

# ENROLLMENT PREDICTION



## Problem Domain

Healthcare Insurance Enrollment Prediction

## Client

Humana Inc., is one of the nation's largest publicly traded health benefits companies with approximately 7 million members.

## Challenge

On January 1, 2006, the government enacted the *Medicare Modernization Act*, which provides seniors and disabled individuals with prescription drug benefits, more choices, and better benefits under Medicare. Health insurance companies had an opportunity to compete to offer new Medicare plans that included prescription drug coverage.

This represented an opportunity but also a significant disruption for the industry since Medicare plans previously had not included prescription drug coverage, and there was no historical data to understand how seniors would react to the new plans. This meant that traditional regression-based models, which rely on historical data, could not be used to estimate enrollment or to guide marketing investments. The complexity of health insurance, coupled with the vast amounts of information disseminated by the government by special interest groups and by competing health insurers meant that seniors would be bombarded with information-with no clear understanding of whether they would be able to process it, or whether they would simply become overwhelmed and either not choose a plan, or choose randomly. How would Humana respond to the uncertainty of the new healthcare policy, as well as try to understand how seniors would make their decision?

## Approach

In our partnership with Humana, we developed a tool called SimSenior to help them better understand how marketing initiatives are influenced by a rich network of interactions. This includes competitive messaging, government information, as well as direct exchange of information between consumers and other members of the healthcare "ecosystem", such as physicians, nurses, pharmacists, service professionals and sales reps.

Icosystem uses a technology known as Agent-Based Modeling (ABM) for simulating, predicting and optimizing consumer behavior. A key premise of ABM is that unlike statistics, which considers high-level correlations between variables based on past observations, ABM uses historical data to derive causal relationships between events and behaviors. This key distinction engenders ABM with certain benefits such as understanding causalities makes it easier to predict future behaviors even in the face of changes such as a new product launch or policy change which cannot be predicted by statistical methods.

In the absence of data, the ABM can still provide meaningful insights and guide the selection of data after the simulation is implemented. Also, an ABM captures the behavior of all elements of the system as they unfold in time, rather than providing a static snapshot. For Humana we designed and tested specific scenarios by setting the characteristics of seniors, how they make choices, product offerings, marketing campaign focus and timing, as well as customer service experience. The results emerged over time as all of these interactions were taken into account to produce the final outcome.

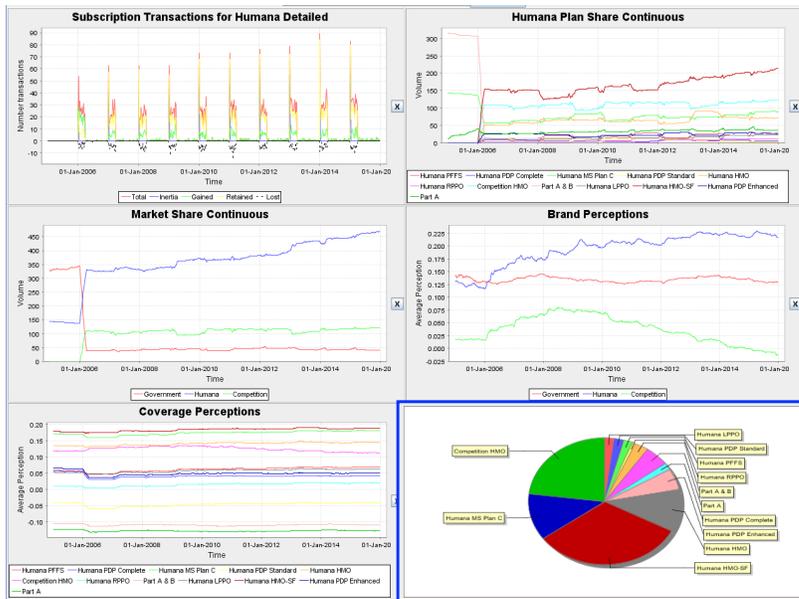
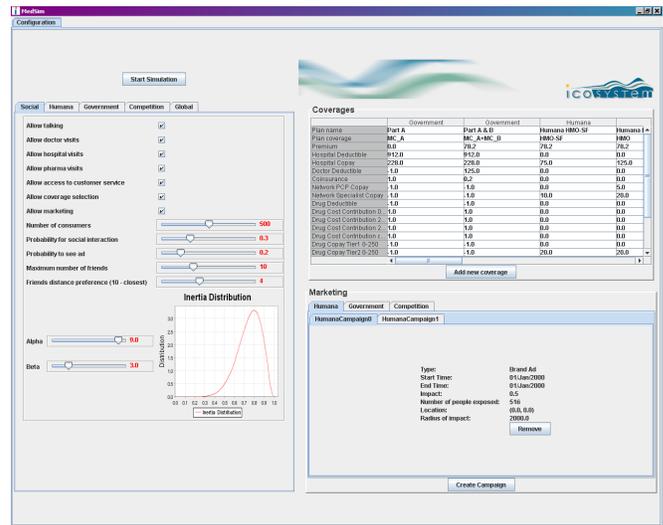
## Outcome

The model predicted widespread adoption of Humana's new offerings. When the new plans actually rolled out, Humana experienced a much greater increase in subscriptions than had been expected by analysts.

The overall results speak for themselves: one year after launch of the new plans, Humana moved from sixth largest to second largest Medicare provider in the nation, with plans in all 50 states, more than one million members in their managed health plans, and 3.6 million members in their prescription drug plan. SimSenior was a key tool in their arsenal, and one that enabled them to make important strategic decisions with a high degree of confidence.

# “We achieved a 100:1 return on our investment” - John Bertko, Chief Actuary, Humana Inc.

- The user is allowed to select values for various parameter sets. Parameters used for social networks include the average number of friends for senior agents, the probability for social interactions, and a number of other factors that jointly determine the likelihood of Word of Mouth (WOM) events at any given time during the simulation.
- Also each Medicare plan is shown, including Government, Humana and its competitors. Each plan is defined in terms of a large number of benefits including monthly premiums, hospital deductibles, copays, and so on.
- Marketing and communication activities can also be captured for Humana or its competitors. Marketing specialists can set up a desired scenario, initial conditions, marketing activities and other relevant parameters.



- Simulating a thousand agents on a week-by-week basis for an entire year only takes seconds on a standard laptop. This makes it easy to run many different scenarios to understand how the different parameters and assumptions lead to different results.
- The report engine allows the user to select nearly any variable or any output metric, and display it either as a time series or cumulative result. Typical result metrics may be year-end market share for Humana versus its competitors, as well as brand perceptions and WOM volume by topic.

Companies and government agencies worldwide rely on Icosystem's predictive analytics and expertise on human decision-making to capitalize on high-potential trends and avoid risk.

For more information on Icosystem and our Healthcare Solutions, please contact Andy Cosgrove 617.520.1032 [acosgrove@icosystem.com](mailto:acosgrove@icosystem.com)



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