Risk Adjustment Basics

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Caveats and Limitations

• This presentation is designed to acquaint the participants with broad concepts and uses of risk adjustment. It is not intended to convey a recommendation for you, or your organization.

• The material contained in this presentation is a compilation of publicly available information on risk adjustment. These slides do not necessarily represent the policies or desired practices that may be recommended by Milliman.

• You should seek expert consultation for your organization before taking actions based on the materials provided in these slides.
Disclosures

While Milliman owns and actively markets risk adjustment products and services, and these products or services may be used for illustration, it is not our intention to endorse or recommend any particular risk adjustment product or service during this presentation.
Session Purpose

• Describe risk adjustment and illustrate experiences and uses of risk adjustment
• Discuss the importance of complete and validated data to achieve the policy goals of risk adjustment
• Identify recent developments and risk adjustment in the context of actuarial soundness
• Summarize lessons learned from early adopters and keys to success
Risk Adjustment Definition

A process of adjusting:

- health plan payments, or
- health care provider payments, or
- premiums

...to reflect the health status of plan members.
Risk Adjustment Definition

Risk adjustment is commonly described as a two-step process.

1. The first step involves risk assessment, which refers to the method used to assess the relative risk of each person in a group. The relative risk reflects the predicted overall medical claim dollars for each person relative to the claim dollars for an average risk person.

2. The second step in the risk-adjustment process is payment or rate adjustment, which refers to the method used to adjust payments or premium rates in order to reflect differences in risk, as measured by the risk assessment step. It is common to refer to a particular risk assessment method as a risk adjuster.
Risk adjustment methods use different types of data and variety of statistical models to explain an outcome – risk, events, etc.
Risk Adjustment Begins with Individual-Level Risk Assessment

Risk Assessment creates individual clinical profiles:

- Minimally: Classifies medical codes or drugs into “condition groups or disease groups”; and sometimes,

Risk Adjustment Scores Risk at the Individual Level:

- Calculates relative risk for each condition, interaction of age/gender and co-morbidities
- Predict resource use or events, as dollars, days, visits, admissions, etc.
Risk Adjustment Starts with Risk Assessment

EXAMPLES:
1) John Smith
2) Dave Wave
3) Jane Jonson
EXAMPLE 1
John Smith* – Clinical Profile, Risk Score

Risk adjustment prediction produces one Relative Risk Score and Clinical Profile

Patient ID: 00001
Name: John Smith
Age: 53
Sex: M
Relative Risk Score: 10.94
*A DCG-HCC model example

Diabetes with Chronic Complications
  x diabetes w/other spec. complications
Chronic Ischemic Heart Disease
  x pulmonary congestion/hypostasis
Hypertension
  x essential hypertension
  x chest pain
Endocrine, Nutritional and Metabolic
  x disorders of lipoid metabolism
Chronic Ulcer of the Skin
  x cellulitis/abscess/other local skin
  x disorders of the soft tissues
Bone Joint Infections
  x gangrene
Other Lung Disease
  x pleurisy/fibroids of lungs
Example 2
Dave Wave’s Risk Score Composition –

Risk Score Composition

Example using MARA - Milliman Advanced Risk Adjusters

Prospective Risk Drivers
Total Risk Score = 4.244

- CHF 34%
- Pneumonia 7%
- Sinusitis 3%
- Hypertension 6%
- Chest Pain 4%
- Diabetes 22%
- Other 18%
- Appendicitis 0%
- Fatigue, Asthenia Other Than Chronic Fatigue Syndrome 3%
- Age/Sex Contribution 3%

Rx = 1.390
IP = 1.305
OP = 0.806
Phy/Other = 0.743

Med = 2.853
Total = 4.244
EXAMPLE 1
Jane Jonson* – Risk-based Pharmacy Profile

Risk Assessment based on NDC codes from claims
*MARA RxAdjuster - Relative Risk Scores by Category, Subtotal Medical and Total RRS

Demographics
Member ID 467743202
Age 59
Gender Female
Dependent Status Spouse
Exposure Months 12
Lag Months 3

Prospective Cost Distribution
Rx 29%
IP 16%
OP 23%
Phys 32%

Risk Scores & Annual Cost Estimates
Hospital Inpatient 0.559
Hospital Outpatient 0.828
Physician/Other 1.118
Prescription Drugs 1.006
Subtotal Medical 2.506
Total 3.513 $14,582.46

Jane is 3.5 times sicker than average.

Drugs Observed
NDC Product Name Generic Name Category
00149075202 ASACOL Mesalamine Inflammatory Bowel Agents
62175044601 PEG 3350 & ELECTROLYTES K Cl/Na Bicarb/Na Cl/Na Sulf/PEG Bowel Evacuant Combinations
63304040701 PROCTOSOL-HC Hydrocortisone Rectal Steroids
00378041502 ATROPINE SULFATE/DIPHENOXYLATE HCL Atropine Sulfate/Diphenoxylate Hydrochloride Antiperistaltic Agents
52152015502 HYOSCYAMINE SULFATE Hyoscyamine Sulfate Belladonna Alkaloids
00185070401 BISOPROLOL/HCTZ Bisoprolol Fumarate/Hydrochlorothiazide Beta Blocker & Diuretic Combinations
00069307075 ZITHROMAX TRI-PAK Azithromycin Azithromycin
00085119701 NASONEX Mometasone Furoate Nasal Steroids
00591555250 METRONIDAZOLE Metronidazole Misc. Anti-infectives
00590701314 COMBIVENT Albuterol Sulfate/Ipratropium Bromide Adrenergic Combinations
00090450003 COLESTID Colestipol Hydrochloride Bile Sequestrants
01432053716 NYSTATIN Nystatin Anti-infectives - Throat
00046086881 PREMARIN Conjugated Estrogens Estrogens
00378050301 BISOPROLOL/HCTZ Bisoprolol Fumarate/Hydrochlorothiazide Beta Blocker & Diuretic Combinations
Value of Risk Adjustment

- You can not make fair comparisons from observational data without adjusting for illness burden

- Risk Adjustment is a tool for learning what factors affect outcomes
Beyond Risk Adjustment

- Risk Adjustment may reveal the need for more controlled studies, or more comprehensive observational studies may be needed to resolve remaining questions.
- However, more controlled studies may not be practical (or even possible).
Where To Apply Risk Adjustment

Concurrent Models
- Profiling – providers and networks
- Selection analysis
- DM reconciliation
- ROI studies
- Employer account reporting
- Trend analysis
- Provider payment
- Pay for performance
- Contribution strategies

Prospective Models
- Underwriting
- Reinsurance
- Health-based budgeting
- Provider payment systems
- Case management mitigation
- Disease management & prevention

Event Models
- Care intervention
- Disease management
- Utilization management
- Pay-for-performance
- Network monitoring
- ROI studies

Customized Models
- Medical home, PCP burden payments
- Medicaid payment models
- Underwriting customizations
- Top coding, top 1%, reserve setting
- Work compensation
- Mortality
- LTC
## Example: To Stratify Members

<table>
<thead>
<tr>
<th>ID</th>
<th>Age</th>
<th>Gender</th>
<th>Individual Relative Risk Scores</th>
<th>Relative Risk Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total RRS</td>
<td>Pharmacy RRS</td>
</tr>
<tr>
<td>467763702</td>
<td>65</td>
<td>Male</td>
<td>10.6</td>
<td>1.89</td>
</tr>
<tr>
<td>467751001</td>
<td>57</td>
<td>Male</td>
<td>4.09</td>
<td>1.39</td>
</tr>
<tr>
<td>467743202</td>
<td>59</td>
<td>Female</td>
<td>3.48</td>
<td>1.01</td>
</tr>
<tr>
<td>467749501</td>
<td>51</td>
<td>Male</td>
<td>2.08</td>
<td>0.54</td>
</tr>
<tr>
<td>467744301</td>
<td>65</td>
<td>Male</td>
<td>2.1</td>
<td>0.46</td>
</tr>
<tr>
<td>467743302</td>
<td>60</td>
<td>Female</td>
<td>4.03</td>
<td>1.42</td>
</tr>
<tr>
<td>467743301</td>
<td>61</td>
<td>Male</td>
<td>1.61</td>
<td>0.42</td>
</tr>
<tr>
<td>467745113</td>
<td>55</td>
<td>Female</td>
<td>1.54</td>
<td>0.09</td>
</tr>
<tr>
<td>467751002</td>
<td>43</td>
<td>Female</td>
<td>1.32</td>
<td>0.25</td>
</tr>
<tr>
<td>467745112</td>
<td>56</td>
<td>Male</td>
<td>1.01</td>
<td>0.13</td>
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<tr>
<td>467763701</td>
<td>57</td>
<td>Female</td>
<td>1.63</td>
<td>0.74</td>
</tr>
<tr>
<td>467744302</td>
<td>64</td>
<td>Female</td>
<td>0.8</td>
<td>0.06</td>
</tr>
<tr>
<td>467749502</td>
<td>49</td>
<td>Female</td>
<td>1.85</td>
<td>0.62</td>
</tr>
<tr>
<td>121231000</td>
<td>35</td>
<td>Male</td>
<td>0.24</td>
<td>0</td>
</tr>
<tr>
<td>467751003</td>
<td>19</td>
<td>Male</td>
<td>0.34</td>
<td>0.16</td>
</tr>
</tbody>
</table>
...and to Identify Populations for Interventions

Assess the health status of the population

Identify the group of individuals at high risk of future utilization or poor health outcomes

Focus on the subset of people that case managers believe they can impact through a defined intervention
Risk Can be “Binned” by Cost or Severity Categories
To Segment (Stratify) for Pricing, for Case Management, and Profiling

<table>
<thead>
<tr>
<th>Percent of Total</th>
<th>Members</th>
<th>Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>$9 - $999</td>
<td>76.0%</td>
<td>17.3%</td>
</tr>
<tr>
<td>$1,000 - $4,999</td>
<td>12.8%</td>
<td>17.3%</td>
</tr>
<tr>
<td>$5,000 - $9,999</td>
<td>17.3%</td>
<td>17.3%</td>
</tr>
<tr>
<td>$10,000 - $24,999</td>
<td>27.0%</td>
<td>22.0%</td>
</tr>
<tr>
<td>$25,000 or more</td>
<td>4.1%</td>
<td>4.1%</td>
</tr>
</tbody>
</table>

Members: Green bars
Dollars: Orange bars
Supports Comparisons of “Groups”
Plans, Employers, Funds, Providers, Cohorts, etc.

- Promotes transparency
- Provides credible and meaningful reports to constituents
- Focuses on variation in resource use and not profits or budget variances
- To understand contributing factors – prevalence of disease and efficiency of care
- Supports peer discussions/education
- For strategic decision-making – benefit changes, carve outs, intervention programs, etc.
Example: Observe Risk by Type of Health Plan, or Benefit Program Supports Risk-based Pricing

The traditional plan attracts a “sicker” than average population who are 37% sicker than the overall population. The POS Plan has the healthiest members.

<table>
<thead>
<tr>
<th>Information for Pricing or Underwriting</th>
</tr>
</thead>
<tbody>
<tr>
<td>By PLAN</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>ALL PLANS</td>
</tr>
<tr>
<td>FFS</td>
</tr>
<tr>
<td>PPO</td>
</tr>
<tr>
<td>HMO</td>
</tr>
<tr>
<td>POS</td>
</tr>
</tbody>
</table>
## Analyze risk in the FFS plan by group

<table>
<thead>
<tr>
<th></th>
<th>Subscribers</th>
<th>Members</th>
<th>Contract Size</th>
<th>Projected Risk</th>
<th>Projected Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL PLANS</td>
<td>5,449</td>
<td>15,177</td>
<td>2.00</td>
<td>1.00</td>
<td>$200</td>
</tr>
<tr>
<td>FFS Members</td>
<td>137</td>
<td>377</td>
<td>2.75</td>
<td>1.37</td>
<td>$274</td>
</tr>
<tr>
<td>Group A</td>
<td>2</td>
<td>4</td>
<td>2.00</td>
<td>7.41</td>
<td>$1,482</td>
</tr>
<tr>
<td>Group B</td>
<td>34</td>
<td>58</td>
<td>1.71</td>
<td>5.14</td>
<td>$1,028</td>
</tr>
<tr>
<td>Group C</td>
<td>15</td>
<td>51</td>
<td>3.4</td>
<td>1.21</td>
<td>$242</td>
</tr>
<tr>
<td>Group D</td>
<td>3</td>
<td>9</td>
<td>3.00</td>
<td>0.84</td>
<td>$168</td>
</tr>
<tr>
<td>Group E</td>
<td>8</td>
<td>19</td>
<td>2.38</td>
<td>0.78</td>
<td>$156</td>
</tr>
<tr>
<td>Group F</td>
<td>17</td>
<td>69</td>
<td>4.06</td>
<td>0.53</td>
<td>$106</td>
</tr>
<tr>
<td>Group G</td>
<td>20</td>
<td>57</td>
<td>2.85</td>
<td>1.00</td>
<td>$200</td>
</tr>
</tbody>
</table>
### Which PHO Cares for a “Sicker” Population?

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>PHO A</th>
<th>PHO B</th>
<th>PHO C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PMPY Expend 1997</strong></td>
<td>$1,263</td>
<td>$1,366</td>
<td>$1,058</td>
<td>$2,176</td>
</tr>
<tr>
<td><strong>Age/Sex Relative Risk Score</strong></td>
<td>1.00</td>
<td>1.15</td>
<td>0.64</td>
<td>1.22</td>
</tr>
<tr>
<td><strong>Relative Risk Score</strong></td>
<td>1.00</td>
<td>1.16</td>
<td>0.61</td>
<td>1.52</td>
</tr>
</tbody>
</table>
## How does disease affect risk?

How many patients (per 10,000) have diabetes?

<table>
<thead>
<tr>
<th>Diabetes with...</th>
<th>PHO A</th>
<th>PHO B</th>
<th>PHO C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic Complications</td>
<td>16</td>
<td>8</td>
<td>169</td>
</tr>
<tr>
<td>Acute Complications</td>
<td>21</td>
<td>12</td>
<td>141</td>
</tr>
<tr>
<td>No Complications</td>
<td>166</td>
<td>68</td>
<td>410</td>
</tr>
</tbody>
</table>
Risk Adjusted Funding – risk selection impacts funding

Risk-based funding
Monthly Payment/Member
$150.00

PHO - A
Risk Score: 1.16
Budget: $150 x 1.16
$174.00

PHO - B
Risk Score: 0.61
Budget $150 x 0.61
$ 91.50

PHO - C
Risk Score: 1.52
Budget: $150 x 1.52
$228.00

* This example is for illustration purposes only. Funds would not be distributed based purely on risk scores. A number of actuarial adjustments would need to be made to account for benefit designs, trend, performance programs, carve-outs, stop-loss, reinsurance, etc.
From Risk Assessment to Risk Adjustment

Implementing Risk Adjustment – Applications and Uses of Risk Adjustment
RISK ADJUSTMENT MUST BE CONTEXT SPECIFIC

- For what purpose?
- Risk of what outcome?
- Over what time frame?
- For what population?
- With what data?

- Liza Iezzoni, MD

RISK ADJUSTMENT MUST FIT THE PURPOSE

- Consider Strengths & Weaknesses for each application

  - Risks that may be caused by the model
  - Completeness of the model, design
  - Stability of the model over time
  - Frequency and reliability of model updates
  - Costs of managing the model
  - Support to simulate, implement, educate and on-going use which may include recalibration, or customization
Context: Defining the Purpose

- To compare provider panels requires assessment of patients who make up the providers practice
- To compare risk by region requires identification of individual’s residence, such as zip code
- To compare selection among health plans, such as HMO, PPO, POS, etc., risk is assessed and sorted by “plan type”
- Comparing patients who opt-in or –out of disease management programs, group by
Context: Defining the Outcome

What should the model predict:

• This year? Future Period? With/without Lag?
• Risk relative score as compared to a benchmark?
• Dollars?
• Days?
• Visits?
• Etc.
Context: Time Frame

- **Concurrent** models use data from a particular year to predict the outcome for that *same* year.
  - Predictions are based on episodic and chronic conditions.
  - Used for profiling and outcomes analyses.

- **Prospective** models use data from a particular year to predict outcomes the *following* year.
  - Predictions are based on chronic conditions.
  - Used for payment, budgeting, risk stratification, pricing, budgeting.
Context: Population

• Is there sufficient population for analysis to be meaningful, are “groups/panels” of sufficient size?
• Who will be assessed?
  • An entire population (everyone, regardless of coverage)
  • Commercially Insured
  • Medicaid (all, FFS, MCO, TANF, SSI, SHCIP)
  • Medicare (FFS, Medicare Advantage)
  • Uninsured (individuals, groups, special populations)
  • Disease subsets (intervention carve outs)
Context: Available Data

• Is there sufficient population for the analysis to be meaningful, are “groups/panels” of sufficient size?

• What are the data sources?
  • Administrative claims and enrollment data?
  • Pharmacy data?
  • EMR data (but what about eligibility data)?
  • Survey data
Medicaid Applications

- Academic studies, actuarial analysis, state and plan experiences in Medicaid managed care demonstrate that where states operate competing FFS plan types, variations in selection, or member risk varies when compared to managed care plans.
- Some of the variation can be explained by the type of provider networks offered by health plans in a given geographic area.
- Risk adjustment can improve the fairness of the state’s capitation rate setting system.
- Risk adjustment promotes plan and provider participation to serve a disproportionately sicker population.
Since 2000...
Risk Adjustment for Medicaid

“Among people with disabilities, health expenditures are strongly related to recent diagnoses, and health plans are well aware that attracting too many people with costly problems can lead to large financial losses. If a State Medicaid program does not pay more to health plans whose members have above average levels of need, it will penalize plans attractive to people with greater needs and jeopardize quality of care. The greater predictability of expenditures among people with disabilities compared with a general population both increases the importance of health-based payment and makes it easier to do well.”

Richard Kronick, Ph.D., Todd Gilmer, Ph.D., Tony Dreyfus, M.C.P., and Lora Lee, M.S., Health Affairs, Spring 2000
Medicaid - Early Adopters

- Early adopters (states and health plans) experienced implementation challenges
- Incomplete coding, incomplete claims reporting (encounters), incomplete record storage
- Surprising results – material swings in risk, some due to changes in coding, or stability of the risk adjuster used, caused rate setting challenges and barriers to adoption
- A realization of the complexity and technical expertise required to successfully implement and apply risk adjustment
Ten years later...

- Risk adjustment is the predominant model for Medicare, Medicaid, Uninsured (states) and a growing list of health exchanges, ACOs, and plan-provider arrangements.
- Used for strategic planning, budgeting, payment, profiling, care management and performance measurement.
- Implementation issues prevail – learning curve is steep, picking the right risk adjuster still a huge concern, success stories still being written.
- Data are improving, and
- Risk adjustment models are improving.
Lessons Learned

- Complete and valid data from providers to health plans’ and the risk adjustment administrator’s subsequent use of the data is essential. Stakeholders are better positioned to drive cost control and quality initiatives when data strengths and weaknesses are known in advance.

- States should work closely with health plans throughout the preparation and implementation phases.

- Simulations should be run to avoid surprises or business disruptions in the implementation. Data anomalies will be identified during simulation, some of which may not be easily remedied, but accounted for in the roll out.
Lessons Learned cont.

- Model “fit” is an important selection criteria. (does the model accurately describe risk for the target populations?)
- Model selection *should not* be based solely on the cost of the risk adjuster.
- Recognize that risk adjustment is part of a larger programming context, with complex financing and adequate measurements put in place to monitor changes in risk, trend and selection. The goal is to drive better quality care, and control costs for all residents.
- Risk adjustment alone does not solve rate inadequacy.
Model Selection – Evaluating Performance

Milliman - SOA Study
2007 Comparative Study of Risk Adjustment Tools
## Offered, Prospective, Non-lagged, without Prior Costs, R-Squared and MAPE% for 250K Truncation Level

<table>
<thead>
<tr>
<th>Risk Adjuster Tool</th>
<th>Inputs</th>
<th>250K</th>
<th>250K</th>
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</thead>
<tbody>
<tr>
<td><strong>Milliman Advanced Risk Adjusters</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DxAdjuster</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACG</td>
<td>Diag</td>
<td>24.90%</td>
<td>86.40%</td>
</tr>
<tr>
<td>CDPS</td>
<td>Diag</td>
<td>19.2%</td>
<td>89.9%</td>
</tr>
<tr>
<td>Clinical Risk Groups</td>
<td>Diag</td>
<td>14.9%</td>
<td>95.3%</td>
</tr>
<tr>
<td>DxCG DCG</td>
<td>Diag</td>
<td>17.5%</td>
<td>90.9%</td>
</tr>
<tr>
<td><strong>Milliman Advanced Risk Adjusters</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>RxAdjuster</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DxC G RxGroups</td>
<td>Rx</td>
<td>21.40%</td>
<td>83.10%</td>
</tr>
<tr>
<td>Ingenix PRG</td>
<td>Rx</td>
<td>20.4%</td>
<td>85.3%</td>
</tr>
<tr>
<td>Medicaid Rx</td>
<td>Rx</td>
<td>20.5%</td>
<td>85.8%</td>
</tr>
<tr>
<td><strong>Milliman Advanced Risk Adjusters</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CxAdjuster</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ImpactPro (Ingenix)</td>
<td>Med+Rx+Use</td>
<td>24.4%</td>
<td>81.8%</td>
</tr>
<tr>
<td>Ingenix ERG</td>
<td>Med+Rx</td>
<td>19.7%</td>
<td>86.4%</td>
</tr>
<tr>
<td>ACG w/Prior Cost</td>
<td>Diag+Rx</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>DxCG UW Model</td>
<td>Diag+$Total</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>MEDai (Service Vendor)</td>
<td>All</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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**NOTE:** Higher R-Squared is better; Lower MAPE% is better.
# Model Evaluation

Deciding on the best fit for the purpose and population

<table>
<thead>
<tr>
<th>Simulation with 2 models</th>
<th>MA Medicaid FFS</th>
<th>MA Medicaid MC</th>
</tr>
</thead>
<tbody>
<tr>
<td>DxCG DCG/HCC for Medicaid</td>
<td>25.21%</td>
<td>26.62%</td>
</tr>
<tr>
<td>CDPS unrecalibrated</td>
<td>2.42%</td>
<td>5.28%</td>
</tr>
<tr>
<td>CDPS recalibrated</td>
<td>17.74%</td>
<td>19.95%</td>
</tr>
</tbody>
</table>

The SOA 2007 Risk Adjustment Report has a similar finding.

Source: Ehcca, 2008, Risk adjustment and predictive modeling for Medicaid, Rong Yi, Ph.D.
Summary

- Risk Adjustment Starts with assessing individual risk

- Risk Adjustment is essential to be successful in today’s medical care financing

- Pick your Risk Adjustment method carefully

- Context – purpose, data, outcome, population, timeframe, model fit
QUESTIONS?

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