Caring

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Health Care Analytics

Knowing when sophisticated data analysis is useful and when it isn't

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"We need to make data driven decisions"

"We are not going to make decisions based on gut feel"

"Insights; Insights; I want Insights!"

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Decision Making

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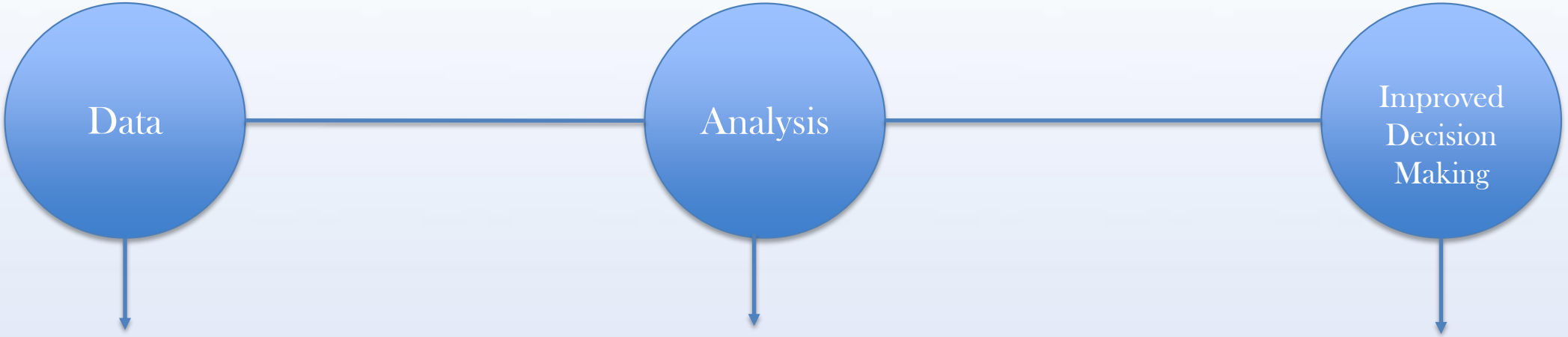
Building Blocks for good analytic decision making



Accurate and sufficient data necessary to answer the research question

Objective analysis free from bias

No technical errors

Rational decision-making based on objective data analysis

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Data: The starting point for any analysis

- Accurate – Respondent do not have an incentive to be untruthful
- Sufficient data to ensure the representative sample reflects the entire population
- The historical data period can be a good predictor of the future

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Potential for biased analysis or technical errors

Biases

- Confirmation bias
- The law of the instrument
- Under or overstating the probability of an extreme event
- Pro-innovation bias
- Information bias
- Automation bias
- Parkinson Law and the problem with trivia

Technical Errors

- Mistaking causation and correlation
- Insensitivity to sample size
- The Diderot Effect and Risk Management

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Looking out for Biased Analysis

- Financial incentives for a desired outcome
- Results that produce notoriety for the author
- Politically charged question
- Little historical data or data collected inconsistently
- Attempts to explain a complex system over an extended period of time

Managing Bias and Faulty Analysis

- Immediate feedback on results allow constant refinement of the model and mitigates potential biases

- Operational considerations
  - Create a team to manage individual biases
    - Look for "truth-seekers" rather than advocates
  - Manage the team's social environment
    - The bandwagon effect
    - Courtesy effect
  - Creating competing teams to answer a question

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After objective data analysis: Less than rational decision-making

- Lack of holistic decision making – rely on expert data analysis that produce quantitative findings
- Overemphasis on quantitative findings to justify data infrastructure spend
- Hubris created by historical success of relying on a quantitative metric

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Historical Events with poor analytic analysis and decision making

Event	Data	Data Analysis	Decision Making Impact
2016 Presidential Election Polling	Poll respondents unwilling to reveal true candidate preference	Used historical poll of polls approach without considering qualitative factors in their estimate	Incorrectly estimated the probability of a Republican victory; Operational decisions within the campaign
Value at Risk during the 2008 financial crisis	Short time frame did not allow for adequate time to include extreme events	Technically sophisticated analysis based on economic theory	Relied on a simplifying metric to drive risk decisions
Robert MacNamara and the Vietnam War	Inflated casualty metrics ("kill ratio") and highly subjective data provided by the military	Relied too heavily on favorable quantitative analysis	Overly optimistic view of the war drove operational decisions

When More Sophisticated Data Analysis is Useful

- Good data
  - Accurate data free from bias or collection error
  - A large number of observations
  - A stable underlying system – the past is likely a good indictor of the future
- Limited Opportunity for biased findings
  - Immediate feedback on the model's accuracy
  - Analysis not connected to financial incentives; fame; or intensely held opinions
  - Well organized teams to properly question quantitative findings
- Decision making requires less consideration of qualitive factors
  - Clear operational decision
  - Correlation sufficient to make a decision (low cost if wrong)

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The "Big Data" Analysis Approach

- Accurate Data (Based on actual purchases for example)
- Large Number of observations
- Based on simple system (buy/not buy) – the history is a good indicator of the future

- Immediate Feedback allows constant refinement of the model and limits potential biases

- Improved targeting requires a clear direction for operational change (better product positioning, for example)
- Low Impact Decisions (its ok to be wrong)
- Holistic decision-making less important
- The success of this approach is measured relative to targeting with no data

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Application to Health Care Analytics

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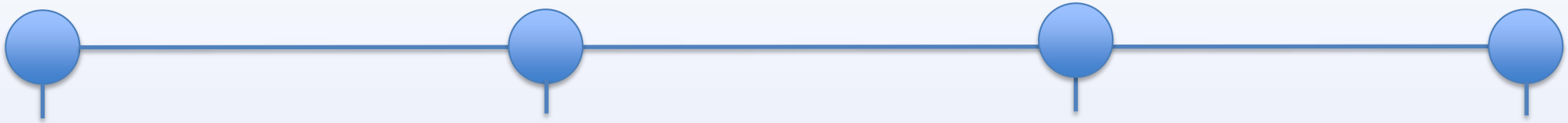
The Data Analysis Continuum



Targeting Activities (Fraud and targeting Medical Management activities)	Benchmarks to compare operating performance	Prospective Risk Taking	ROI and Academic Studies
Comprehensive and sophisticated modeling	High quality data that can be used to benchmark performance against others	Holistic decision making uses data with other qualitive factors	High potential for biased findings
Operational Impact:			
Data analysis should drive the decision	Comparison point can highlight operational improvement opportunity	Data is one factor of many when making a final decision	Research finding should be approached with skeptism

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Targeting Analysis
(Fraud, Waste and Abuse; Medical Management)

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Healthcare Utilization Benchmarks

- Provides comparative values for the Degree of Healthcare Management, 0% to 100%
  - 0% - Loosely Managed (LM)
  - 100% - Well Managed (WM)
  - Moderately Managed (MM) – any point between 0 – 100%

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Benchmarks Example

FIGURE 1

Top 10 DRG Codes	Annual Utilization/1000 Actual	Benchmark	Variation	Estimated Savings (,000)
SKIN GRAFTS FOR INJURIES	0.37	0.05	640%	$690
SPINAL FUSION CERVICAL W/O CC	1.38	0.67	106%	$419
OTHER O.R. PROCEDURES FOR INJURIES W CC	0.98	0.36	172%	$312
OTHER CARDIOTHORACIC PROCEDURES	1.21	0.33	267%	$308
MAJOR SMALL & LARGE BOWEL PROCEDURES W CC	5.79	4.06	43%	$268
MAJOR CARDIOVASCULAR PROCEDURES W CC	1.43	0.84	70%	$220
STOMACH, ESOPHEGEAL, & DUODENAL PROCEDURES AGE>17 W CC	2.10	0.89	136%	$209
SPINAL FUSION EXCEPT CERVICAL W CC	0.98	0.54	81%	$208
CARDIAC VALVE & OTHER MAJOR CARDIOTHORACIC PROCEDURES W/O CARDIO CATHETER	0.96	0.59	63%	$202
OTHER DIGESTIVE SYSTEM O.R. PROCEDURES W CC	1.20	0.39	208%	$160
Estimated Total Savings				**$2,996**

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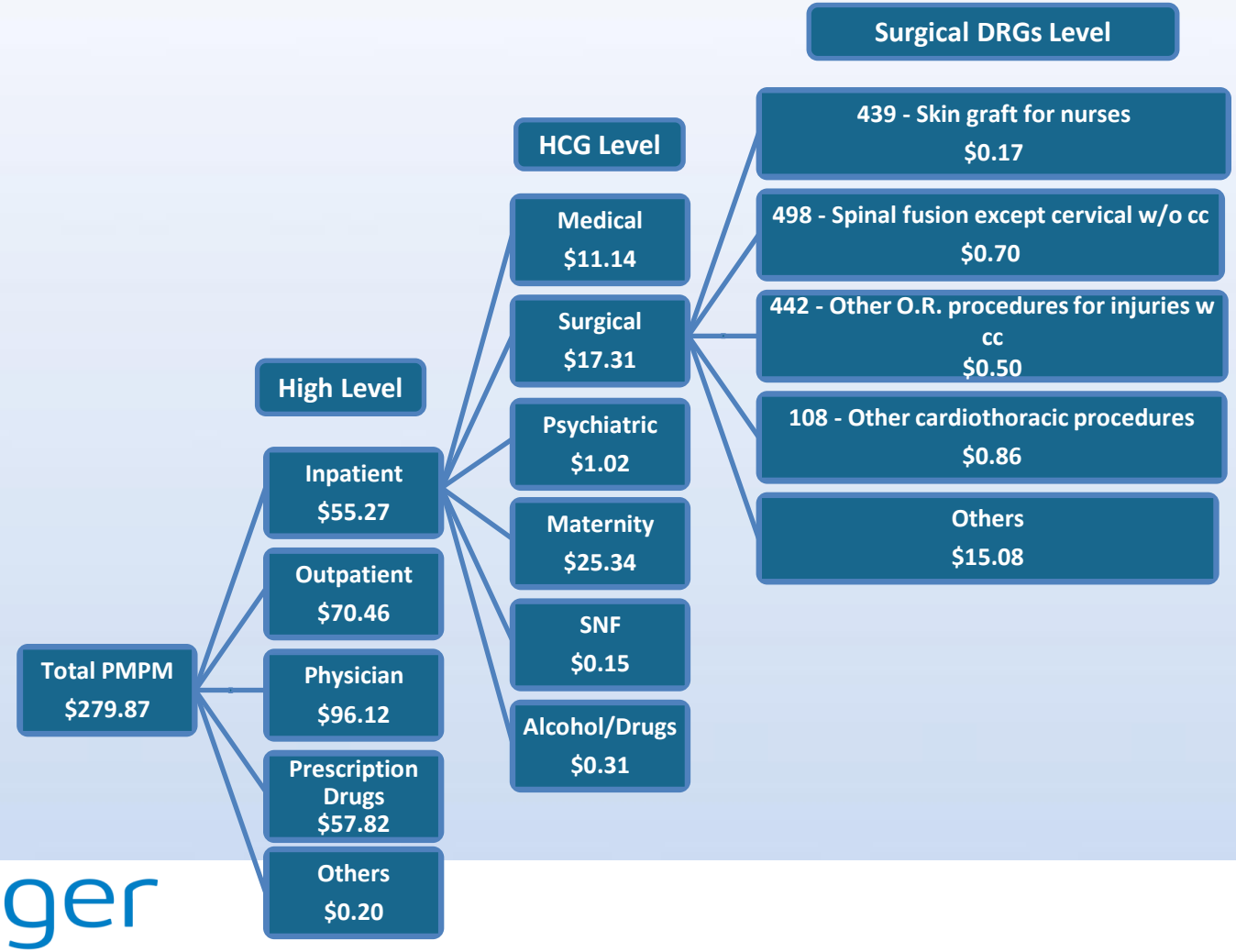
Benchmark Examples



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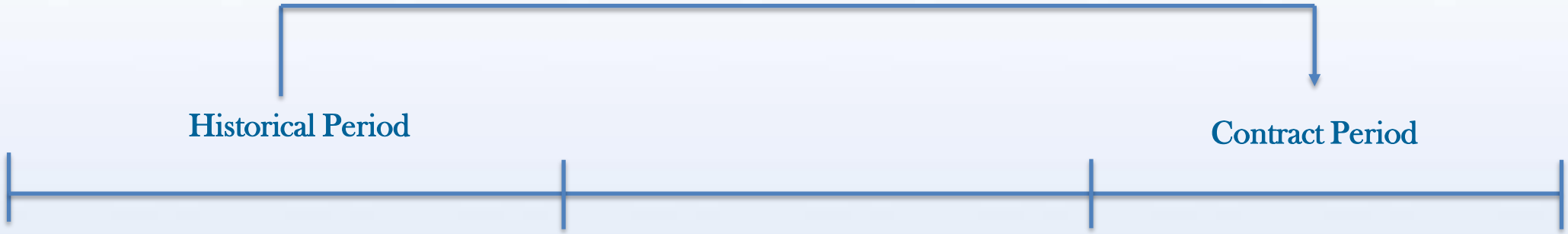
Prospective Risk Taking



- Key Features
  - Financially meaningful
  - Annual decisions
  - Long Projection period

- Accurate Data; Objective data analysis (Actuarial Professionalism)

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Prospective Risk Taking (Continued)

- Qualitive Factors Key
  - Estimates of Provider Contracts and Utilization Management
  - Consider long term business impact and membership – Where do you want to be wrong?
  - Portfolio Considerations
- Risk Management considerations critical
  - Need to balance complexity with simplicity
- Communication and Process are important as modeling
  - Senior Management needs to understand key assumptions and risks
- Rate Setting Case Studies
  - 2014 Rate Setting
  - Rating small populations

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Return on Investment Studies

- The incentive problem
- Defining a control group

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Academic Studies

- Wide range of potential data sources
- Potential for bias
  - A published article must show an interesting result
  - Notoriety for the author is important
  - Technical analysis can easily produce a wide range of results – "regression fishing"
  - Peer review process
- Decision making
  - Limited skin in the game
  - Outcome of research may never be known

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Academic Study: Cross Country Comparison of Infant Mortality

- Case Study: Infant Mortality in industrialized countries
- Data
  - Cross country data collection reliant on different methods
  - Limited Data
- Objective analysis potentially impacted based on prior beliefs
- A definitive answer will not be known with any accuracy
- No immediate decision-making possible

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Bringing it all together

- Remember the goal: Make better decisions – not necessarily use data sets in a complex or interesting way
- Know your domain – Is sophisticated data analysis useful and needed?
  - Data
  - Feedback and the ability to refine the model
  - Know when holistic decision-making is important
- Know the limits of the power of data and complex modeling
- Managing a team and process is as important as technical skill

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