

# Milliman IntelliScript

# Underwriting with Rx Based Models

Actuaries Club of the SouthWest

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June 8, 2018



# Agenda

Prescription Data and Mortality

Rules Engine and Mortality

Predictive Model and Mortality

Simplified Issue Findings

Combining Predictive Models and Clinical U/W



# The Future of Underwriting ...

## Increasing

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

## Decreasing

- APS, Labs
- Cycle times
- Costs

 **Better Customer Experience**

# Multiple Levels of Data



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# Prescription Histories

1

## Prescription

Brand and generic name | Dosage and quantity | Date of fill

2

## Physician

Specialty | Contact information

3

## Pharmacy

Contact information

4

## Dates of eligibility

With or without prescriptions

5

## Underwriting significance indicator

Red, yellow, green

# Mortality Study Timeline

**2009**

## Milliman / RGA study

- 1M exposure years
- 2,500 deaths

**2012**

## Milliman study

- 21M exposure years
- 45,000 deaths
- **Began to validate and expand Irix**

**2015**

## Milliman study

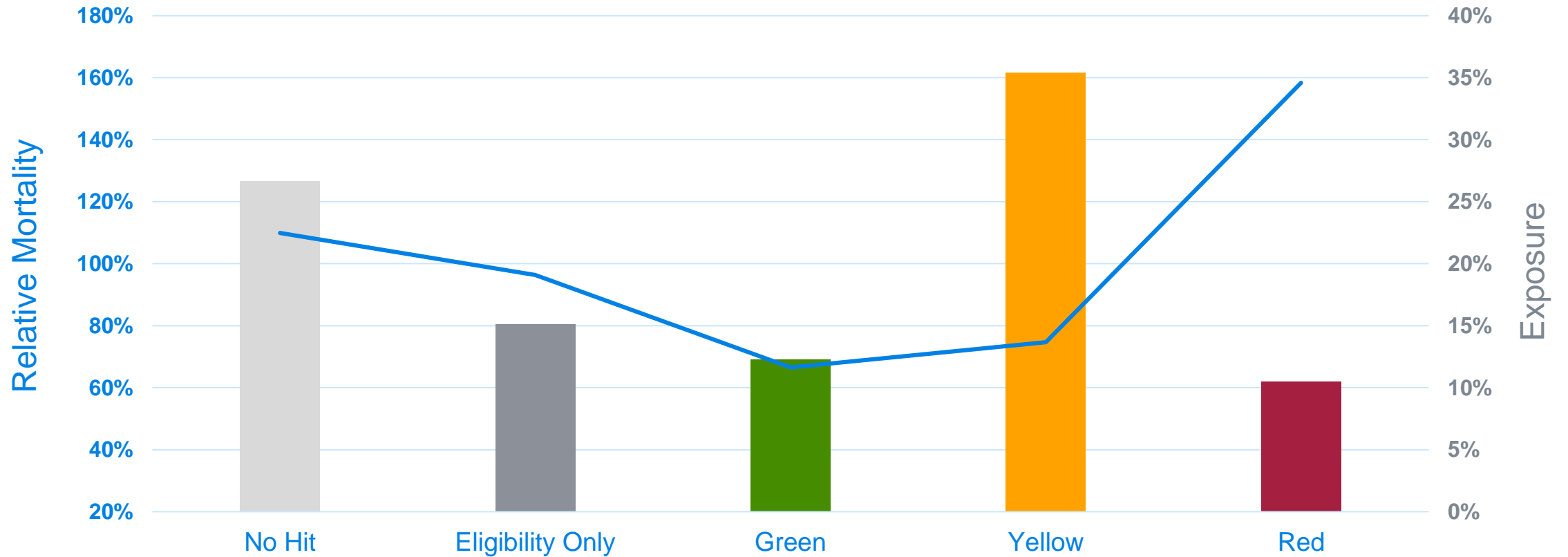
- 53M exposure years
- 231,000 deaths
- **Created Risk Score**

**2017**

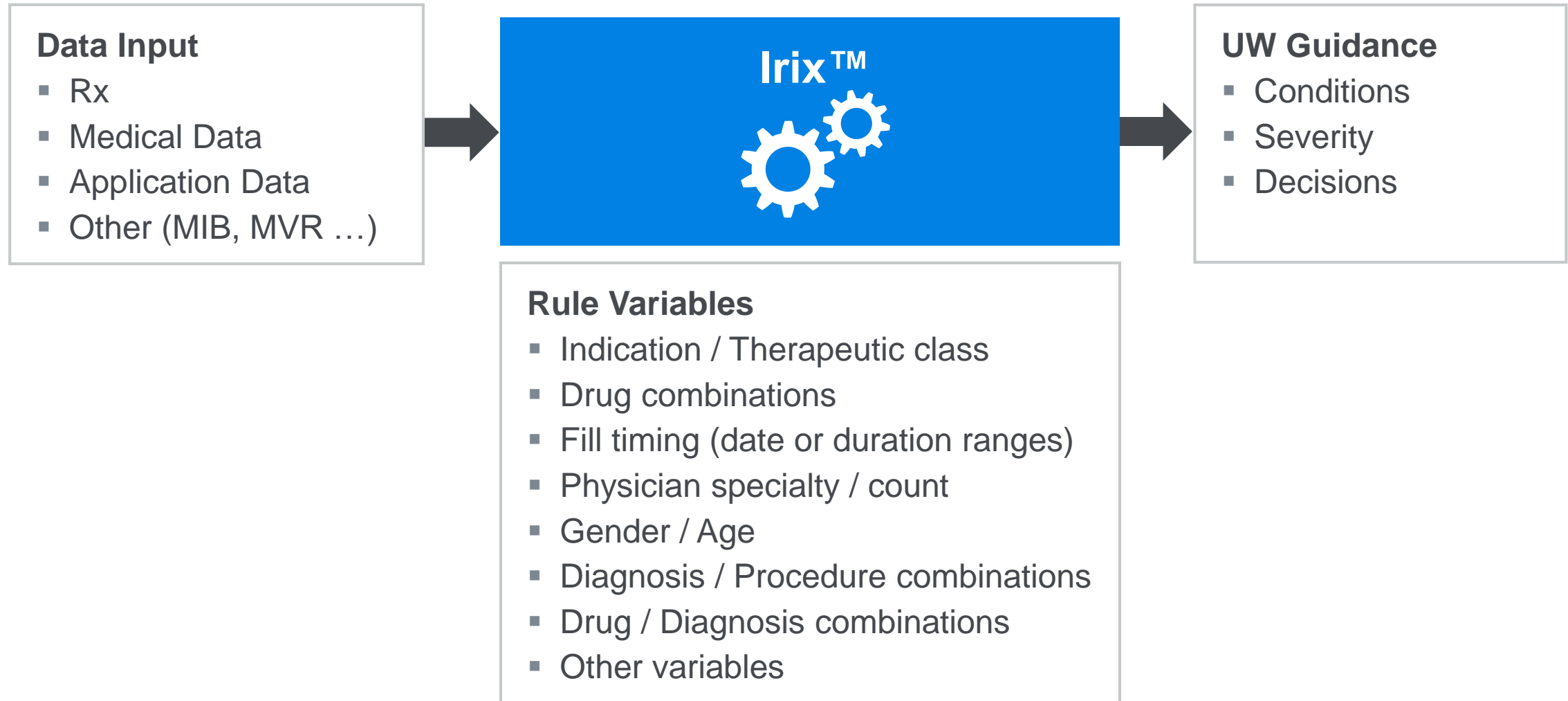
## Milliman study

- 104M exposure years
- 469,000 deaths
- **Update Risk Score model**

# Rx: Relative Mortality by Maximum Drug Priority

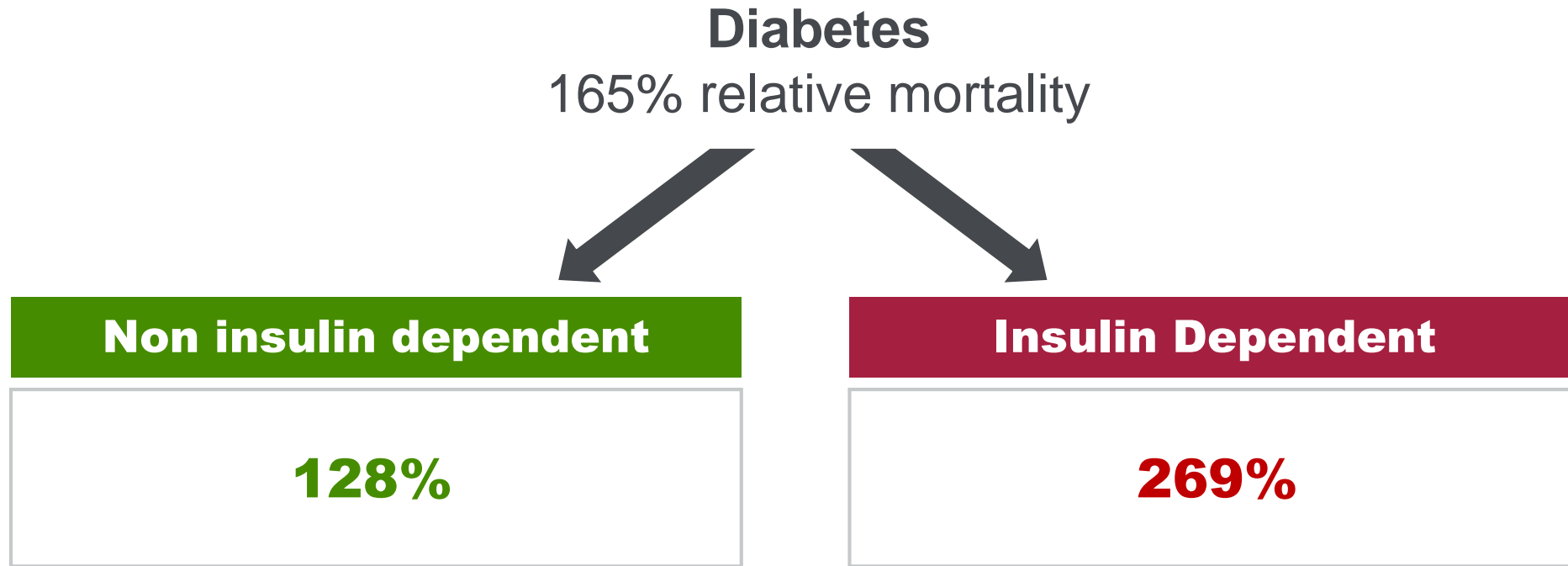


# What is a rules engine?

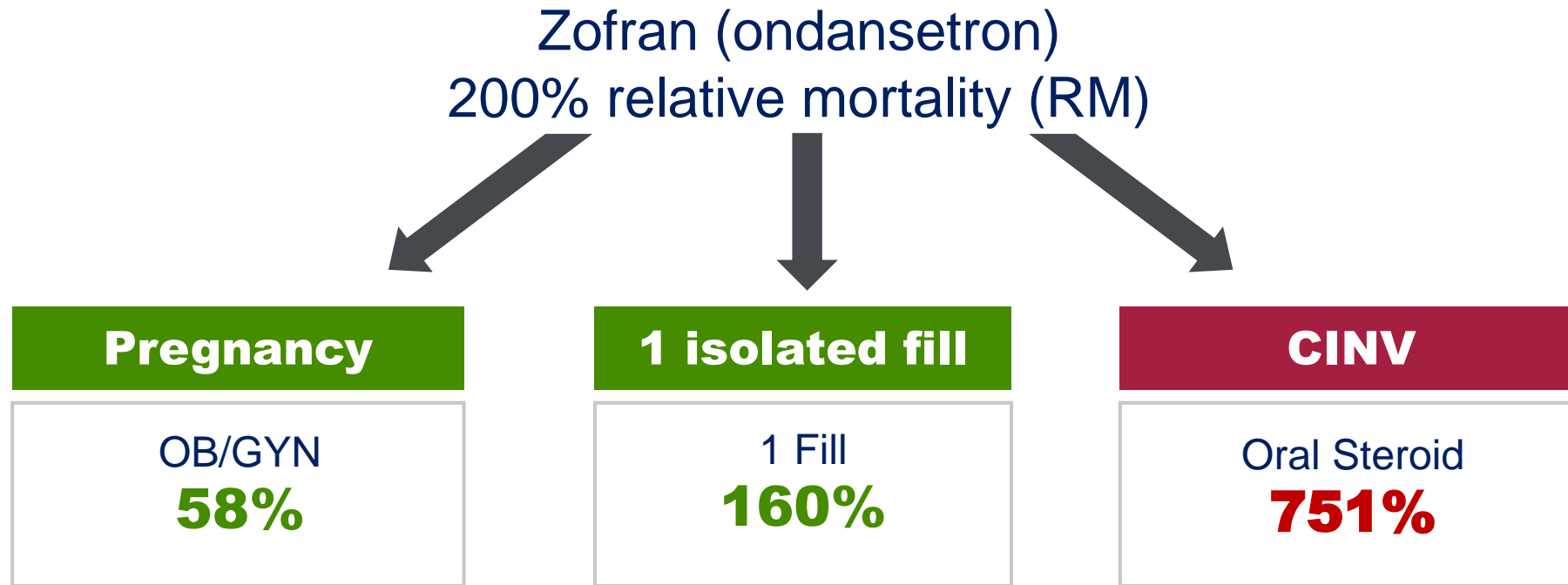




# Irix – Insulin Matters



# Irix – Context Matters



# Irix – Drug Combinations Matter

**Spironolactone**  
243% relative mortality

**With** 2 out of 3 of:

- Thiazide Diuretics (177%)
- Ace / Angio II (ARBS) (119%)
- Beta Blocker (137%)

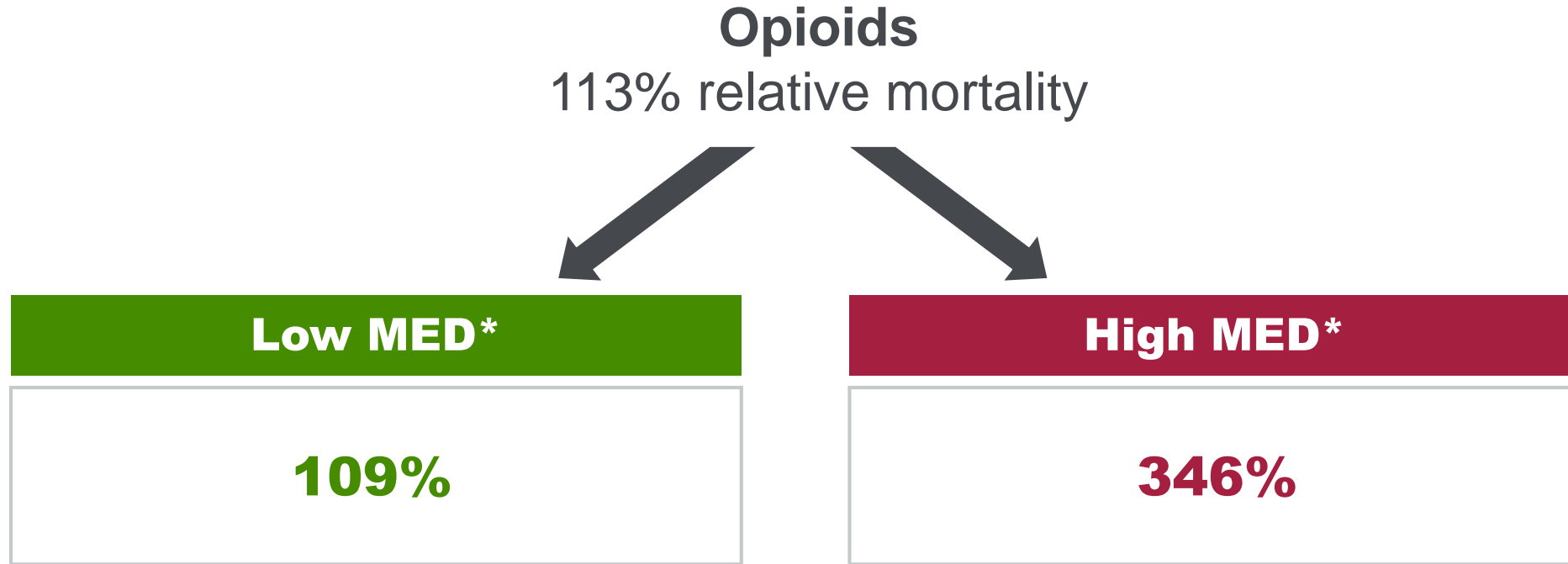
**338%**

**Without** 2 out of 3 of:

- Thiazide Diuretics (177%)
- Ace / Angio II (ARBS) (119%)
- Beta Blocker (137%)

**169%**

# Irix – Morphine Equivalence Matters



\* MED = Morphine equivalent dosage

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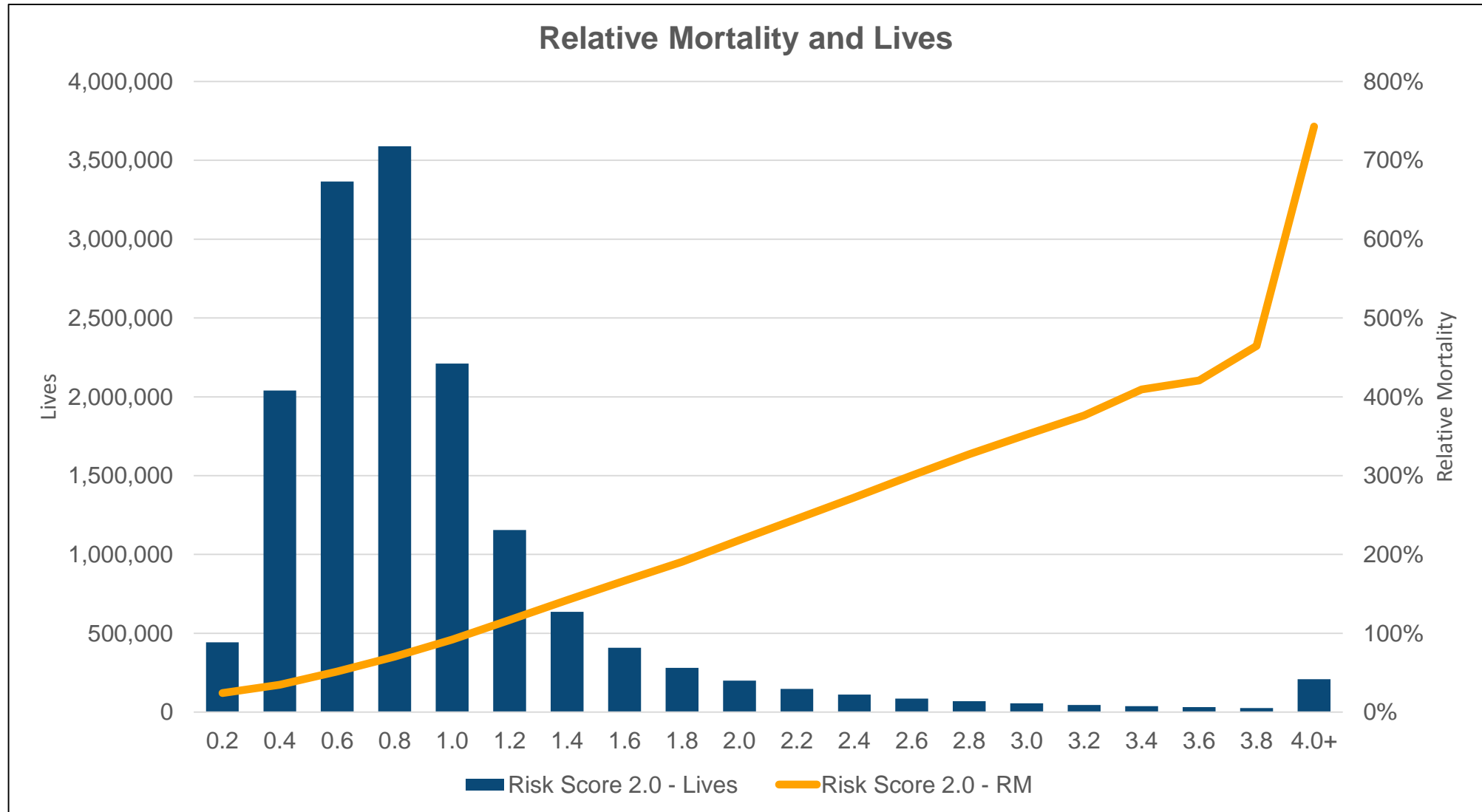
# What is an Rx-based predictive model?

Holistic Multi-variate Rx Model of Mortality Risk

Predicts Relative Mortality of a Life or Group of Lives

Delivered via a Rules Engine

# Models can predict relative mortality accurately.



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# Predictive Model Benefits

- Evidence based and data driven
- Stratify risk within a given medical condition
- Detect unintuitive patterns
- Quickly and consistently interpret large amounts of data
- Easy to test, implement, use, and update

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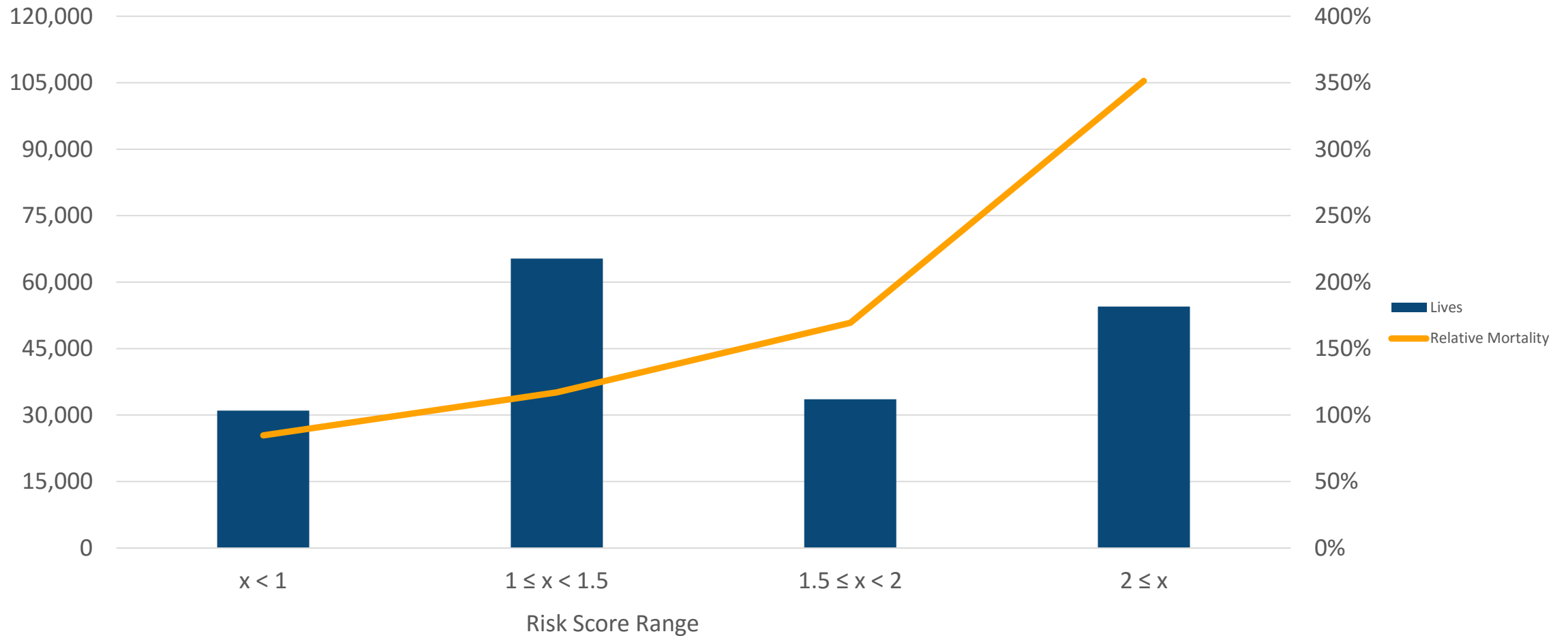
# Predictive Model Challenges

- Limitations of data or lack of data
  - How to reflect low-incidence risks?
  
- Operational challenges
  - Change in underwriting
  - Field underwriting more difficult
  - Client / agent communication challenges

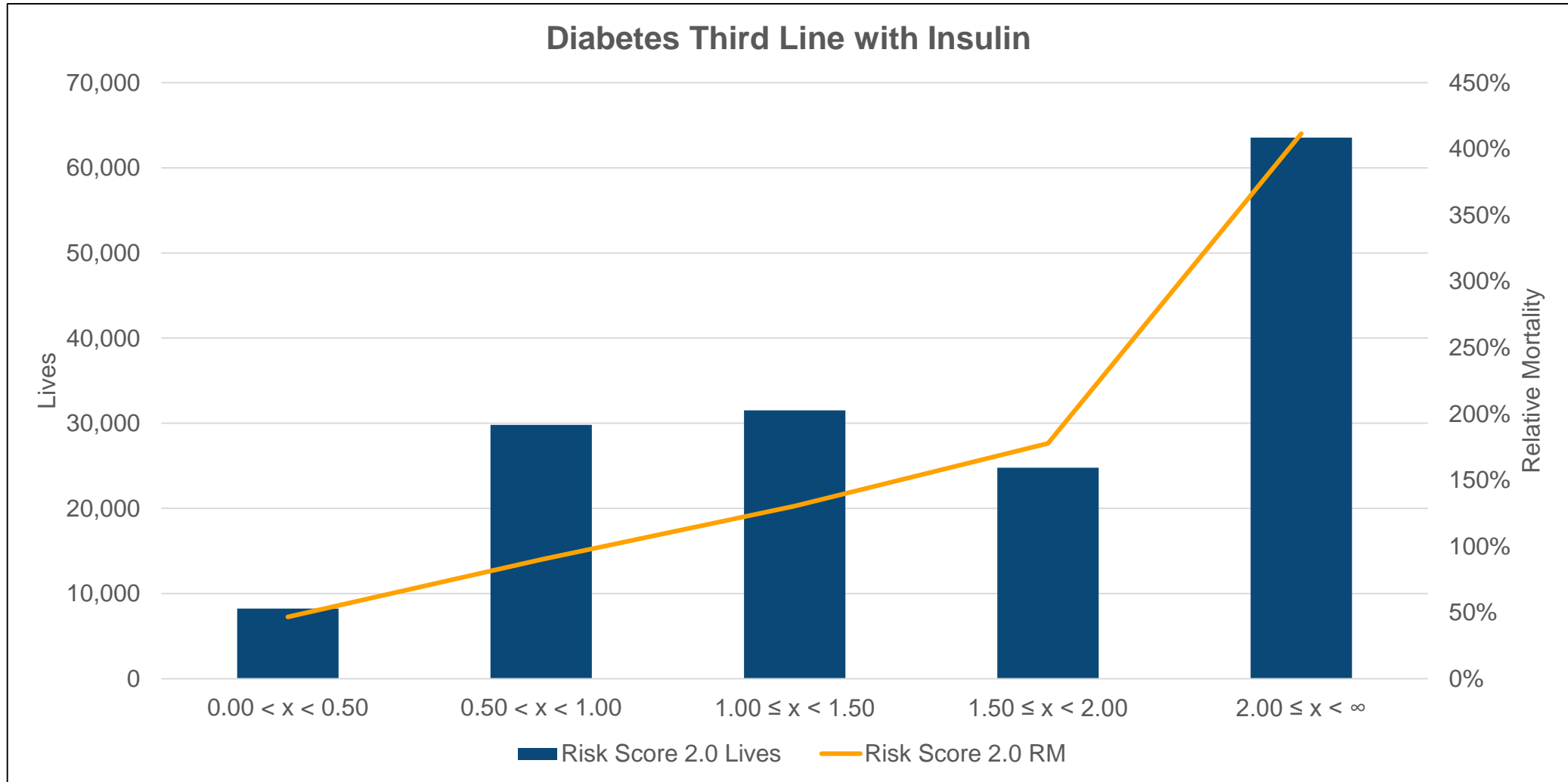


# Risk Score stratifies platelet inhibitor risk.

## Very Serious Platelet Inhibitor (Plavix)



# Risk Score stratifies risk within conditions.

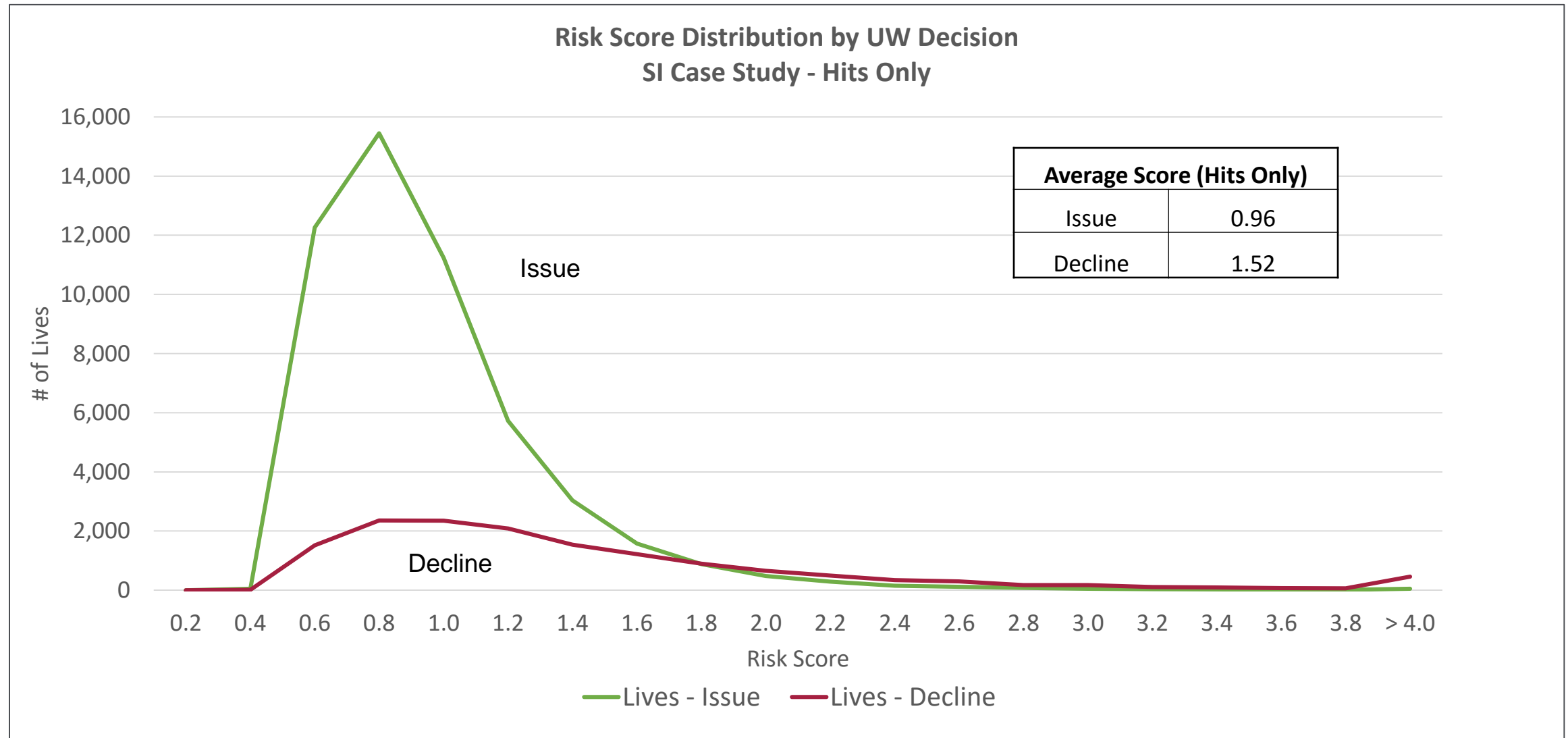


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# SI Case Study Background

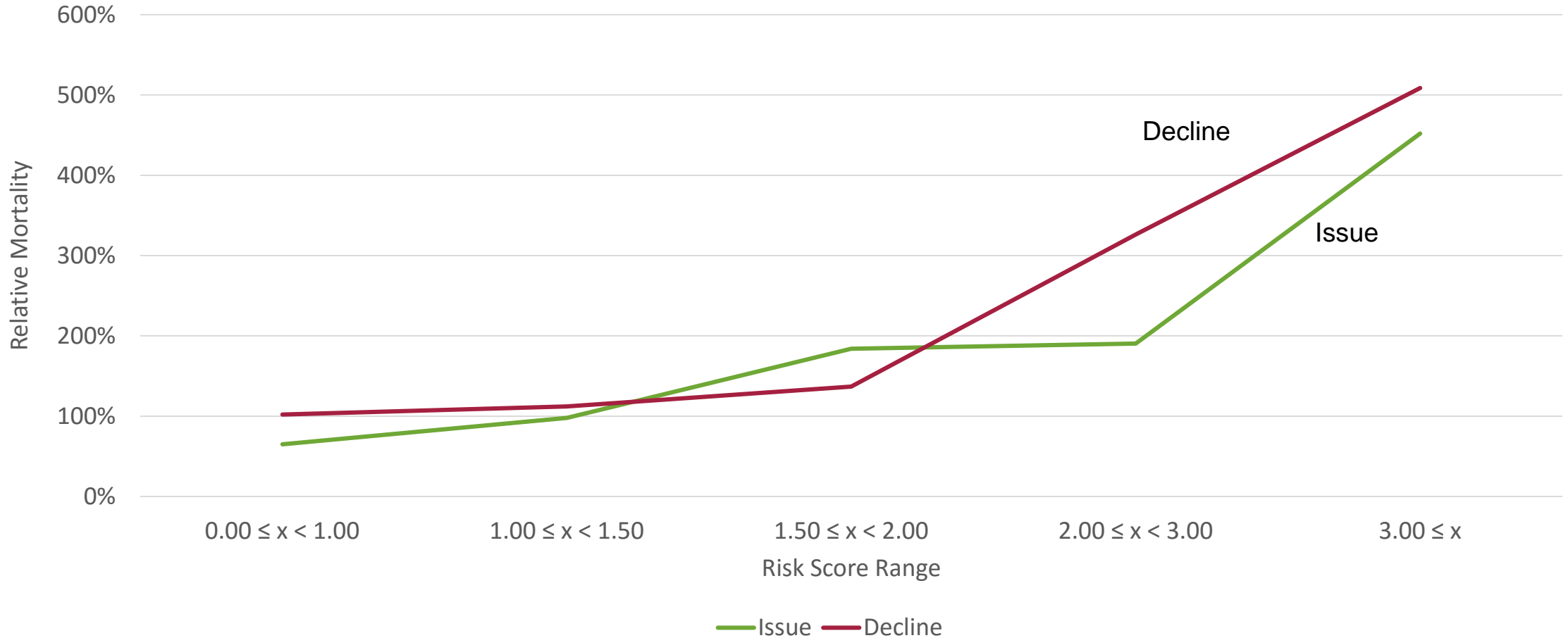
- Mostly auto-decision via Irix
- Risk Score as of time of underwriting
- Have deaths on issued **and declined** cases

# SI Case Study – Distribution of Lives

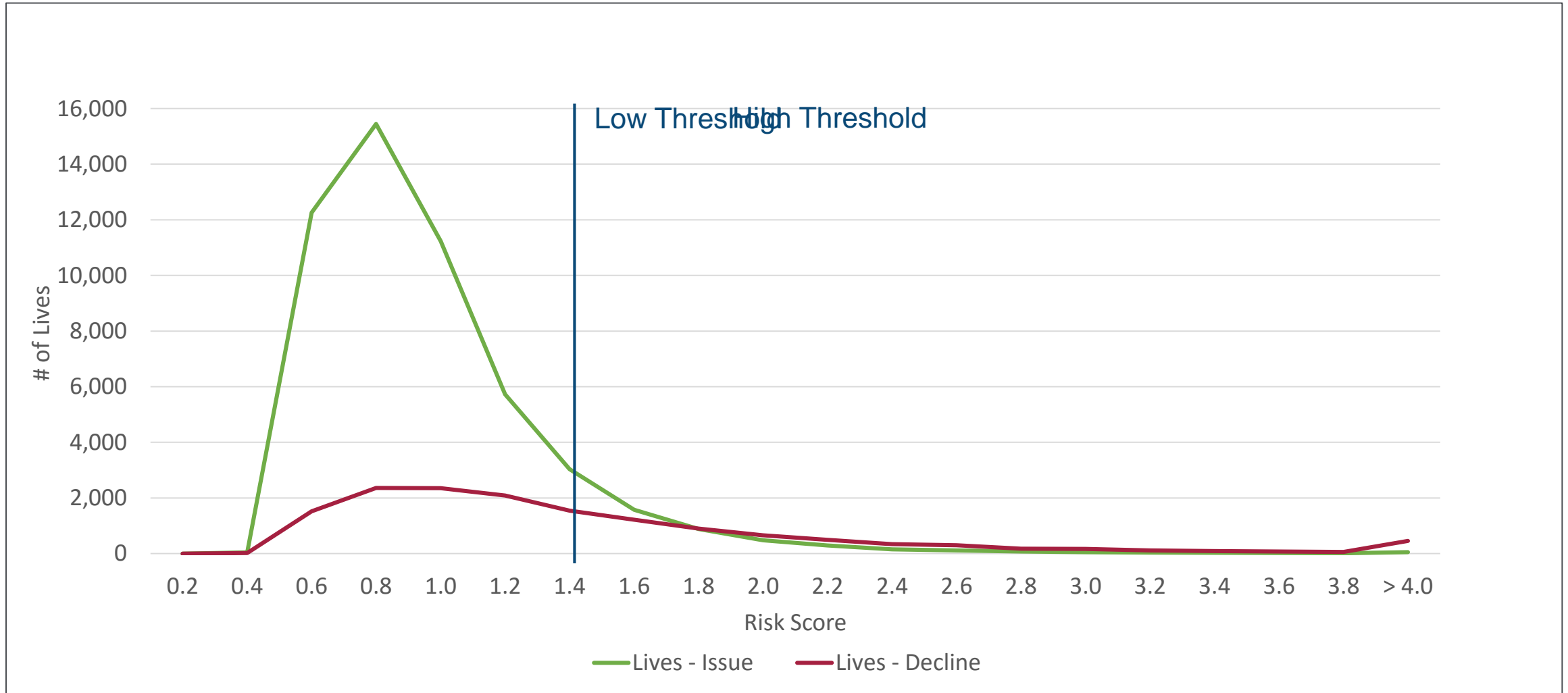


# SI Case Study – Relative Mortality

Relative Mortality by Risk Score and UW Decision  
SI Case Study - (Hits Only)

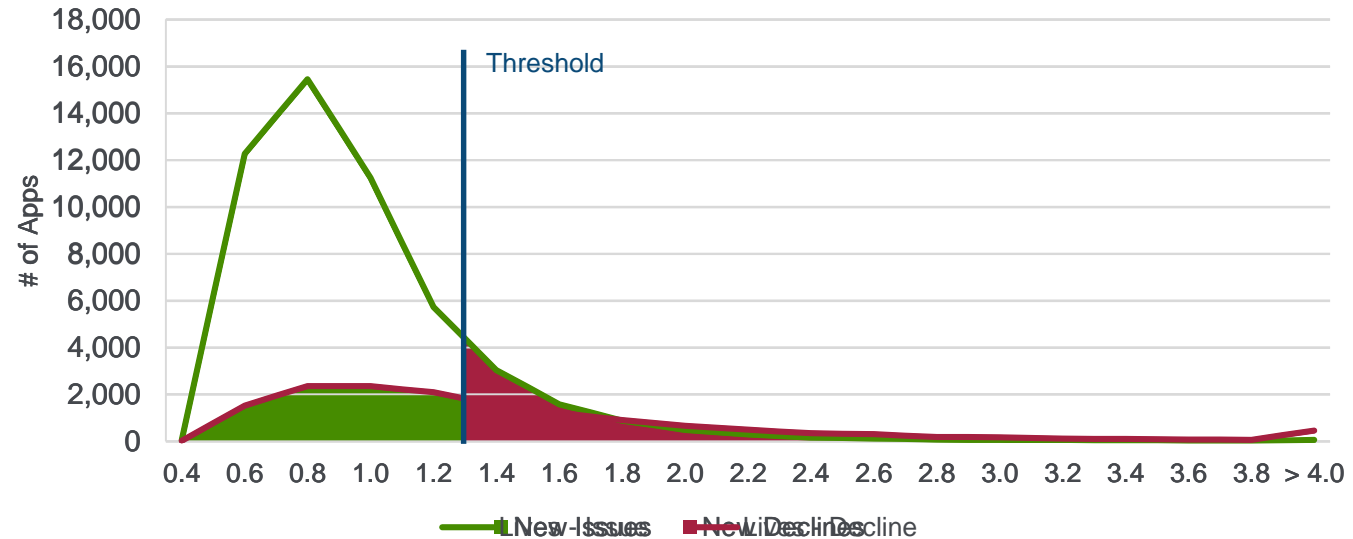


# Thresholds can be adjusted to achieve desired business results.



# Set Risk Score threshold to issue the same amount of business.

- Some issued premium now gets declined
- Equal amount of declined premium now gets issued

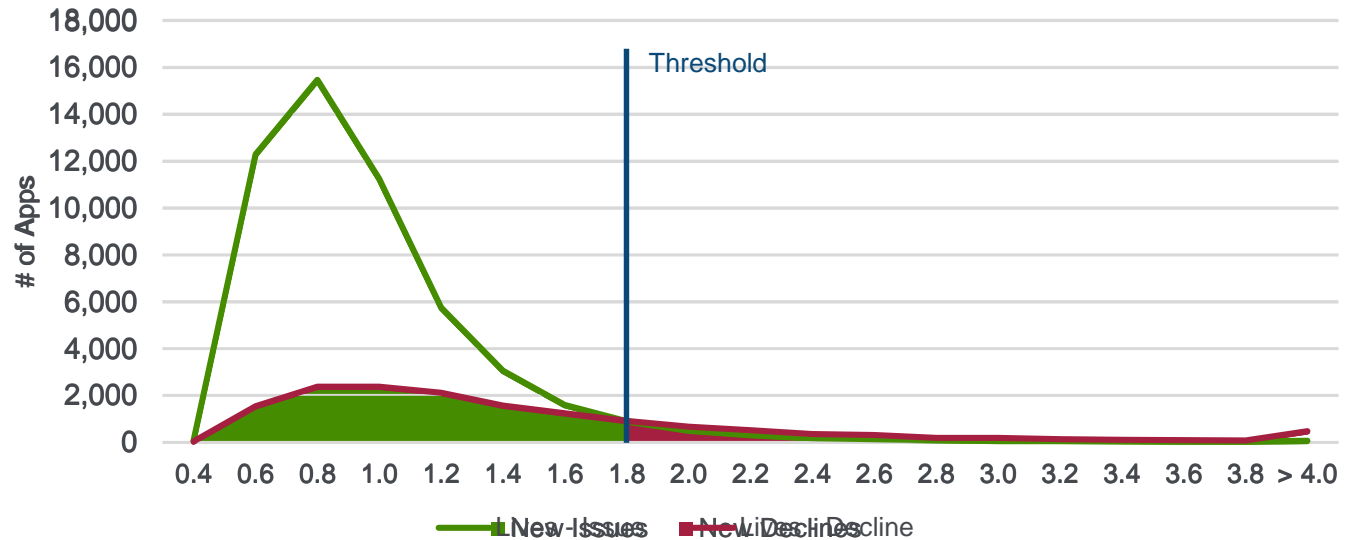


Issued Cases Relative A/E	
Before Risk Score	After Risk Score
83%	75%

**Same amount of business issued**  
**9% Mortality improvement**  
**\$4 Million increase in profit**

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

- Some issued premium now gets declined
- More declined premium now gets issued



Premium Issued	
Before Risk Score	After Risk Score
\$56.1 M	\$66.0 M

Same mortality A/E

18% More issued business

\$2.9 Million increase in profit



# Optimal solution combines clinical underwriting with the power of predictive modeling.

## Paradigms

### Clinical Underwriting

- Condition based
- Univariate
- Uses clinical expertise

### Predictive Model

- Statistical basis
- Multivariate analysis
- Single risk metric for each case

The diagram illustrates the integration of two paradigms into a single decision. At the top, a dark blue bar contains the word 'Paradigms'. Below this, two columns are separated by a vertical blue line. The left column is titled 'Clinical Underwriting' and lists three bullet points: 'Condition based', 'Univariate', and 'Uses clinical expertise'. The right column is titled 'Predictive Model' and lists three bullet points: 'Statistical basis', 'Multivariate analysis', and 'Single risk metric for each case'. Two large, dark grey downward-pointing arrows originate from the bottom of each column. These arrows point towards a central green rectangular box at the bottom of the slide, which contains the text 'Underwriting decision' in white.

**Underwriting decision**



# Thank you!

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