



DETECTING FRAUD, WASTE, AND ABUSE WITH PREDICTIVE MODELING

Elder Research developed an advanced analytics prototype to detect potential provider fraud, waste, and abuse. The solution increased fraud detection by a factor of ten and enabled the client to more efficiently target suspect claims for investigation.

INDUSTRY

- » Healthcare Insurance

BUSINESS NEED

- » Develop an advanced analytics prototype to detect potential provider fraud, waste, and abuse for a Medicare and Medicaid Dental Insurance client

SOLUTION

- » Developed a predictive model that scores and ranks cases by risk to generate leads with the highest return on investment leads for investigators and analysts

BENEFIT

- » Increased fraud detection rate from 5% to 48% for the top 50 riskiest providers identified by the model

THE CHALLENGE

Investigating providers suspected of billing for fraudulent procedures can be a costly and time consuming process, since there are relatively few bad actors. For example, for this client, there was an estimated global rate of provider fraud of 5 percent. To optimize resource utilization, it is critical to focus investigations on the providers most likely to be fraudulent or non-compliant. A good predictive model can evaluate all providers, identify those most likely to be fraudulent or out of compliance, and prioritize them to focus the investigative resources.

The goal for this project was to identify and quantify fraud, waste, and abuse (FWA) indicators for a Medicare and Medicaid Dental Insurance client so that they could rank potentially fraudulent providers and target them for appropriate interventions. Having explainable scoring was a key component of success, since the model results would be used as evidence to warrant opening an investigation for providers identified as suspicious.

THE SOLUTION

Elder Research created a model that met the requirement of being defensible based on the specific dental procedures the provider performed. When developing analytical models, there is often tension between interpretability and accuracy of the results. For this client, the solution needed to be interpretable, and more importantly the model needed to incorporate relevant and actionable features that could be used to assist in investigations. Elder Research utilized ensembles to achieve explainable and actionable results while minimizing sacrifices in accuracy. Dr. Elder was one of the first to discover that combining different methods or algorithms into an ensemble usually outperforms a single algorithm, an approach that has become a best practice for predictive analytics.

As with all models built on historical health data, sample bias was a major concern. Sample bias is when the observations in the training sample are not representative of the observations to which the model will be applied. These complications included seasonal differences in billing, diverse patient demographics (child vs. adult, Medicaid vs. private insurance, etc.), and different levels of effort expended to identify cases for investigation. The latter challenge was characterized by markedly different audit rates between states. Audits of fraudulent providers

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were occurring, but these audits were not fully represented in the data due to delays in state programs and other operational factors. Ignoring this would have resulted in an inaccurate and biased model. With advanced techniques, Elder Research was able to estimate the assumed audit rate to improve accuracy and avoid model bias (Figure 1).

This analytics solution enabled investigators to focus their time and effort by automatically generating a list of prioritized cases for review.

RESULTS

Significant time and resources are required to investigate fraud, so it is important to determine the caseload that can be handled. Based on the available resources, the client wanted a solution that would provide a ranked list of 50 providers to target for investigation.

The model ensemble increased the hit-rate for fraud to 48% of cases in the top 50 providers (Figure 2). Providers identified by the model as the top 50 based on risk score were nearly ten times more likely to be fraudulent than a provider selected at random.

These results enabled the client to provide targeted interventions, recoup fraudulent charges, educate providers on correct billing procedures, and ultimately reduce Medicare and Medicaid spending.

ABOUT ELDER RESEARCH

Elder Research is a recognized leader in the science, practice, and technology of advanced analytics. We have helped government agencies and Fortune Global 500® companies solve real-world problems across diverse industries. Our areas of expertise include data science, text mining, data visualization, scientific software engineering,

and technical teaching. With experience in diverse projects and algorithms, advanced validation techniques, and innovative model combination methods (ensembles), Elder Research can maximize project success to ensure a continued return on analytics investment.

Simulated vs. Actual Audit Rate

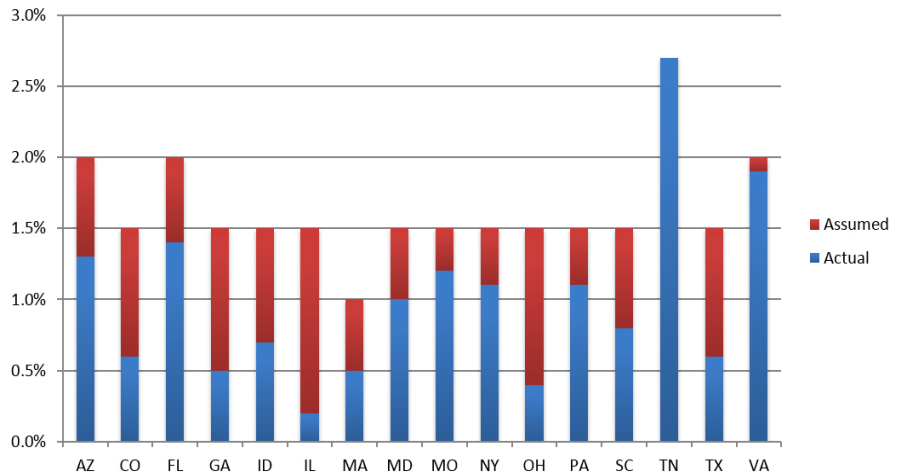
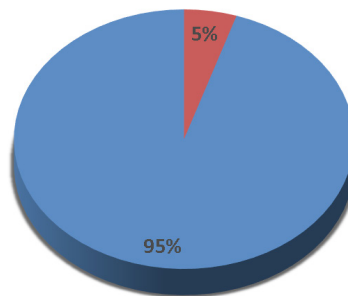


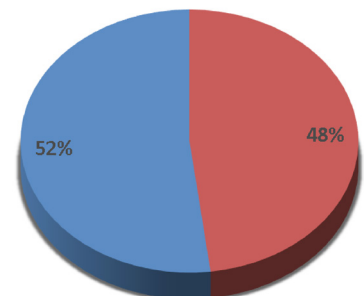
Figure 1. Simulation of the assumed and actual audit rate by state.

Global Rate



Fraud Not Fraud

Top 50



Fraud Not Fraud

Figure 2. The FWA model increased the hit rate to from 5% chosen at random to 48% for the top 50 riskiest providers.

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