

# Predictive Modeling

## NEWS

## Healthways Details Tools for Targeting Patients for Intervention

Identifying the right individuals at a time when prevention is possible is the key

by Russell A. Jackson

"Five principal rules govern healthcare costs within a total population and should guide the targeting of care management interventions. Predictive modeling can improve the targeting of care management programs by mathematically determining the likelihood of defined outcomes." That's according to "Maximizing Care Management Savings Through Advanced Total Population Targeting," from a recent issue of *Outcomes & Insights in Health Management*, a publication of Healthways Inc.'s Center for Health Research. Here are excerpts, providing a look at how Healthways defines those rules and at how it uses predictive modeling to find the right candidates for effective intervention.

**There are five rules of healthcare costs.**

[1] *Cost distribution across a population is static.* Segmenting a population into spending brackets from year to year shows that the percent of the population within each bracket remains relatively constant over time. Healthcare spending is low for the majority of individuals and high for relatively few. Healthcare costs for individuals are not normally distributed around the population mean, because individuals with exceedingly high costs – the outliers of the population – skew the average cost upward.

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## Leading Healthcare Actuaries Announce Advanced Risk Adjustment for the Road Ahead

Better guidance on insurance decisions with a focus on results

Contributed by Milliman Inc.

As the government orchestrates new policies to reform healthcare, it is imperative that health plans and providers become more strategic about risk evaluation and management. Simply having business intelligence tools that serve up cost and utilization data -- or simply having older risk adjustment methods that produce one relative risk score on an individual -- is no longer an adequate solution. If reform requires plans to accept all applicants, adequate risk recognition becomes imperative. An inadequate system of risk adjustment could put health plans at a disadvantage under proposed health reform scenarios. Plans and their at-risk providers need only take a lesson from the Medicare Advantage program. Despite payments made for risk selection, boosting income from the federal government has proved difficult. Currently, Medicare risk adjustment models serve up just one overall risk score that explains only 11% of spending<sup>1</sup>, reflecting risk that can be as stale as 18 months old.

Whether health reform passes or not, plans and providers are calling for better risk adjustment tools coupled with the expertise to make the best use of them. Health plans are investing in new approaches to manage risk; those new approaches require more insight than ever before. Important risk management strategies that will benefit from improved risk adjustment include underwriting and provider payment reforms and cost and care management efforts. Delivery system redesign, such as medical homes and accountable care programs, requires risk adjustment that is guided by highly qualified risk management expertise.

Despite huge investments in business intelligence tools, many plans remain data-rich and insight-poor. According to William Bluhm FCA MAAA FSA, a leading health actuary and modeling expert with Milliman's Minneapolis practice, "we developed Milliman Advanced Risk Adjusters, or MARA, because clients told us they wanted better guidance on insurance decisions -- particularly those affecting underwriting, rate setting and provider payment arrangements. We responded by improving on standard risk adjusters, through a focus on results that are more valuable to the working health plan."

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**Modeling Episode Payment...continued**

"In some ways, the equation expressed in the chart addresses the great unknown of healthcare quality improvement: How do investments in systems of care translate into actual improvements in patient outcomes and cost reduction?" D'Andrea points out. "While we cannot claim that our PAC rate equation answers the question definitively, we do assert that it has the correct properties that one would expect from any such equation."

He continues: "We set up the model to run through 1,000 iterations. In each, the physician's investment in avoiding PACs varied randomly between \$0 and \$500,000. Recall that the average total bonus potential was about \$540,000. A physician investing \$0 would be making no effort to reduce PACs, while a \$500,000 investment would represent a very significant effort, as it would consume almost the entire potential bonus. Each iteration of the model also generated a new patient population; while the underlying probabilities remained the same, random variation meant that some patient populations had more risk factors present than others. While such riskier populations have higher bonus potentials than average populations – because the Prometheus ECRs are adjusted based on patient risk and complexity – they also have a higher probability of PACs and the higher costs associated with them."

For each iteration, the key output was the physician's net bonus. "Recall that the potential bonus is the difference between the Prometheus ECR payment for all the patients and what the physician would have received under fee-for-service payment," D'Andrea goes on. "The net bonus is the potential bonus minus any investments the physician makes to prevent PACs and any costs for treating those PACs that do occur. Over 1,000 iterations, the average net bonus was about \$57,500, with a standard deviation of \$43,000. The maximum net bonus was \$105,000, and the worst outcome was negative \$64,000; that is, in that iteration, the physician was \$64,000 worse off than under fee-for-service. Those initial results suggest a high volatility, with the standard deviation being very large."

What's driving that volatility? First, look at population risk. Are physicians with a riskier population losing money, while physicians lucky enough to get a healthy population are making money? A glance at a scatter plot of net bonuses as a function of population risk shows that's not the case. Indeed, visual examination of the scatter plot suggests there is little if any relationship between the count of the total number of risk factors in the population and the physician's net bonus, a conclusion confirmed by the very low r-square number in the scatter plot. "It appears that Prometheus Payment's adjustment for riskier patients is fulfilling its purpose," D'Andrea notes, "and physicians are not better or worse off with a risky or less risky patient population."

If population risk is not driving the variation in net bonus, then what is? Says D'Andrea: "Look at the physician's efforts to prevent PACs. There is a connection between the physician's investment to reduce PACs, which is one of the inputs for our PAC prediction equation, and the physician's net bonus." What produces the connection? "At very low PAC prevention efforts, the PAC rate is not reduced significantly and the physician ends up spending a lot of money treating PACs, which consumes most of the potential bonus.

*continued***Modeling Episode Payment...continued**

As the physician's PAC prevention efforts increase, the PAC rates and costs go down, so the net bonus increases." However, he adds, "past a certain point – about \$240,000 – the physician is spending too much on reducing PACs. That is, the money spent preventing PACs is more than the money it would have cost to treat the PACs themselves."

He concludes: "Armed with that knowledge, we can then ask: What is the volatility of the physician's net bonus when the PAC investment is optimized? To answer that question, we ran another thousand iterations of the model, setting the PAC prevention investment to \$240,000 instead of allowing it to vary randomly. The results: The average net bonus was \$102,000, which is very close to the maximum net bonus we observed for the previous simulation. Perhaps more importantly, the standard deviation was \$2,350, suggesting that physicians who optimize their PAC prevention efforts would have a high confidence of achieving the average net bonus of about \$6,000."

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**Leading Health Care Actuaries Announce  
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With hundreds of years of risk management experience among them, industry-leading Milliman actuaries are responding to customer needs with a new suite of risk adjusters.

Jonathan Shreve FSA MAAA, a co-founder of Milliman's risk adjusters, adds that "the major differences in the way we approach risk adjustment design is how we incorporate actuarial expertise – specifically, health plan-related experience -- in the design of models. We more specifically recognized the markers that might lead to particular conditions."

Milliman's data resources, including its Health Cost Guidelines, are a superior resource relied on by more than 100 insurers. They reflect the latest trends, and they deliver deep healthcare cost information for specific geographic areas, benefits, reimbursement structures and plan characteristics. "We believe MARA will be a better fit for those organizations that want the best predictive power and the most insightful scoring," adds Shreve, who also serves as CEO of Milliman's Care Guidelines.

Milliman Advanced Risk Technologies is the first suite of risk adjusters developed by seasoned healthcare actuaries and the first to offer more information on each individual. MARA has three risk adjusters: RxAdjusters, DxAdjusters and Comprehensive-CxAdjusters.

Each projects individual spending for each of four health service categories. That means that for each pass through any of the prospective models, plans get more information on each individual. "In fact, all the prospective models produce six risk scores describing future expenses, including inpatient, outpatient, physician/professional, total medical, drugs and a total illness burden score," according to Diane Laurent, managing director of Milliman's Advanced Risk Technologies.

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## Leading Health Care Actuaries Announce...continued

Because every plan has unique claim management arrangements, data delays can seriously influence risk predictions. The software suite starts with the modeling "engine," a library of medical and pharmacy-based models that also offer users a choice of three lag scenarios. Users can select 0-, 3- or 6-month lag models for each risk adjuster, or an interpolated value between them.

The foundations of the Milliman models benefit from years of actuarial and clinical information and expertise. MARA leverages Milliman's expertise as a provider of superior healthcare information and IT solutions. One of the foundations of the MARA models is Milliman's Medical Underwriting Guidelines clinical classification system for grouping ICD, CPT and NDC codes into more than 1,000 clinically meaningful groups. Using longitudinal analysis, Milliman identified opportunities to refine the models to better stratify persons with chronic conditions. Whether used for individual or group underwriting or as the basis for risk-based provider reimbursement, the results offer a new scoring perspective. MARA customers get improved population risk assessment and more insight from the models and, with Milliman's expert consultative guidance, enjoy improved application of risk adjustment.

Performance of risk adjusters is a big deal for users. Witness the number of published references to the Society of Actuaries Study, "A Comparative Analysis of Claims-Based Tools for Health Risk Assessment," from 2007. Thus, to assure clients of the unbiased information on predictive accuracy of MARA, Milliman actuaries performed the same analysis published in the 2007 SOA Study.

The following chart illustrates Milliman's Advanced Risk Adjusters with comparative performance from the SOA Study results:

<b>Milliman Advanced Risk Adjusters Performance Comparison for Selected Vendors</b>				
Shown for Offered Models without Prior Cost				
R-Squared for Prospective, Non-Lagged, 250K Truncation				
Risk Adjuster Tool	VENDOR	Inputs	Offered Models	
			R <sup>2</sup>	MAPE \$
<b>Diagnosis-based Models</b>				
Milliman Advanced Risk Adjusters - DxAdjuster	Milliman	Diag	24.09%*	\$3,925*
DxCG DCG	Verisk/DxCG	Diag	20.6%*	\$3,976*
Ingenix ERG	Ingenix	Med + Rx	19.7%*	\$3,926*
ACG	Johns Hopkins	Diag	19.2%*	\$4,085*
<b>Pharmacy-based Models</b>				
Milliman Advanced Risk Adjusters - RxAdjuster	Milliman	Rx	21.40%*	\$3,867*
DxCG RxGroups	Verisk/DxCG	Rx	20.4%*	\$3,876*
Ingenix PRG	Ingenix	Rx	20.5%*	\$3,899*
<b>Models that use more data</b>				
Milliman Advanced Risk Adjusters – Comprehensive - CxAdjuster	Milliman	Med + RX	28.80%*	\$3,776*
DxCG UW Model	Verisk/DxCG	Diag+\$Total	27.4%*	\$3,642*
Impact Pro	Ingenix	Med+Rx+Use	24.4%*	\$3,717*
ACG - w/Prior Cost	Johns Hopkins	Diag+\$Rx	22.4%*	\$3,865*
<b>Reprinted with permission.</b> This table is based on an original version of a table published in a Milliman, Inc. paper titled, "A Comparative Analysis of Claims-Based Tools for Health Risk Assessment," in a Society of Actuaries' Health Research Project of the same name, "A Comparative Analysis of Claims-Based Tools for Health Risk Assessment." It can be found on the SOA Web site at <a href="http://www.soa.org/files/pdf/risk-assessmentc.pdf">http://www.soa.org/files/pdf/risk-assessmentc.pdf</a> .				
*HIGHER R-SQUARE AND LOWER MAPE\$ IS BETTER.				

MARA customers also enjoy a technical advantage because the software is a ubiquitous solution supporting Windows, Unix or Linux environments. It can include a graphical user interface or, for plans or technology partners that prefer integrated processing, an API is included.

Laurent concludes: "Milliman Advanced Risk Adjusters pharmacy models also dovetail with Milliman's IntelliScript prescription history reporting for a powerful individual underwriting tool. Plus, MARA integrates with MedInsight, Milliman's powerful business intelligence and analytic reporting software."

To learn more about Milliman Advanced Risk Technologies, contact [ART@Milliman.com](mailto:ART@Milliman.com).

<sup>1</sup>Risk Adjustment of Medicare Capitation Payments Using the CMS-HCC Model. Pope, et al, Health Care Financing Review, Summer 2004, Volume 26, Number 4, Page 124: "Adding all 38 interactions barely increased the base DCG/HCC model's R2 (from 11.10 to 11.13 percent)."