2024 ANNUAL CONFERENCE

PMSA
PHARMACEUTICAL MANAGEMENT SCIENCE ASSOCIATION

Using Longitudinal Claims Data to More Accurately Predict Response Uptake Curves in Rare & Ultra Rare Disease

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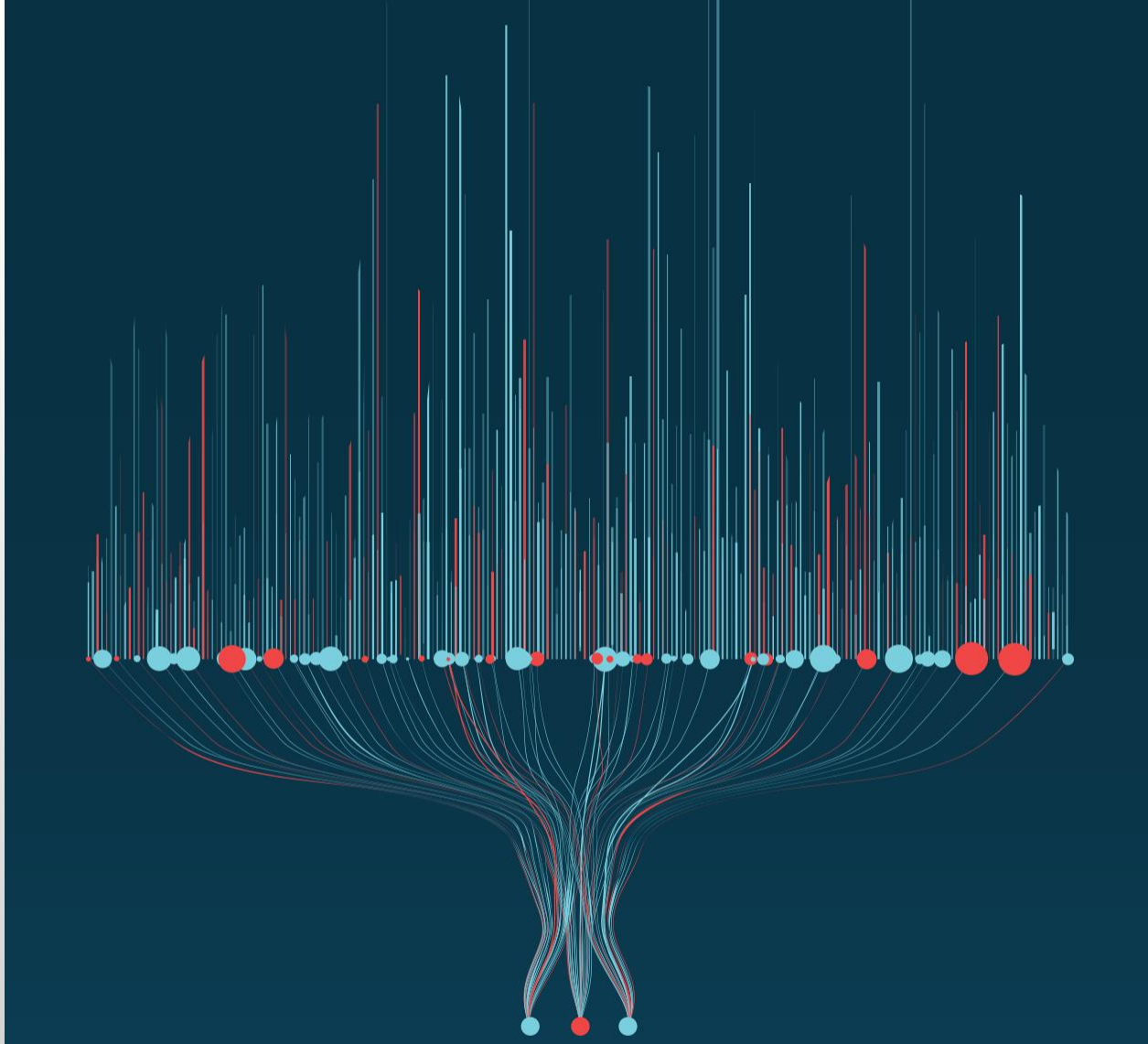
Next Generation Analytics:
Shaping the Future of Pharma

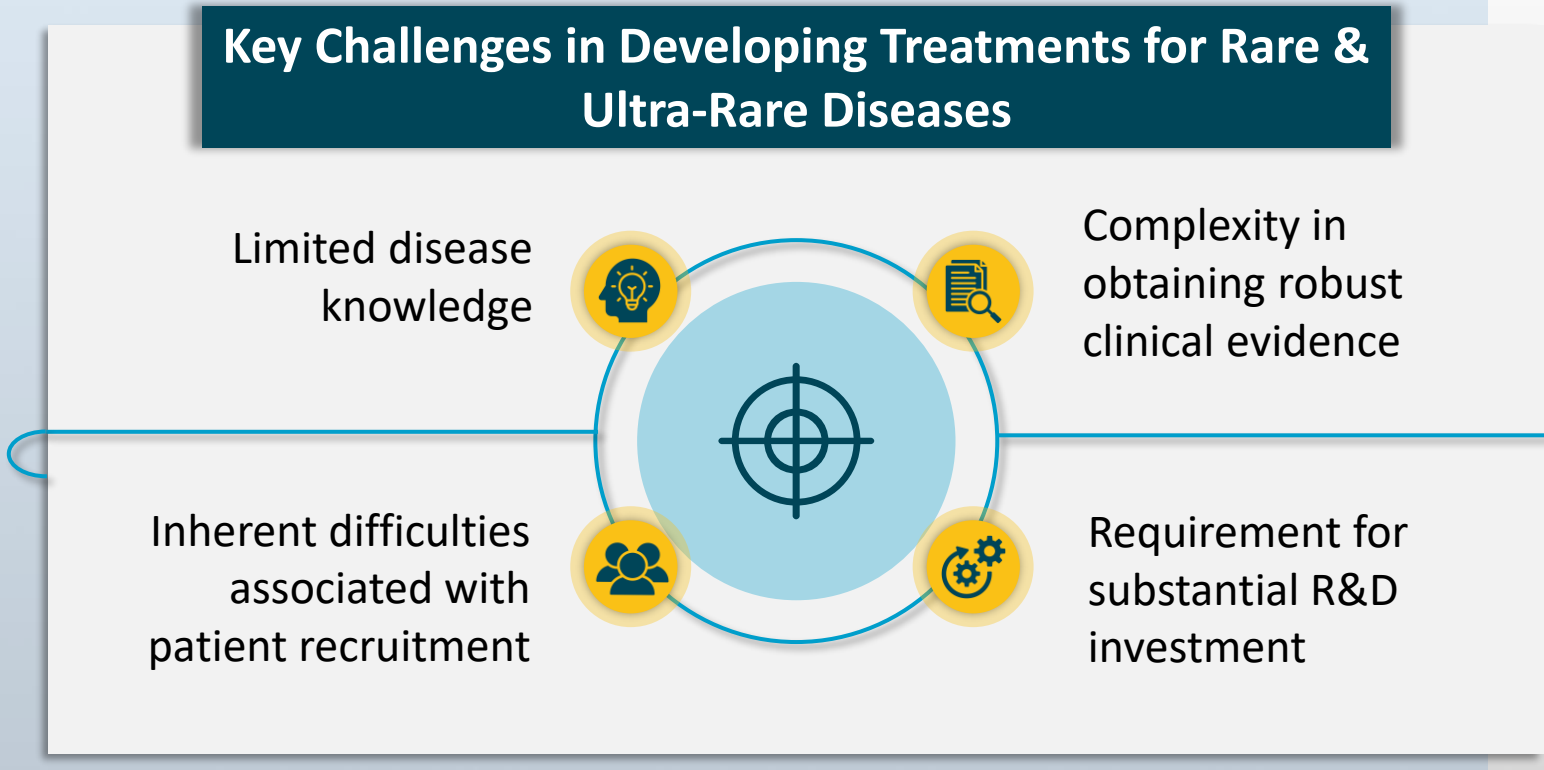
Agenda

- The Importance of Understanding Rare & Ultra Rare Disease Characteristics
- Research Methods
- Results & Findings
- Conclusions, Caveats, Next Steps



Background

- Significant growth in drug development for rare and ultra-rare diseases since 1980s Orphan Drug Act
- Challenges in developing effective treatments in these diseases remain



This assessment was performed under a confidential arrangement between Rosenblatt Life Science Consultants and Forian Inc. While not all results can be presented, the highlights of this analysis will further advance the PMSA's members knowledge and insights with respect to rare disease launches

Limited evidence regarding potential drivers of product adoption in rare/ultra-rare diseases

Our Objectives

01

To develop and broaden our understanding of the market dynamics for rare and ultra rare diseases using longitudinal medical and patient claims data

02

To identify and define potential product and market attributes that impact market uptake dynamics (curve type and time to peak)

Only a handful of rare/ultra-rare diseases currently have suitable drug treatments available

There are ***6,000 - 8,000*** unique RDs identified; ***50 - 75%*** of which have a pediatric onset

Currently, ***less than 3%*** of diagnosed RDs have a ***suitable drug treatment available***

A study based on 3,585 RDs recently estimated the ***global prevalence to be 3.5% - 5.9%***

The total number of people affected by RDs is equivalent to the population of the ***3rd largest country in the world!***

Including RD patient' family & care-givers, the impact of RDs extends to more than ***1 billion people worldwide***

There is a pressing need to better understand drivers of adoption in rare/ultra-rare diseases

Better knowledge of factors and market dynamics that potentially impact adoption of rare and ultra-rare disease treatments can help **inform public policy, regulatory processes, and foster effective drug development** in currently untreated conditions

From the pharmaceutical industry perspective, the **commercialization of drugs** for patients suffering from rare diseases may be **very profitable, minimally, or not profitable at all**

This research is necessary, as most analytical commercial assessments have either typically been completely **proprietary** or **conducted for larger markets**

Understanding the **commercial potential**, including how quickly sales could achieve certain milestones is required not only for "profit" purposes, but rather to **inform all stakeholders** - governments, pharmaceutical manufacturers, physicians, and patients alike

Methodology

01

Definitions

Disease type was defined based on the common US thresholds:

- **Rare: <200,000 prevalent patients** (or <650 patients/million)
- **Ultra-Rare: <6,500 prevalent patients** (or <20 patients/million)

02

Initial Assessment

All rare and ultra-rare drugs launched in the US on or after 2015 were selected for initial assessment

03

Data

Longitudinal medical and patient claims data from Forian Inc.

Methodology

04

Variables assessed for potential influence on product uptake

- **Clinical/product-level variables**
  - (efficacy rating, safety rating, route of administration type, route of administration rating, dosing frequency, order of entry)
- **Commercial-level variables**
  - (company size, cost of therapy)
- **Disease-level variables**
  - (disease type, level of unmet need)

05

Final Data Selection

Based on data suitability to conduct the intended analyses, a **final set of 38 drug launches** was retained

06

Uptake Curve Analysis

Historical patient claims data for each of these products were analyzed to identify their **uptake curves** and **time-to-peak**

Real World Data Source

FORIAN

- RLS utilized a HIPAA-compliant anonymized, patient-level longitudinal medical and pharmaceutical hybrid claims database to enable analysis.

Forian's health system and healthcare provider solutions are enabled by Forian's proprietary data product, **CHRONOS**, which captures data for **over 270M+ patients annually** in the US.

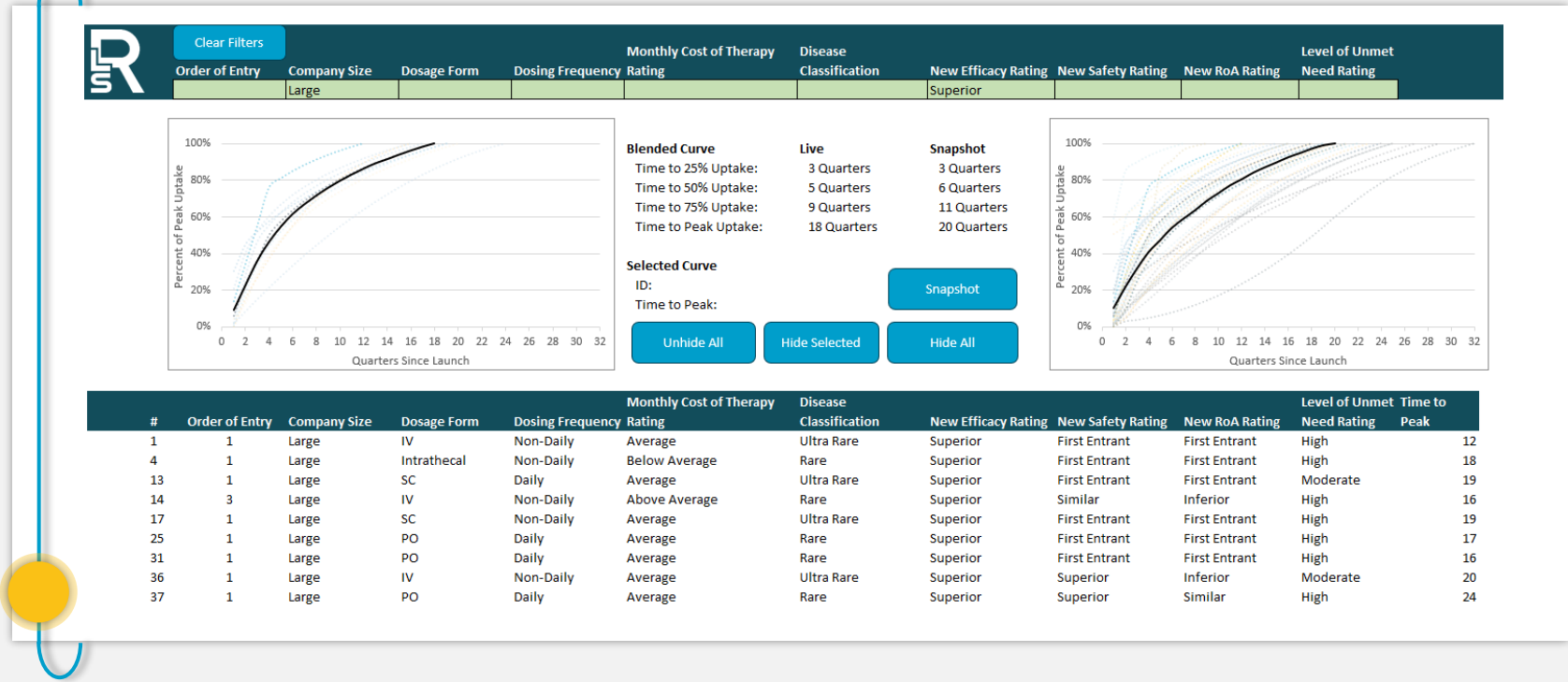
CHRONOS is a **hybrid** data ecosystem comprising of medical and pharmacy claims including **full provider and payer details** across clinicians, facilities, and pharmacies.

- Fully-integrated, proprietary, and HIPAA privacy-compliant data
- **270M+ annual patients and 8B+ annual claims (2015 – 2024)**
- **110M+ patients with enrollment**
- **Full claim lifecycle availability**
- **9+ years of longitudinal patient data**
- **2.1M+ HCPs, 9,000+ U.S. hospitals and 200,000+ HCOs**
- **98% of payers captured, representative of all payer types**
- **Linkable to Forian's EHR, SDoH, and Lab data**

Methodology

Blended Uptake Curve Analysis

- Descriptive analytics were performed with the help of the uptake curve tool, developed as part of this project by RLS Consultants and Forian
- Curves were aggregated using a methodology that combined their shapes as well as time-to-peaks into a “Blended Curve”



#	Order of Entry	Company Size	Dosage Form	Dosing Frequency	Monthly Cost of Therapy Rating	Disease Classification	New Efficacy Rating	New Safety Rating	New RoA Rating	Level of Unmet Need Rating	Time to Peak
1	1	Large	IV	Non-Daily	Average	Ultra Rare	Superior	First Entrant	First Entrant	High	12
4	1	Large	Intrathecal	Non-Daily	Below Average	Rare	Superior	First Entrant	First Entrant	High	18
13	1	Large	SC	Daily	Average	Ultra Rare	Superior	First Entrant	First Entrant	Moderate	19
14	3	Large	IV	Non-Daily	Above Average	Rare	Superior	Similar	Inferior	High	16
17	1	Large	SC	Non-Daily	Average	Ultra Rare	Superior	First Entrant	First Entrant	High	19
25	1	Large	PO	Daily	Average	Rare	Superior	First Entrant	First Entrant	High	17
31	1	Large	PO	Daily	Average	Rare	Superior	First Entrant	First Entrant	High	16
36	1	Large	IV	Non-Daily	Average	Ultra Rare	Superior	Superior	Inferior	Moderate	20
37	1	Large	PO	Daily	Average	Rare	Superior	Superior	Similar	High	24

Findings

Generally, Ultra-Rare & Rare Products follow an R-shaped curve

- In 35/38 of the products observed, the uptake curves followed a “R-shaped” growth curve.
- There is a steep early uptake – 40% of peak patient volume is achieved in 1 year; 60% in 2 years; 80% in 3 years; peak penetration at approximately 5 years
- These results are ***significantly faster*** compared to the expected behavior in a non-rare markets; for example, at the 1-year mark, Rare and Ultra-Rare products achieved ***double the peak penetration compared to non-rare diseases***

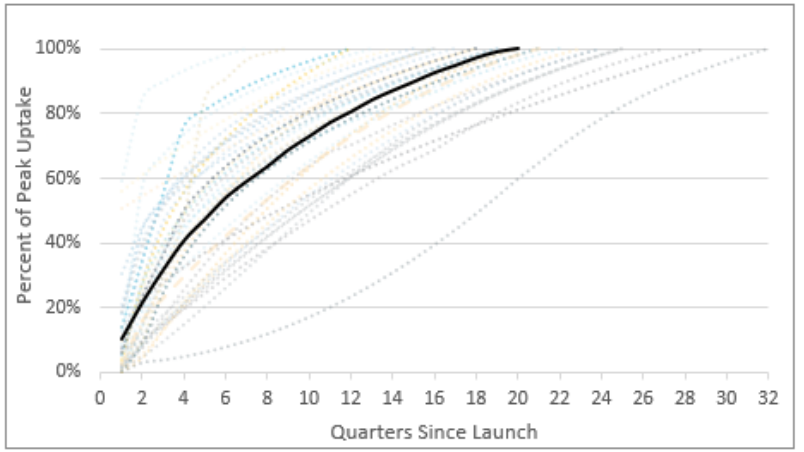
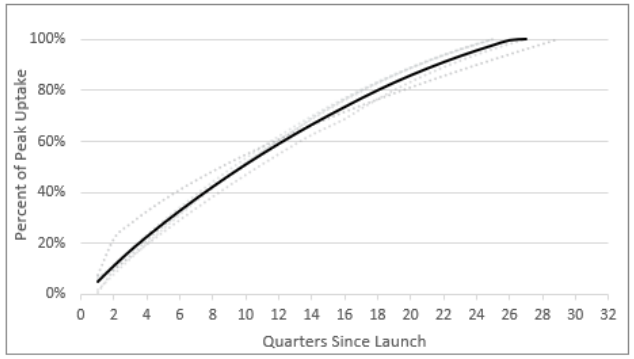


Image taken from RLS/Forian

Findings

Company Size is Likely a Significant Driver of Speed of Uptake

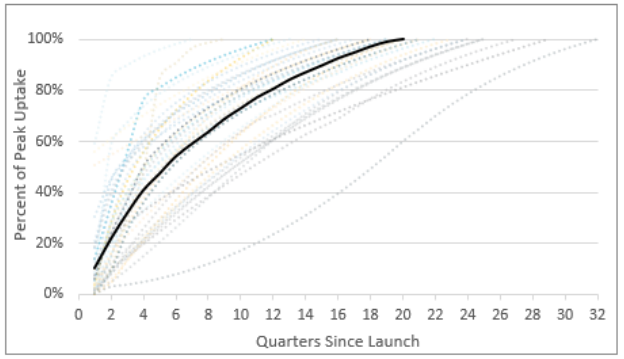
- Of the very slow products, the majority were small-medium companies.
- The sole product coded as marketed by a large company was launched by a small company



Blended Curve	Live	Snapshot
Time to 25% Uptake:	5 Quarters	3 Quarters
Time to 50% Uptake:	10 Quarters	6 Quarters
Time to 75% Uptake:	17 Quarters	11 Quarters
Time to Peak Uptake:	27 Quarters	20 Quarters

Selected Curve
ID:
Time to Peak:

Snapshot | Unhide All | Hide Selected | Hide All

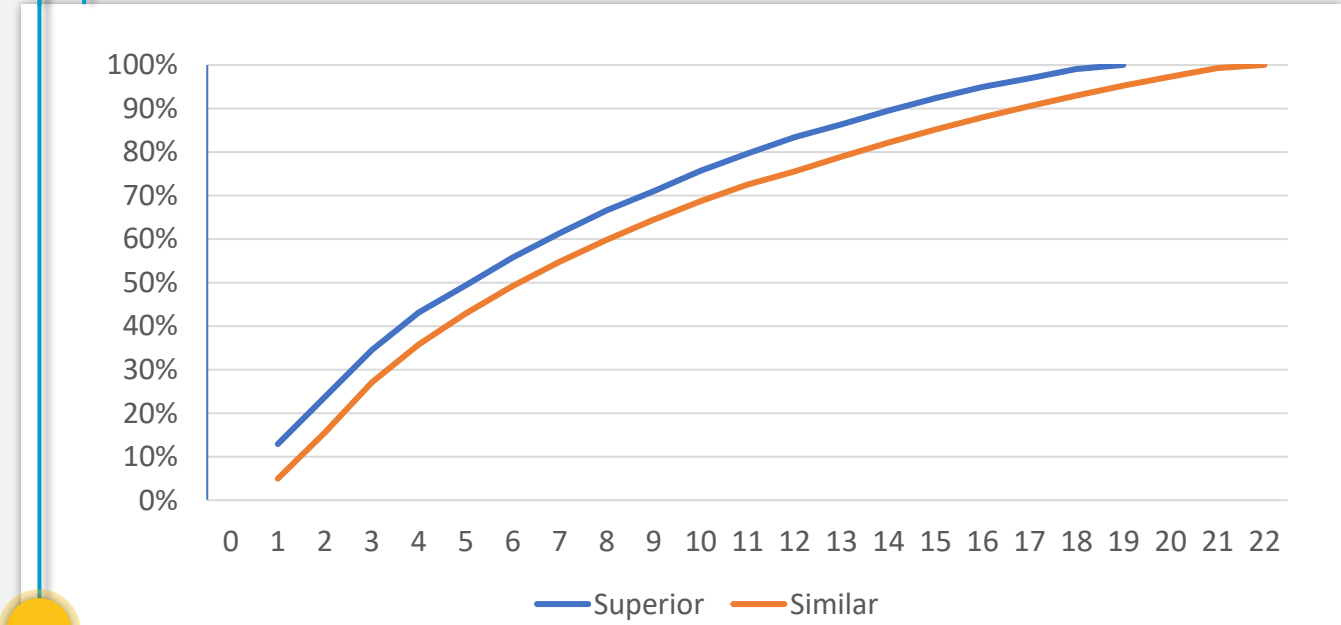


#	Order of Entry	Company Size	Dosage Form	Dosing Frequency	Monthly Cost of Therapy Rating	Disease Classification	New Efficacy Rating	New Safety Rating	New RoA Rating	Level of Unmet Need Rating	Time to Peak
10	3	Small-Medium	PO	Daily	Above Average	Rare	Similar	Similar	Inferior	Low	29
15	1	Small-Medium	SC	Non-Daily	Average	Ultra Rare	Superior	Similar	Superior	High	25
16	4+	Large	PO	Daily	Above Average	Rare	Similar	Similar	Superior	High	27
27	1	Small-Medium	IM	Non-Daily	Average	Ultra Rare	Similar	Similar	Similar	Moderate	25
28	1	Small-Medium	SC	Non-Daily	Average	Ultra Rare	Superior	First Entrant	First Entrant	High	25

Findings

Efficacy Rating is a Driver of Speed of Uptake

- A clear-cut descriptive segmentation of the uptake curves was the case of relative efficacy as compared to the products available before launch in high and moderate unmet need markets
- Products superior to those pre-existing in the market had an on-average 1 quarter faster time-to-50% uptake, and >2 quarters faster time-to-100% uptake



Findings

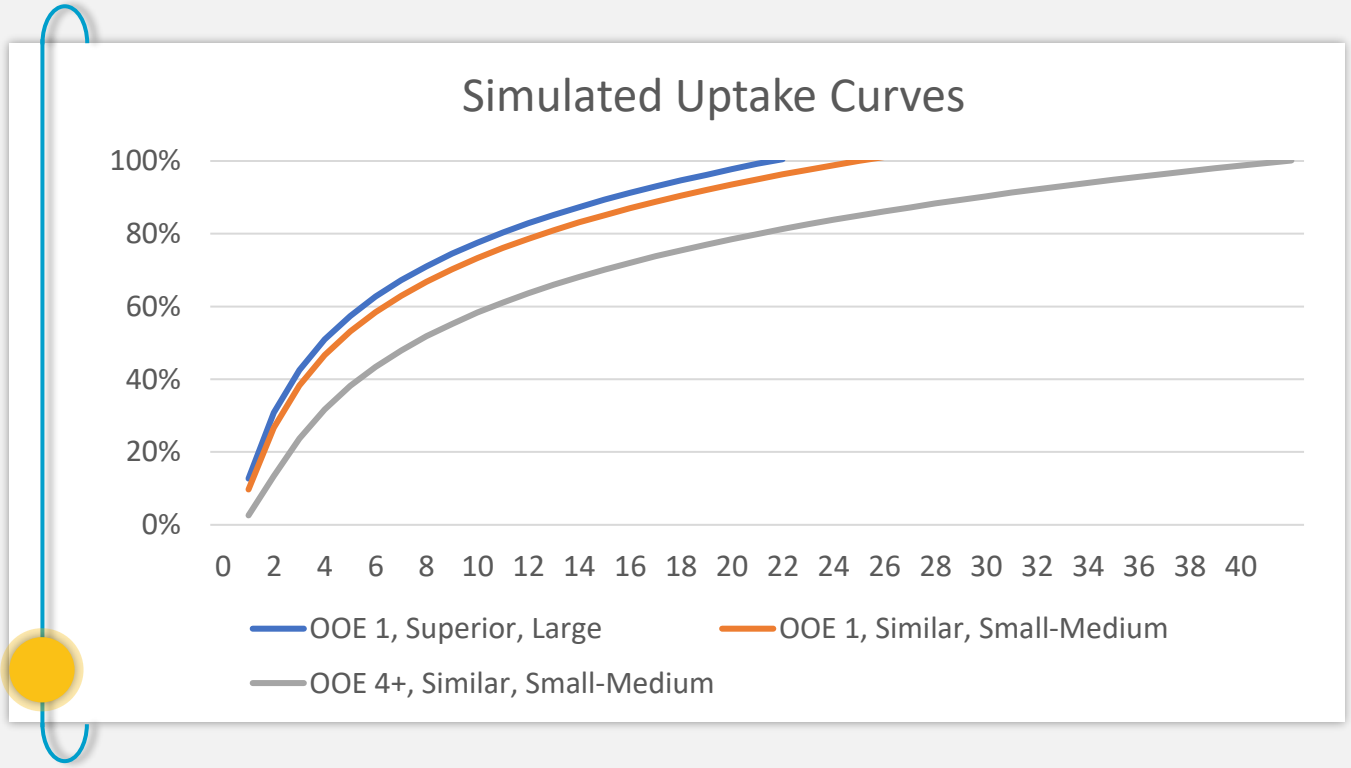
The Association between Unmet Need and Efficacy

- Efficacy and Unmet Need were highly associated (p-value 0.007)
- In high and moderate unmet need markets, products with superior efficacy had a significant increased speed of uptake as compared to those of similar efficacy
- Lower unmet need markets had proportionally more similar-efficacy products as compared to moderate and higher unmet need markets
- ***In lower unmet need markets, other factors such as route of administration or safety are the main drivers of speed of uptake***

Findings

Predictive Model Preliminary Outcomes

- Despite the small sample size, predictive analytics on Rare and Ultra-Rare disease were conducted
- A predictive model was developed using the curves as seen previously, predicting uptake at a given quarter using the following variables (all statistically significant):
  - ***Order-of-Entry***
  - ***Efficacy***
  - ***Company Size***



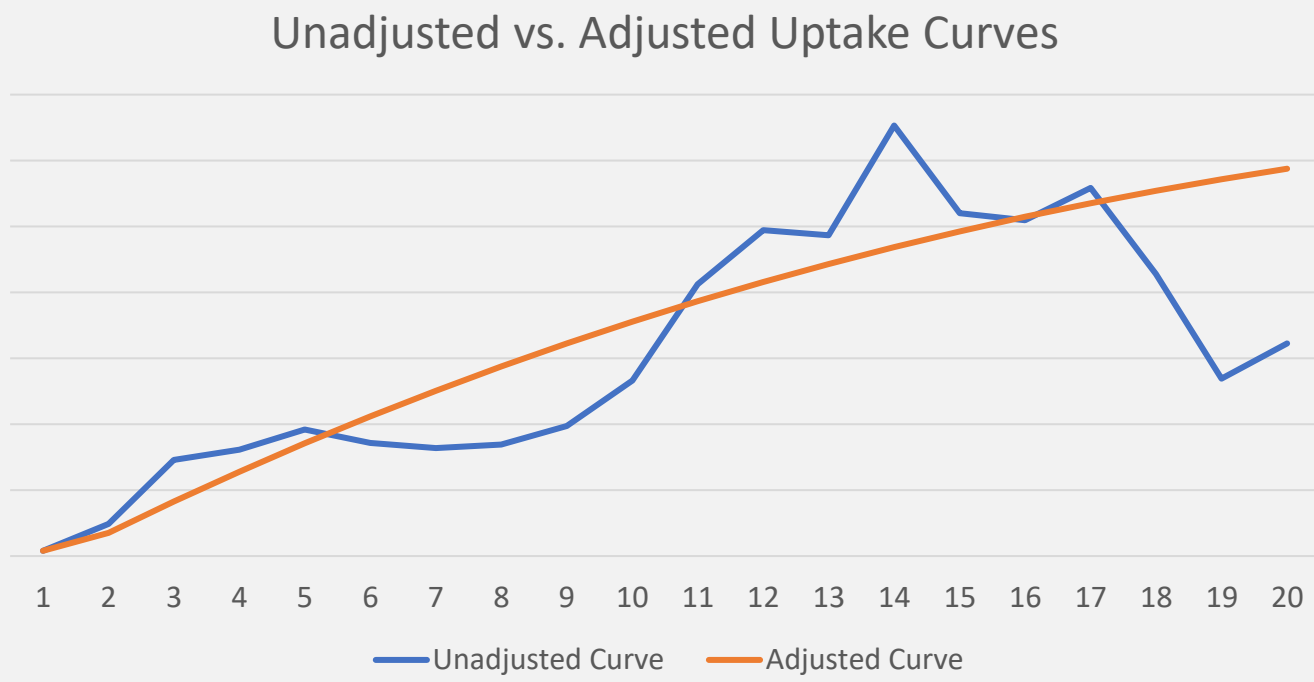
Caveats / Challenges

- This analysis was restricted to *paid* prescriptions captured in Forian's CHRONOS ecosystem. CHRONOS has access to the full claim adjudication lifecycle for additional dimension to analysis (for ex. Reversed Rx claims)
- As with all transactional RWD data sources, the prescription claims data included in this analysis are limited to patient and treatment characteristics required to complete a healthcare revenue cycle for prescription drugs; When modeling outcomes using healthcare claims data there is potential for missing data, misclassification, or unmeasured confounding to threaten the internal and external validity of the analysis
- These threats are minimized in CHRONOS due to the linked nature of the data source, combining patient data from multiple sources; CHRONOS combines prescription data captured from healthcare payers, clearinghouses, switches, and other sources; Not only is missingness in patient treatment reduced but this expansive data source represents a large proportion of the US population reducing issues of generalizability in rare disease cohorts

Caveats / Challenges

- Capture rate of a product's medical or Rx claims may be impacted by negotiated contracts between payers and manufacturers
- Specialty Pharmacy distribution channels can be difficult to capture in traditional claims RWD sources
- Manufacturers may specifically *block* a product's claims through traditional processing channels, disrupting capture & coverage

Raw Uptake Curve requiring smoothing for jumps/drops in claims volume



Conclusion

Several factors have been identified as **potential determinants of speed of uptake:**

- *Efficacy*
- *Company Size*
- *Order of Entry*

The analysis shows that the value of a product can be different depending on **company size**, presuming this relates to **share of voice**

Understanding the rate of uptake has significant implications for **commercialization decisions** as well as **business development:**

- *Increased accuracy in forecasting (uptake curves and time to peak)*
- *Improved information to assist in Go/No-Go decisions*
- *Impact on product financial valuation (product sales and ramp significantly impact NPV and ROI outcomes)*

Understanding rare and ultra-rare disease uptake can help inform **public health policy**

- *Timeline and volume of rolling out public and commercial patient assistance programs*

Next Steps

01

We are currently investigating additional variables in the predictive model:

- ✓ *RoA Rating*
- ✓ *Safety Rating*
- ✓ *Cost of Therapy*

02

Further analysis may include non-rare products as well, to investigate how predictors differ between rare and non-rare disease:

- ✓ *Specialty vs Primary Care*
- ✓ *Acute vs Chronic*
- ✓ *Oncology*

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Questions ?

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