

# Predictive and Prescriptive Analytics for Dynamically Targeting Customers

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# Agenda

- ▶ Background: Introduction to Pharmaceutical Marketing
- ▶ Business Question: How do we dynamically target customers?
- ▶ Defining the Problem: working backwards from the decision/outcome
- ▶ Analytics solution overview
  - ▶ Predictive: Quantifying & predicting customer “opportunity”
  - ▶ Prescriptive: Influencibility & Optimization
- ▶ Bonus: Building Buy-in with your Organization

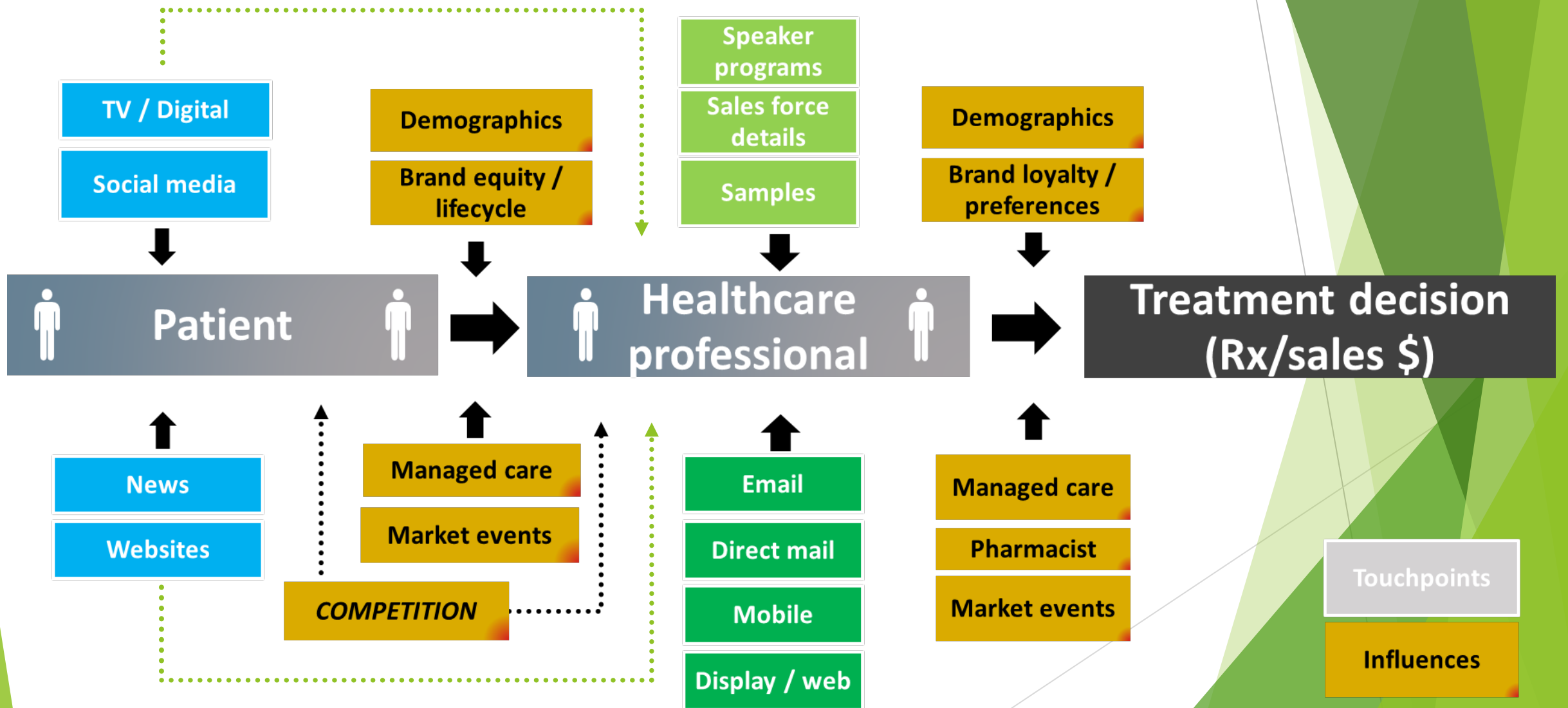
# What is Business Insights & Analytics?

- ▶ End-to-end analytics & decision-making team
  - We have data engineers, data analyst, data scientist, ml engineers, and business integration
  - We work on the commercial side of the pharmaceutical business, which means most of our support starts a year before a medicine is approved and goes until we stop marketing
- ▶ Most of our work falls into answering the following questions:
  - What is the market opportunity?
  - Who should we engage with?
  - How should we engage with them?
  - How are we performing?
  - Where should we invest moving forward?

# What is Statistical Engineering?

- ▶ In a quick nutshell, statistical engineering is the discipline dedicated to the art and science of **solving complex problems** that require data and data analysis. These problems almost always are **unstructured and typically large**, crossing several disciplines. The key is how to provide enough definition and structure to create a reasonable solution path to a truly sustainable solution.
- ▶ Our discipline provides guidance to develop appropriate strategies to produce sustainable solutions. It discusses which statistical and analytic tools/methods are appropriate depending on the circumstances, and it outlines how to **create sustainable solutions efficiently and effectively**. Statistical engineering is the discipline that helps practitioners determine “the right tool for the right job at the right time, properly applied.”
- ▶ Real problems, particularly large, complex, unstructured problems, are not so simple. There is **no single “correct” method**, and in most cases multiple statistical methods and perhaps multiple disciplines are needed. In other words, a sequential approach is needed.

# Intro to Pharmaceutical Marketing



# Challenges in Pharmaceutical Marketing

## Key Challenges: How does a patient get onto a medication?

1. Patient privacy (patient data must be anonymous)
2. Multiple decision-makers (patient, doctor, insurance, pharmacy)
3. Low data capture & lag (missing Rx data)
4. Missing or blinded data (no visibility to certain competitor information)
5. Unconnected marketing ecosystem (separate marketing to patients & doctors)

# Business Question: How do we dynamically target doctors?

Goal: Use data & analytics to maximize the impact of Lilly sales representatives.

1. Which doctor should they visit?
2. When/how often?
3. Why now?
4. What should they discuss?

## FROM



## TO

- |  |                                     |
|--|-------------------------------------|
| 1. Top doctors identified every 6 months | 1. Top Doctors refreshed monthly    |
| 2. Visit frequency fixed for 6 months    | 2. Visit frequency adjusted monthly |
| 3. No insights on “why”                  | 3. Data-driven insights on “why”    |
| 4. Multiple info sources for Reps        | 4. Single interface for info        |

# Solutions Requirements

- ▶ **Solveable:** can analytics answer the question?
  - ▶ Do we have data?
  - ▶ What method?
  - ▶ How much time do we have?
- ▶ **Scaleable** across small & large disease states
- ▶ **Maintainable** (automation & ML operations)
- ▶ **Deployable** on an external ecosystem
- ▶ **Priority:** Is this the most important problem?

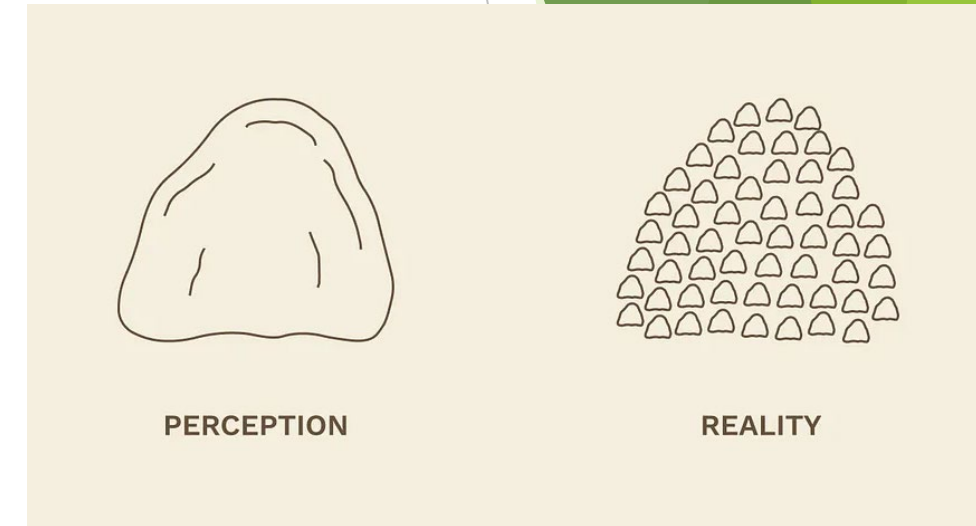


# Working Backwards: What is the decision or outcome?

- ▶ What does *data science* need to deliver?
  - ▶ Monthly list of recommended doctor-rep visits.
- ▶ Why those doctor-rep combinations?
  - ▶ Because they drive the highest impact.
- ▶ What does "highest impact" mean?
  - ▶ Doctor has most patients that benefit from medicines.
  - ▶ Sales Rep can help doctor understand medicines.
- ▶ How?
  - ▶ Analytics! (next slide)

# One Big Problem -> Subproblems

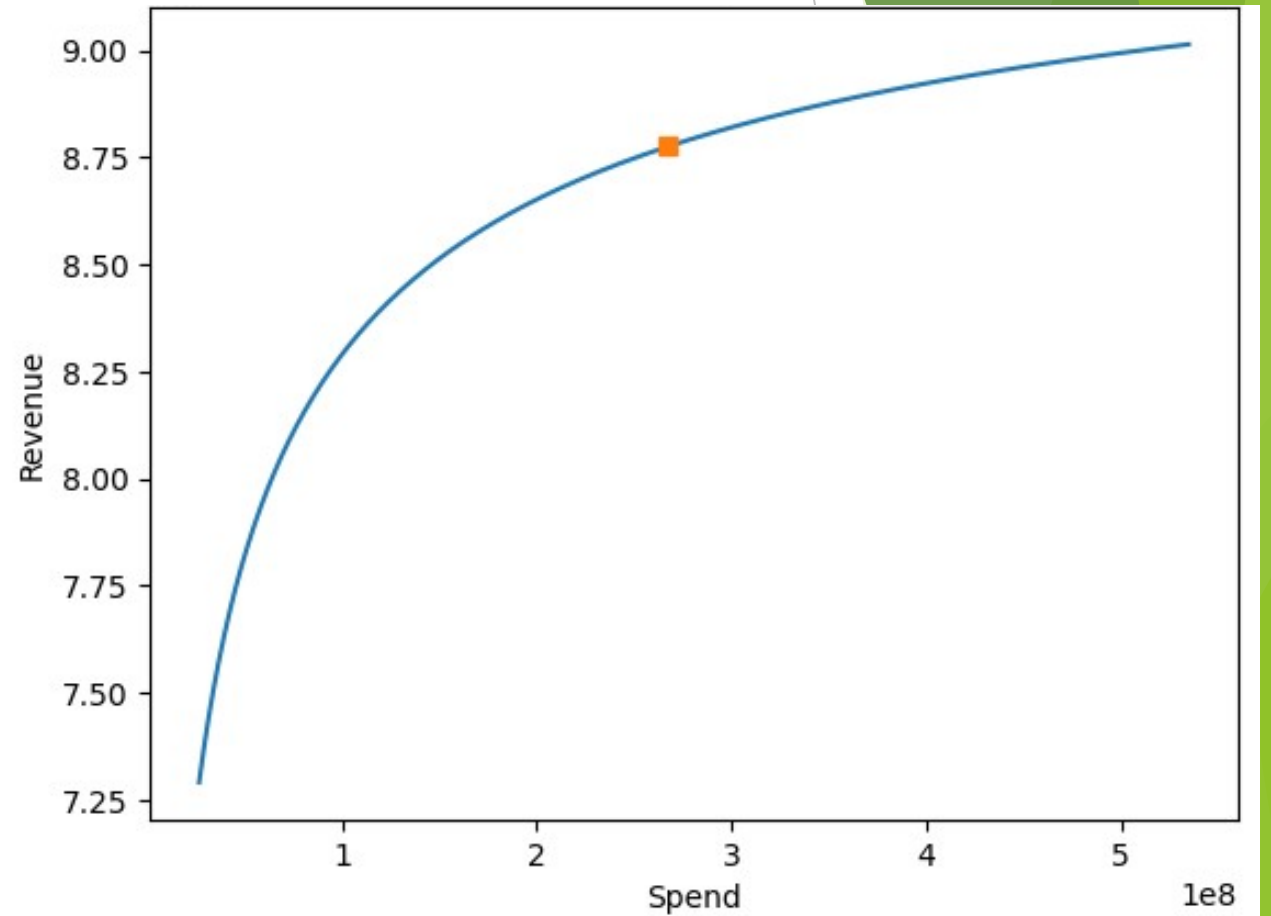
- ▶ What does "highest impact" mean?
  - ▶ Doctor with most patients.
  - ▶ Sales Rep can help doctor understand medicines.
- ▶ Quantifying "impact" via multiple models:
  - ▶ Patient Quantity (regression)
  - ▶ Doctor Likelihood to Engage (causal inference)
  - ▶ Maximizing impact (optimization)
- ▶ Can the models also generate insights to help Reps understand "why"?
  - ▶ Feature importance & SHAP values to identify top factors
- ▶ Unexpected benefit: Breaking up the problem creates flexibility to handle large and small disease spaces.



# Analytics Overview

- ▶ Step 1: Model 1 x Model 2
  - ▶ Model 1: Regression (LightGBM)  
Output: Patient Quantity
  - ▶ Model 2: Causal Inference  
Output: Probability of HCP to engage  
Final Output: Visits vs Patients starting Lilly meds
- ▶ Step 2: Optimization
  - ▶ CPLEX algorithm on Response Curves
  - ▶ Subject to 10+ business constraints (geography, rep time, etc)

Generic Response Curve



# Building buy-in from the Business

1. Acknowledge skepticism/concern.
  - ▶ Keep it Simple
  - ▶ Repeat, Repeat, Repeat
2. Identify early (non-technical) advocates for your solution.
3. Use analogies!
4. Document everything.
  - ▶ Timelines, RACI, and Quality Control builds confidence.

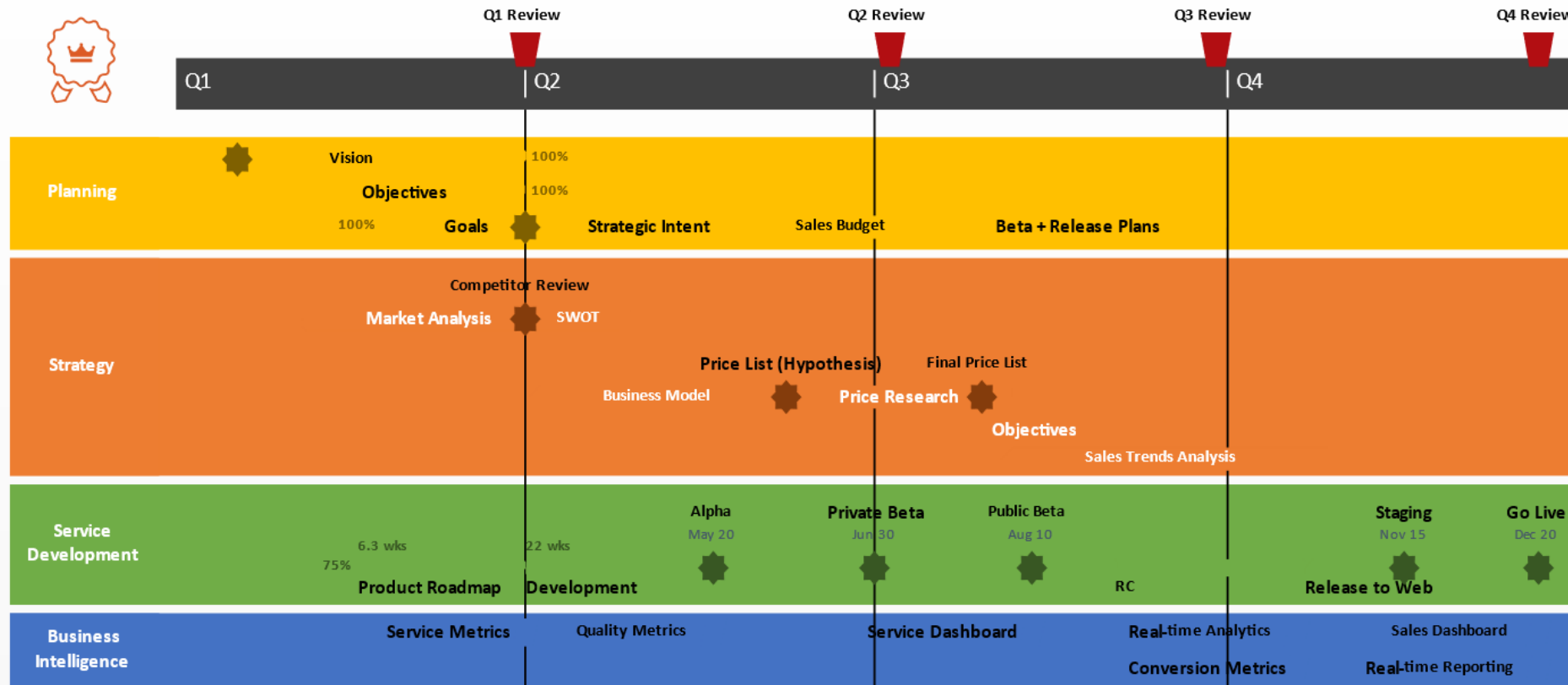
**Let's talk about  
delicious pie & how  
it's served**



2 & 3: Advocating for analytics using pie.

# Solution in Production: Building for Scale

## Example Project Timeline



- 7 Team members & 12 Brands
- 3 Brands live
- 2 Brands model building
- 3 Brands in-development
- 4 Brands not started