Forecast Health* Outperforms Competitors on Predictive Accuracy

** Forecast Health was acquired by Lumeris in April 2017*

Executive Summary

The Society of Actuaries' (SOA) recently published their study titled "Accuracy of Claims-Based Risk Scoring Models". It evaluated 11 vendors including Forecast Health (others included 3M, DxCG, Hopkins, Milliman, Optum, SCIO, and Truven, now an IBM company). The last evaluation was in 2007. In this 2016 study, all vendors were evaluated on their ability to predict costs using Truven Marketscan® commercial claims dataset of 1 million members.

Unlike its competitors, Forecast creates custom models for each of its clients. For this reason, the SOA states in their report on page 54 that they presented Forecast's results in a separate section of the study. But all the vendors were assessed on the same 1-million life dataset and the measures are identical. This cover sheet combines the results from across the different sections of the 90 page SOA study to illustrate in one place how Forecast performed against its peers.

Vendors assessed by SOA include:

- Forecast
- 3M
- DxCG
- Hopkins
- Milliman
- Optum
- SCIO
- Truven, an IBM company

The highlights are that Forecast:

1. **Beat the 2nd best vendor at predicting people with the top 1% of costs by 9%**
   Outperformed all vendors by 9% to 14%
2. **Beat the 2nd best vendor at predicting overall costs when costs per person were capped at $250k by 13%**
   Outperformed all vendors by 13% to 27%
3. **Beat the 2nd best vendor at predicting overall costs when per person costs were uncapped by 25%**
   Outperformed all vendors by 25% to 36%

The study also evaluated the models using R-squared, another measure of predictive accuracy. Using this approach, the results did not reflect Forecast's superior performance. However, the paper concluded that the R-squared measure is susceptible to the influence of outliers and that the methods outlined above are a more robust way to measure models.

Note, the SOA study compared models using claims data only. In real world applications, Forecast integrates claims, clinical and person-level social determinants of health data. This achieves even higher levels of predictive accuracy than what was reported by the SOA, while also helping to identify which high-risk patients are impactable, and what factors are driving their risk.

Forecast's higher predictive accuracy will enable clients to manage person and population risk, underwrite populations, and create high value, narrow networks by pinpointing high risk, impactable members and patients.

Study Details

Predicting Top 1%

The SOA study evaluated the vendors' ability to predict members who would be in the top 1% of costs in the next 12 months. The predictions were evaluated using the measure called the Area Under the Curve (AUC). **Figure 1** below shows the actual AUC results from the study. **Table 1** shows the AUC results and the vendors results as the percent difference from Forecast's results.

Mean Absolute Error (MAE)

The SOA study evaluated the vendors' ability to predict costs in the next 12 months for the entire 1 million life dataset. The predictions were evaluated using the measure called the Mean Absolute Error (MAE). A lower MAE represents higher performance ("lower is better").

The SOA study evaluated the MAE two ways: Costs for when the costs were capped, or "censored", at $250k/year per person (**Table 2**); and costs for when per person costs were not capped (**Table 3**).

Figure 1: Area Under the Curve (AUC) for Top 1% Predictions[1]

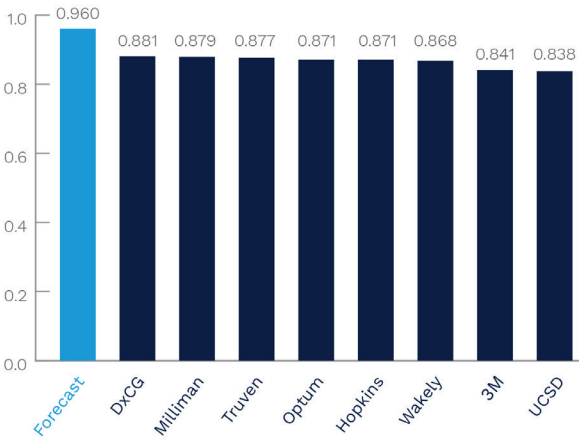

Table 1: Forecast Outperforms 2nd best vendor by 9%[1]

	Predict Top 1%	Difference from Forecast
Forecast	0.960	N/A
DxCG	0.881	9.0%
Milliman (MARA)	0.879	9.2%
Truven	0.877	9.5%
Optum (Impact Pro)	0.871	10.2%
Hopkins (ACG)	0.871	10.2%
Wakely	0.868	10.6%
3M (CRG)	0.841	14.1%
UCSD (CDPS)	0.838	14.6%

Table 2: Forecast Outperforms 2nd Best Vendor by 13%[2]

	Capped MAE	Difference from Forecast
Forecast	77.5%	N/A
DxCG	89.1%	13.0%
Milliman (MARA)	90.1%	14.0%
Optum (Impact Pro)	92.5%	16.2%
SCIO	93.5%	17.1%
Truven	94.0%	17.6%
Hopkins (ACG)	94.6%	18.1%
Wakely	95.1%	18.5%
3M (CRG)	97.6%	20.6%
UCSD (CDPS)	105.1%	26.3%
Medicaid Rx	105.7%	26.7%

Table 3: Forecast Outperforms 2nd best vendor by 25%[2]

	Uncapped MAE	Difference from Forecast
Forecast	68.4%	N/A
DxCG	91.2%	25.0%
Milliman (MARA)	91.8%	25.5%
Optum (Imact Pro)	94.6%	27.7%
SCIO	95.8%	28.6%
Truven	96.4%	29.0%
Hopkins (ACG)	96.7%	29.3%
Wakely	97.1%	29.6%
3M (CRG)	99.5%	31.3%
UCSD (CDPS)	107.0%	36.1%
Medicaid Rx	107.6%	36.4%

R-Squared

The predictions were also evaluated using the R-Squared approach. A higher R-Squared represents higher performance ("higher is better"). Forecast did not outperform the other vendors on this measure, but the authors noted "One of the key points stressed throughout the paper is the observation that R-Squared values alone are not sufficient to explain the predictive abilities of a risk scoring model" and that this measure is "particularly susceptible" to the influence of outliers (SOA, page 6).

Tables 4 and **5** show the R-Squared when per person costs were capped and uncapped.

Social Determinants of Health Data

The SOA study compared models using claims data only. It is worth nothing that in real world applications, Forecast integrates claims, clinical and person-level social determinants of health (SDH) data into the models. This achieves even higher levels of predictive accuracy than what was reported by the SOA. For example, we observe that integration of the person-level SDH data with claims increases performance by 25%. In addition, Forecast's integration of SDH data also helps to identify which high-risk patients are impactable, and what factors are driving the person's risk.

Table 4: Forecast performed at lower end on R-Squared[3]

	Capped R-Squared	Difference from Forecast
Forecast	20.8%	N/A
Milliman (MARA)	27.7%	-24.9%
DxCG	27.7%	-24.9%
Optum (Impact Pro)	25.8%	-19.4%
Truven	26.4%	-21.2%
Wakely	23.7%	-12.2%
Hopkins (ACG)	23.7%	-12.2%
3M (CRG)	21.7%	-4.1%
SCIO	22.4%	-7.1%
UCSD (CDPS)	13.3%	56.4%
Medicaid Rx	12.8%	62.5%

Table 5: Forecast performed in the middle on R-Squared[3]

	Uncapped R-Squared	Difference from Forecast
Forecast	19.7%	N/A
Milliman (MARA)	24.8%	-20.6%
DxCG	23.8%	-17.2%
Optum (Impact Pro)	20.7%	-4.8%
Truven	20.7%	-4.8%
Wakely	18.5%	6.5%
Hopkins (ACG)	17.8%	10.7%
3M (CRG)	17.0%	15.9%
SCIO	15.1%	30.5%
UCSD (CDPS)	10.0%	97.0%
Medicaid Rx	8.6%	129.1%

Endnotes

1 *Data from Society of Actuaries 2016 publication titled "Accuracy of Claims-Based Risk Scoring Models" Figure 5, page 46, and Section 5.3, page 55.*

2 *Data from Table 4.2.2, page 19, and Section 5.3, page 54.*

3 *Data from Table 4.2.2, page 19, and Section 5.3, page 54 and 55.*