SOCIETY OF ACTUARIES

475 N. Martingale Road, Suite 600
Schaumburg, IL 60173
P +1-847-706-3500
F +1-847-706-3599
SOA.ORG

Case Study: Quantifying Healthcare Industry Adverse Disruptors

Your team of actuarial consultants has been engaged by the chief executive officer (CEO) of a successful health care corporation providing insurance benefits for comprehensive medical care. The corporation's Board of Directors assigned the CEO to conduct a risk management exercise to identify and quantify potential business disruptors within a five year time horizon. In general, a disruptor radically changes a business market with bottom-line impact to a corporation's financial results. For the purposes of this assignment, the focus is on disruptors that impact health care benefit claims costs with a negative impact to financial results. The CEO hired your team because of its proven ability to describe and creatively solve open-ended, real world problems involving limited, imperfect data under time and resource constraints.

The CEO has been particularly concerned with obtaining reliable projections of expected benefit costs and minimizing losses. In general, benefit costs can be categorized into four major medical service categories: inpatient services, outpatient services, physician services, and pharmaceuticals. Over the past few years, the CEO has been surprised by unexpected and substantial costs from a number of sources including increased inpatient costs and lengths of stay, rapid growth in the utilization of outpatient services, and the introduction of new technologies. Examples of relevant disruptors were costs from previously uncovered experimental drugs treating human immunodeficiency virus (HIV) and hepatitis C which became covered plan expenses after approval by the U.S. Food and Drug Administration. The utilization of these new pharmaceuticals resulted in significant losses for the corporation. In addition, overall population health issues such as bacterial resistance to treatments, pandemics, or costs of untreated chronic diseases are further examples of potential disruptors to the company financials.

For this exercise, your team's primary objective is to forecast and model risks from disruptors for the purpose of strategic decision-making by the Board of Directors. The CEO chose your team for your unique approach of examining past disruptors, discerning patterns, and using this information to predict the onset and magnitude of future disruptors.

Although the CEO provided helpful guidance, your team needs to finalize the scope of this exercise and identify the analyses to perform for the several substantial disruptors your team chooses to model. To develop a plan for this exercise, your team needs to consider the following:

- Nature of the Disruptor: Should the choice of disruptors be related to one of the four major medical service categories or an entirely new area?

- Impact of the Disruptor: Should the disruptors' substantial impacts come from combined frequency and severity or from infrequent but severe occurrences? And are historical costs in need of adjustment for inflation?

- Duration of the Disruptor: Will the disruptors impact the entire five year projection period or only have intermittent impact?

- Data related to the Disruptor: Is existing data applicable or will the exercise rely primarily on simulated data?

- Underlying incidence and prevalence rates: Are the disruptors based on historical incidence or prevalence rates that may shift over time?

For specific data sources, the CEO would like to examine national data repositories that are applicable. If focusing on U.S. sources, national repositories such as the Centers for Medicare and Medicaid Services (CMS) at www.cms.gov (and additional information at www.resdac.org) and their cost reports should be considered. Regardless of the data source, this exercise will require creativity to model benefit costs by applying existing methods or creating new ones.

The CEO is excited to be proactively planning for potential risks. Requested report formats and considerations are listed below. Actionable items stemming from your team's work might be for the company to consider increasing reserves or mitigating negative effects where possible. With your team's input, the company can prepare effectively for the future.

SOCIETY OF ACTUARIES

Submission components, format and considerations

1. Executive Summary (10%)

   This brief section should summarize an overview of the approach, work, and results along with the significant conclusions.
   a. Include a succinct restatement of issues with overview of the approach to the solution
   b. Highlight significant conclusions without delving into details
   c. Take into account that the intended audience is CEO

2. Purpose and Background (10%)

   This section should describe the reason for the analysis and give context to the approach taken. It should include a brief literature review of current and relevant analyses and findings.
   a. Comprehensively explain why this topic was chosen
   b. Include a brief summary of the related analyses and findings from the literature review
   c. Creatively build on existing approaches (as outlined in literature review) or extend to new methods. Creativity is measured with regards to:
      i. Modeling or estimating costs from non-specific sources
      ii. Combining a variety of approximate sources to piece together total costs
      iii. Discovering new sources to estimate costs
   d. Key variables, such as costs and model components, should be defined and justified

3. Data (20%)

   This section should include all information related to dataset selection, exploration, and validation. It should explain why datasets were chosen, which background evaluations were performed and why, and the preparations which readied the data for modeling.
   a. Describe which databases were used
   b. Outline the data validation process and provide justification for the data that was included
   c. Show progression of data exploration steps and how they answer the data questions
      i. Data exploration should be relevant, thorough, and complete
      ii. Discovered or tangential issues should be investigated, resolved, or otherwise noted why they were not further investigated
      iii. End with final data prepped and ready for modeling

4. Methods, Analysis and Models (30%)

   This section should describe the modeling analysis in detail with all supporting documentation for reproducibility. It should outline the progression from initial analysis with focus on final approach and justified outcomes. The written submission should include links to selected data sources, any data preparation code, and any model generating code. Electronic media formats submitted should include code such that graders could reproduce the results.
   a. Overall solution approach
      i. Clearly state the issue including underlying and necessary assumptions
      ii. Define what is known and what assumptions are needed
      iii. Explain how assumption estimates are determined, quantified or approximated
      iv. Explain how key disruptors were selected
      v. Show how the key disruptors are substantial and relevant to financial impact of benefit costs
   b. Model accuracy
      i. Demonstrate model validation and reasoning behind validation approach
      ii. Define accuracy metrics and justify
      iii. Given that the adverse disruptors may affect population subsets differently, address or account for potential changes in underlying prevalence rates, changing demographic/population distributions, or behavioral shifts over time
   c. Reproducibility
      i. Modeling code and steps should be well documented with comments and explanations for clear understanding

5. Results, Conclusions and Discussion (30%)

   This section should summarize for the CEO the key disruptors that were identified, explain why they are risks to the company, and demonstrate how and why those conclusions were developed. Critical next questions and suggestions for future research should follow from the context of the results. These could be based upon logical next steps, or based upon issues warranting follow-up that were discovered during the analysis.
   a. Describe detailed outcomes and conclusions
   b. Describe how and why those conclusions were developed
   c. Results and numerical information should be presented clearly and efficiently
   d. Summarized findings should facilitate discussion of next steps
   e. Identify and address any outstanding issues discovered during the analysis
   f. Present important follow up questions or related issues beyond the scope of the case study