



Predictive Analytics Milliman Risk Score and Hannover Re

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November 18, 2016

Agenda

Why Risk Score

What is Risk Score

Retrospective Study Results





The Future of Underwriting

Increasing

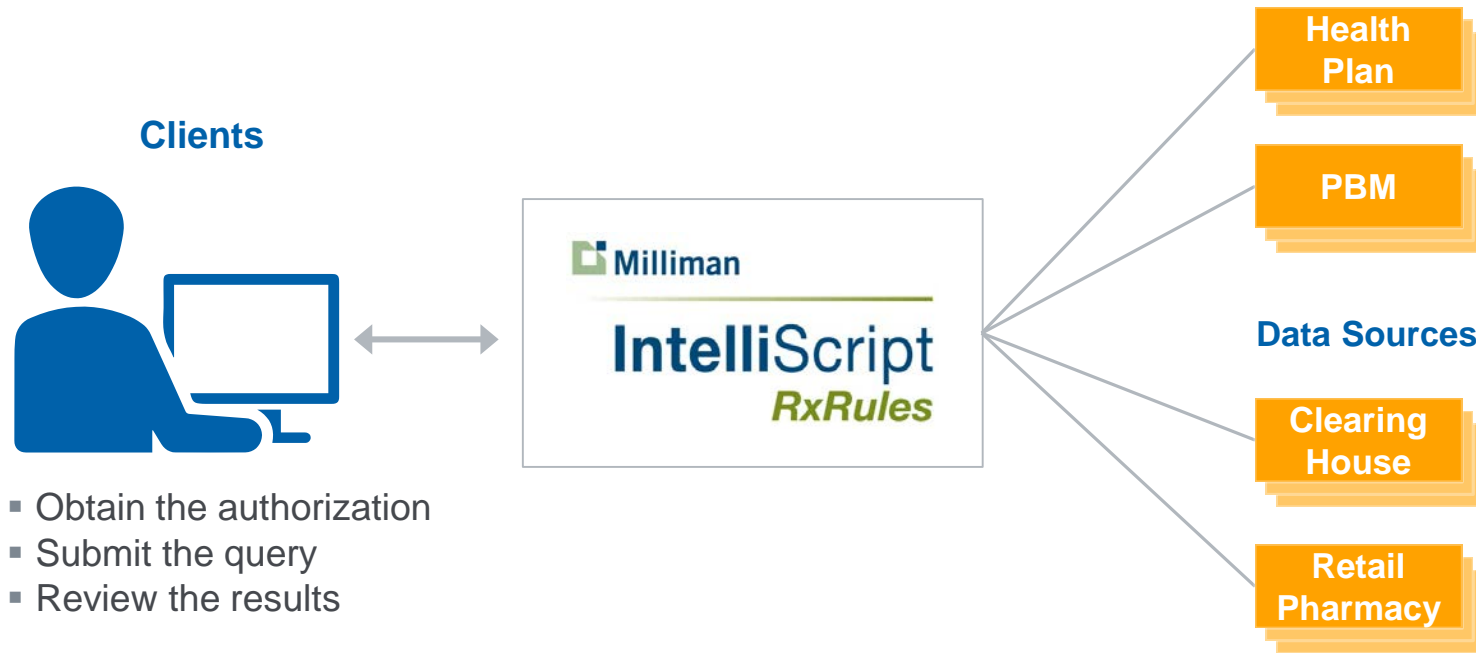
- Electronic requirements (Rx, MIB, MVR, Medical, Credit ...)
- Decision engines driven by data
- Predictive Models
- Automation

Decreasing

- APS
- Labs
- Interviews
- Cycle times
- Costs

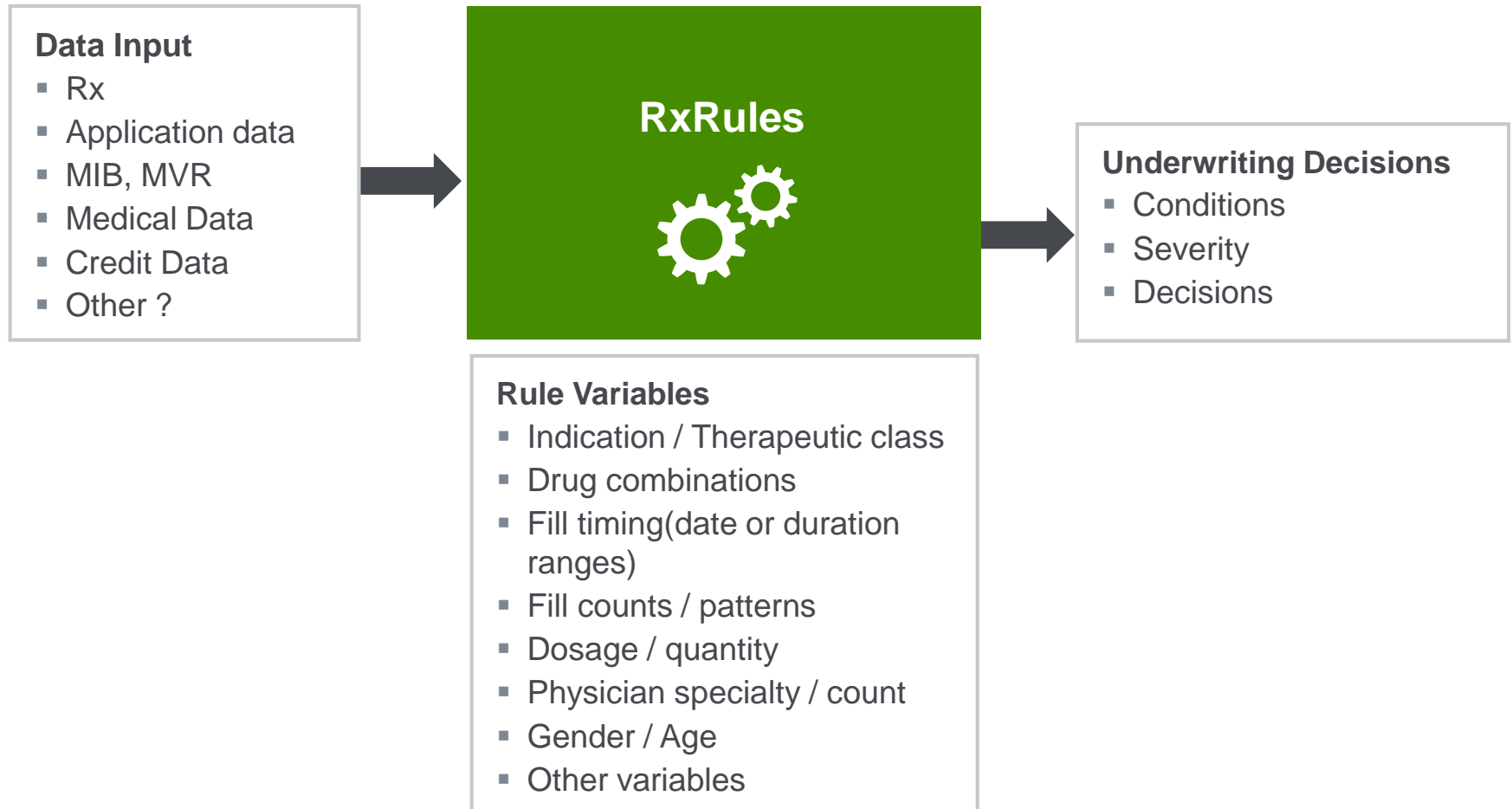
 **Better Customer Experience**

How does Rx work?



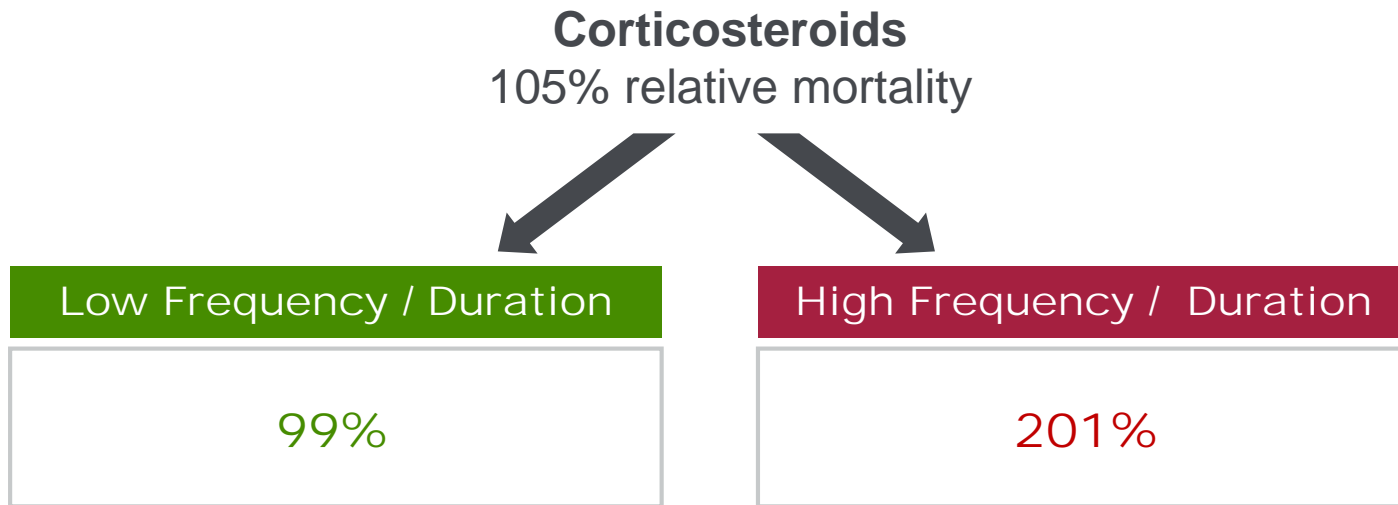


What is a rule engine?





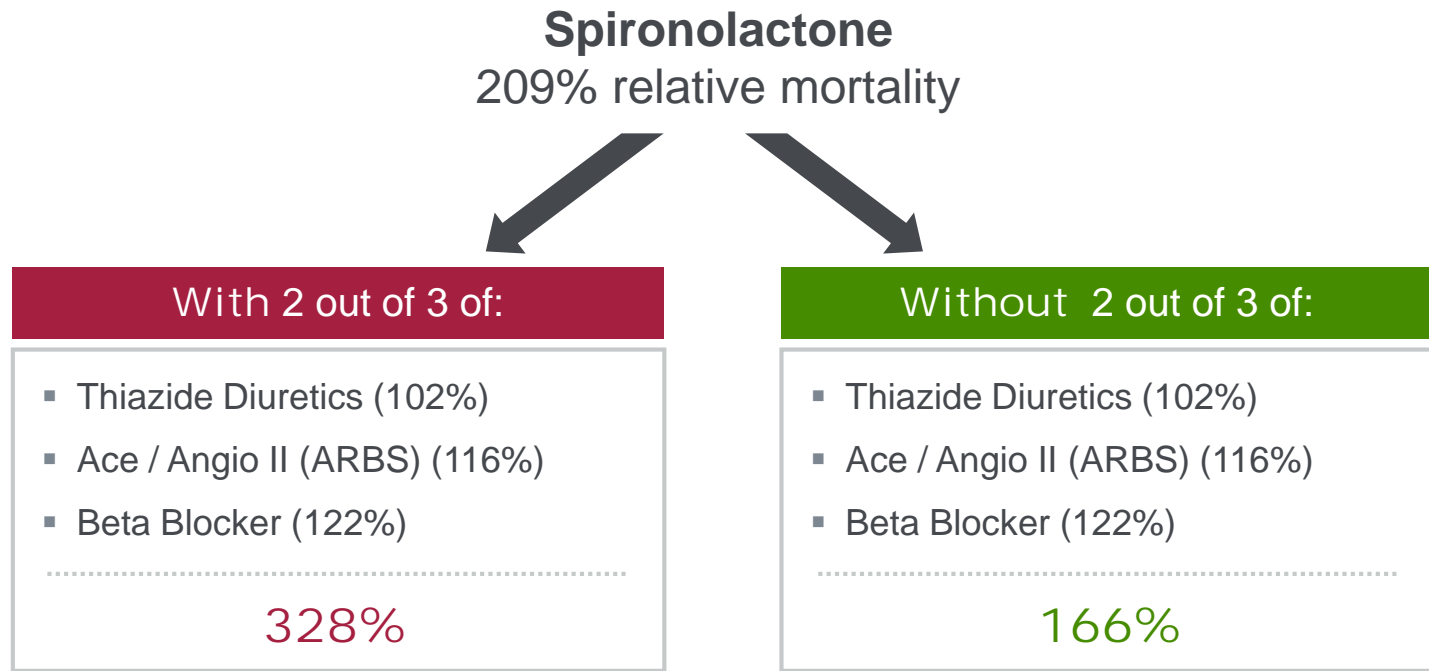
RxRules – Timing and Duration matter



Corticosteroids are very common among insurance applicants



RxRules – Drug Combinations matter



Milliman Risk Score

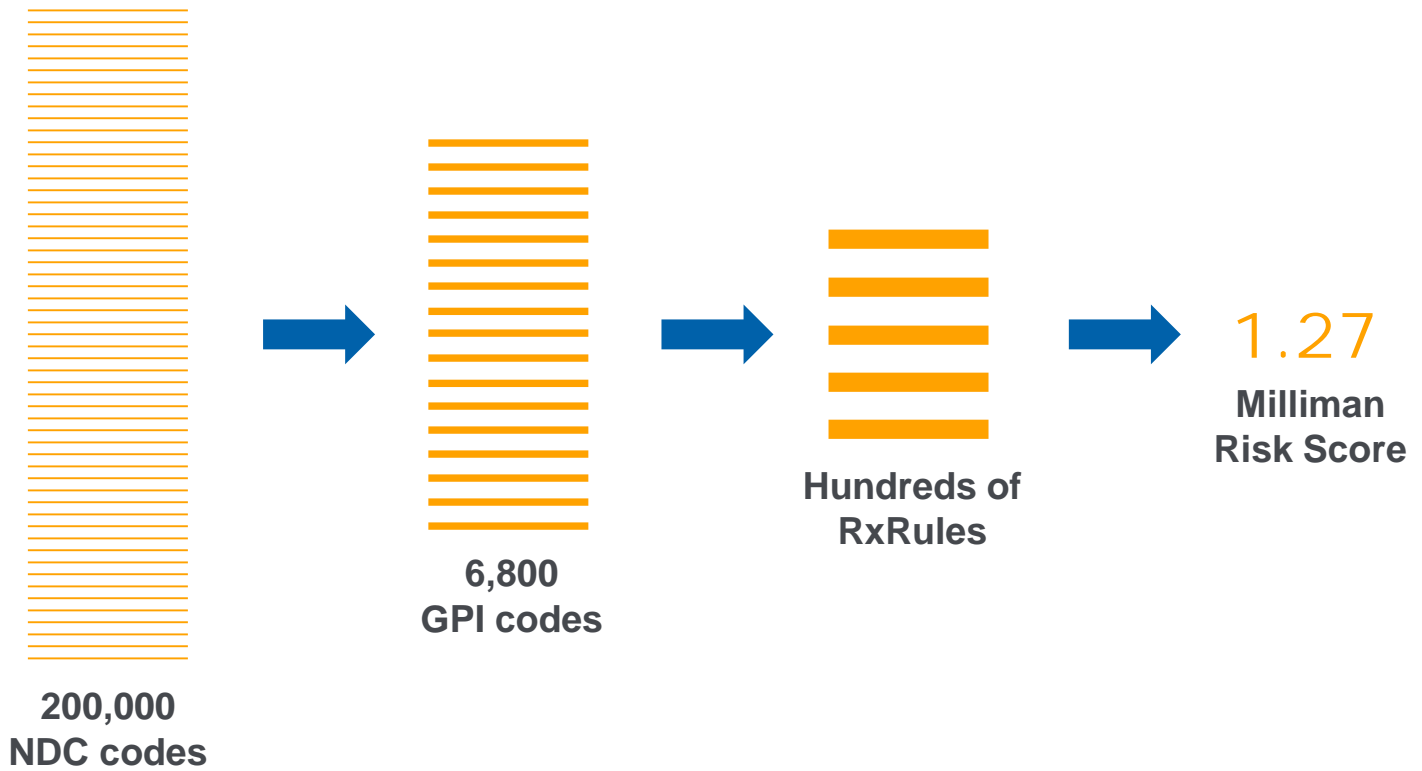
RxRules-driven Predictive Model

Predicts relative mortality of a life or group of lives

Used in PopulationRx

Delivers results within RxRules

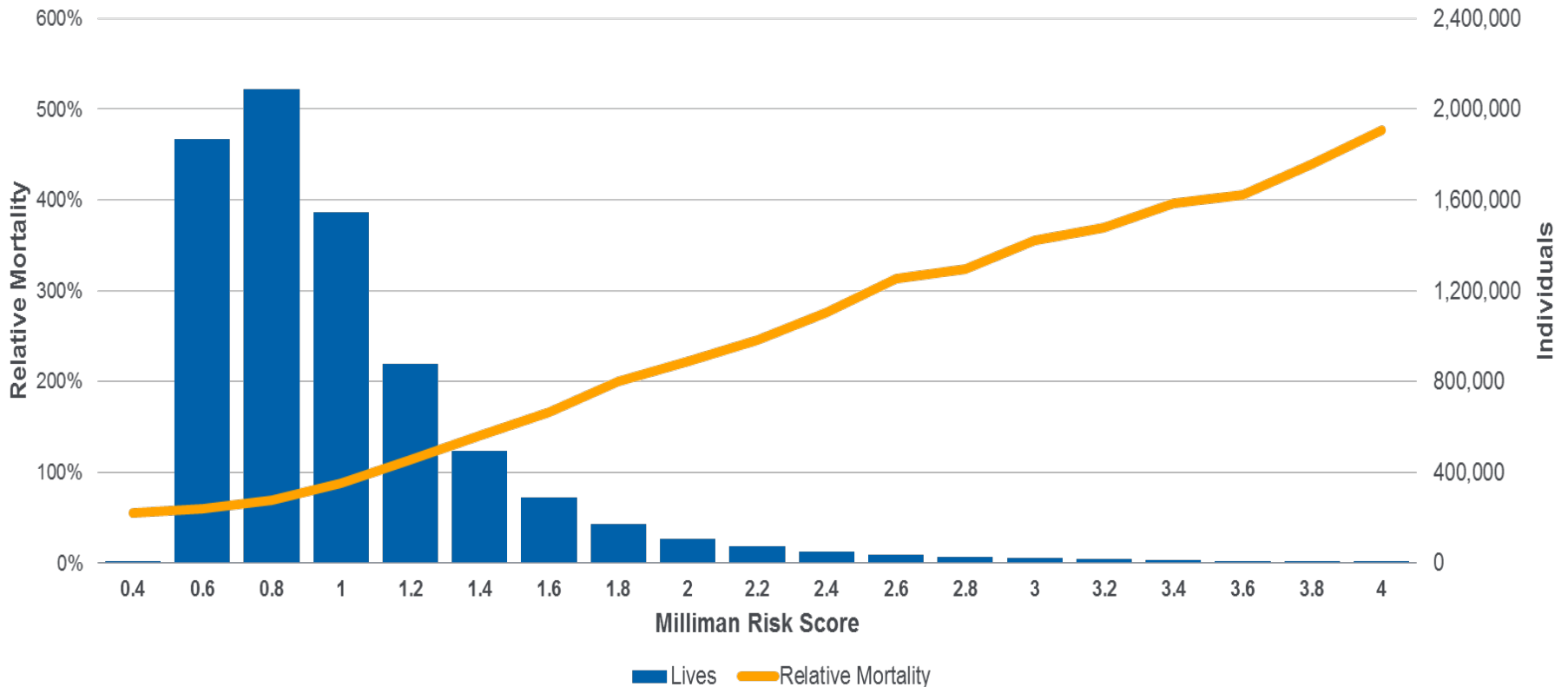
The Milliman Risk Score is built on RxRules.



Milliman's Risk Score effectively predicts mortality.

- 2015 Milliman Mortality Study: 13M lives, 8M Rx hits, 230K deaths

Relative Mortality and Lives by Milliman Risk Score



*somewhat
different*

Hannover Re Analysis

Independent Validation of Milliman Risk Score

Milliman RxRules & Risk Score

Model Validation

Milliman

IntelliScript

 Over 13 million records representing IntelliScript Rx queries

- ▶ Entry years 2005 – 2013
- ▶ Exposure period 2005 – 2014
- ▶ 230,000+ deaths
- ▶ Over 52 million exposure years
- ▶ 6 lines of business:
 - Life
 - Health
 - LTC
 - Final Expense
 - Med supp
 - DI
- ▶ Milliman included risk score, hit status, and most severe drug (red/yellow/green)



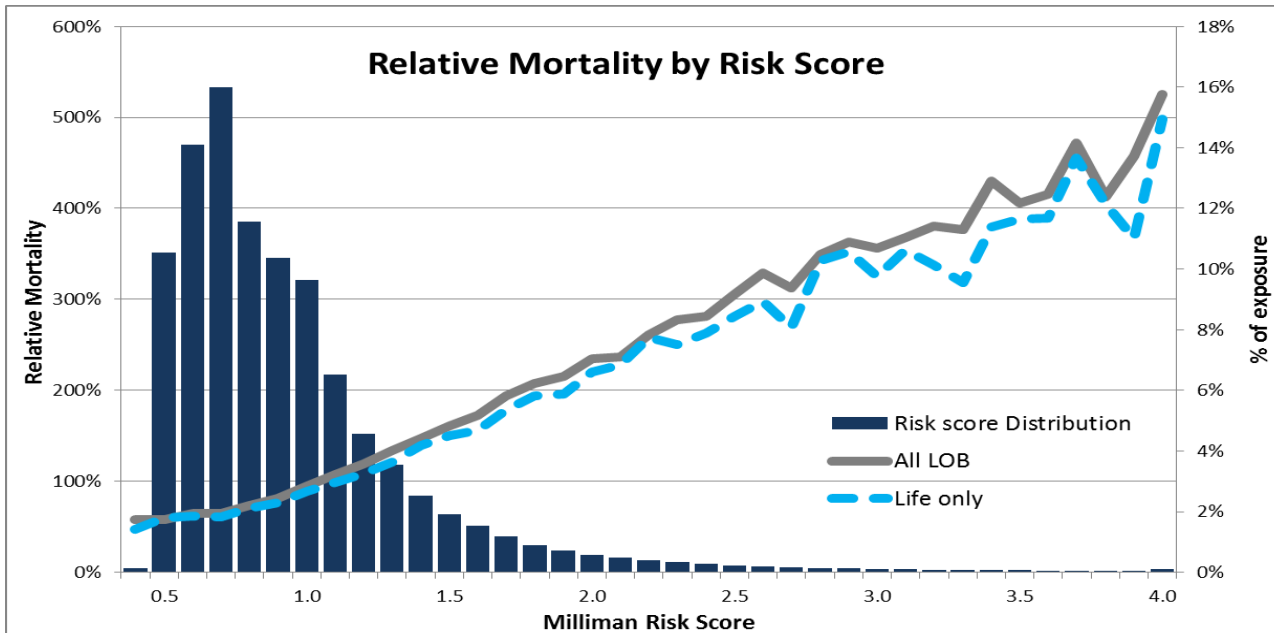
Milliman RxRules & Risk Score

Total Model Results

- ▶ High level results consistent with expectations

Lower Risk Scores = Lower Mortality

- ▶ This relationship was consistent regardless of whether we looked at all lines of business (LOB) together or Life only



Milliman RxRules & Risk Score

By Drug Severity

Relative Mortality by Drug Severity

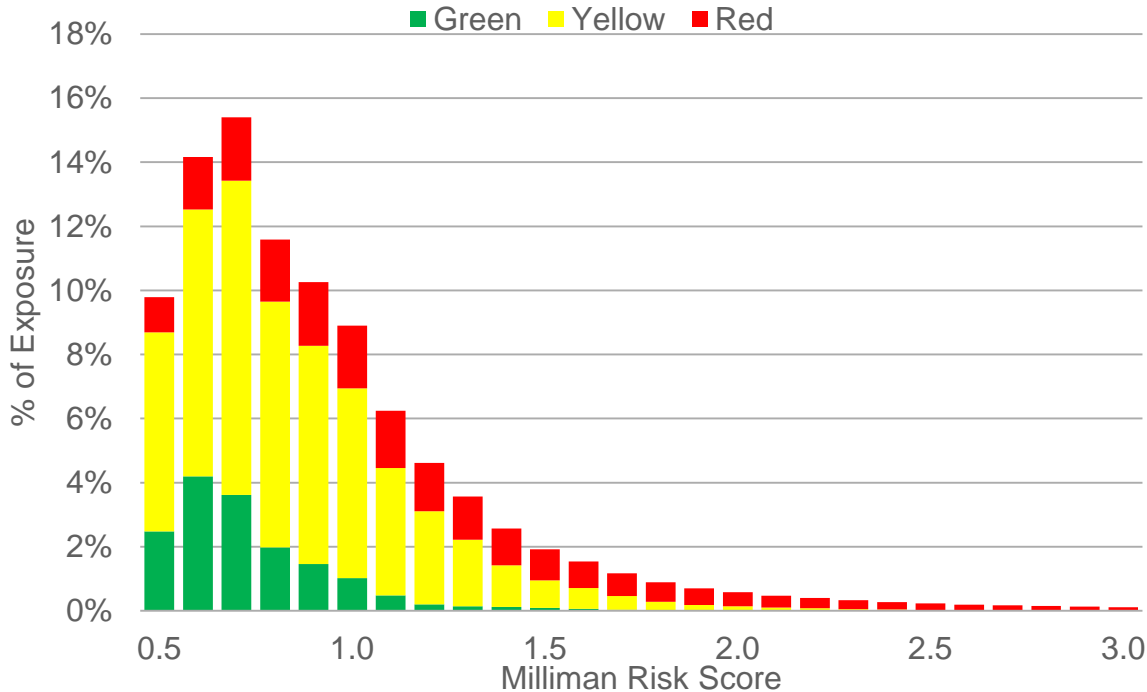


- ▶ Predictive value of risk score is consistent regardless of whether most severe drug is red/yellow/green
- ▶ Multivariate nature of the risk score is better way to stratify risk

Milliman RxRules & Risk Score

Distribution of IntelliScript Risk Scores - Life Only by Drug Severity

Distribution of Risk Scores - Life Only by Drug Severity



- ▶ Red/yellow/green mix varies by risk score
- ▶ Not all “green” have low risk scores and not all “red” have high risk scores

Milliman RxRules & Risk Score

Benefits & Potential Use Cases

Milliman

IntelliScript

- ▶ Quick, efficient, and consistent method for evaluating Rx
- ▶ Synthesize complex aspects of Rx history (# of refills, who prescribed?, etc.)
- ▶ Triage Rx info – identify “clean” Rx histories vs. those to review in more detail

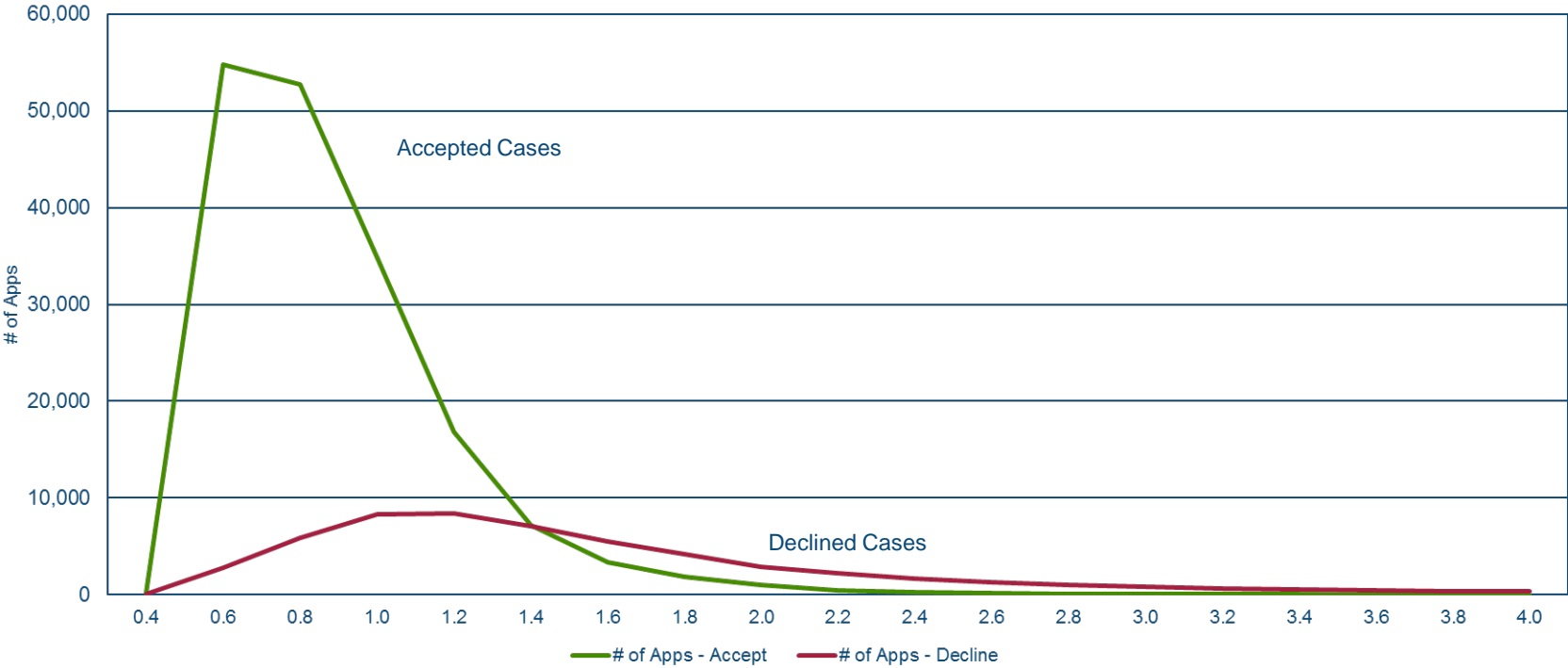


Increase acceptance rates and/or decrease mortality expectation

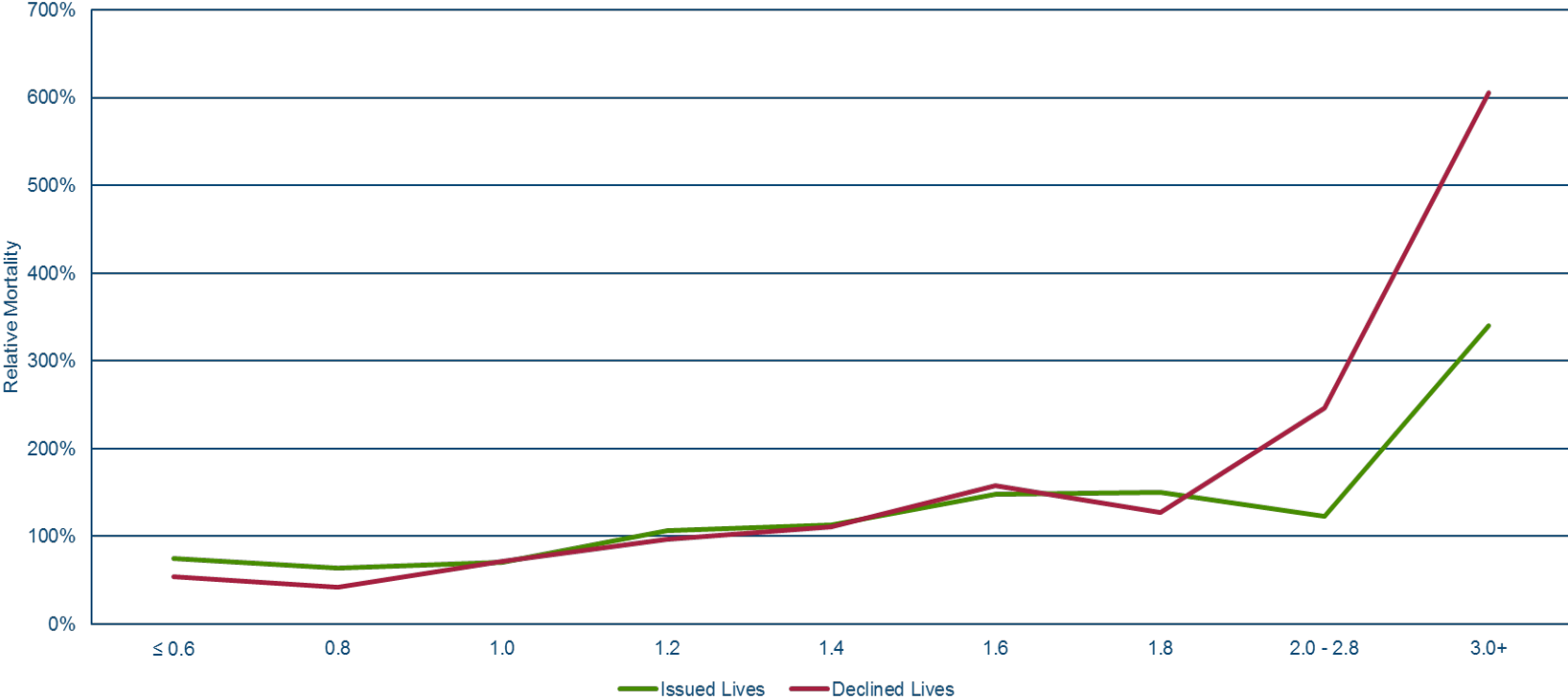
Case Study Background

- Simplified Issue writer
- Cases are either issued or declined – no rate classes
- Decisions are almost exclusively automated
 - Used application, Rx / RxRules, plus MIB and MVR as decision elements
- 230,000 lives
- 1,200 deaths – deaths for issued policies AND declined policies

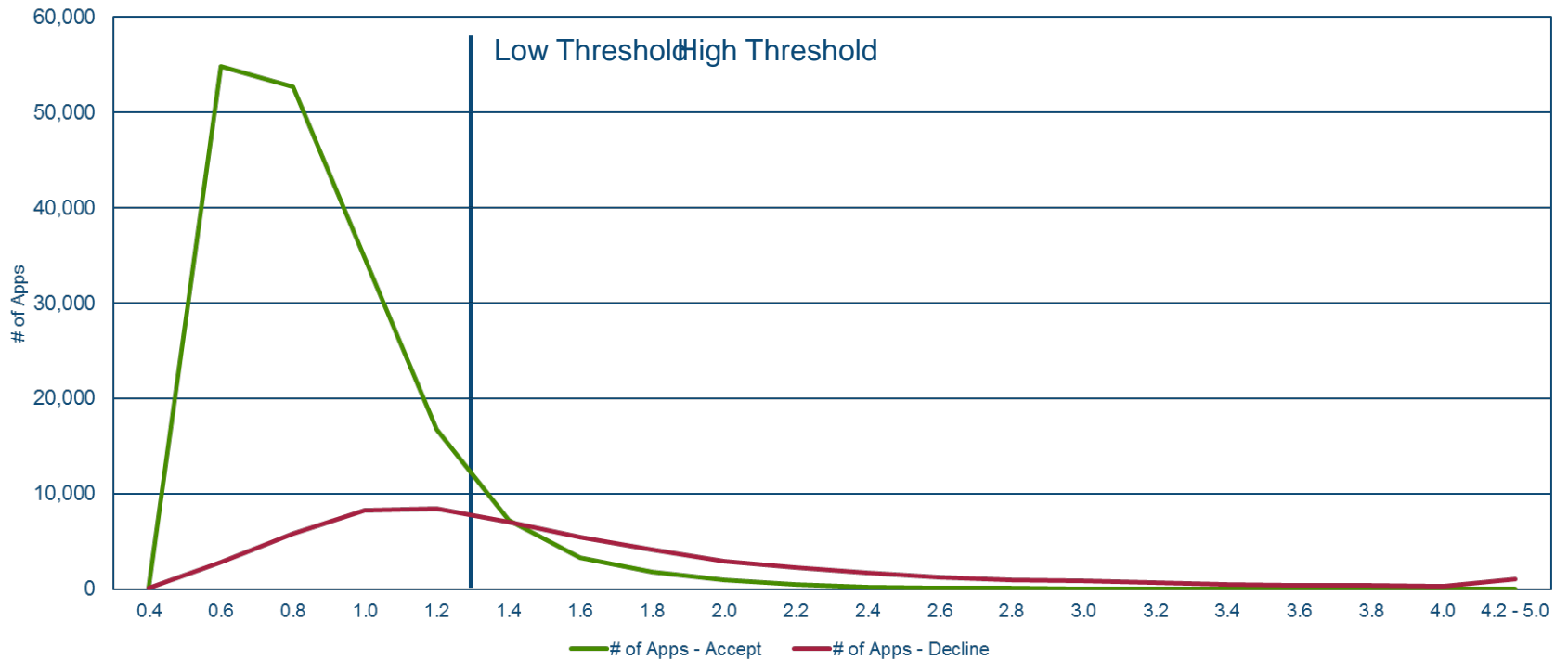
Case study Risk Score distribution



Relative mortality by decision



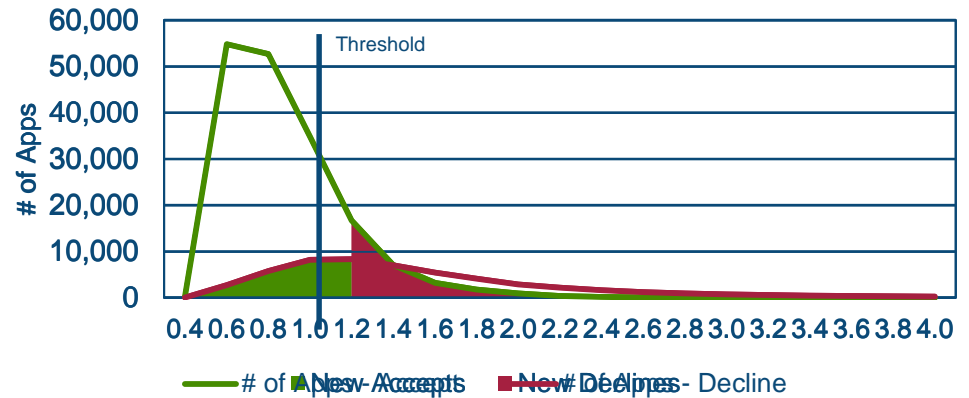
Thresholds can be adjusted to achieve desired business results



Case Study – Management Option #1

- Set Risk Score threshold to issue the same amount of business

- Some issued cases now get declined
- Equal number of declined cases now get issued



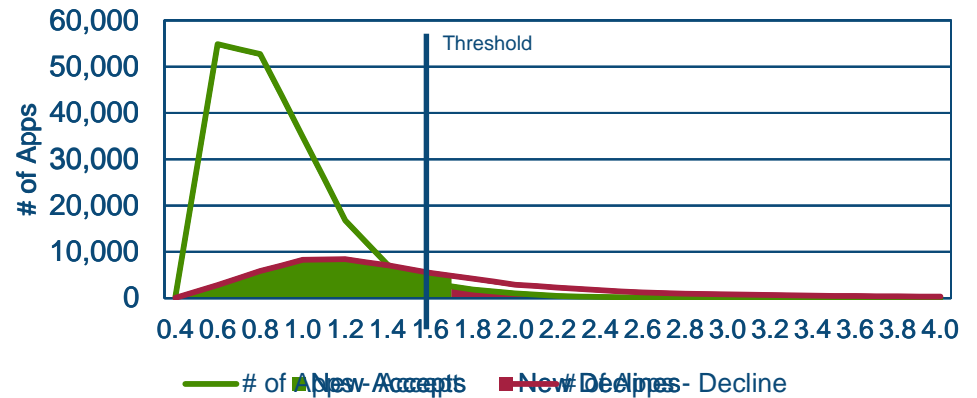
Issued Cases Relative A/E	
Before Risk Score	After Risk Score
76%	70%

- Same amount of business issued
- 8% Mortality Improvement
- \$22 Million increase in profit

Case Study – Management Option #2

- Set Risk Score threshold to maintain the same mortality A/E

- Some issued cases now get declined
- More declined cases now get issued



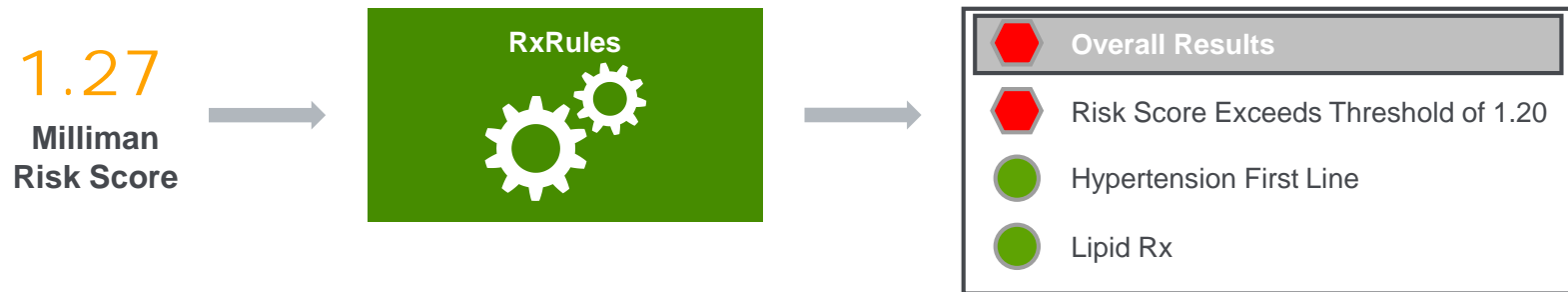
Number of Cases Issued	
Before Risk Score	After Risk Score
174K	199K

Same mortality A/E

14% More issued business

\$37 Million increase in profit

Integration with RxRules



- Run standardized rule set to calculate Risk Score
- Pass Risk Score to client calibrated RxRules engine
- Determine underwriting decision based on most severe of RxRules decisions and Risk Score

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