Predictive meta-modeling to quantify future health risk and identify individuals for clinical programs aimed at improving health outcomes and quality of care.

More than one-sixth of the U.S. economy, about $3.7 trillion annually, is devoted to health care spending and the proportion continues to rise every year. Reports from the Center for Disease Control (CDC) show chronic diseases such as heart disease, stroke, cancer, and diabetes account for 71% of all deaths each year in the U.S and account for approximately 70% of all health care expenditures.

• Costs considered in this project were only incurred for health care services. Analyzing a more comprehensive set of data sources beyond claims data, to more quickly identify individuals at the highest risk for future adverse outcomes, enabling more timely outreach and interventions.

• The unhealthiest 20% of the U.S. population (16 million) account for 80% of overall health care spending. More than one-sixth of the U.S. health care dollars (more than $300 billion) are devoted to health care spending.

• The customized model in this meta-model identified 20% of the population segment with high risk complex chronic conditions were identified and enrolled in clinical programs earlier compared to using the predictive models in isolation. This model has a high ROC, suggesting both high sensitivity and specificity.

• Compared to traditional predictive models, this meta-modeled high dimensional data using multiple data sources and predictive variables, allowed more accurate and timely identification of individuals in clinical programs.

• This meta-model is also being used for individuals newly signed up for health insurance via the Affordable Care Act Health Insurance Exchanges. The model for this segment was launched in early 2014 and had identified more than 34,400 individuals for referral to clinical programs by August 2014.

• Costs considered in this project were only calculated from administrative medical and prescription claims data. The model is limited by the data used as inputs. Unstructured data and electronic medical records are examples of new data sources that can be leveraged to enhance this meta-model.

Population Segmentation
• Populations were grouped in two ways:
  - By criteria, such as insurance type (i.e. commercial or Medicare); new or returning patients; presence of chronic conditions.
  - By applying statistical segmentation and clustering techniques.

Meta-Modeling
• Multiple mathematical and statistical functions were applied to create the most optimized predictive values for each population segment.

Meta-Modeling Overview and Results

Model Performance: Medicare Segment

Conclusions

References
http://www.ahip.org/ Hearings/Health-Care-Costs.aspx
2. Rising Health Care Costs, Un可持续，Center for Disease Control and Prevention (CDC)
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Figure 1. Challenge and Strategic Intent

Figure 2. High Dimensional Data Set

Figure 3. Meta-Modeling Process

Figure 4. Model Validation: Medicare Segment

Figure 5. Model Performance: Medicare Segment

Figure 6. Clinical Program Enrollment: Medicare

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Figure 1: A challenge to identify individuals in the long tail of cost distribution

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