A MODEL INFORMED DRUG DEVELOPMENT (MIDD)-BASED QUANTITATIVE DECISION FRAMEWORK (QDF) FOR IMPROVING R&D PRODUCTIVITY: PROOF OF CONCEPT FOR ATOPIC DERMATITIS (AD)

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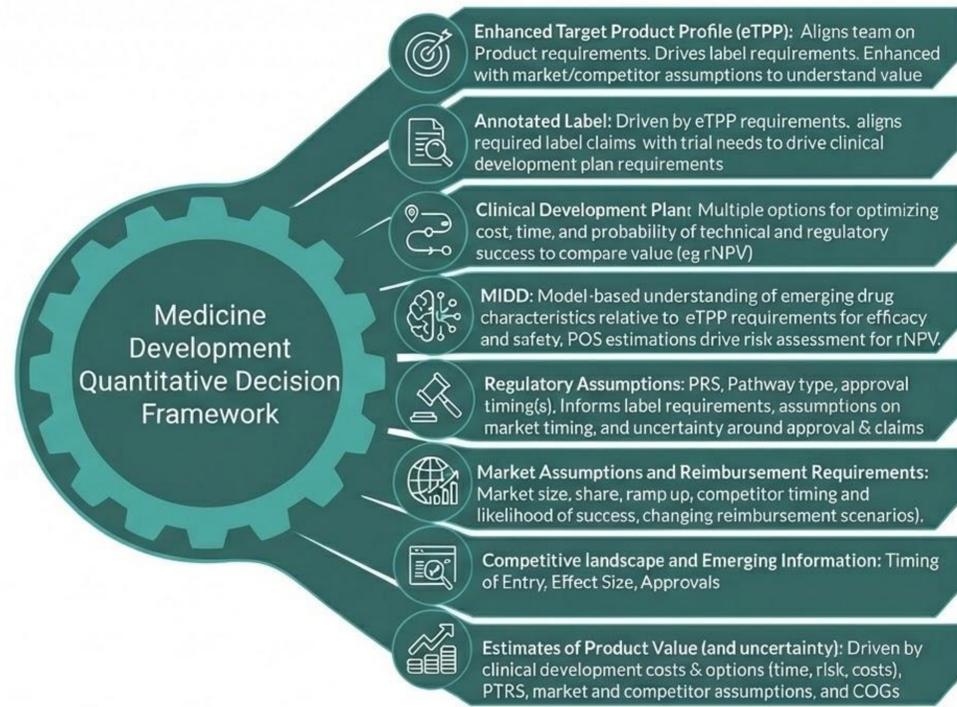
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Project Rationale

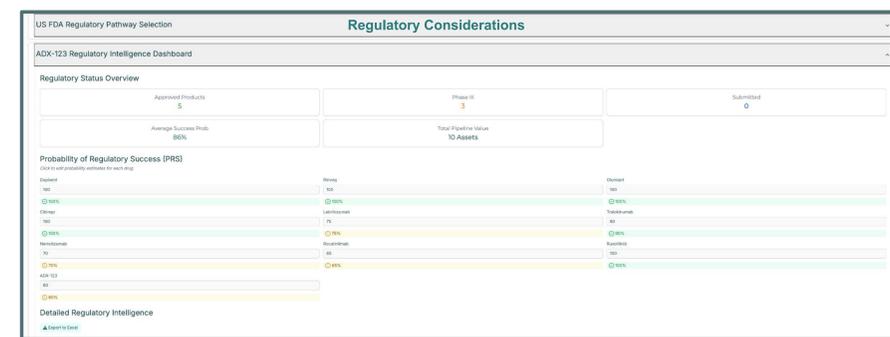Rising costs, uncertain reimbursement, competition, and declining success rates have reduced drug R&D productivity and investment over the last decade.
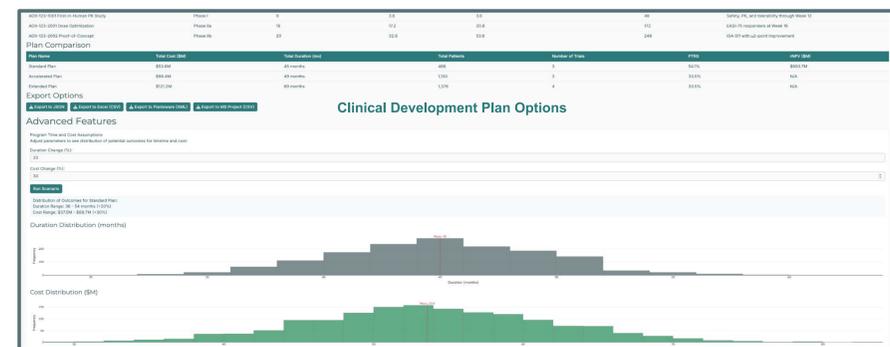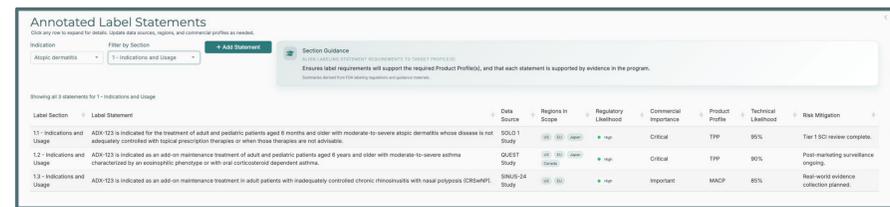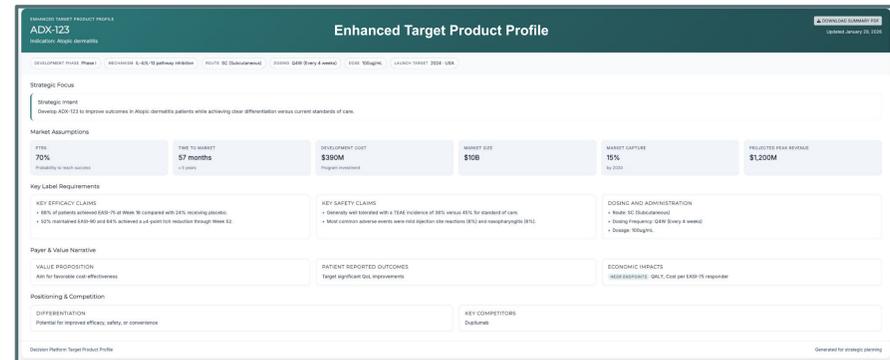
Proposed strategies to improve R&D productivity include four key factors: 1) leveraging all data sources; 2) utilizing quantitative models; 3) elimination of information silos across R&D and commercial organizations; and 4) application of decision frameworks to reduce cognitive bias and improve decision making.[1]

A QDF for a drug development program in atopic dermatitis (AD) was developed to: 1) link MIDD models aligned with a target product profile (TPP) to risk-adjusted net present value (rNPV); and 2) integrate context-sensitive large language models (LLMs) to incorporate non-structured data from novel sources into the decision-making framework in a responsible manner.
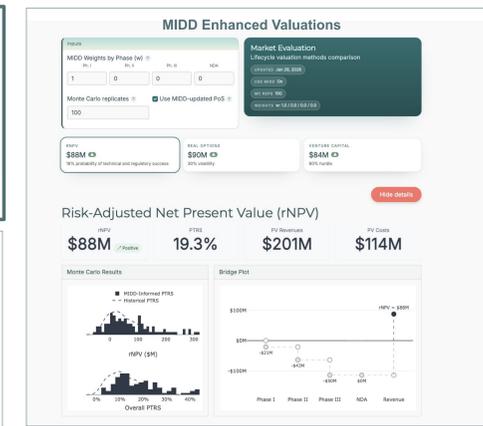
Elements of a QDF for Drug Development

Medicine Development Quantitative Decision Framework

Enhanced Target Product Profile (eTPP): Aligns team on Product requirements. Drives label requirements. Enhanced with market/competitor assumptions to understand value

Annotated Label: Driven by eTPP requirements. aligns required label claims with trial needs to drive clinical development plan requirements

Clinical Development Plan: Multiple options for optimizing cost, time, and probability of technical and regulatory success to compare value (eg rNPV)

MIDD: Model-based understanding of emerging drug characteristics relative to eTPP requirements for efficacy and safety, POS estimations drive risk assessment for rNPV.

Regulatory Assumptions: PRS, Pathway type, approval timing(s). Informs label requirements, assumptions on market timing, and uncertainty around approval & claims

Market Assumptions and Reimbursement Requirements: Market size, share, ramp up, competitor timing and likelihood of success, changing reimbursement scenarios).

Competitive landscape and Emerging Information: Timing of Entry, Effect Size, Approvals

Estimates of Product Value (and uncertainty): Driven by clinical development costs & options (time, risk, costs), PTRS, market and competitor assumptions, and COGs

QDF Components

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Results and Conclusion

This MIDD-based QDF framework successfully integrates each of the four proposed strategies to improve R&D productivity

The QDF introduces a single cross-organizational framework for achieving quantitative, transparent, high-quality R&D and commercial decisions.

Dose-dependent likelihoods of achieving TPP targets estimated from MIDD-based efficacy/safety models resulted in significant changes to PTS assessment and overall product rNPV. Changes in clinical development program strategies impacted PTRS. Altering assumptions around market size, development cost and time all have significant impacts on product rNPV that can be assessed rapidly.

The concepts and tools are directly applicable across any indication or stage of development and allow for cross-portfolio decision making.

References

1) Deloitte: Measuring the return from pharmaceutical innovation 14th edition
2) Spitzer et al. Decision quality: Value creation from better business decisions
3) Hampson et al. Improving the assessment of the probability of success in late stage drug development
4) Chandra, A. Mazumdar, S. Biotech Asset Valuation Methods: A Practitioner's Guide