

# Session D. Analyzing Outcomes Data

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# Introduction and overview of analytic approaches

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# The Learning Health System

## 1. Data to knowledge:

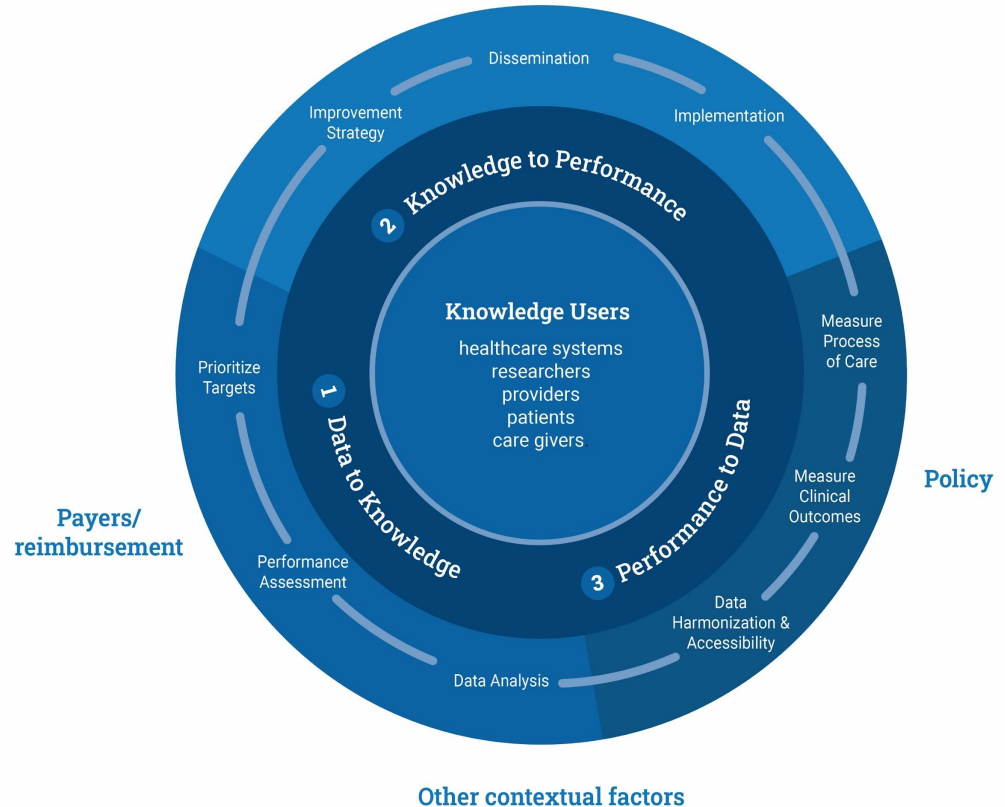
Selection of data elements  
Collection and assembly of data  
Analyze data to understand practice

## 2. Knowledge to performance:

Apply knowledge to change practice

## 3. Performance to data:

Collection and assembly of data to  
assess impact of changes



# Types of quantitative data analyses

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- **Descriptive analytics:**

- What happened?

- **Diagnostic analytics:**

- Why did it happen?

- **Predictive analytics:**

- What will happen?

- **Prescriptive analytics:**

- How can we make it happen?



Hindsight



Insight



Foresight

# Descriptive analytics

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## WHAT HAPPENED?

- Who is our patient population?
- What type of care do we provide?
- How have our outcomes changed over time?

## WHY DID IT HAPPEN?

- How do outcomes of one subgroup of patients compare to another?
- What factors are associated with better or worse outcomes?

# Why did it happen?

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- Case-mix adjustment
  - Observed differences could be a result of serving different types of patients
- Clustering by provider
  - Patients clustered in the same clinic share their clinics' characteristics
- Selection bias
  - Patients are not assigned to specific treatment at random.

# Predictive analytics

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## WHAT WILL HAPPEN?

- Use historical and real-time data to predict future outcomes
  - Assess risk of adverse events or poor outcomes
  - Predict recovery trajectories
  - Set goals and expectations
  - Support clinical decision-making

# Prescriptive analytics

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## HOW CAN WE MAKE IT HAPPEN?

- Use historical data to identify treatment approaches that are most likely to be effective for the individual patient
- Use information to develop clinical pathways and protocols
- Use data to recommend specific actions or interventions to mitigate risk of poor outcomes for particular patients or subgroups of patients



# Analytic methods

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- Stratified analyses
  - Examine the effect at different levels of a potential confounding factor
- Multivariate modeling approaches and propensity scores
  - Include multiple potential confounders simultaneously
- Hierarchical linear models (HLM)
  - To account for clustering
- Inverse probability of treatment weighting (IPTW)
  - To control for selection biases

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