialty drugs—particularly biologics—are becoming increasingly significant and concerning for health plans and employers. Even when rebates are calculated into rising spend estimates, these medications are financially hurting sponsors' bottom-lines.

Key trends and statistics highlight the impact on healthcare spending:

Indirect Costs

Indirect costs significantly add to the economic burden of chronic conditions like eczema and psoriasis, impacting individuals' lives and workplace productivity. A 2013 study estimated that productivity losses from chronic conditions, such as psoriasis, totaled $36 billion annually—adjusted for inflation and population growth, this now exceeds $59 billion annually, averaging over $5,400 per individual. Similarly, a 2006 study attributed 20% of the total economic burden of eczema to indirect costs.

These losses arise from:

- **Presenteeism:** Reduced work output caused by physical or mental impairments like itchiness or discomfort.
- **Absenteeism:** Time away from work due to severe flare-ups or medical appointments.
- **Unemployment:** Lost workforce participation in severe cases.
- **Mental and Physical Health Challenges:** The emotional toll of conditions like eczema and psoriasis that undermine personal and professional functioning.

Eczema's Groundswell

Dupixent's 2024 US eczema sales of $5.1 billion exceeded analysts' 2022 projections by $3.3 billion, representing a 183% increase over forecasted figures.

Utilization Growth

Since 2020, biologic utilization for psoriasis has surged at an annual growth rate of 19.7%, signaling a shift toward more expensive treatment options.

Drug Development Pipeline

Between 2005 and 2015, 29 drugs targeting psoriasis or eczema achieved global commercialization, with 10% comprising biologic molecules. From 2015 to 2025, this number jumped to 41 drugs, 34% of which were biologics, reflecting a focus on advancing high-cost therapies. As of January 2025, 317 psoriasis or eczema drugs are in active clinical trials, spanning Phase 1 to Phase 3, underscoring continued investment and innovation in treatments for these dermatologic conditions.

PMPM Spending Increase

Health plans have seen a 24% increase in per-member-per-month (PMPM) spending on biologics, reflecting the escalating financial burden placed on insurers and employers.

Projected Spending

Total specialty drug spending is forecasted to exceed $500 billion by 2026, indicating an unsustainable upward trajectory.

Prior authorization requirements

The prior authorization process, intended to ensure the appropriate use of high-cost medications, often imposes a significant administrative burden on healthcare providers. When all options beyond first-line therapies like topical steroids require prior authorization, the system inadvertently incentivizes providers to prioritize the paperwork for biologics—the most extreme yet efficacious option. This dynamic can lead to an over-reliance on biologics, even when alternative treatments might be more clinically appropriate, highlighting the need for systemic reform to better align authorization requirements with patient care goals.

Insufficient value-based care models

Current reimbursement structures predominantly follow fee-for-service models, which emphasize treatment volume rather than outcomes. These models often lack the infrastructure to fully support value-based care initiatives, limiting opportunities for dermatologists to adopt cost-effective approaches that could improve long-term patient outcomes. Enhancing alignment between reimbursement and patient-centered care is crucial to effectively managing biologic costs while maintaining high-quality care.

Market dynamics and access challenges

The biologics market remains concentrated among a few major pharmaceutical companies, creating a competitive environment that can limit innovation and contribute to sustained high prices. This dynamic poses challenges for dermatologists and patients seeking affordable and accessible treatment options. Most notably there has been limited adoption of biosimilars due to: large pharmaceutical company rebates incentivizing formulary placement of branded products, limited prescriber awareness, lack of support from institutional dermatology societies, and less financial assistance for patient access. Addressing these barriers is essential for fostering a more equitable and sustainable dermatologic care landscape.

Financial reporting

In partnerships with Health Plans and Employers, many point-solution value-based care providers fall short by avoiding upfront patient cost benchmarking and lacking robust digital infrastructure, leading to financial discrepancies, delayed payments, and cumbersome backend adjudication. **Zest's Rx Insight Navigator** transforms this process by leveraging up-to-date pharmacy claims data and delivering customized dashboards tailored to each partner's unique needs. This innovative platform provides transparent, precise financial reporting at the individual level, streamlining payment reconciliation, eliminating surprises, and building trust in the future of value-based care.

6

The Zest Approach

Improve access to care & reduce total spend

Zest removes barriers to accessing timely care. This approach allows for implementation of multiple interventions including treatment adherence programs and non-pharmacological treatments that reduce reliance on costly, long-term systemic therapies. By aligning care delivery with value creation for all stakeholders rather than fee-for-service models, we produce exceptional patient outcomes and experience while reducing the total cost of care.

What is Zest Health?

Zest is the leading value-based, virtual dermatology clinic dedicated to the comprehensive care of psoriasis, eczema, and other chronic inflammatory skin and joint conditions. Our value-based approach ensures that patients receive clinically validated treatment with the added convenience of next-day appointments and 24/7 access to our multidisciplinary team of dermatology experts. We collaborate closely with patients to create personalized, cost-effective treatment plans that prioritize their health and well-being.

With Zest, patients benefit from:

Team of Dermatology Providers

A dedicated team of dermatology providers specializing in psoriasis and eczema care with **91% of patients reporting Zest is better than their previous dermatology experience.**

More Cost-Effective Treatment Approach

Accessible and responsive treatment plans helping over half of patients shift off high-cost drugs.

Accessible, Convenient Care

Next-day appointment availability and 24/7 messaging with your dedicated care team.

Clinically-Proven Relief

83% of patients report improved quality of life, with 49% experiencing clear or near-clear skin, by their second follow up visit.

> Having navigated the complexities of psoriasis care myself, I created Zest to remove obstacles like long wait times and inconsistent access. We partner with employers and health plans to deliver high-quality dermatology care that keeps our patients healthier and helps our partners proactively manage rising pharmacy costs.

Olivia Deitcher
CEO & Founder of Zest

TAKE ACTION:

Lower biologics costs and improve patient care

Schedule a consultation with our team to discover how Zest can help you implement cost-effective strategies that reduce reliance on expensive biologic treatments.

Get a complimentary claims analysis of your pharmacy spend

Discover valuable insights into how Zest can help you better manage costs, improve outcomes, and create a more sustainable future for dermatology care.

Contact us at partnerships@zesthealth.com

Bibliography

1. AlphaSense. (2024). Biopharma Industry Insights [Market Report]. Retrieved from https://research.alpha-sense.com/search?search_id=tnfe51fa051fcbd7fc58ba0c78d976a2ee58fe5bf5&utm_doc_id=ASR-BOFA-e6cfb17ef4b8c20de117cc374132543

2. AlphaSense. (2024). Global Drug Strategies Overview [Market Report]. Retrieved from https://research.alpha-sense.com/search?search_id=nzb045431951be560ee5ed5115fd0a372f104d10&utm_doc_id=GDS-c6eef6d5f017f5b3929d26a

3. AlphaSense. (2024). Pharmaceutical Market Trends [Market Report]. Retrieved from https://research.alpha-sense.com/search/search_id=ban80088b2d28140a700510761c8e1_doc_id=ASE-KN10a37122931c4f2d8c40f65c

4. American Academy of Dermatology. (2023). Impact of Biologics on Patient Access.

5. Atalay, S., van den Reek, J. M. P. A., Groenewoud, J. M. M., van de Kerkhof, P. C. M., Kievit, W., & de Jong, E. M. G. J. (2022). Two-year follow-up of a dose reduction strategy trial of biologics adalimumab, etanercept, and ustekinumab in psoriasis patients in daily practice. Journal of Dermatological Treatment, 33(3), 1591-1597.

6. Bader, K. (2023, January 31). Discover Dermatology Times: January 2023. Dermatology Times.

7. Beyond Topicals. (2024). Homepage. Retrieved October 1, 2024, from https://www.beyondtopicals.com

8. Bingham, J. W., & Feldman, S. R. (2006). The direct costs of atopic dermatitis. Journal of Managed Care Pharmacy, 12(4), 335-342.

9. Blauvelt, A., Leonardi, C. L., Gooderham, M., Papp, K. A., Philipp, S., Wu, J. J., ... & Langley, R. G. (2020). Efficacy and Safety of Continuous Risankizumab Therapy vs Treatment Withdrawal in Patients With Moderate to Severe Plaque Psoriasis: A Phase 3 Randomized Clinical Trial. JAMA Dermatology, 156(6), 649-658.

10. CVS Health. (2023). Specialty Dermatologicals Spend Grows 16.8 Percent in 5 Years. CVS Caremark Insights. Retrieved from https://payorsolutions.cvshealth.com/insights/2023/specialty-dermatologicals-spend-grows-168-percent-5-years.html

11. Di Altobrando, A., Magnano, M., Offidani, A., Patrizi, A., Campanati, A., et al. (2022). Deferred time of delivery of biologic therapies in patients with stabilized psoriasis leads to a 'perceived satisfaction': a multicenter study. Journal of Dermatological Treatment, 33, 415-419.

12. Eyerich, K., Asadullah, K., Pinter, A., et al. (2024). Noninferiority of 16-Week vs 8-Week Guselkumab Dosing in Super Responders for Maintaining Control of Psoriasis: The GUIDE Randomized Clinical Trial. JAMA Dermatology, 160(9), 953–963.

13. Fact.MR. (2024). Atopic Dermatitis Market Report. Retrieved from https://www.factmr.com/report/4603/atopic-dermatitis-market

14. Feldman, W. B., Duesztsza, S. B., & Kesselheim, A. S. (2023). Humira: The First $20 Billion Drug. JAMA Dermatology, 159(2), 121-122.

15. Gleeson, D., Naveed, M., Moorhead, L., McAteer, H., Sewell, G., McGuire, A., ... & Mahil, S. K. (2024). Acceptability of 'as needed' biologic therapy in psoriasis: insights from a multistakeholder mixed-methods study. British Journal of Dermatology, 191(2), 243-251.

16. GlobalData. (2022). Atopic Dermatitis (AD) 68: Market Analysis and Sales Forecast. GlobalData.

17. GlobalData. (2024). Atopic Dermatitis: Global Drug Forecast and Market Analysis to 2030. Retrieved from https://pharma.globaldata.com/Analysis/TableOfContents/Atopic-Dermatitis--Global-Drug-Forecast-and-Market-Analysis-to-2030

18. Huang, Y. H., Hung, S. J., Lee, C. N., Wu, N. L., Hui, R. C., Tsai, T. F., ... & Chiu, H. Y. (2024). Predicting the Time to Relapse Following Withdrawal from Different Biologics in Patients with Psoriasis who Responded to Therapy: A 12-Year Multicenter Cohort Study. American Journal of Clinical Dermatology, 25(6), 997-1008.

19. IQVIA. (2020). Novel Therapies Drive Growth in the Atopic Dermatitis Market. Retrieved from https://www.iqvia.com/blogs/2020/11/novel-therapies-drive-growth-in-the-atopic-dermatitis-market

20. Joyce, G. F., Carrera, M., Goldman, D. P., & Sood, N. (2011). Physician Prescribing Behavior and Its Impact on Patient-Level Outcomes. The American Journal of Managed Care, 17(12), e462-e471.

21. Masson Regnault, M., Shourick, J., Jendoubi, F., Tauber, M., & Paul, C. (2022). Time to Relapse After Discontinuing Systemic Treatment for Psoriasis: A Systematic Review. American Journal of Clinical Dermatology, 23(4), 433-447.

22. McCormick, N., Wallace, Z. S., Sacks, C. A., et al. (2020). Decomposition analysis of spending and price trends for biologic antirheumatic drugs in Medicare and Medicaid. Arthritis Rheumatology, 72(2), 234–241.

Bibliography cont.

23. Menter, A., Strober, B. E., Kaplan, D. H., Kivelevitch, D., Prater, E. F., Stoff, B., ... & Elmets, C. A. (2019). Joint AAD-NPF guidelines of care for the management and treatment of psoriasis with biologics. Journal of the American Academy of Dermatology, 80(4), 1029-1072.

24. Mindera Health. (2023). Mindera Health Launches Program with Innovative Pharmacy Benefit Manager to Improve Management of Moderate to Severe Psoriasis Patients through Precision Medicine. Retrieved from https://minderahealth.com/mindera-health-launches-program-with-innovative-pharmacy-benefit-manager-to-improve-management-of-moderate-to-severe-psoriasis-patients-through-precision-medicine/

25. National Psoriasis Foundation. (2023). Cost of Psoriasis Treatment.

26. Prime Therapeutics. (2020). Prevalence and Cost of Autoimmune Specialty Drug Use by Indication: 2012–2015, 2019–2020.

27. Puig, L., Carrascosa, J. M., Carretero, G., de la Cueva, P., Lafuente-Urrez, R. F., Belinchón, I., ... & Vidal, D. (2013). Spanish evidence-based guidelines on the treatment of psoriasis with biologic agents, 2013. Part 1: on efficacy and choice of treatment. Actas Dermosifiliográficas, 104(8), 694-709.

28. Reich, K., Gordon, K. B., Strober, B. E., Armstrong, A. W., Miller, M., Shen, Y. K., ... & Griffiths, C. E. M. (2021). Five-year maintenance of clinical response and health-related quality of life improvements in patients with moderate-to-severe psoriasis treated with guselkumab: results from VOYAGE 1 and VOYAGE 2. British Journal of Dermatology, 185(6), 1146-1159.

29. Sensors Editorial Office. (2023). Recent Advances in Wearable Sensors for Continuous Health Monitoring: A Focus on Skin-Integrated Devices. Sensors, 23(16), 7295.

30. Shen, C., Huang, C., Giordano, J., & Fuxench, X. (2024). Treatment Preferences among Adult Patients with Atopic Dermatitis. Presented at the 2024 Revolutionizing Atopic Dermatitis Mid-Year Virtual Update, December 8, 2024.

31. Spekhorst, L. S., Bakker, D., Drylewicz, J., Rispens, T., Loeff, F., Boesjes, C. M., ... & de Bruin-Weller, M. S. (2022). Patient-centered dupilumab dosing regimen leads to successful dose reduction in persistently controlled atopic dermatitis. Allergy, 77(11), 3398-3407.

32. Steele, R., Chernin, S., Langan, S. M., Smeeth, L., Silverwood, R. J., & Abuabara, K. (2021). Adult atopic eczema and the risk of depression and anxiety: A population-based cohort study. Journal of Allergy and Clinical Immunology: In Practice, 9(10), 3663-3673.

33. Stern, R. S. (2000). The roles of the pharmaceutical industry and drug development in dermatology. Journal of Investigative Dermatology Symposium Proceedings, 5(1), 65-67.

34. Sweeney, D. (2024, September 29). Tarsus Firing on All Cylinders as Xdemvy Launch, Salesforce Expansion Roll Ahead: CEO. Fierce Pharma.

35. van der Schoot, L. S., van den Reek, J. M. P. A., Grine, L., et al. (2021). Dose reduction of the new generation biologics (IL-17 and IL-23 inhibitors) in psoriasis: study protocol for an international, pragmatic, multicenter, randomized, controlled, non-inferiority study—the BeNeBio study. Trials, 22, 707.

36. van der Schoot, L. S., Verhoef, L. M., van Ee, I., van Oort, F. P. A. H., Pieterse, A. H., Seyger, M. M. B., ... & van den Reek, J. M. P. A. (2023). Patients' perspectives towards biologic dose reduction in psoriasis: a qualitative study. Archives of Dermatological Research, 315(6), 1735-1745.

37. van Muijen, M. E., van der Schoot, L. S., van den Reek, J. M. P. A., et al. (2022). Attitudes and behaviour regarding dose reduction of biologics for psoriasis: a survey among dermatologists worldwide. Archives of Dermatological Research, 314, 687–695.

38. van Riel, C. A. M., Michielsens, C. A. J., van Muijen, M. E., van der Schoot, L. S., van den Reek, J. M. P. A., & de Jong, E. M. G. J. (2024). Dose reduction of biologics in patients with plaque psoriasis: a review. Frontiers in Pharmacology, 15, 1369805.

39. Worm, M., Simpson, E. L., Thaçi, D., Bissonnette, R., Lacour, J. P., Beissert, S., ... & Ardeleanu, M. (2020). Efficacy and Safety of Multiple Dupilumab Dose Regimens After Initial Successful Treatment in Patients With Atopic Dermatitis: A Randomized Clinical Trial. JAMA Dermatology, 156(2), 131-143.