SOCIETY OF ACTUARIES

Article from:

Health Watch

May 2012 – Issue 69

Health Care (Pricing) Reform

By Syed Muzayan Mehmud

Introduction

Health care reform poses an assortment of pricing challenges for the health care actuary. Some of these we have dealt with before, and some are new. This article focuses on those challenges that necessitate a re-think of the tools and methods that health actuaries typically use in pricing.

In terms of methodology and technique, many reform-related changes do not require abandoning established pricing practices. The adjustments needed to current models may be complex, but do not require building a radically new toolset.

Then there are other changes which may require innovations in pricing methods and techniques in order to address them satisfactorily. This article presents four such changes. The discussion below does not focus on policy or on quantifying the answers. The goal is to introduce new ways of thinking about old problems that would make the job of pricing health care costs more sound, efficient, and reflective of underlying uncertainties in actuarial estimates.

Beyond Counting

At the core of a pricing exercise is an appropriate valuation of health care cost—historical and projected health care. An example is developing utilization and unit cost of preventive services. The typical approach towards this type of pricing is summarizing historical data from a certain source in a deterministic model that produces point estimates for analysis. This process is resource intensive, is replete with issues around inadequate or insufficient data, and produces results that can be inconsistent across data sources.

The empirical technique of summarizing, or if I may, *counting* utilization/cost has served pricing exercises well. It is a simple method that is easy to implement. There is however a better way, one that especially under the myriad of benefit options to be modeled under changes posed by reform offers a more robust, consistent, efficient, and credible way to model health care resource use. We could also do well with moving away from point-estimates and developing scenarios of varying likelihood (i.e., confidence intervals) around our priced estimates.

The 'innovation' I would like to describe is actually not a new idea at all. All of us have learned it during our training and exams. I am talking about parametric distributions that model health care cost. These distributions can be fitted for overall cost and just as well for subcategories such as preventive care or ER, etc. Adjustments for copay,

CONTINUED ON PAGE 26

Syed Muzayan Mehmud, ASA, FCA, MAAA, is a consulting actuary with Wakely Consulting Group in Englewood, Colo. He can be reached at *syedm@wakely.com*.

cost sharing and other popular benefit design variations fall elegantly out of the modeled distributions without additional modeling overhead. And finally, confidence intervals can also be constructed as a natural extension of this modeling framework.

Imagine a reference manual that has fitted parametric distributions as well as a menu of parameters to tailor them to specific situations. Multiple data sources (public and private) can be utilized in a Bayesian modeling approach in order to develop a robust family of probability density functions for various health care service categories. As research turns up more evidence, or if an organization's own data are available, the modeled distributions can be adjusted to the extent the new information is credible in relation to that which is already incorporated. We are using a patchwork of models sliced and diced from disparate sources yielding a distribution of answers to the same question. If we can have a repository of modeled distributions that can easily be credibility-adjusted to specific client data, we can rest assured in the quality of these estimates and focus attention and time away from data and towards higher-level pricing functions.

Use of Non-Traditional Variables

Risk adjustment is an important piece of reform. Variables traditionally used in pricing morbidity risk include demographic information, diagnosis codes, and national drug codes (NDCs) from pharmacy data. However there exist other variables with the potential to supplement claim data vis-à-vis risk assessment; these include information such as income, education, and information on lifestyle.

Economists have long studied the positive correlation of health care with almost every positive indicator of socio-economic status. The impact of non-traditional variables in assessing risk has not yet crossed over into mainstream risk adjustment methodologies, but it may be of great interest to actuarial pricing in a risk adjusted environment that only utilizes traditional variables. The math is simple and compelling. Say we have two diabetics of the same age and gender, one in an urban low income setting and one in a suburban high income area. If these two have markedly different costs on average (and econometric literature suggests that they do) then this difference in cost is up for grabs. A plan attracting high income folks with a certain condition will receive the same credit from a traditional risk scoring model as another that attracts low income individuals with the same condition—but the high income folks will likely have much more favorable experience. Traditional variables mitigate the potential for selection; however, they do not eliminate it.

The entities implementing a risk assessment methodology will need to think carefully through what non-traditional variables can be incorporated into the risk pricing model such that the goal of mitigating selection is advanced, while plans in a competitive environment will be highly incented to look for other variables not yet incorporated into the pricing methodology but that explain variation *beyond* which is already captured.

Uncertainty in Risk Adjustment

An important area where uncertainty in actuarial calculations is not currently recognized is risk adjustment. Risk adjustment is a critical concern for health care organizations as the amount that gets adjusted can exceed profit margins. It is also of vital importance to governmental entities to ensure that the policy goals of risk adjustment are met. Currently we have the tools to estimate whether an individual, group, or plan has an x% risk relative to the average—but we do not have tools that tell us what the confidence interval is around that point estimate of future risk. Risk score predictions are far from perfect, and recognition of probable ranges where the right answer will fall can offer significant help in anticipation of and preparation for a set of outcomes.

To develop this concept further, there are two key questions for a risk adjustment application. One question is whether any risk adjustment is justified at all given an observed difference in risk scores and the underlying variance in predictions. This is a question that requires computing the statistical significance of an observed difference in (typically group level) risk scores. The second question is that given the observed difference is significant, how confident can we be that the predicted risk score will be equal to or close to actual risk? This requires innovations in terms of development of a bootstrap methodology that allows calculation of confidence intervals around risk score point estimates.

The Affordable Care Act (ACA) establishes a risk adjustment program for all non-grandfathered individual and small group plans inside and outside of an exchange. The pricing challenge for plans is that the risk score for covered members for 2014 is somewhat an unknown quantity. This is a combination of not knowing the members that will enroll, lack of data on the previously uninsured, and also not knowing the risk score of members enrolled in other participating plans as that will affect the risk-related payment transfers. This calls for not only recognizing uncertainty in risk scores for existing enrollees, but performing a simulation that provides ranges of outcomes and associated probability based on scenarios of member movements.

Related to member movement, there is an important characteristic of risk assessment that has historically not been discussed much, but it may need to be addressed in an exchange environment. This is the question of bias in risk scores, which is a component concept of overall uncertainty in risk score estimates. There are various types of bias that need to be addressed but are outside the scope of this article, however one in particular is important to consider here. It is well-known that risk assessment modeling results in over-predicting costs for low cost individuals and under-predicting for higher cost individuals. This means for example that if only higher-cost individuals shift from one plan to another, the risk score that follows them is *biased* downwards, resulting in a lower payment to the plan relative to the transferred risk.

One way to address this potential imbalance is to develop *correction factors* by predicted risk score bands that normalize for this bias. For example, we can empirically calculate the bias by looking at the relativity in actual PMPM by predicted risk score band and compare it to the average risk score within the band. The ratio of these is how much the risk score needs to be increased (or decreased) in order to correct for systematic over/under prediction of low and higher cost individuals. There are subtle consequences of making an ad-hoc adjustment of this nature, and as such this is a good topic for further research and study.

Complexity Science Models of Population Transfers

The pricing challenge for health care actuaries is to determine who will enroll into the plan, their morbidity risk, their associated utilization and costs, how will competitors behave, what payment transfers will be produced by the risk adjustment exchange mechanism, and finally—what is the expected loss ratio. In a certain sense—this section encapsulates the earlier discussion and brings it all together in order to compute the bottom line impact. Developing a pricing methodology for one of these issues is hard enough, how do we put the whole jig-saw together? Oh and by the way, every piece interacts dynamically with every other piece—like completing an evolving puzzle where every piece added changes how other pieces go together.

Traditional actuarial models can be thought of as a "top-down" perspective. Where we take large amounts of health care data, boil it down to a few cells in excel and develop assumptions, estimates, and methods that operate on a highly abstracted level of detail. We are typically applying our trend or other assumptions to cell-based estimates representing thousands of individuals. But those individuals are not the same, do not behave the same, and do not cost the same—do they?

Health care reform presents us with changes that do not have a lot of historical precedent and historical data is not really an option to model out some of the changes. We need an exploratory tool to analyze impact of policy changes. We know a great deal about agents within the system and how they behave, for example how individual policy holders may react to premium changes or to plan offerings, how employers may offer coverage or not depending on tax subsidies, how plans may offer certain benefits or coverage depending on anticipated or experienced loss ratios. However we

CONTINUED ON PAGE 28

do not have a good sense of how these behaviors and interaction of agents will translate into large-scale changes in access, delivery, quality, and cost of care.

Complexity models include micro-simulation approaches which, in contrast with traditional pricing methods, offer a "bottom-up" perspective. Individuals are synthesized and their behavior and interaction with other entities in a system is coded into simple equations or algorithms. The system is then *run* and the impact of various changes in the system can be studied. For example, one can study how the uninsured population will participate in an exchange, what Medicaid expansion will do to the risk profile of the program and associated costs, how competition will play out in an exchange, how a particular risk adjustment mechanism will perform, and estimate loss ratio experience for participants in an exchange.

All of this sounds a little bit like science-fiction and lot like "The Matrix," however it is very real and relevant. Micro-simulation models like the one discussed above have been developed by the Congressional Budget Office and other organizations. Going forward, these models will find increasingly more uses (in particular in pricing) and it is extremely important that this modeling tool is better understood by practicing actuaries. Complexity science has been around for a while, however for the first time it is being used to shape health care policy. Currently it is the domain of econometricians who understand and model the behaviors of individuals and organizations in response to changes in tax policy or the migration patterns and aging of the population. Today presents a great opportunity for actuaries to get involved and further develop the pricing dimension of micro-simulation models to make them even more powerful tools to address challenges posed by reform.

Conclusion

There are four important areas where traditional approaches to actuarial pricing need to be reimagined. The first one is a need for consistent, efficient, and accurate modeling of utilization and costs that also recognizes the uncertainty in such estimates. We need to move toward parametric distribution-based health care estimates rather than point-estimates derived through summarizing data.

The second challenge is appropriate pricing of health care risks in a risk adjusted environment. Traditional variables do not capture the full variation of health care cost, and this article suggests including non-traditional variables in the risk adjustment methodology in order to advance and to preserve the policy goals of a risk adjustment mechanism.

Third, an opportunity to advance pricing of morbidity risk lies in recognizing the uncertainty in health care claim-based risk scores. The article discusses how this uncertainty may be quantified through development of confidence intervals around average point-estimates of risk.

And finally, the fourth challenge is how to aggregate the various pricing models and innovations and tell the big picture story. The article describes modeling complex population movements and market interactions in order to yield ultimately important estimates such as loss ratios and risk adjusted payment transfers. This modeling is accomplished through an agent-based complexity approach.

Change is challenging, but it also represents a great opportunity for us to add even more value than before in important areas such as pricing. The way I see it, we are fortunate to practice in an exciting time that challenges us to develop existing skills and learn new ones. A sense of purpose and meaning in work is a universal yearning—*id temporis carpe diem*! ■

The opinions expressed in this article are solely those of the author. Syed can be reached at Syed@PredictiveModeler.com