Background

Presently, a large national employer ("employer") receives risk score reporting from both a competitor and HCMS on the same population. The employer's benefit staff are interested in understanding the differences in risk scoring output in order to make the most informed decisions on the appropriate use and interpretability of the reports that utilize these scores. The following documentation represents the results of an educational project comparing the two different risk scores for a defined benefit enrolled population. The specific intent of this project was to empirically compare the competitor risk scores to the HCMS HUI risk scores on the same set of individuals in the same time period. The following explains the methodology used in this project and presents the key output of the comparisons.

- HCMS HUI scores and competitor risk scores are both used by the employer to measure the health risk within populations of employees and dependents.
- Both scores are created from an individual's medical and drug claims data. The HUI is also built from employee lost-time information, including short-term disability, long-term disability, and workers' compensation.
- A comparison of the two scores is desired to highlight performance similarities and differences under various scenarios, including the ability to predict and identify individuals with high costs.

Methods

The employer provided HCMS with a set of risk scores for a subset of employees that were enrolled in the health plan and had at least one claim. For the purpose of this analysis, both the HUI and competitor scores were produced retrospectively and outcomes were measured during the same time period used to build the scores.

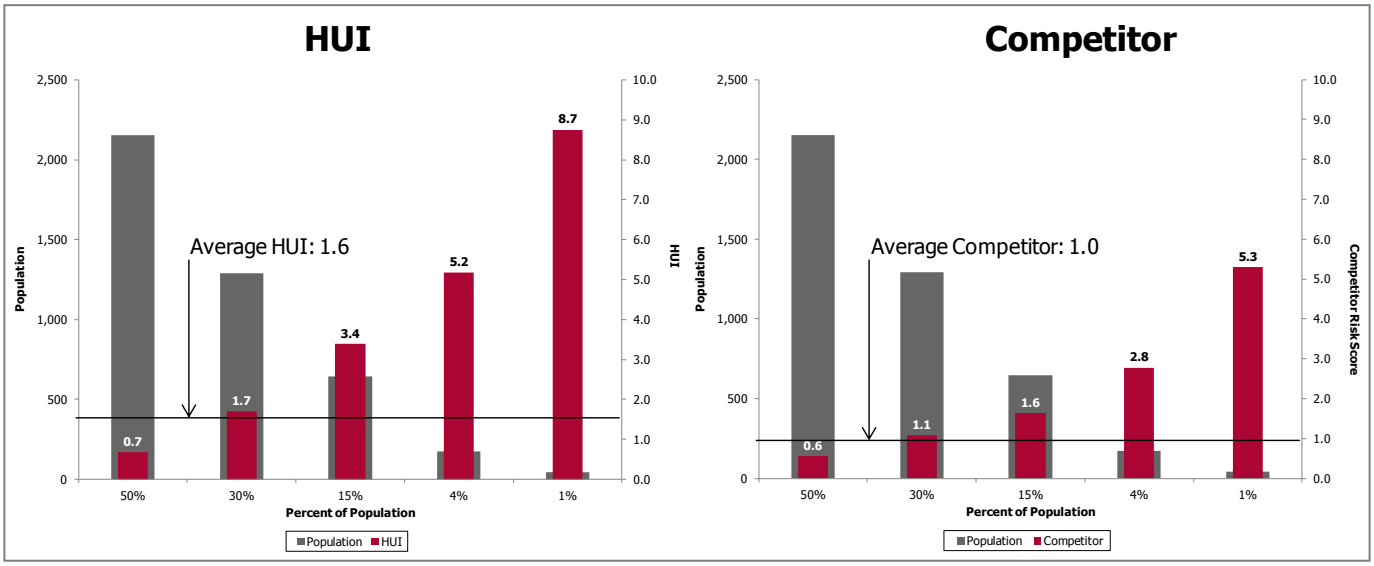
July 2012 competitor risk scores were used. HUI scores and costs were calculated on the 12-month time period from August 1, 2011 through July 31, 2012. The competitor scores appear to be normalized to the employer's population, where a value of 1.0 equates to the average risk person at the employer. The HCMS HUI is typically normalized to our entire Research Reference Database which includes data on over 3.3 million individuals, where a score of 1.0 equates to the average risk person in our collection of employer data. To ensure that the comparison was as fair as possible, the HUI score was also normalized to the employer's average and standard deviations were also normalized between the two risk scores.

Regression modeling was used to compare the predictive power of the competitor's score versus the HUI on concurrent outcome metrics, including integrated cost (health plan and lost time) and the likelihood of being a high-cost claimant. When integrated, cost was used as the dependent variable, a log transformation of cost was used to normalize the distribution, and a linear regression model was used with either the competitor risk score or the HUI as the only independent variable. The coefficient of determination (R^2), which measures the percent of variance explained in the dependent variable, was then used to compare the performance of the competitor risk score against the HUI. When examining the likelihood of being high-risk, logistic regression was used and a pseudo-R^2 was calculated to compare performance.

Results

Unscaled HUI scores for this population ranged from 0.7 for the least expensive "50% population" (bottom 50%) to 8.7 for the most expensive "5% population" (top 5%) with a mean of 1.6. The competitor risk scores ranged from 0.6 for the bottom 50% to 5.3 for the top 5% with a mean of 1.0. As noted above, it was assumed that competitor scores had already been scaled to an average of 1.0, while an unscaled HUI score of 1.0 representing the mean from the Research Reference Database.

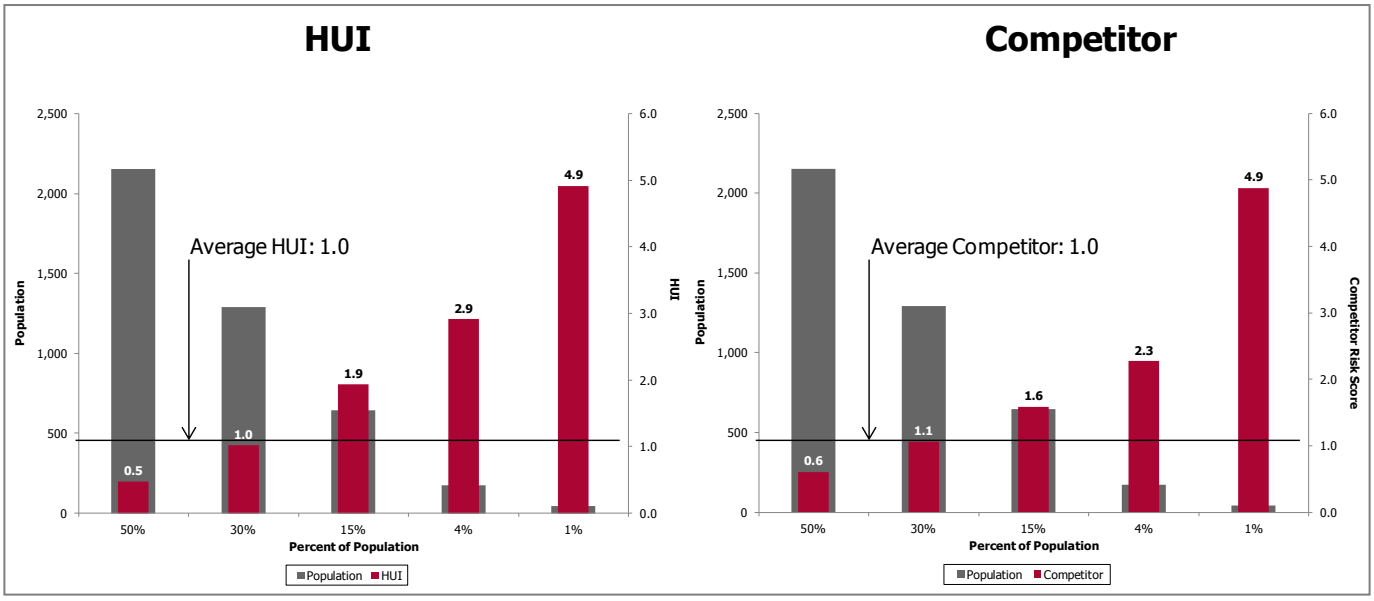
Figure 1: Employee HUI and Competitor Comparison, not standardized to a mean of 1.0 and a standard deviation of 1.0



Key Finding: Non-standardized comparisons reveal the HUI's ability for the employer to compare their overall population to a large employer benchmark score in addition to a risk distribution of score within its own population.

For purposes of the remaining analysis, both HUI and the competitor's risk scores were normalized to have a mean of 1.0 and standard deviation of 1.0.

Figure 2: Employee HUI and Competitor Risk Score Comparison, standardized to a mean of 1.0 and a standard deviation of 1.0



Key Finding: The distributions of the scaled HUI and the competitor scores were similar, as shown in Figure 2.

The following tables show the results of the regression models that related each score to costs and likelihood of having high costs. Results are shown for employees, adult dependents, and child dependents.

Table 1: Employee HUI and Competitor Comparison

Metric	N	R^2 When Compared to Integrated Cost	
		Competitor	HUI
Entire Population Cost	4,307	0.27	0.48
Population with Disability Cost	515	0.02	0.34
Top 5% Cost	215	0.22	0.24
Likelihood of Being High Cost	4,307	0.26	0.45

Key Findings:

- Both types of scores were strongly associated with the costs of the entire employee population, the costs of the top 5% of employees, and the likelihood of being in the top 5% of employees.
- In each case, the HUI explained more of the cost variability than the competitor's risk score.
- The HUI's use of a broader set of integrated lost-time metrics including disability data led to a stronger association with high costs.

Table 2: Adult Dependent HUI and Competitor Comparison

Metric	N	R^2 When Compared to Health Plan Cost	
		Competitor	HUI
Entire Population Cost	1,933	0.27	0.42
Top 5% Cost	96	0.29	0.44
Likelihood of Being High Cost	1,933	0.45	0.51

Key Findings:

- For adult dependents, both types of scores were strongly associated with the costs of the entire adult dependent population, the costs of the top 5% of adult dependents, and the likelihood of being in the top 5% of adult dependents.
- In each case, the HUI again explained more of the cost variability than the competitor risk score.

Table 3: Child Dependent HUI and Competitor Comparison

Metric	N	R^2 When Compared to Health Plan Cost	
		Competitor	HUI
Entire Population Cost	1,903	0.12	0.33
Top 5% Cost	95	0.11	0.41
Likelihood of Being High Cost	1,903	0.30	0.34

Key Findings:

- For child dependents, both types of scores were strongly associated with the likelihood of being in the top 5% of child dependents.
- The HUI score was strongly associated with the costs of the entire child dependent population and the costs of the top 5% of child dependents.
- In each case, the HUI again explained more of the cost variability than the competitor risk score.

Conclusion

- Both scores behaved similarly when data was limited to Medical and Rx only and were associated with employee costs and the likelihood of being in the top 5% of costly employees.
- HUI scores were a stronger risk and cost indicator when limited to dependent and child populations.
- The HUI's use of a broader set of integrated lost time metrics including disability data produced a stronger association with high costs and risk prediction.