

Incorporating Expert Judgment as a Model Input

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Potential
of One

Power
of
All

The image features three men's faces in the center, each with a wide-eyed, open-mouthed expression of surprise or shock. They are set against a background of glowing blue binary code (0s and 1s) that forms a perspective tunnel effect, receding into the distance. Three blue speech bubbles are overlaid on the image: one at the top center, one at the bottom left, and one at the bottom right.

Thoity!

Listen up! I tell
ya it's 20% !

Let's say yer
both right and
make it 50 ...

Decision Environment: HiPPPO

- Highest
- Paid
- Person's
- Opinion



HiPPO Challenge

- Typical Challenge:
 - Incorporate new information as a model input
 - » Market Research
 - » Historical Value
 - » HiPPO Generated

Copay?

We think 25% of patients will have a \$10 copay... be sure to factor that in.



HiPPO Challenge Response

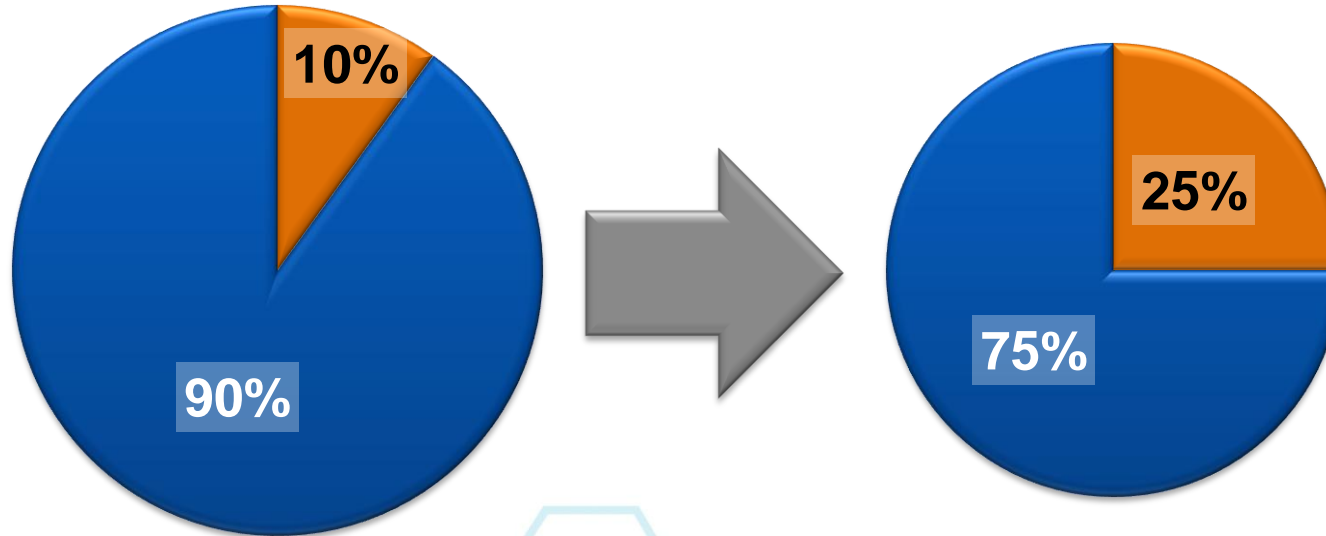
- Typical Response:
- Better Response:
 - Drop Cases
 - Bootstrap
 - Profile & Impute
 - Monte Carlo Simulation



Drop Cases

...25% of patients will have a \$10 copay...

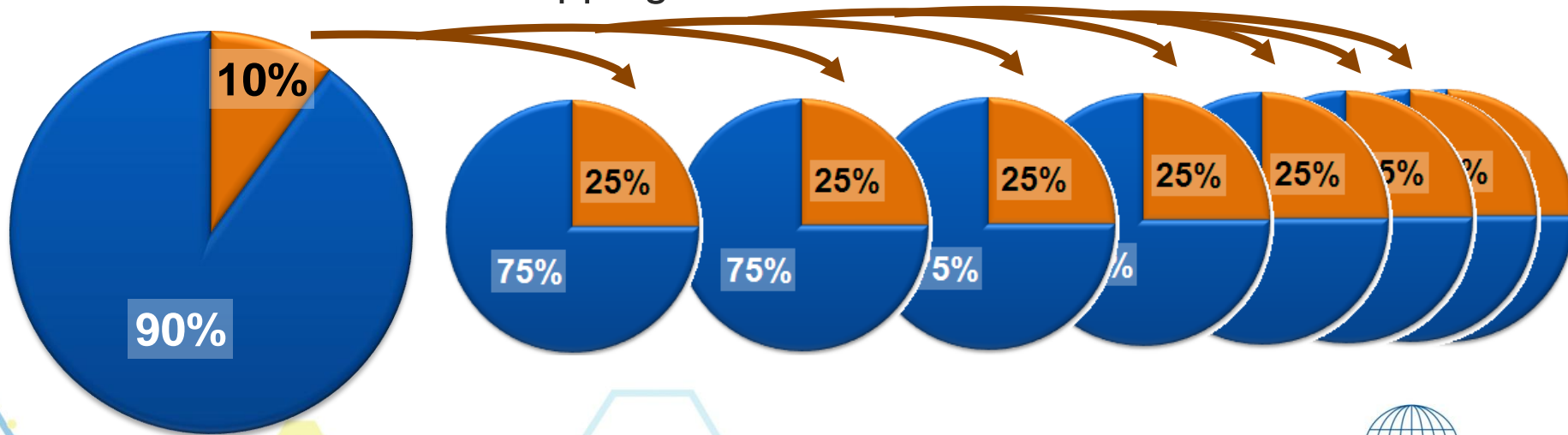
- Requires that “copay” is a variable in the data set.
- Simply drop cases until reaching the desired proportion.



Bootstrap

...25% of patients will have a \$10 copay...

- Requires that “copay” is a variable in the data set
- Bootstrapping: resampling technique
 - Partitioned Bootstrapping



Profile & Impute

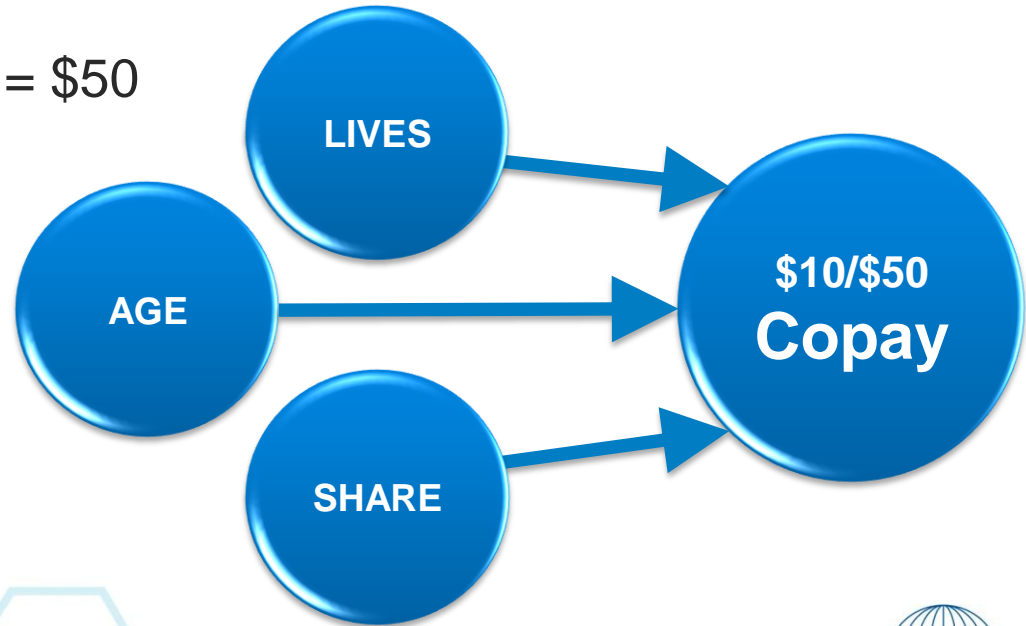
...25% of patients will have a \$10 copay...

- Copay isn't a variable in the data set
 - Moving from PREDICTION to SIMULATION
- Develop a Profile: *Where should we see a \$10 copay?*
 - Smaller plans (LIVES)
 - Younger populations (AGE)
 - Higher market share (SHARE)
 - Not \$10? Other 75% will have copays as high as \$50

Profile & Impute

...25% of patients will have a \$10 copay...

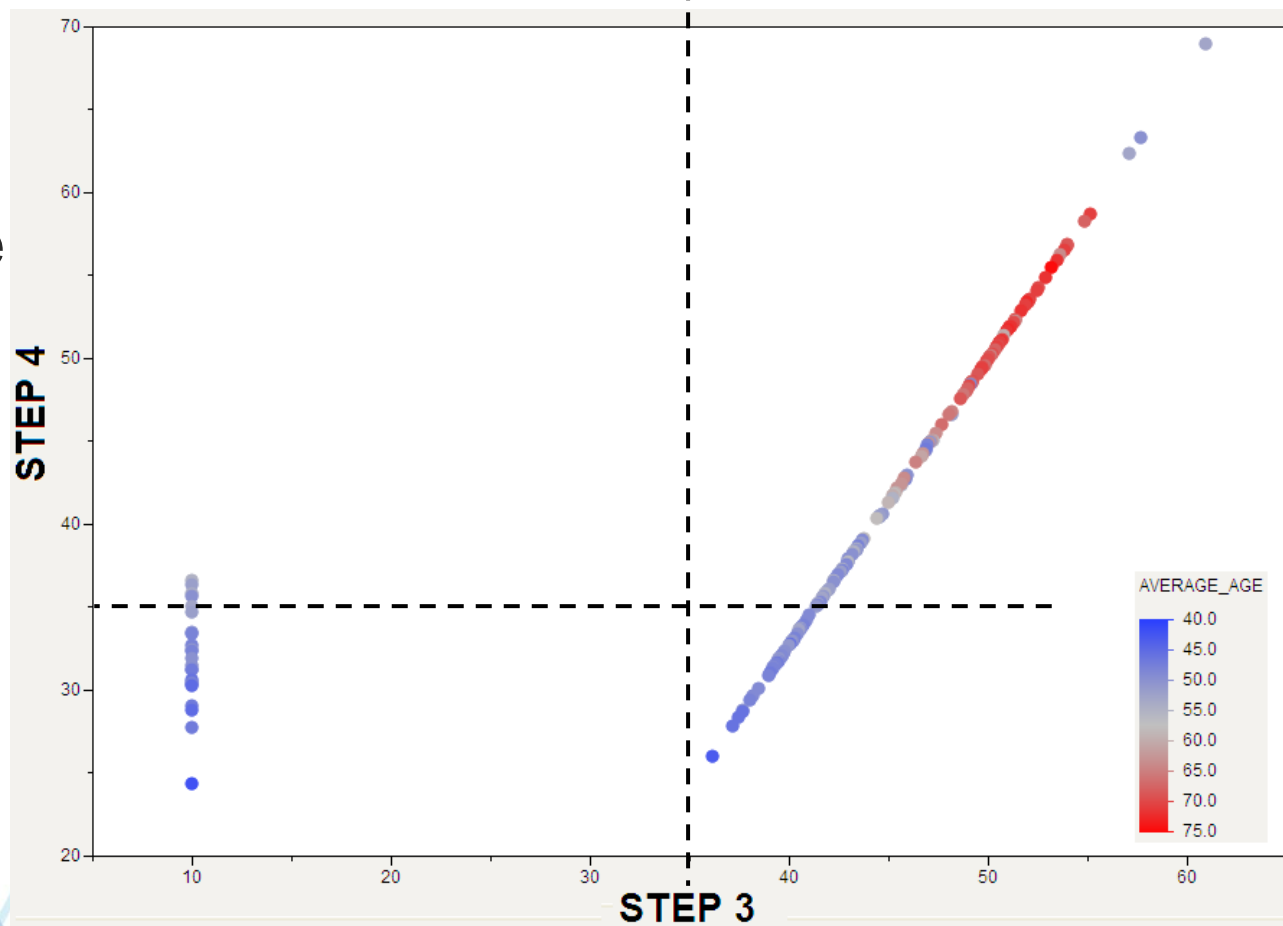
- 1) Identify 15-20% of cases matching “profile” best
 - Set their copay = \$10
 - Set remaining copays = \$50
- 2) Regression:
 - Save the prediction



Profile & Impute

- 3) Replace \$50 copays with predicted value (*retain \$10 value*).
- 4) Re-run regression with new copay & establish scoring cut-off.

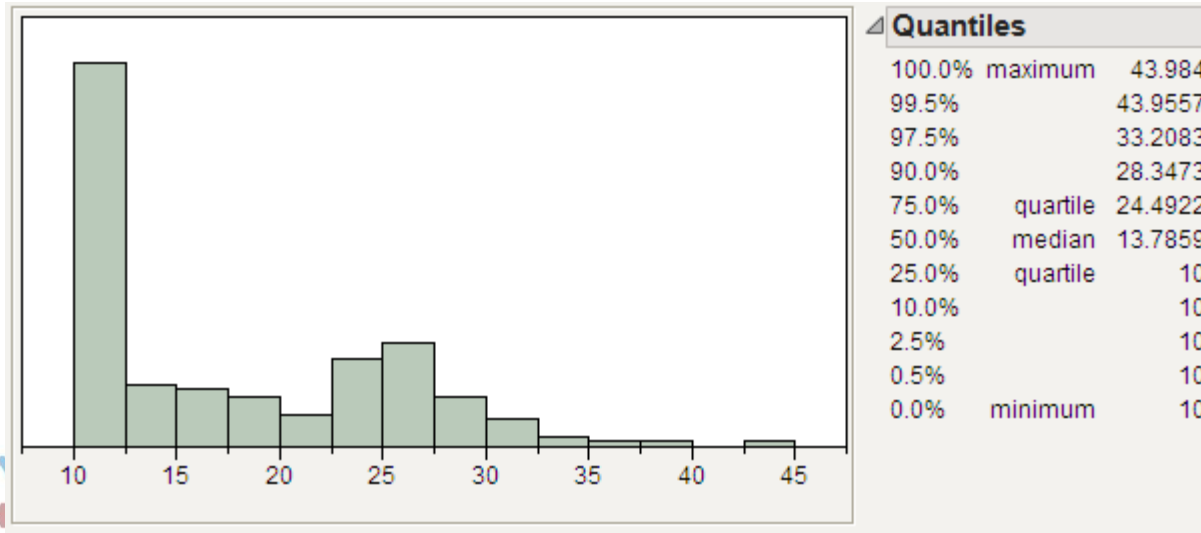
...25% of patients will have a \$10 copay...



Profile & Impute

...25% of patients will have a \$10 copay...

- 5) Apply cut-off ($<\$35 \rightarrow \10) & subtract \$24 from remaining values.
- 6) Evaluate resulting distribution & correlation matrix:



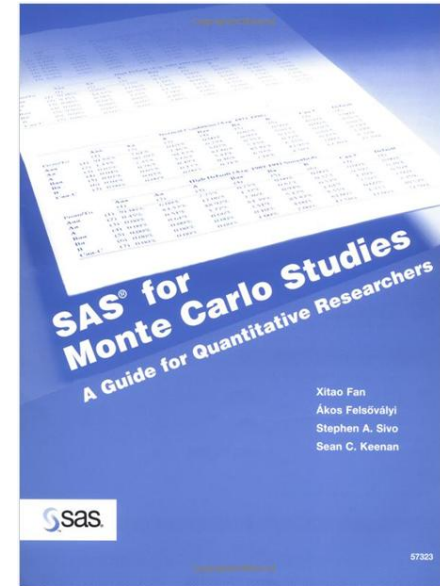
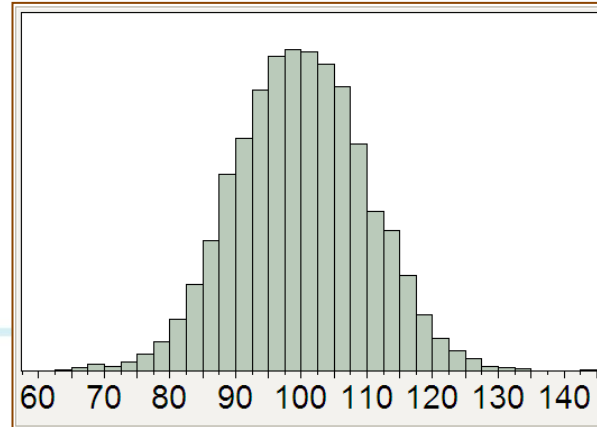
	Copay
LIVES	$r = +0.35$
AGE	$r = +0.62$
SHARE	$r = -0.32$

Monte Carlo

...25% of patients will have a \$10 copay...

- Copay isn't a variable in the data set
- What is a “Monte Carlo Simulation”?
 - Allows you to take a single estimated value and construct a distribution with a specified standard deviation where that estimate is the mean.

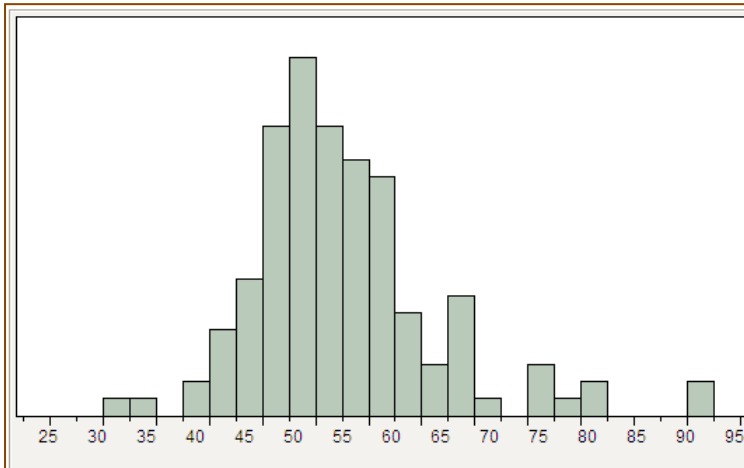
100 ± 20



Monte Carlo

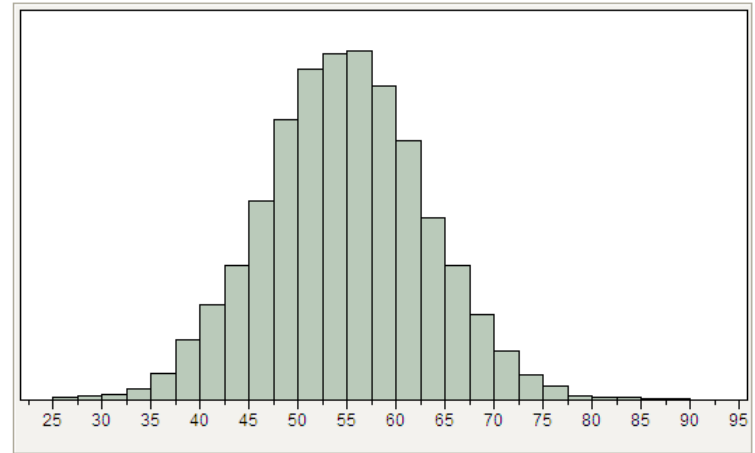
...25% of patients will have a \$10 copay...

- Create a Monte Carlo simulated version of each of the “profile” variables:
 - Based on your original data, historical data, expectations, or a ‘best guess’.



Original Data

**A
G
E**

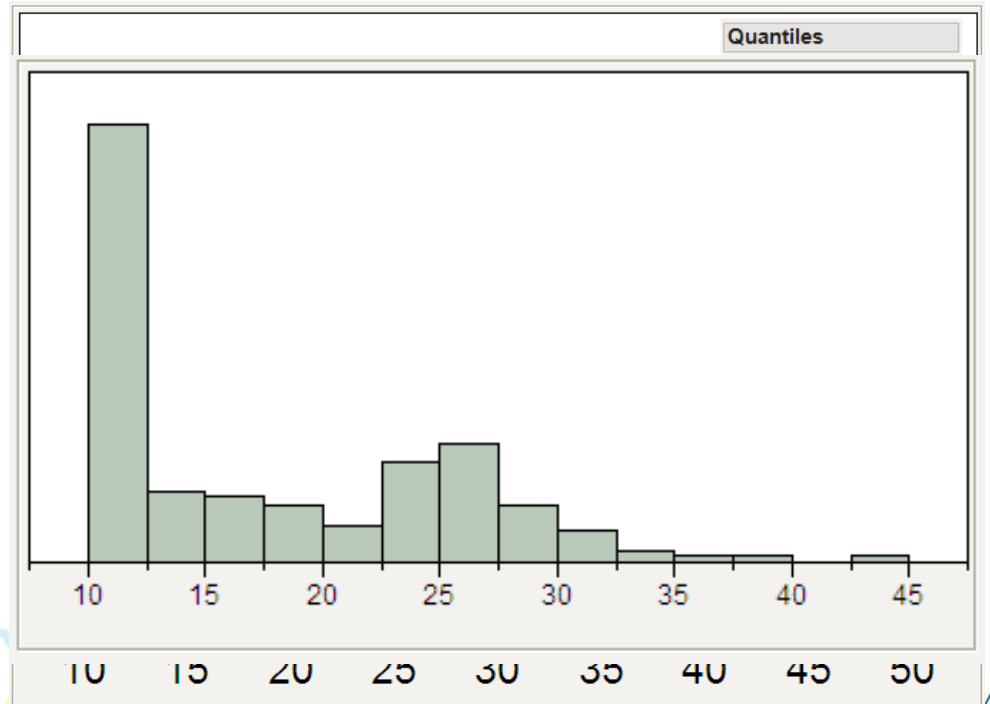


Monte Carlo Simulation

Monte Carlo

...25% of patients will have a \$10 copay...

- For each variable (including our outcome, “copay”) we can precisely specify:
 - Mean
 - Standard Deviation
 - Shape of Distribution (skewness & kurtosis)
 - Intercorrelations with other simulated variables



Monte Carlo

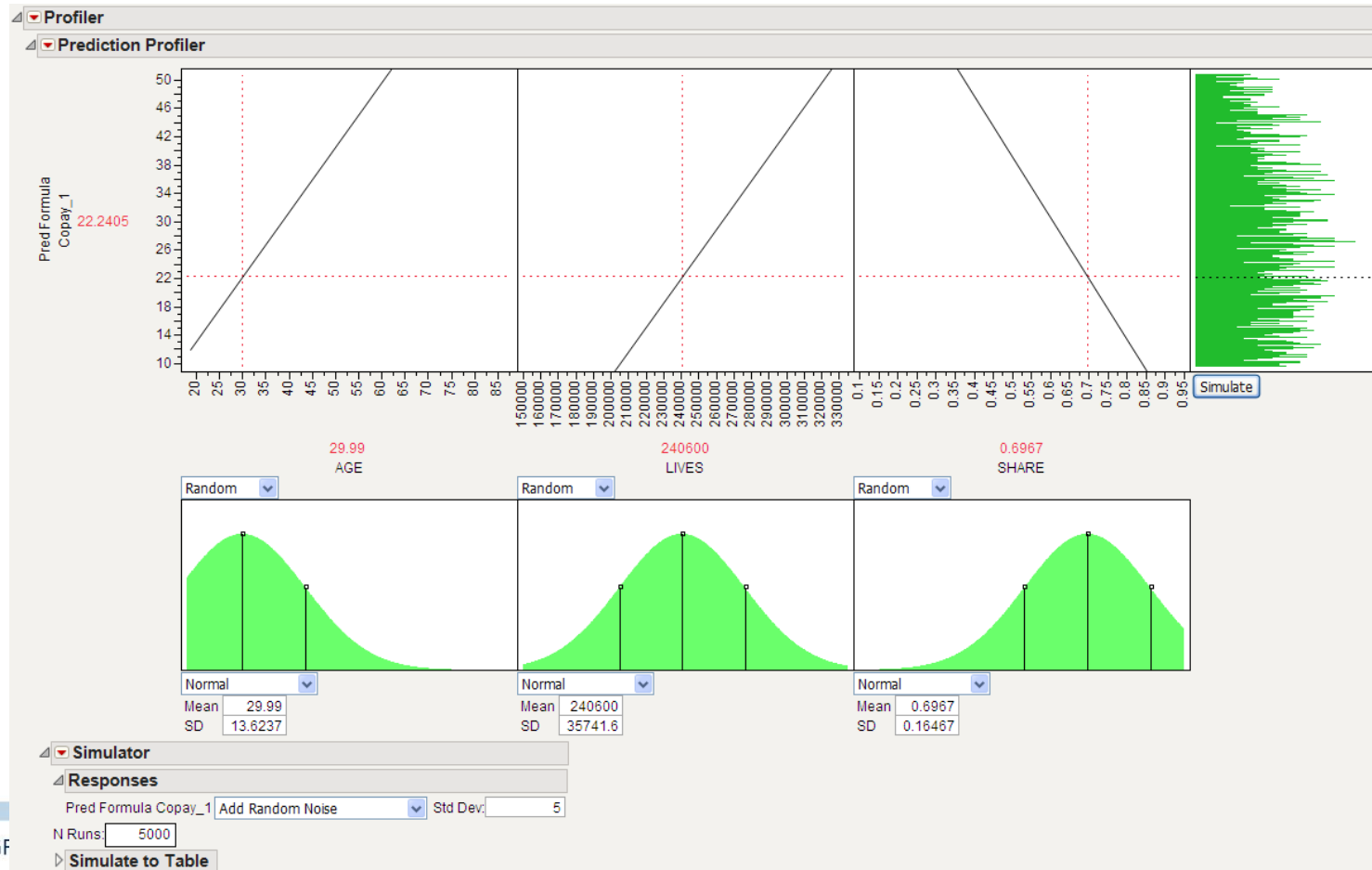
...25% of patients will have a \$10 copay...

- Can work with a completely simulated data set
- In our example:
 - Generate a regression equation using the simulated data set

$$y_{\text{COPAY}} = \beta_{\text{AGE}} + \beta_{\text{LIVES}} + \beta_{\text{SHARE}} + C$$

- Apply that equation to the original data set to calculate the new “copay” variable.

JMP Profiler & Simulator



Summary: HiPPO Challenge

Variable in data set?	Technique	Advantages	Disadvantages
Yes	Drop Cases	<ul style="list-style-type: none">• Fast• Simple	<ul style="list-style-type: none">• Loss of Power• Loss of Information
Yes	Partitioned Bootstrapping	<ul style="list-style-type: none">• Superior to 'Drop Cases' in a number of ways	<ul style="list-style-type: none">• Can be effortful to carry through all subsequent analyses
No	Profile & Impute	<ul style="list-style-type: none">• Relatively Fast• Relatively Simple	<ul style="list-style-type: none">• Too many to list!• A 'Frankenstein' approach
No	Monte Carlo Simulation	<ul style="list-style-type: none">• Superior to 'Profile & Impute' in a number of ways	<ul style="list-style-type: none">• Specialized programming skills needed• Time Consuming

HIPPO KEEP YOUR
HAPPY!



Questions?

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Washington, D.C.

March 23–26, 2014