Swiss Re

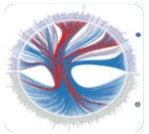
Data Science Techniques in Pricing and involvement of actuaries in non-conventional areas

Seminar in Health Care Insurance
December 4th 2017

Contents

- Data Science as an enabler for better risk assessment
- Data Analytics use cases
- Q&A

Smart analytics comprises multiple data science areas and enables to shape the next level of risk understanding

Insights & Predictive Modelling		We use **machine learning** algorithms to explore and understand large data in order to identify hidden correlations and patterns and to **predict potential future outcomes**
Text analytics		We leverage **text mining** and **natural language processing** algorithms to extract insights from unstructured data sources (usually from textual information)
Cognitive computing		We develop **cognitive computing capabilities** that combine various technologies including **machine learning, natural language processing** and **artificial intelligence** to facilitate human-machine interaction and to support business decision making
Visual Analytics		We employ **advanced visualization methods** to create visual representation of both structured and unstructured data to reinforce human cognition

Contents

- Technology driven transformation
- **Data Analytics use cases**
- Q&A

Predicting health like smoking status

Predicting Health: Smoker Propensity Model

Problem

Need to segment customers risks better for L&H products

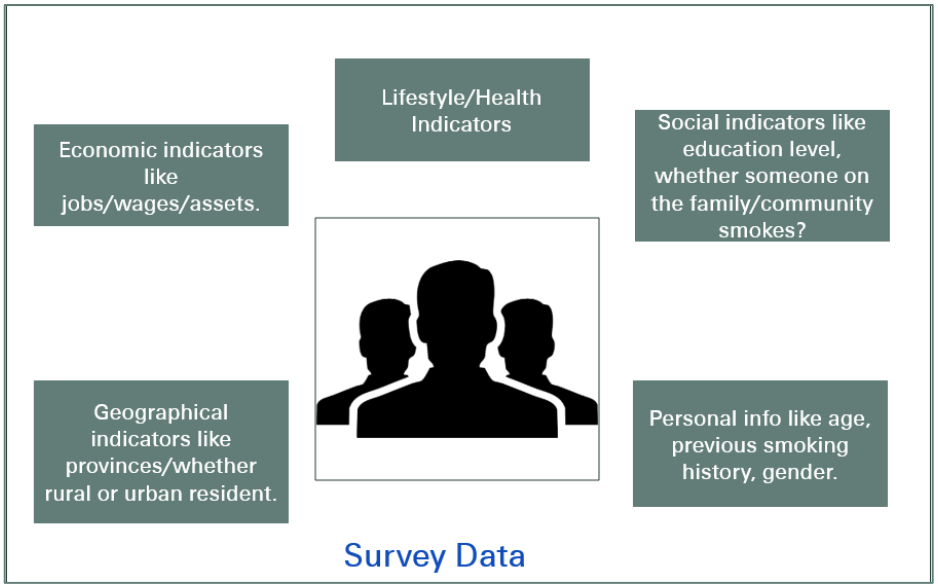
- Low disclosure rates
- Smoking as key risk criterion in UW
- Fluid test used to identify smokers (in USA, EMEA): time-consuming, costly and intrusive
- High smoker prevalence in certain markets

Solution

A model to predict smoking status

- Faster underwriting process
- Cheaper & less cumbersome for applicants than fluid tests
- Targeted marketing
- Differentiation through new
- Scalability to other health parameters

Smoker propensity model predicts the likeliness of an individual to be a smoker



20–50%

of smokers do not disclose smoking in their life insurance applications.

Insights found

- **Education**: Likelihood of being a smoker was found to decrease with increase in education level
- **Gender**: Males were found to more likely to be smoker compared to Females
- **Marital status**: Cohort who are divorced/separated are more likely to be smokers than who are married/widowed
- **Alcohol consumption**: Individuals who consumed alcohol were found to be more likely to smoke vs the teetotalers

New critical illness products through insights generation

Development of innovative Critical Illness (CI) products via Smart Analytics

Problem

CI products limited to lump sum payout

- Increase in cancer cases and evolution of CI
- Increase in life expectancy after diagnosis
- Changing client needs

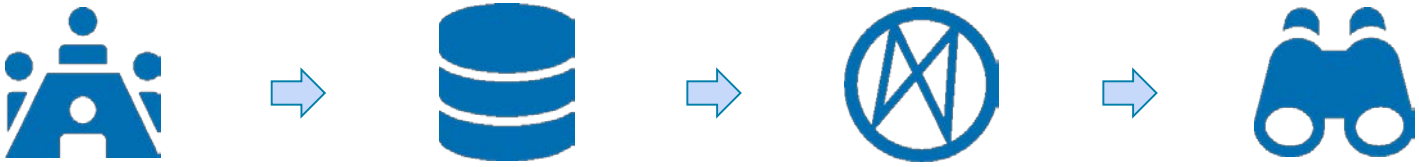
➢ How do we build insurance products that are truly relevant for our clients ?

Solution

Innovative CI products

- With improved CI risk understanding, we are able to define new innovative CI products beyond the point of diagnosis.

The CI product development follow the best practice analytics project approach



Problem Statement

- Understanding disease journeys for various critical illnesses
- Co-morbidity understanding
- Cost of treatment over disease lifetime
- Identify relevant factors for underwriting risks

Medical Database

- Size: 100 Gb
- Duration: 10 years
- 3.8 mio. persons
- 120k CI cases
- Health check-ups
- Policy & Claims data
- Diagnosis and treatment data
- Procedure and hospital data

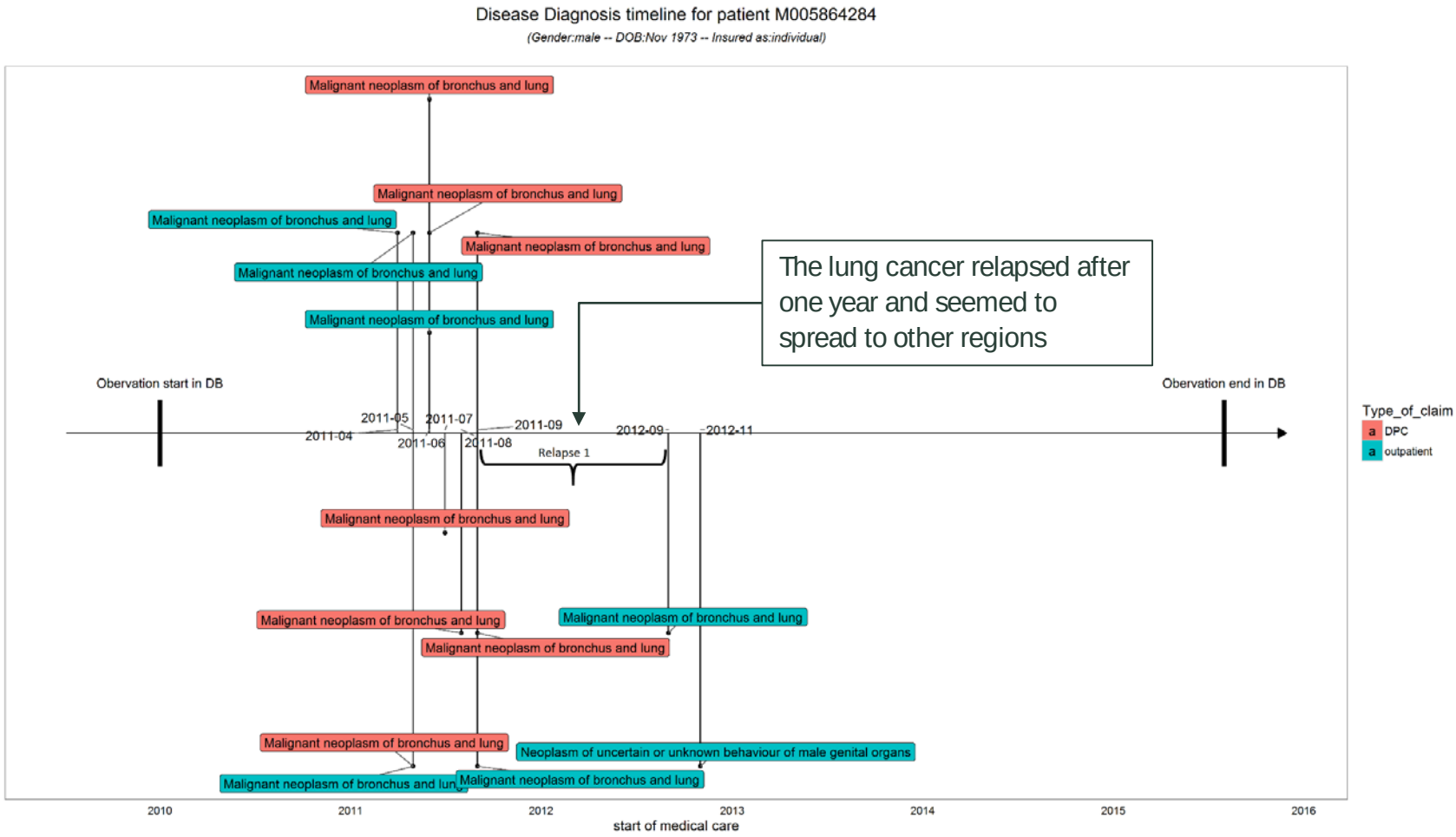
Data Engineering

- Descriptive approach
- Data exploration
- Associative rule mining

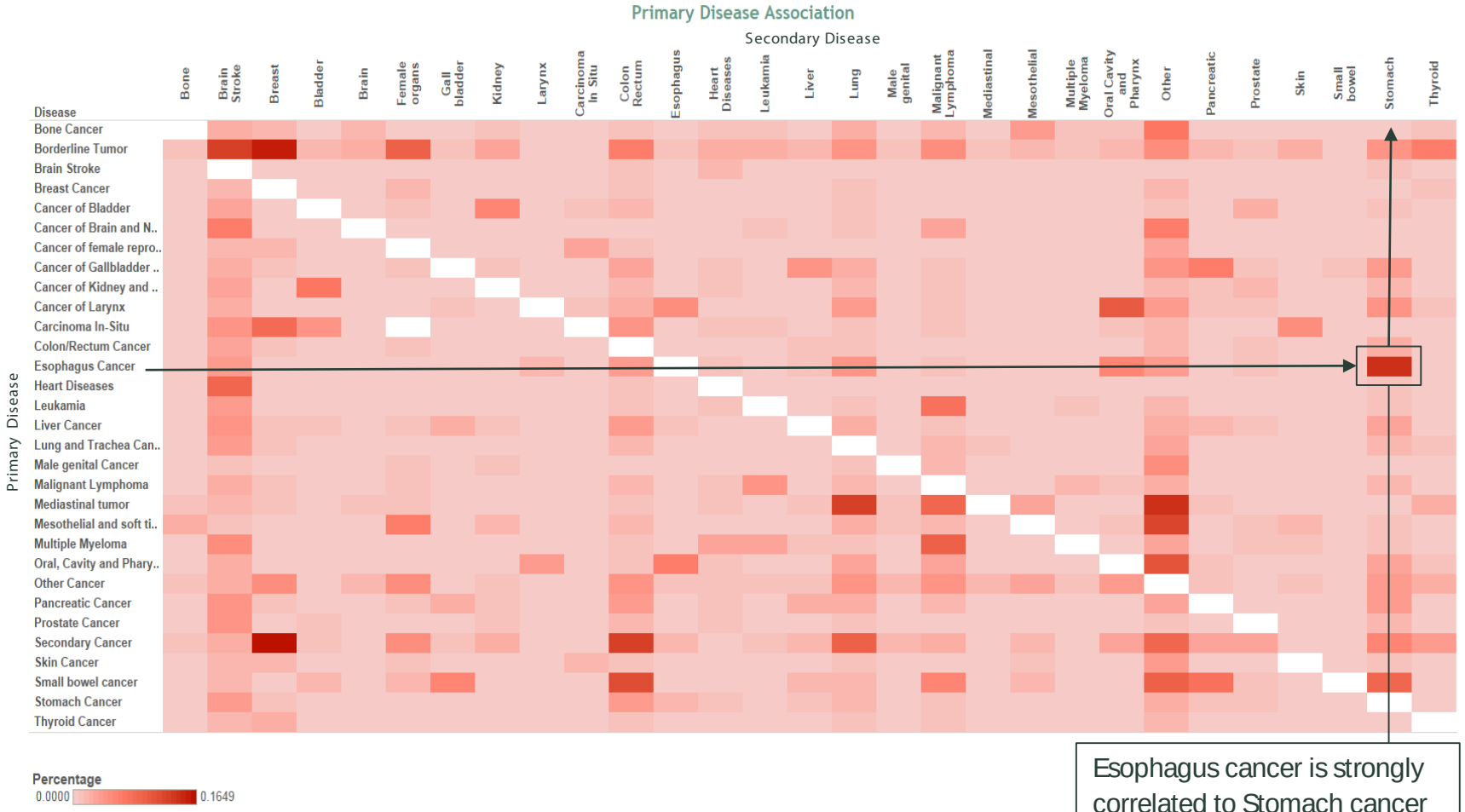
Insights Generation

- Patient disease timeline
- Disease journeys
- Co-morbidity heat map
- Cost lifecycle overview

Single Patient Diagnosis Timeline (Relapse 1 – Lung Cancer)

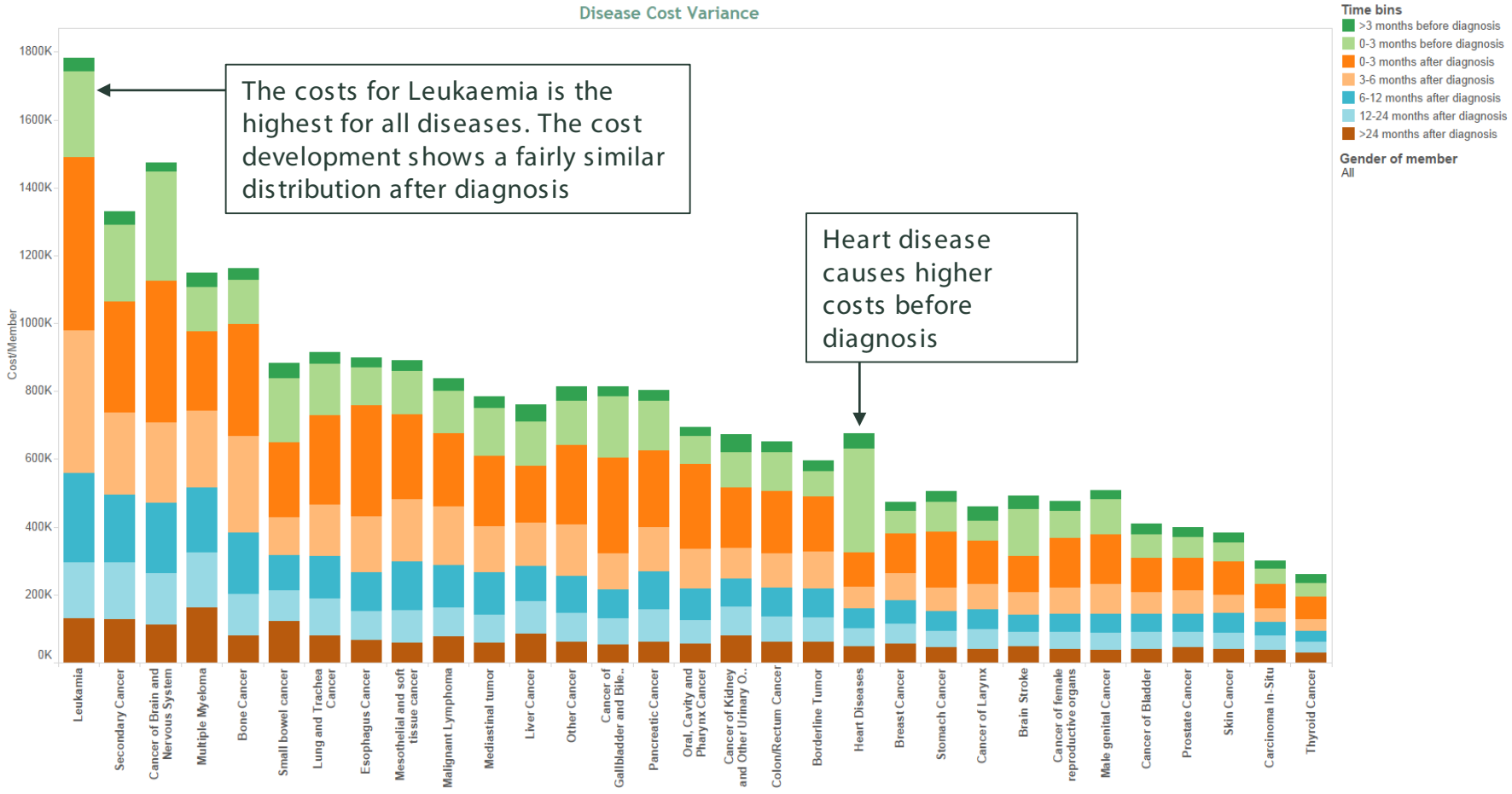


Understanding of typical co-morbidities helps to shape a more flexible CI product



Esophagus cancer is strongly correlated to Stomach cancer as a secondary disease.

Treatment costs for different critical diseases vary over time, especially before and after diagnosis



Better Understanding of Cancer Risk through Data analytics could enable new CI products

New CI Product Propositions

1. **Tier products**
   Replacing a one time pay-out with a stage-wise pay-out

2. **Variable pay-out products**
   Pay-out based on cancer-site, demography and co-morbidity

3. **Insurance for cancer survivors**
   Examine disease timelines to structure products aimed at cancer survivors

4. **Cancer recurrence products**
   Develop products with relevant waiting periods and pay-outs

5. **Insurance for co-morbidities**
   Insurance cover for commonly co- occurring diseases for cancer patients

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