



# Applying Predictive Analytics in Practice

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June 15, 2017

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# Limitations

The views expressed in this presentation are those of the presenter, and not those of Milliman or The Actuaries' Club of the Southwest. Nothing in this presentation is intended to represent a professional opinion or be an interpretation of actuarial standards of practice.

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# What are Predictive Analytics

- Anything that can be used to forecast future results
- Naive
  - Prior year costs
  - Number of/types of conditions
- Risk Scores
- Custom Predictive Analytics

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# Prospective Risk Scores

- Strengths:
  - Predicting total expenditures
  - Financial adjustment
- Weaknesses:
  - Do not filter out unavoidable expenses
  - Typically based on demographics and diagnosis codes only
  - Difficult to customize for a given population

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# Advantages of Custom Predictive Analytics

- Can be more targeted to use case
- Can identify additional future cost drivers
  - Hidden cost/utilization patterns
- Can be tailored to a specific population
- Can be more flexible to new inputs
  - Machine learning accepts new features easily

**Example 1**

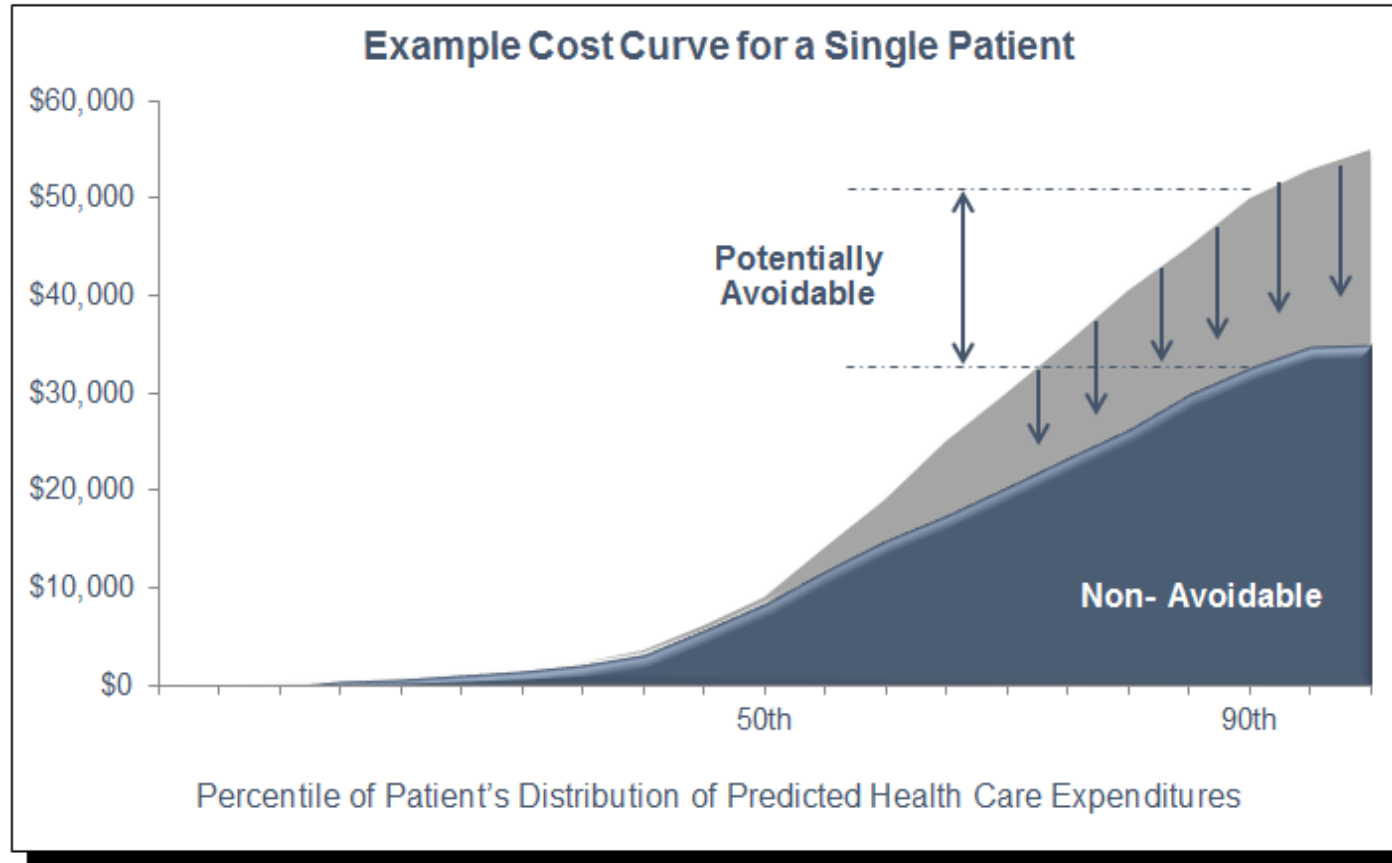
# **Patient Stratification**

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# Goals and Challenges

- Goal:
  - Identify members who would benefit the most from care management intervention to more efficiently direct limited resources
- Challenges:
  - Filtering out high cost of unavoidable issues (i.e. ESRD, cancer) while not ignoring patients with those conditions
  - Identifying patients who are not yet expensive, but have the potential to be
  - Accounting for organization specific strengths/weaknesses

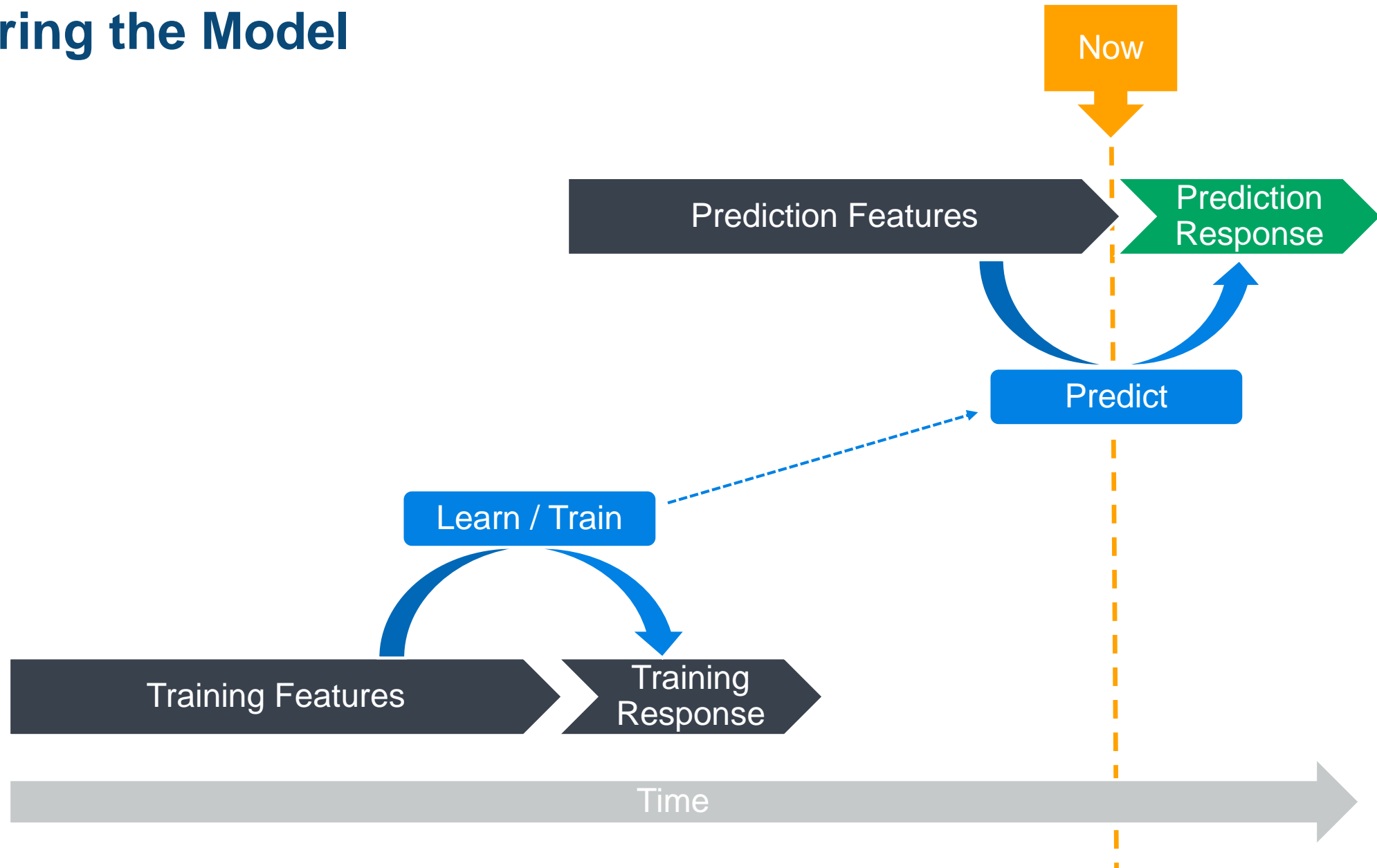
# Approach



- Used AHRQ research and clinical input to identify costs as “Potentially Avoidable”
- Focused on predicting the potentially avoidable costs in the right tail of the distribution (90” percentile)



# Tailoring the Model

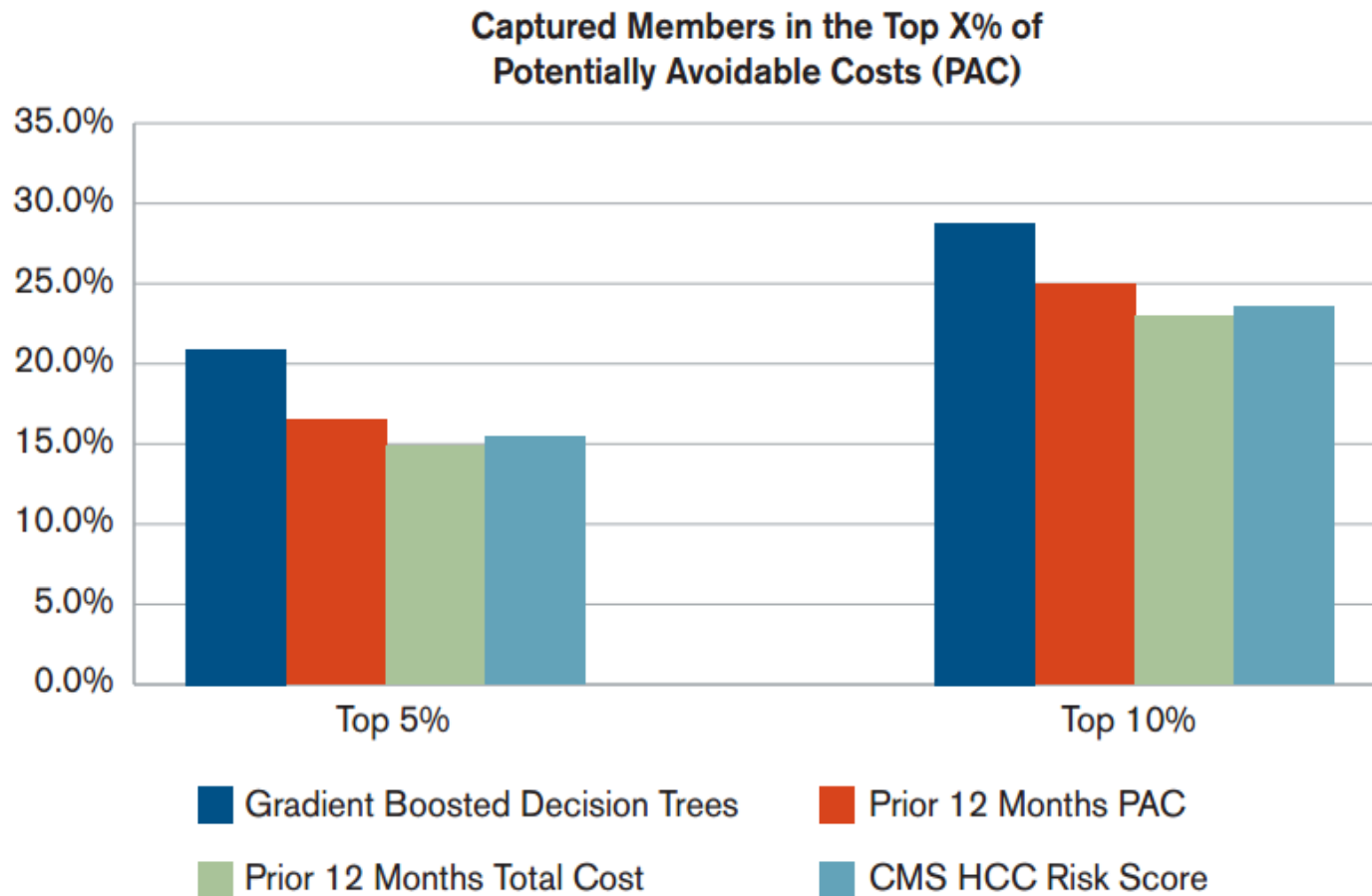


# Output

Adverse Scenario Total Costs		Adverse Scenario Potentially Avoidable Costs	
Dollars	Rank	Dollars	Rank
\$ 88,800	100	\$ 50,600	100
\$ 86,100	100	\$ 50,300	100
\$ 104,800	100	\$ 47,900	100
\$ 86,100	100	\$ 47,500	100
\$ 81,700	100	\$ 43,500	100
\$ 105,600	100	\$ 43,100	100
\$ 91,400	100	\$ 43,100	100
\$ 86,100	100	\$ 43,000	100
\$ 92,100	100	\$ 42,000	100
\$ 102,300	100	\$ 41,200	100
\$ 94,700	100	\$ 40,900	100
\$ 87,000	100	\$ 40,700	100
\$ 93,100	100	\$ 40,100	100
\$ 90,700	100	\$ 39,200	100
\$ 82,900	100	\$ 38,900	100
\$ 75,100	100	\$ 37,900	100
\$ 64,200	100	\$ 37,800	100
\$ 106,300	100	\$ 37,500	100

- Rank-ordered list of high risk patients
- Total cost rank and potentially avoidable ranks differ – as expected

# Performance



- Goal is to rank patients effectively
- Used potentially avoidable cost experience as the scorecard
- The GBM predictions outperformed the risk score and naive models

**Example 2**

**Conditions to Consider**

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# Goals and Challenges

- Goals
  - Improve coding practices for better documentation of patient conditions and improved risk score accuracy
- Challenges
  - Coding patterns differ from physician to physician
  - Differences in claims and EMR data
  - Physicians do not think in terms of performance years
  - Identifying potentially missed conditions

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# Approach

- Developed a two-tier model
- Naive
  - Flag chronic conditions that were coded last year but not this year
- Collaborative Filtering Model
  - Finds conditions that patients with a similar demographic and condition profile have been coded with
    - Patients like this have also been coded with...

# Collaborative Filtering

Feature	Confidence
Age- 45	
Gender- Male	
Subscriber Relationship- Policyholder	
Diabetes mellitus with complications- Chronic	
Essential hypertension	
Disorders of lipid metabolism	
Other nutritional; endocrine; and metabolic disorders- Chronic	
Diabetes mellitus without complication- Chronic	

Highest-Rated Conditions	Rating
Thyroid disorders- Chronic	
Mood disorders- Chronic	
Anxiety disorders- Chronic	
Other upper respiratory disease- Chronic	
Esophageal disorders- Chronic	
Nutritional deficiencies- Chronic	
Other nervous system disorders- Chronic	
Osteoarthritis- Chronic	
Spondylosis; intervertebral disc disorders; other back problems- Chronic	
Asthma	

Thyroid Disorders - Contributing Features	Contribution
Subscriber Relationship- Policyholder	
Essential hypertension	
Diabetes mellitus with complications- Chronic	
Age- 45	
Disorders of lipid metabolism	
Other nutritional; endocrine; and metabolic disorders- Chronic	
Diabetes mellitus without complication- Chronic	
Gender- Male	

# Results

- Combined results of the two models
- Provided reasoning and potential benefit from identifying these conditions

## *Conditions to Consider (Performance Year Ending in December 2016)*

<b>Conditions to Consider</b>	<b>Potential Risk Score Gain</b>	<b>Review Reason</b>
Chronic obstructive pulmonary disease	+ 0.343	Previously coded: 08/27/2015
Cancer of prostate- Chronic	+ 0.149	Previously coded: 11/10/2015
Other diseases of kidney and ureters- Chronic	+ 0.135	Previously coded: 10/23/2015
Diabetes mellitus without complication- Chronic	+ 0.118	Coded on similar patients
Hyperplasia of prostate	+ 0.000	Coded on similar patients
Diabetes mellitus with complications- Chronic	+ 0.236	Coded on similar patients
Thyroid disorders- Chronic	+ 0.000	Coded on similar patients
Heart valve disorders- Chronic	+ 0.000	Coded on similar patients



# Using Predictive Analytics in Practice

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# Background

- Care management intervention targeting high cost patients
- Employs Physicians and RN's
- Contract with Carriers in Specific Regions
- Take Full Risk on Professional Services for Attributed Members
- Capitated Reimbursement and Shared Savings

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# Keys to Success

1. Member Selection and Tracking
2. Setting Reimbursement/Capitation Rate
3. Clinical Efficacy

# Member Selection and Tracking

Who is most impacted by the intervention?

## 1. Target Population

–Medicare

–Commercial

–Medicaid

## 2. Geography

–Where should offices be placed?

## 3. Cost/Diagnoses/Conditions

–Highest Potential for Avoidable Cost

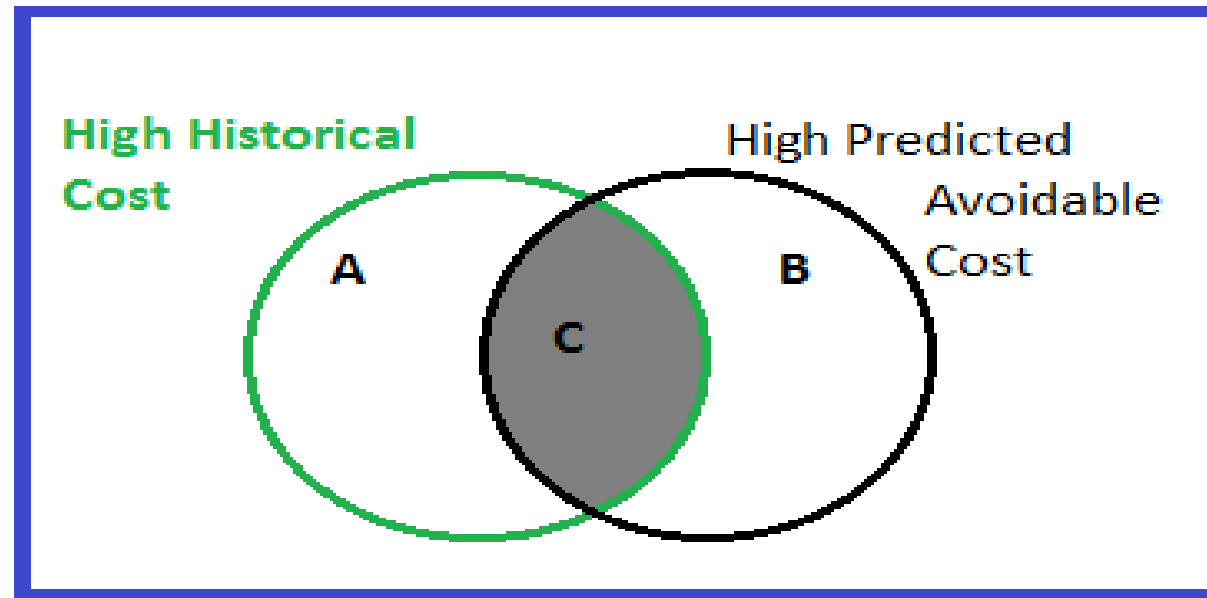
Medical PMPM by Percentile

	Medicare	Commerical	Medicaid
Top 5%	\$ 5,430	\$ 2,820	\$ 3,990
Next 5%	\$ 2,040	\$ 590	\$ 970
Next 5%	\$ 1,200	\$ 340	\$ 550
Next 5%	\$ 840	\$ 230	\$ 370
All Others	\$ 210	\$ 40	\$ 80
Combined	\$ 640	\$ 240	\$ 370

Results shown above are for illustrative purposes only.

## Member Selection and Tracking (cont.)

- Historical claims are still very predictive
  - Filter Acute vs. Chronic
- Minimize Regression to the Mean
- Targeted Intersection of :



# Member Selection and Tracking (cont.)

Selected: Non-ESRD, non-Hospice, top 20% prior medical PMPM and top 20% predicted potentially avoidable cost.

<b>Cohort</b>	<b>% in Top 5%</b>	<b>Next 5% (6%-10%)</b>	<b>Next 5% (11%-15%)</b>	<b>Next 5% (16%-20%)</b>	<b>Other (21%-100%)</b>	<b>Total</b>
<b>Selected</b>	<b>34%</b>	<b>28%</b>	<b>22%</b>	<b>16%</b>	<b>0%</b>	<b>100%</b>
<b>Not Selected</b>	<b>1%</b>	<b>2%</b>	<b>3%</b>	<b>3%</b>	<b>91%</b>	<b>100%</b>
<b>Total</b>	<b>5%</b>	<b>5%</b>	<b>5%</b>	<b>5%</b>	<b>80%</b>	<b>100%</b>

(Percentiles based on prior year medical PMPM)

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# Setting Reimbursement/Capitation Rates

## Two Approaches

### 1. Bottom Up

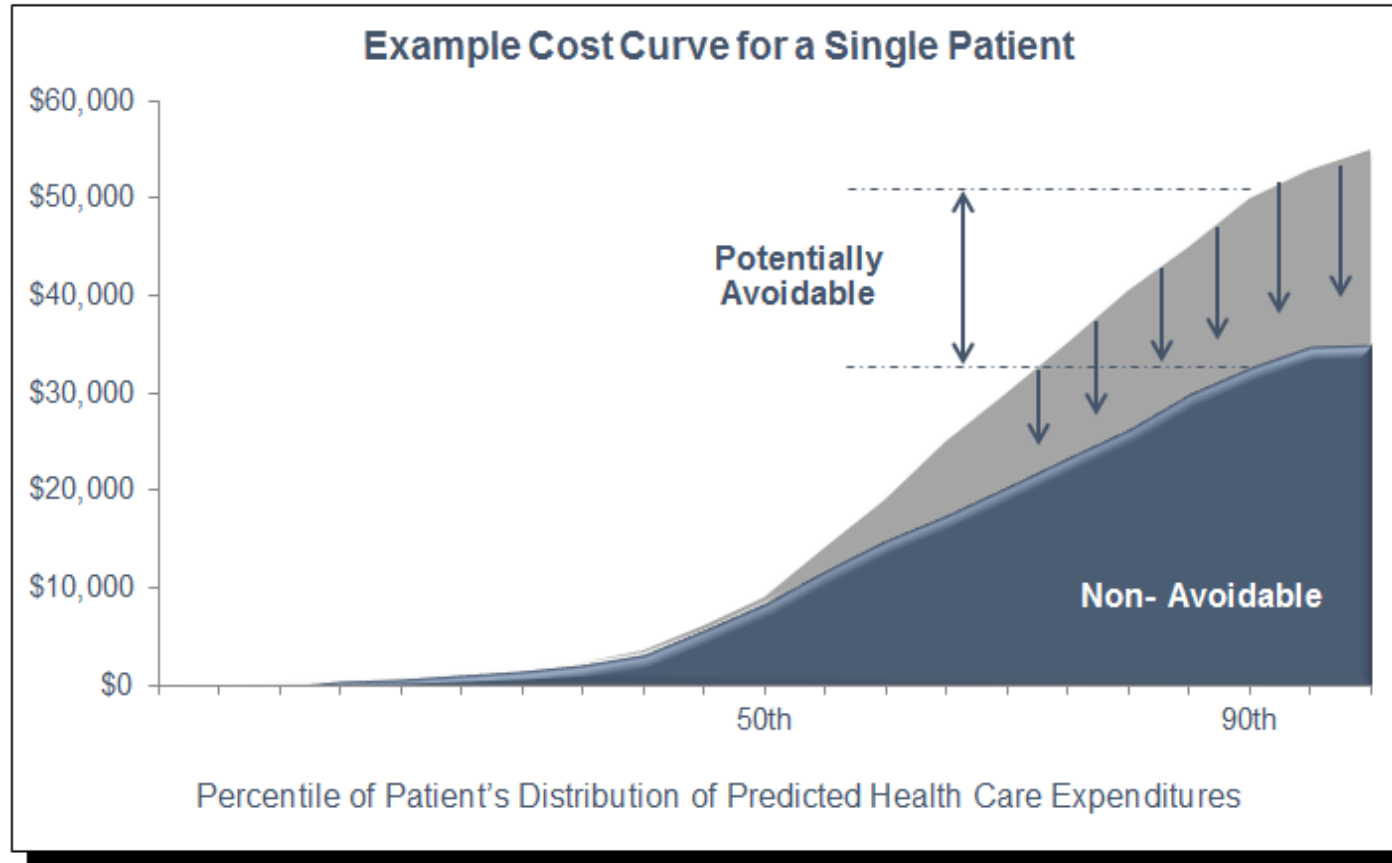
- “Costing”
- Salaries, Overhead, Margin, Etc.

### 2. Top Down

- Predictive Modeling
- Total Cost of Non-Avoidable Care

Must understand both to set appropriate rates

# Approach



- Used AHRQ research and clinical input to identify costs as “Potentially Avoidable”
- Focused on predicting the potentially avoidable costs in the right tail of the distribution (90” percentile)



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# Clinical Efficacy

- Practicing Medicine is already “predictive” by nature
  - IF patient has Diagnosis X, THEN Dr. should also look into Y and Z
- Better data is driving Predictive Analytics
  - ICD-10, EHR, etc.
- Therefore putting better tools in the hands of physicians
  - Care Coordination Reports
  - Automated Patient-Specific Checklists

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# Unique Challenges

- Risk Adjustment
  - Appropriate model should be used for each population
- Transforming Algorithmic Results into Practical Definitions
  - Decision Trees
  - Examples: >3 ER Visits, >2 IP Stays, and >5 Chronic Conditions, Risk Score > 2.00
- Existence of Multiple Contracts within Single Population (overlapping attribution)
  - Filter down population after training model, but before selecting members

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# Considerations for Both Sides

- Insurance Carrier Considerations
  - Healthier Population
  - Lower Premiums leading to...
  - Increased Membership
- Provider/Vendor Considerations
  - Alternative Payment Models (MACRA)
  - Consistent Revenue Stream (capitation)
  - With potential upside (share savings)
  - Continuity of Care (attributed members)



# Thank you

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