

# Modelling Behaviour in Medical Insurance

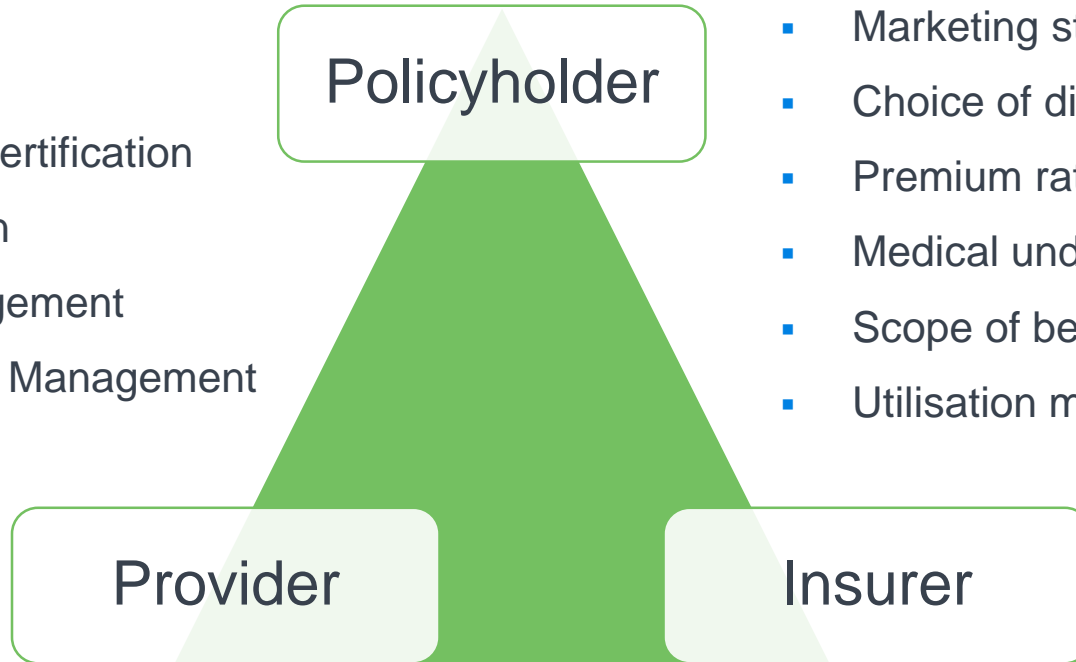
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# Medical Insurance a Dynamic Business

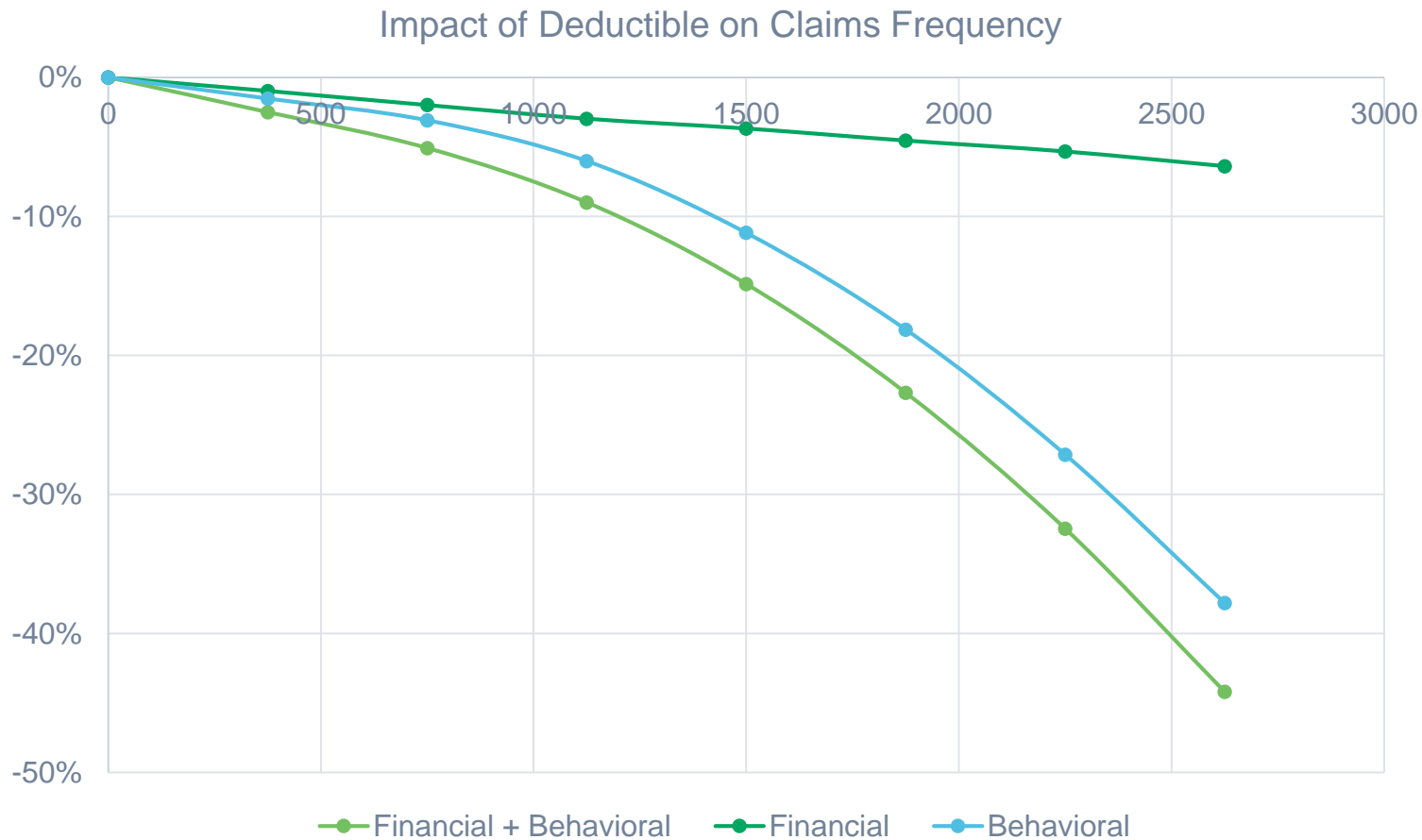
- Pre-authorisation / pre-certification
- Second Surgical Opinion
- Concurrent Case Management
- Catastrophic Care Case Management
- Disease Management



- Marketing strategy
- Choice of distribution channels, including sales training
- Premium rate level and structure
- Medical underwriting and exclusions
- Scope of benefit coverage and limits
- Utilisation management

- Medical management
- Provider network management
- Provider contracting

# Case Study 1 - Impact of Deductible on Claims Behaviour



In markets where public hospitals are a viable alternative to private hospitals, the deductible can have a significant impact on behaviour.

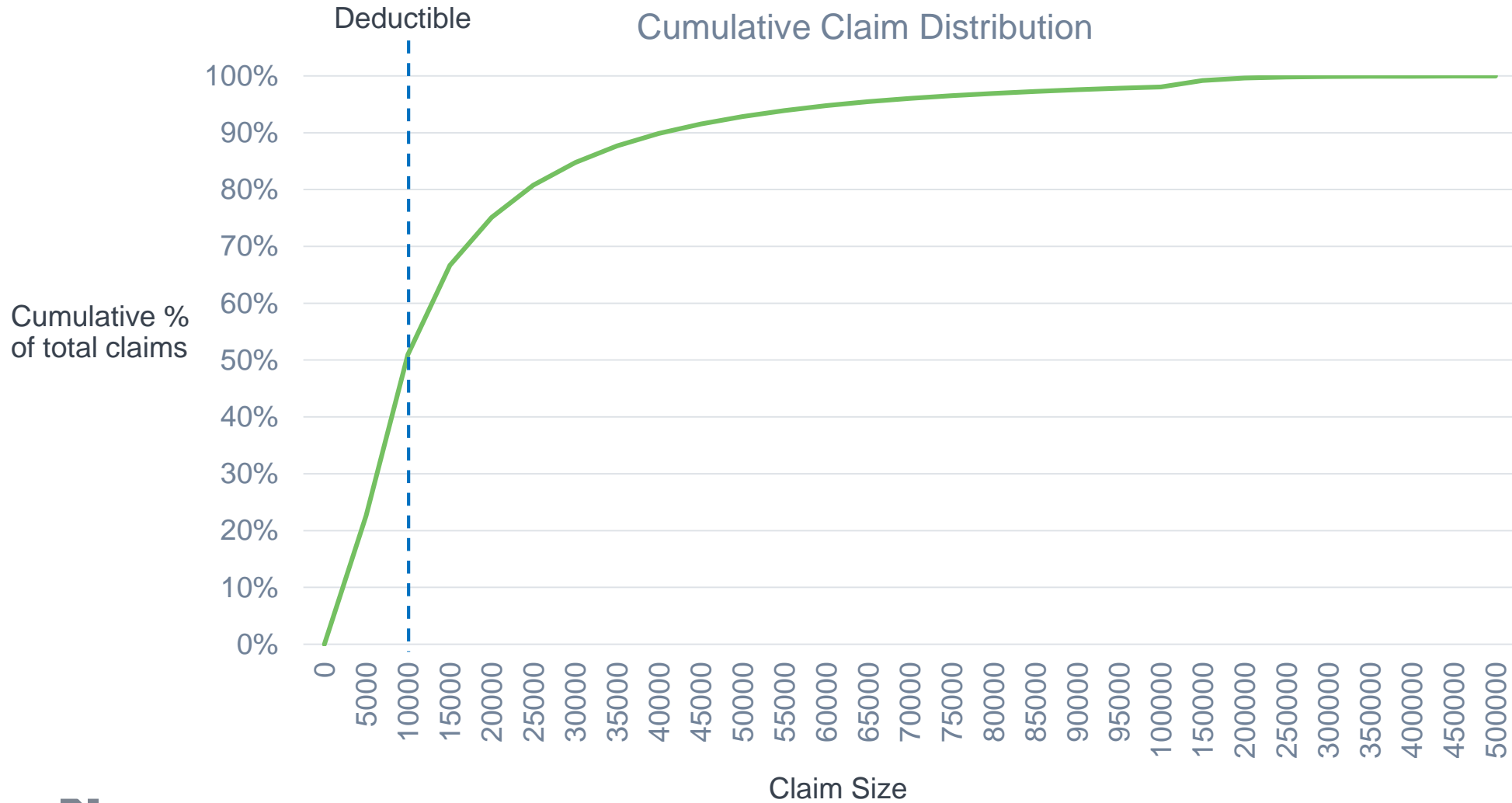
Applying a deductible to claim data from a zero deductible plan understates the impact on premium rates.

We use GLM models to understand claims experience from different products with different deductible levels.

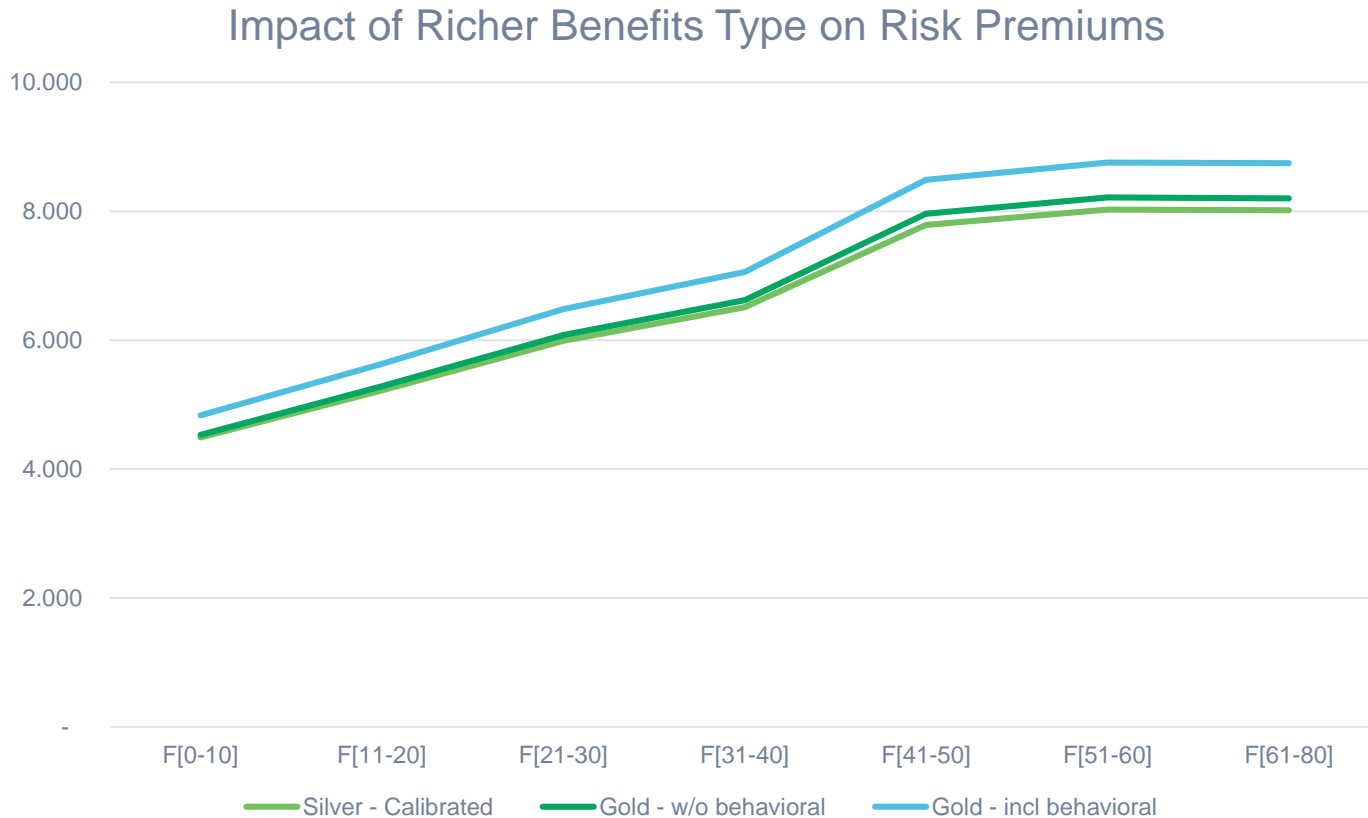
The GLM model considers parameters such as:

- Deductible level and age-gender
- Calendar year and policy duration
- Covered by employer?
- Policyholder, spouse or child
- Etc.

# Case Study 1 - Impact of Deductible on Claims Behaviour



# Case Study 2 - Impact of Benefit Level on Claims Behaviour



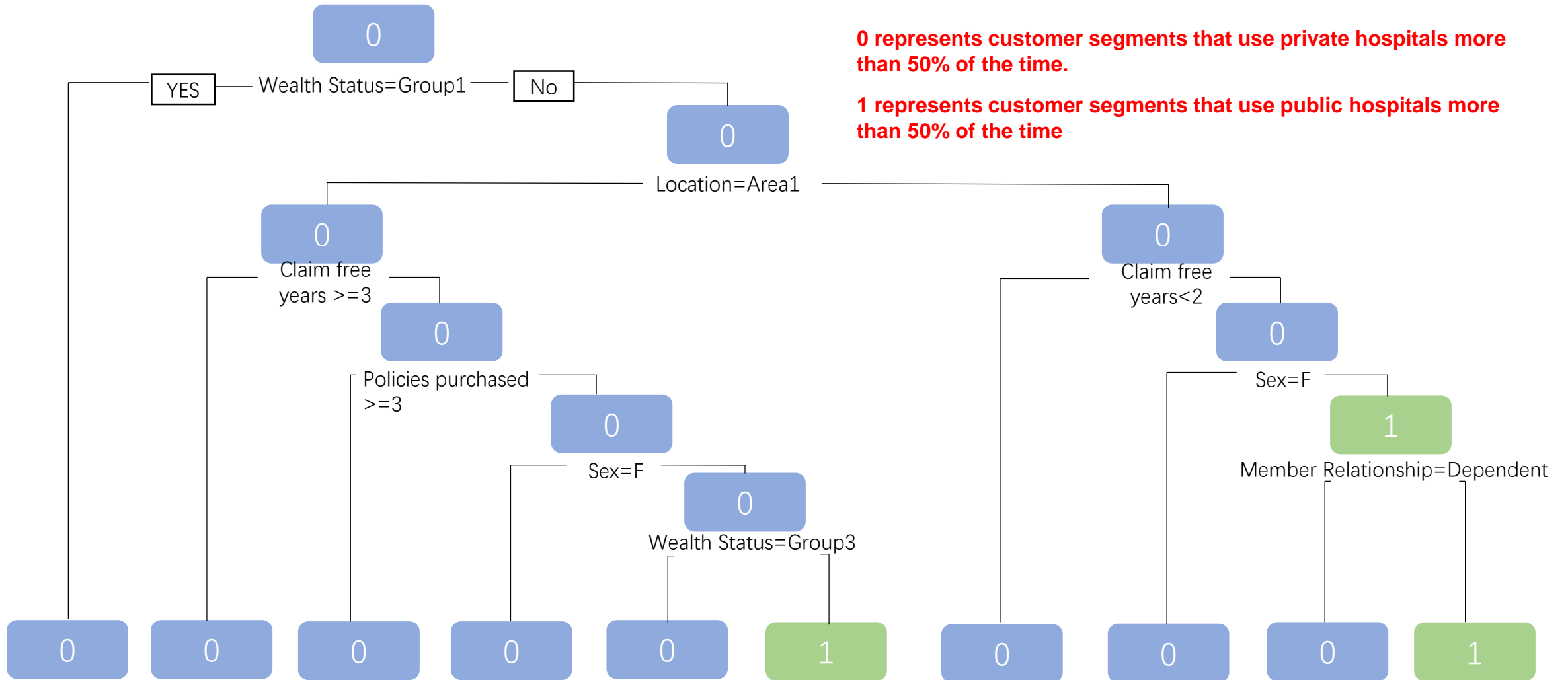
Policyholders who purchase Silver plans have different behaviour to policyholders that purchase Gold plans.

But Gold plans usually have sparse data, but we cannot use Silver plan data to price Gold plan.

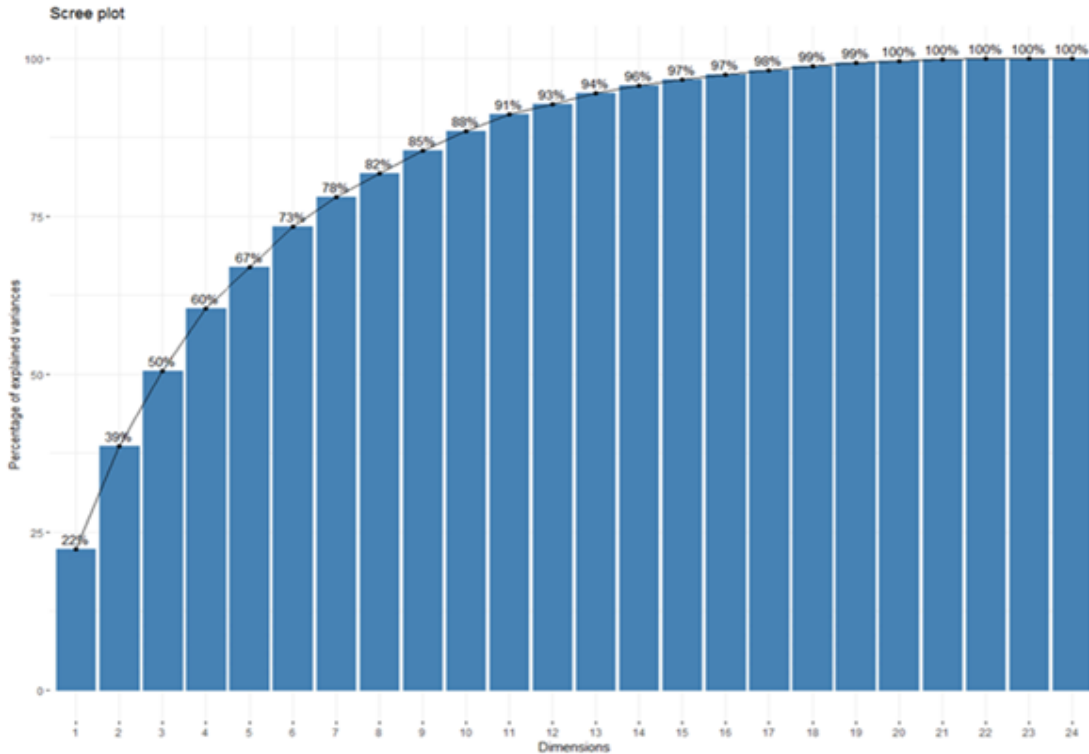
We use GLM models to understand what is driving differences in behaviour between Silver plans and Gold plans, including the policyholder characteristics as far as possible

# Case Study 3 – Policyholder Segmentation

Decision tree (based on Random Forest) to identify customer segments with higher propensity to use government hospital.



# Case Study 4 – Anomaly (Fraud) Detection



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Examined several possible unsupervised learning AI models to identify outlier claims or anomalies.

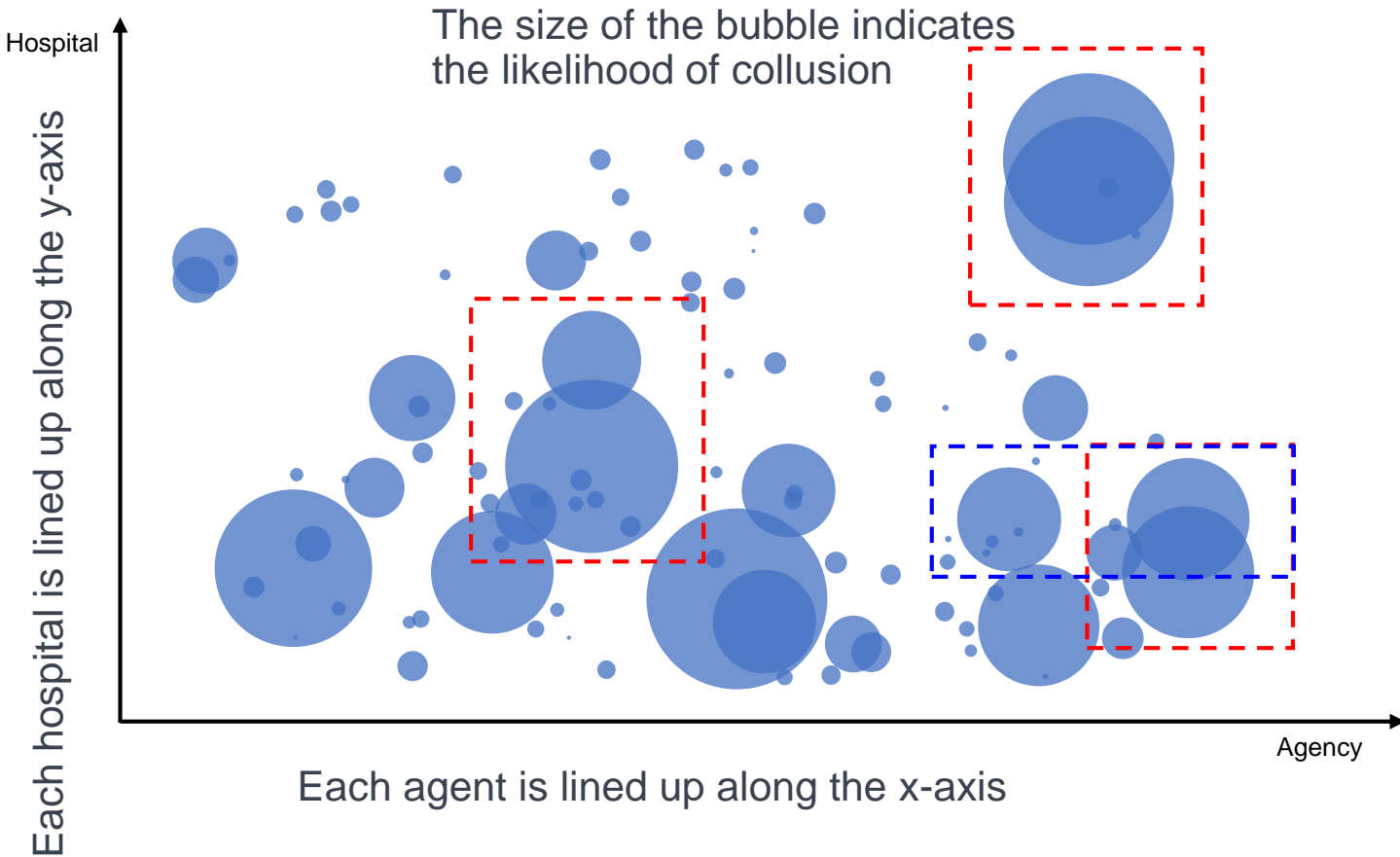
PCA algorithm performed the best.

Out of total claims, 7% were identified as anomalies.

Extracted a random sample of 1% of the outlier claims for further investigation by Claims Team.

Claims Team found that around 12% of the sample were genuine claims, but 88% should have been classified as fraud / abusive claims.

# Case Study 5 – Agent and Provider Collusion



We used collusion models to try to identify collusion between agents and hospitals

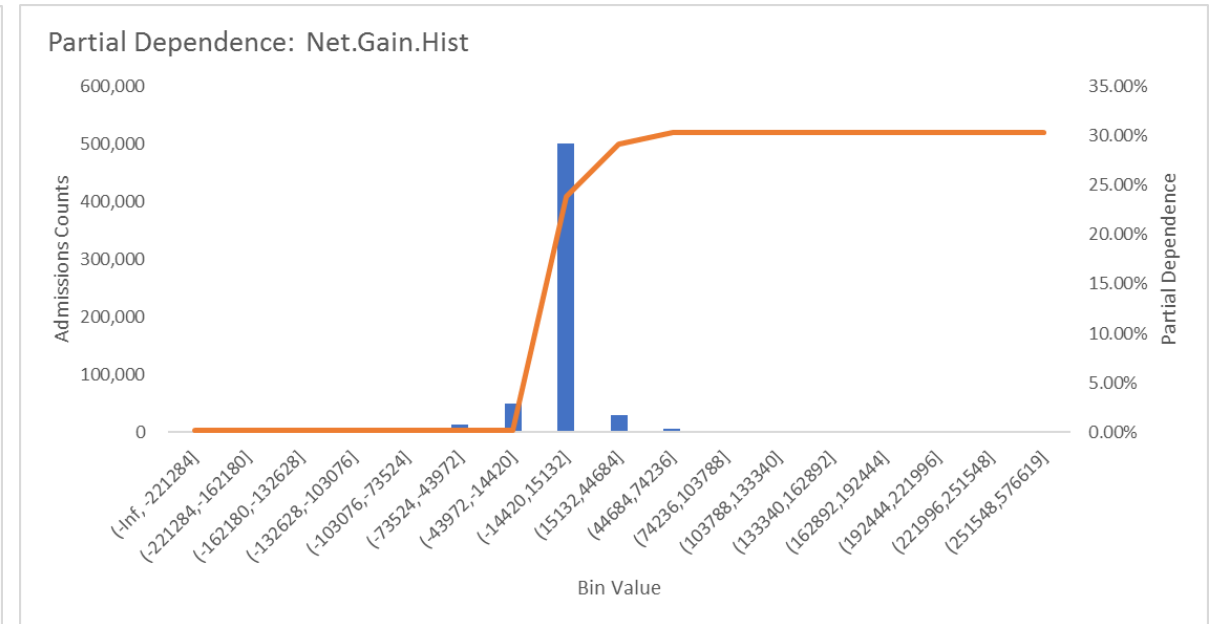
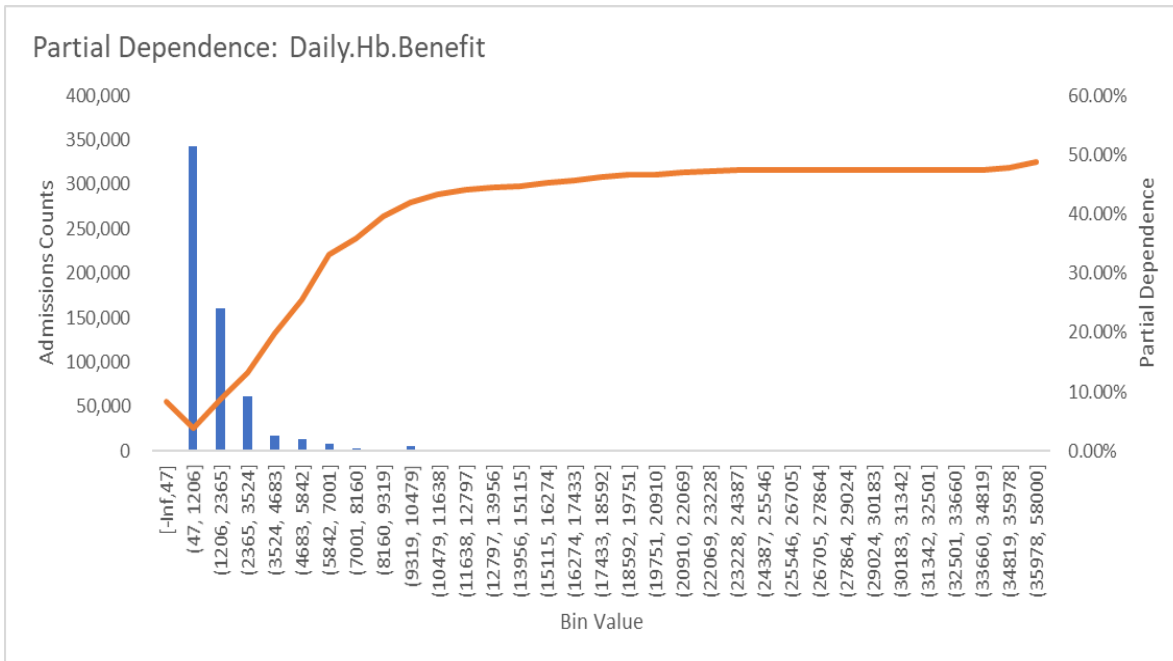
Collusion models more commonly used by supermarkets and the retail industry for fast moving goods.

Our findings indicated:

- Possible collusion between certain agents and hospitals
- Some hospitals seems to have relationships with several agents
- Some agents have relationships with several hospitals



# Case Study 6 – Identifying Drivers of Known Abusive Claims



Analysed abusive claims previously identified by Claims Team for a Hospital Cash portfolio.

Identified key predictors of an abusive claim so that this can be built into a claim rules engine.

Used Random Forest algorithm to identify key drivers.

Unsurprisingly, abusive behaviour is clearly driven by financial gain.

# Thank You

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