Portfolio Management of the existing health business

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Cover

- This presentation is a part of the "15th Capacity Building Seminar In Health Care Insurance (CB HCI)" organised by Institute of Actuaries of India (IAI) held on 13th October 2023.

- The purpose of this presentation is to provide a brief description of what encompasses a portfolio performance review and the reasons for carrying it out regularly with key emphasis on the ways to carry out a robust performance review to help with informed decision making. This will include discussion on the importance of data, steps to prepare the data along with various basic and advanced tools and techniques for performing the review.

Agenda

01	**Introduction**
02	**Portfolio Management**
03	**Data quality and standardisation**
04	**Basic Analyses**
05	**Advanced Analyses**
06	**Final thoughts**

- What
- Why
- How

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1 **Introduction**

Moving towards advanced analytics…

Health Insurance Value Chain					
Health Insurance Plan		Managed Care		Integrated Delivery System	
Financing and Insurance		**Care Management**			**Care Delivery**
Planning Marketing and Sales	**Actuarial & Operations**	**Member Management**	**Provider Management**	**Care Management**	**Care Delivery**
• Branding • Product development • Sales channel management	• Pricing & reserving • Claims • Enrollment & eligibility • Billing • Connectivity • Management reporting & analysis • Utilisation & unit cost targets	• Member engagement education & information • Appeals/ grievances • Member services	• Network development provider contracting • Provider reimbursement • Provider relations • Credentialing • Provider profiling	• Utilisation management • Case management • Demand management • Disease management • Clinical outcomes measurement • Quality measurement & improvement	• Primary care • Specialty care • Hospital care • Physician practice management • Pharmacy • Ancillary service • Skilled nursing care • Long-term care • Rehabilitation care

"Standard" insurer analytics	Basic clinical data & analytics	Advanced power analytics, combining clinical and financial

(2) Portfolio Management
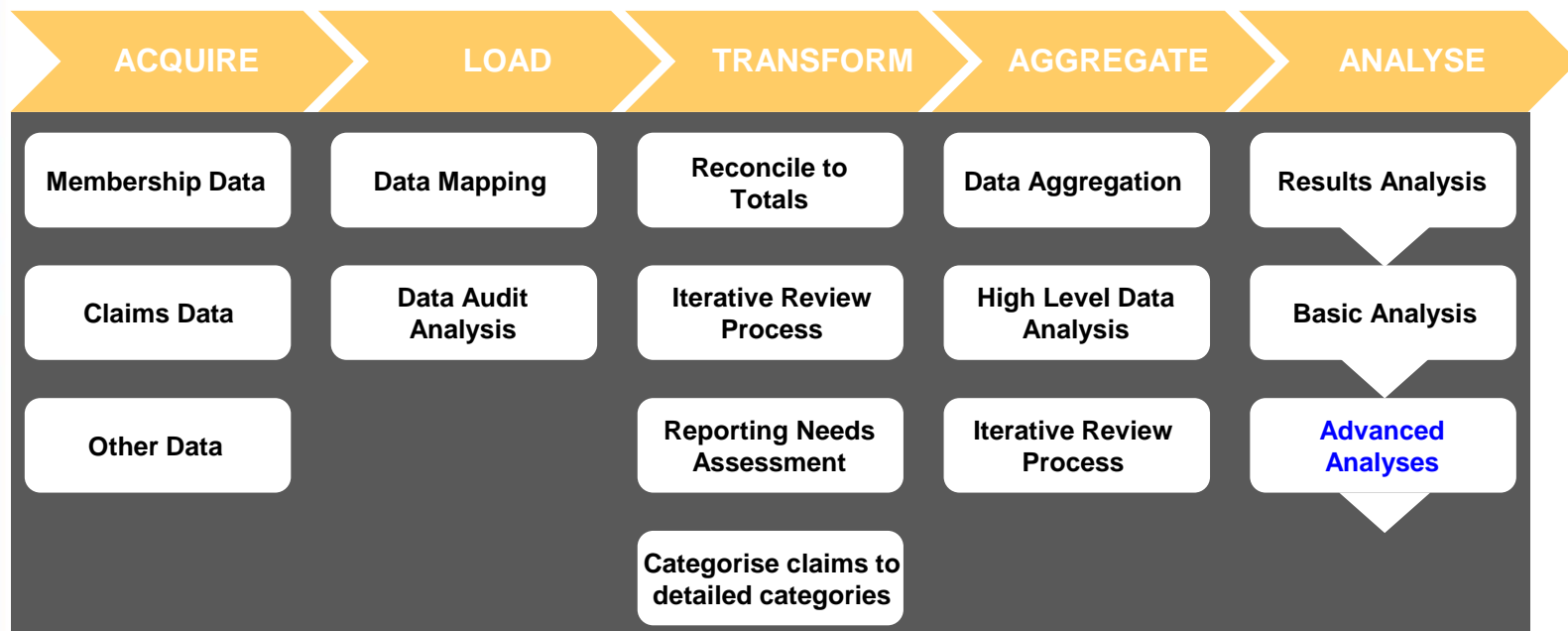
WHAT is portfolio management?

- Primary **foundation** of actuarial work.

- Exercise of **analysing claims experience** of a health product that occurred within a pre-determined time period pertaining to the population insured under that product.

- Identification of the **trigger events** that often result in financial loss or gain for the insurer.

- Compares the actual outcome with previously established expectations (**A/E**).

- A complete portfolio/ product review for a typical health product is likely to include an **A/E analysis** of:

  - Business mix

  - Claim incidence

  - Average claims cost

  - Trends

  - Expenses

WHY is portfolio management required?

- Provides **insightful results** that can improve decision making.

- Key outcomes can be embedded in operational processes to help **improve efficiency** and deliver improvements.

- Produce results to **serve various stakeholders**.

- **Benchmarks** from own data to improve underwriting performance.

- **Provider profiling**.

- **Population profiling**.

- Help understand **key drivers** behind historical results.

- Help with development of assumptions for **pricing, valuation and financial analyses**.

- Helps in managing an existing health business with low or no new business inflow

  - Improve Operational Efficiency

  - Optimize Supply Chain Management

  - Revenue Optimisation

  - Asset management

HOW to carry out experience analysis for portfolio management

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ACQUIRE	LOAD	TRANSFORM	AGGREGATE	ANALYSE
Membership Data	Data Mapping	Reconcile to Totals	Data Aggregation	Results Analysis
Claims Data	Data Audit Analysis	Iterative Review Process	High Level Data Analysis	Basic Analysis
Other Data		Reporting Needs Assessment	Iterative Review Process	Advanced Analyses
		Categorise claims to detailed categories		

GOOD QUALITY DATA IS KEY TO CARRY OUT THE ANALYSIS AT AN ACCEPTABLE LEVEL OF ACCURACY!

3 **Data quality and standardisation**

Complications faced in data processing

Commonly found complications in various parts of different datasets that limits the use of that data in all the analyses – particularly advanced analytics.

CLAIM AMOUNTS:
- Zero allowed amounts.
- Billed amount less than paid amount.
- Negative aggregated amounts for a given claim.

PROCEDURE CODES:
- Missing.
- Incorrectly coded (e.g. does not match the diagnosis code).
- A mix of ICD10 PCS codes and internal coding.
- No standardised coding for procedures that fall outside the ICD10 PCS.
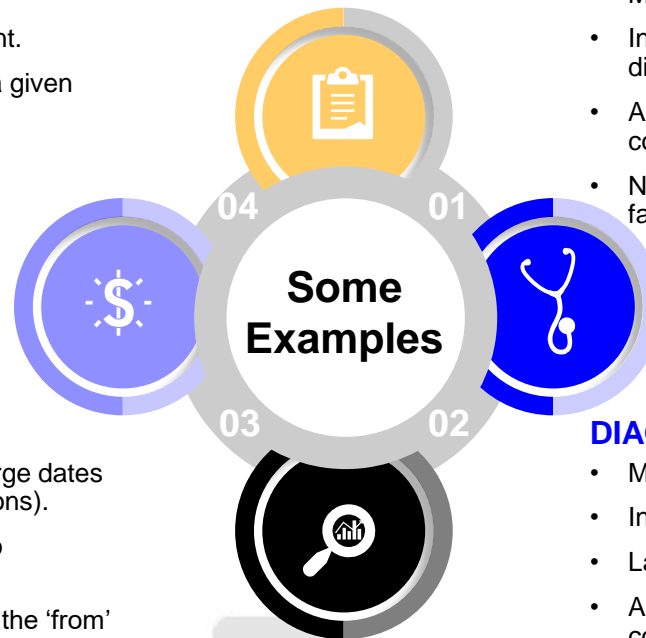
DATES IN THE CLAIMS DATA:
- Overlapping admission and discharge dates (underestimating inpatient admissions).
- Missing discharge dates (leading to misestimating length of stays).
- Claims with 'to' date is set equal to the 'from' date, regardless of length of stay.

DIAGNOSIS CODES:
- Missing.
- Incorrectly coded.
- Lack of granularity (e.g. codes ending in "0").
- A mix of ICD9/ICD10 codes and internal codes or descriptions.

Some Examples

04
01
03
02

Costs of bad data

- Research predicts poor quality data can cost business on average 12% of revenues, ranging from impact on marketing and sales to compliance and certainly risk management.

- Bad data is costly because it is time consuming and often expensive to address.

- Fixing errors can become part of the data analysis process rather than a one time fix.

- Leads to difficulty in ever getting to an automated processing environment.

- As well as high costs of admin, high risks of error and low employee self – service.

- Low confidence in data and analysis from data reduces chances of carrying out advanced analytics to solve business problems.

- Can be a barrier to meet market service level standards – or even to just measure the level of service provided.

Data quality assessment tools

Structure

Thresholds

1   2   3   4

Data validation, edits and thresholds:
- Review key fields.
- Establish thresholds - quantify quality standards.
- Field level edits for consistency checks.

Data Audit:
- Data credibility assessment.
- Investigate data issues.
- Data audit summaries.

Combinational Integrity:
- Dataset coherency to bind data from different systems.
- Quantifying fall out of data.
- Longitudinal study of members possible?

Reconciliation:
- To financial/ accounting information, and to control totals.
- Ease.

4 **Basic Analyses:**

1. One way analyses
2. Two-way/ multi-way analyses

One-way analyses

- One-way premium analyses (number of policies, members, premium, persistency):
  - By state
  - By sum insured / product variant
  - By distribution channel
  - By agents
  - By branch
- One-way claims analyses (number and amount):
  - Top 100 providers
  - Top 20 diagnosis
  - Top 20 procedures
  - Medical vs surgical
  - In-network vs out-of-network
  - Cashless vs reimbursement
  - Claim status (Paid, Rejected etc.)
  - Rejection reason analysis

- Frequency, severity, and loss ratio analyses by:
  - Age-band
  - Gender
  - Zone/ Branch office – Issuing office
  - Zone/ Branch office – Member residence
  - Plan type (individual, floater, extended family etc.)
  - Sum Insured / Product variant (silver, gold, platinum etc..)
  - Duration
  - Family combination
  - Underwriting year month / qtr
  - Accident (exposure) year month / qtr
  - Distribution channel
  - Benefit category (IP, OP etc.)
  - New business vs Renewal business
  - Ported vs non-ported

Two-way / multi-way analyses

Zone/Branch office and distribution channel

7

Age-band and Gender.

1

Frequency, severity, and loss ratio analyses by:

Zone/ Branch office – Issuing office and Sum Insured / Product variant.

2

Duration and product variant.

6

Zone/ Branch office – Member residence and Plan type (individual, floater, extended family etc.).

3

Duration (vintage) and channel.

5

Sum Insured / Product variant.

4
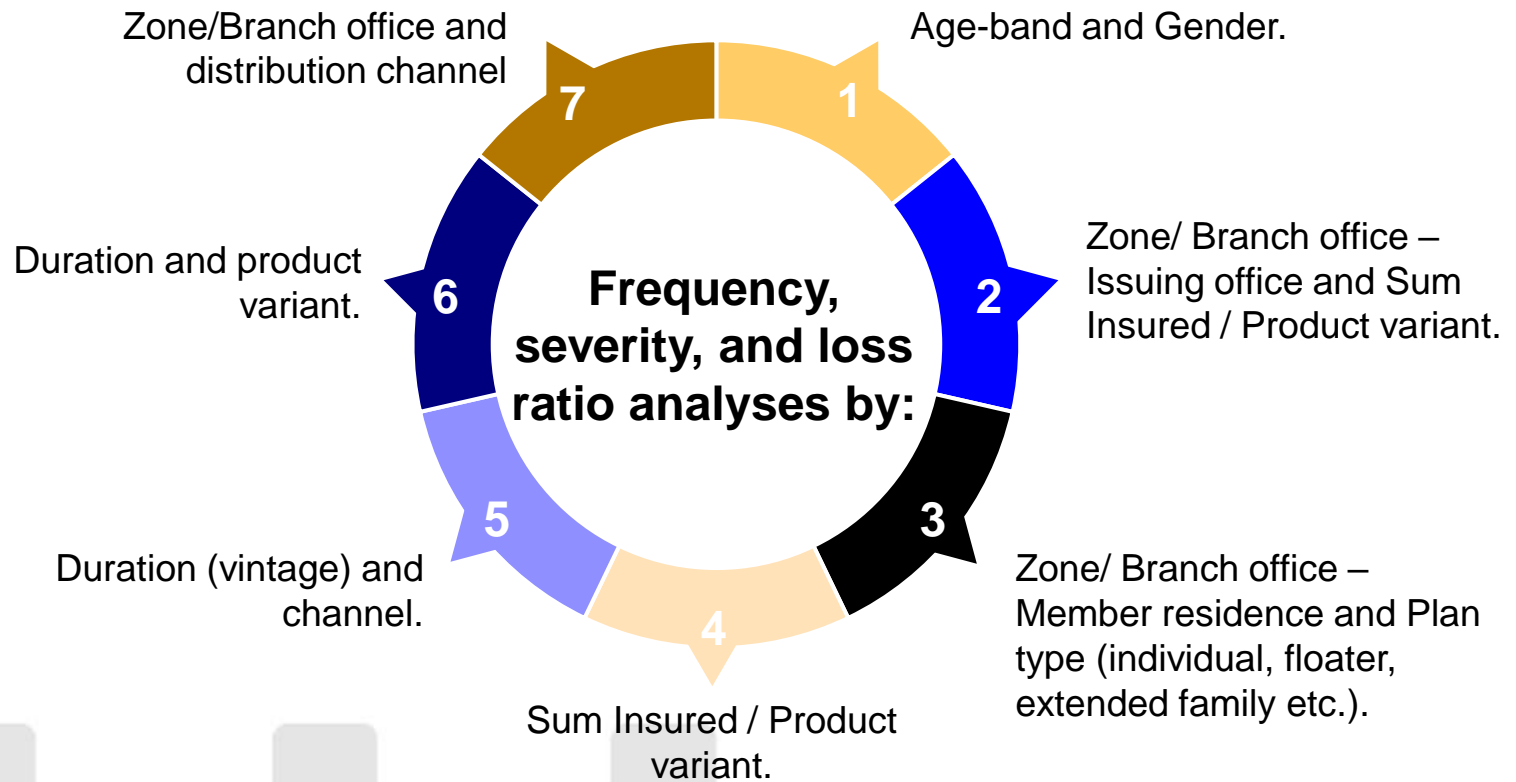
5 **Advanced Analyses:**

1. HCG grouper
2. CCHG grouper
3. MARA
4. Generalised linear modelling
5. Machine Learning and AI

5.1 **HCG: Milliman's Health Cost Guidelines™**

What is HCG?
Background

- Milliman Health Cost Guidelines (HCGs) - Industry standards to classify claims into service categories.

- More than 100 insurers in the US rely on our proprietary methodologies and comprehensive data to model their healthcare costs and utilisation.

- Annual revisions to incorporate latest trends in hospital, surgical, medical, pharmaceutical, and other categories.

- Milliman has also built HCGs in other countries:

  - UK - Collaborative effort of several companies to contribute data to create the HCGs. This is now a bi-annual exercise.

  - Hong Kong – An HCG project resulted in a comprehensive database constructed on some companies data. This is the only credible data available in the market which is cited and used by many stakeholders.

  - Mexico - HCGs were built at the request of the association of insurers.

  - We have also built HCGs in UAE, KSA, Chile, and South Africa.

Benefits of HCGs

- Having a **market data-based benchmarks** will provide a credible estimate of certain parameters which may be a concern area for the entire market for example underpriced segments such as lower sum insured, higher ages etc.

- Assess the **performance** against the peers/market on key parameters such as incidence rates, average claim costs, claim distribution etc.

- Develop accurate **quotations** for group health accounts.

- **Pricing** including assessing the impact of disease -wise limits, sum insured limits, deductibles, copays etc.

- Identify areas for driving **efficiency** or **saving** by trying to perform at par or better than the benchmarks

Example of HCG hierarchy
HCGs Capture 100% of Claims Utilization and Cost
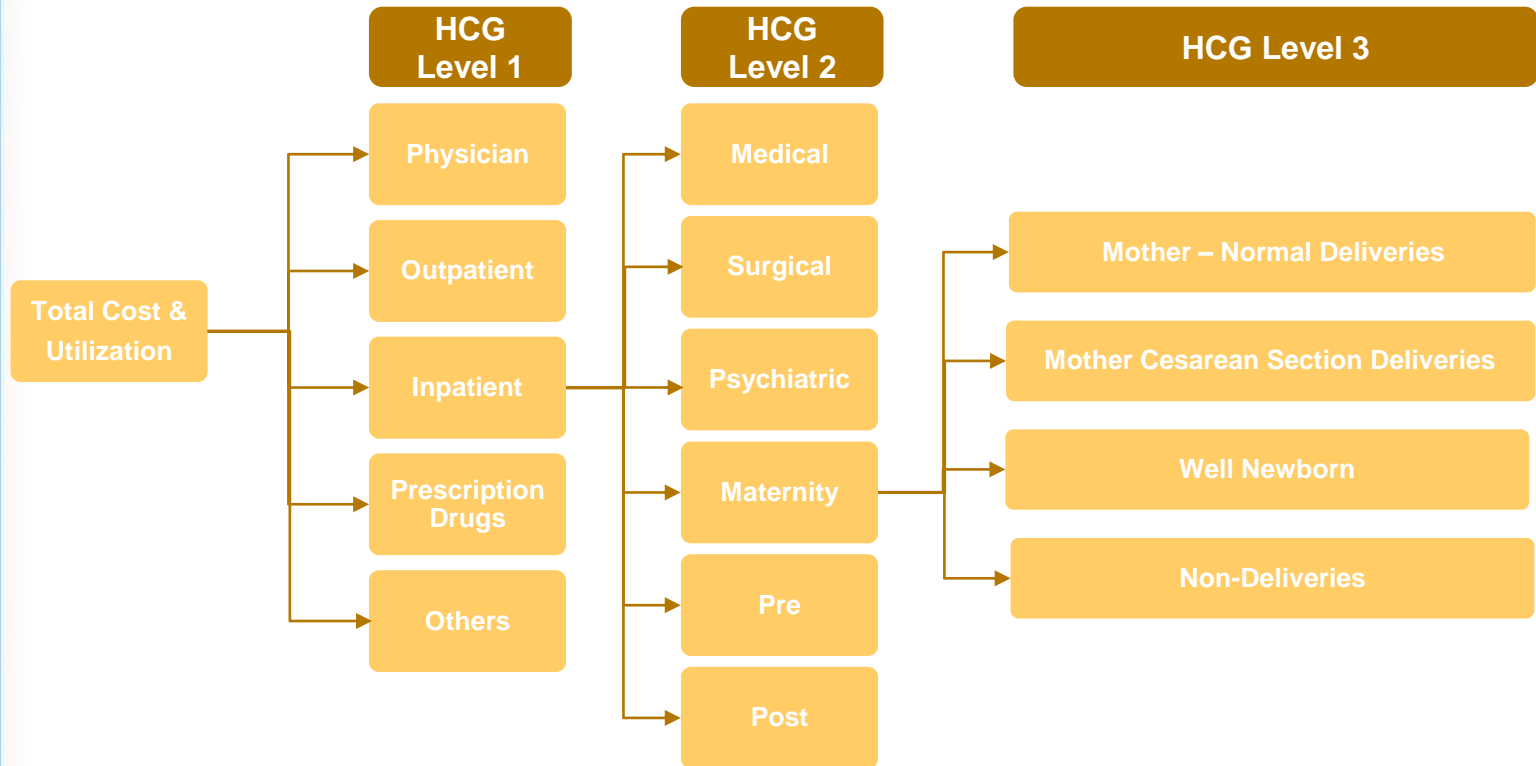
Chronic conditions hierarchical groups (CCHGs)

- A unique, clinical, care-based methodology for enhancing population health management based on patient and chronic condition information.

- CCHGs consist of 43 unique condition groups, of which roughly half represent chronic conditions, and the other non-chronic conditions and healthy members:
    - Using diagnosis codes we identify claims made for conditions that link to chronic conditions, and otherwise.

- The analysis identifies key causes for utilisation and cost trends, and analysis can be used to:
    - Better explain the trends in utilisation and costs than use of standard GLM factors such as age and gender.
    - Measure resource utilisation.
    - Clinical quality.
    - Population based budgets.
    - Other outcomes such as provider profiling.

- Data requirements for detailed analysis:
    - Matching exposure to claims data.
    - Secondary and tertiary diagnosis and procedure codes to identify condition that is most 'clinically relevant'.

Patients are assigned to the following 43 categories

CCHG Categories			
101	Major psychosis	123	Dermatologic disorders
102	Severe dementia	124	Unhealthy newborns and preemies
103	Active cancer	125	Other chronic conditions
104	Renal failure - post transplant	126	Healthy Infant (0-1)
105	Liver disease (Hepatitis, Cirrhosis) – post transplant	127	Healthy Child (2-5)
106	HIV	128	Healthy Male (6-15)
107	Severe rheumatic & other connective tissue disease	129	Healthy Male (16-40)
108	Severe heart failure/transplant/rheumatic heart disease/non-rheumatic valvular heart disease	130	Healthy Male (41-64)
		131	Healthy Male (65-69)
109	Hemophilia & sickle cell & chronic blood disorders	132	Healthy Male (70-74)
110	Both CAD & diabetes	133	Healthy Male (75-79)
111	CAD without diabetes	134	Healthy Male (80-84)
112	Diabetes without CAD	135	Healthy Male (85+)
113	Hypertension (Includes stroke & peripheral vascular disease)	136	Healthy Female (6-15)
114	COPD	137	Healthy Female (16-40)
115	Asthma	138	Healthy Female (41-64)
116	Neurologic disorders	139	Healthy Female (65-69)
117	Learning disability / congenital anomaly	140	Healthy Female (70-74)
118	Chronic musculosketetal/osteo arthritis/osteporosis	141	Healthy Female (75-79)
119	Other mental health/substance abuse	142	Healthy Female (80-84)
120	Gastrointestinal disorders	143	Healthy Female (85+)
122	Thyroid disorders	144	Other Healthy (Unknown Age or Gender)

CCHG profile report (illustrative sample)

CCHG Category	Unique members	% Distribution chronic disease	Inpatient admits/1000	Day case admits/1000	Average cost per year	Average premium per year	Loss ratio	Average age
Active Cancer	76	6%	12.1	6.7	18,950	22,500	84%	57
Both CAD and Diabetes	69	6%	4.3	2.5	16,580	26,200	63%	69
CAD without diabetes	278	22%	3.0	1.6	19,800	19,800	100%	63
Diabetes without CAD	179	14%	0.2	0.0	14,800	15,600	95%	53
Hypertension (incl stroke & peripheral vascular disease)	61	5%	0.4	0.2	13,650	14,800	92%	63
COPD	54	4%	0.2	0.0	18,700	28,200	66%	75
Asthma	132	11%	0.1	0.1	14,680	10,200	144%	42
Chronic musculoskeletal	165	13%	1.1	0.4	12,680	14,600	87%	53
Other chronic diseases (aggregated)	232	19%	1.4	0.5	8,650	9,680	89%	46
Healthy male (16-40)	5,730		3.3	1.4	1,468	6,100	24%	28
Healthy female (16-40)	4,182		2.7	1.2	2,654	7,500	35%	33
Healthy male (41-64)	7,687		5.2	3.3	1,890	7,070	27%	51
Healthy female (41-64)	7,469		4.9	3.1	2,100	7,800	27%	52
Healthy others	6,267		4.0	2.3	3,680	12,600	29%	67
Totals	32,581				150,282	202,650	74%	

UK Cancer analysis – CCHGs feasibility test

- Reviewed the cancer claim trends in UK PMI data over the years.

- Developed an algorithm based on patient and clinical condition information to examine claims related to members with cancer.

- Reviewed per member costs for cancer claims, non-cancer claims of "cancer members", and all other claims.

- Analysis was partially limited by inconsistent clinical coding.

PMPM Distribution among Cancer, 'Cancer Members' and all other claims
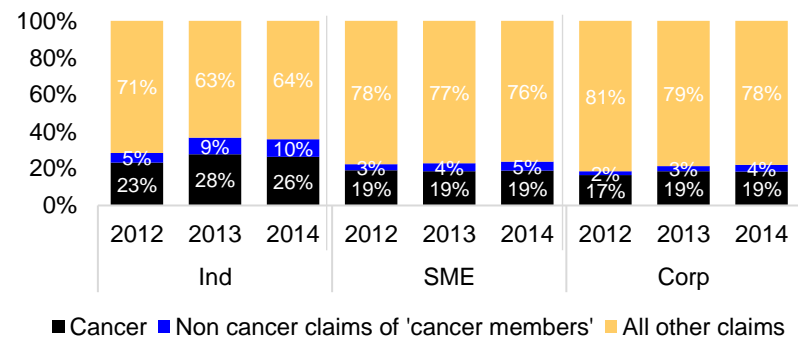
Trends in Average Cost of Claims for Cancer Claims, Non-Cancer Claims and All Claims
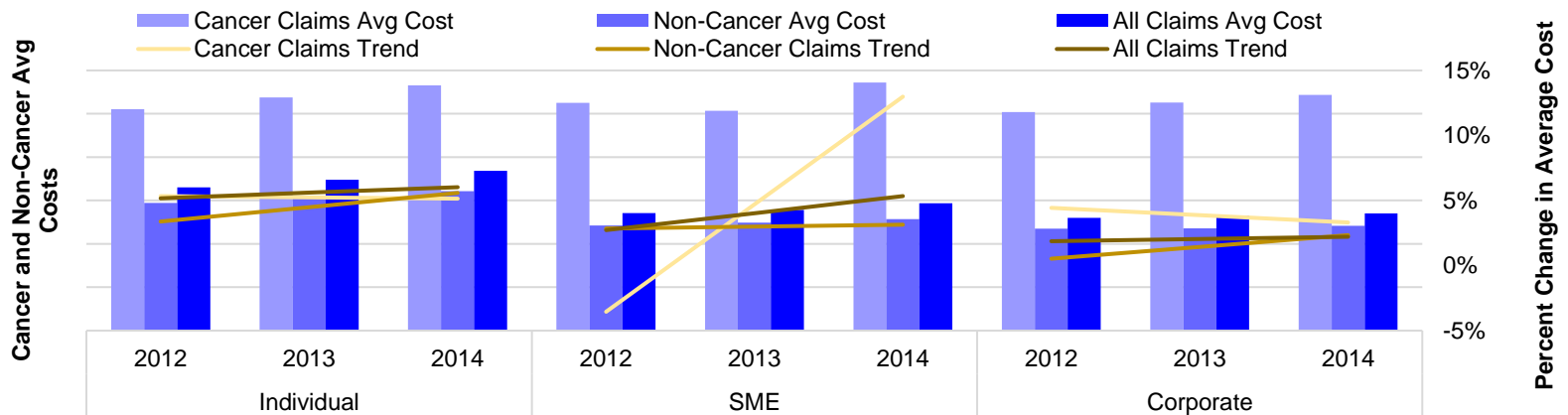
Chronic condition hierarchical groupers (CCHGs)

Example output and insights:

- Using CCHGs, we can identify high-resource utilisation members while identifying each member's most severe condition.

- In the example below, 6% of members account for 44% of total costs while 46% of members in "healthy state" categories account for only 20% of cost.

- In the particular example below, cancer accounted for a large proportion of costs and we therefore further segmented this category into cancer type to gain additional insights*.
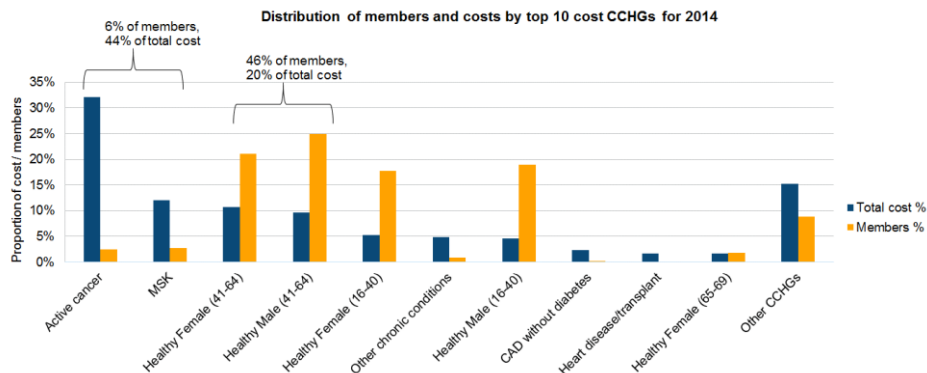
Goodness of fit:

- We have found that using CCHGs as a predictor of healthcare resource use is significantly more powerful than using age/gender alone.

- This dramatic improvement in goodness of fit indicates a key result:

Two members with the same clinical condition and a different age/sex profile are more similar than two members of the same age and sex with different or no clinical conditions.

Distribution of members and costs by top 10 cost CCHGs for 2014

6% of members, 44% of total cost

46% of members, 20% of total cost

*http://uk.milliman.com/uploadedFiles/insight/2018/risk-adjustment-uk-pmi-market.pdf

5.3 | **MARA: Milliman Advanced Risk Adjusters**

Milliman advanced risk adjusters (MARA)

- A population stratification tool that uses longitudinal data assets and advanced statistical methods to calculate a total risk score per member.

- Total risk score represents the expected overall healthcare resource utilisation for each member relative to the average.

- Risk score can be further broken down into service categories.

- These results can also be used to calculate each member's likelihood of hospitalisation within a 12 month period.

- Output summarising each member's clinical conditions and how they contribute to the overall risk score, if at all.

- Using results from this tool we are able to:

  - Understand the risk profile of a particular population/sub-population .

  - Assess how risk profiles have changed over time.

  - Compare risk profiles between different populations.

MARA output

Total risk score by service category

For each member in the population, MARA produces their expected relative healthcare resource utilisation relative to the population average at a total level and by service category.

Example risk score, male aged 51 – Very high risk

Inpatient 13.06

Other 0.50

Emergency Room 0.19

Total risk score = 22.99

I.e. this member is expected to have a per member per month cost 22.99 times higher than average.

Pharmacy 1.19

Outpatient 2.04

Physician 6.01
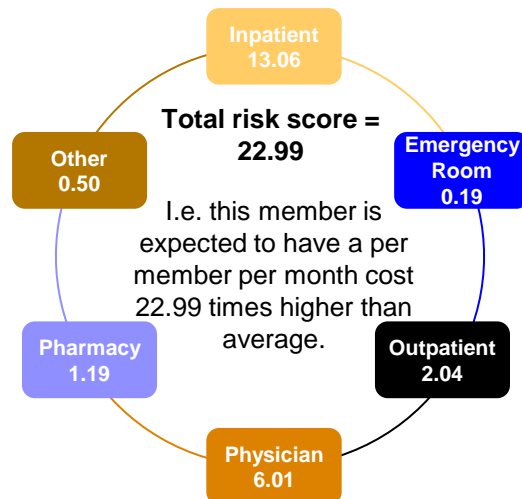
Contribution of clinical conditions to risk score:

For each member in the population, MARA produces a list of clinical conditions and how each condition contributes to the total risk score for each member, if at all. Some identified clinical conditions will not influence the risk score but are included in the list (e.g. Vitamin D deficiency will have a 0% contribution).

Clinical condition contribution to risk score

- Bacterial Infection 8%
- Anaemia 10%
- Degenerative Nerve Disease 12%
- Thrombocytopenia 12%
- Myeloproliferative disorder 22%
- Paralysis 21%
- Hypertension 15%
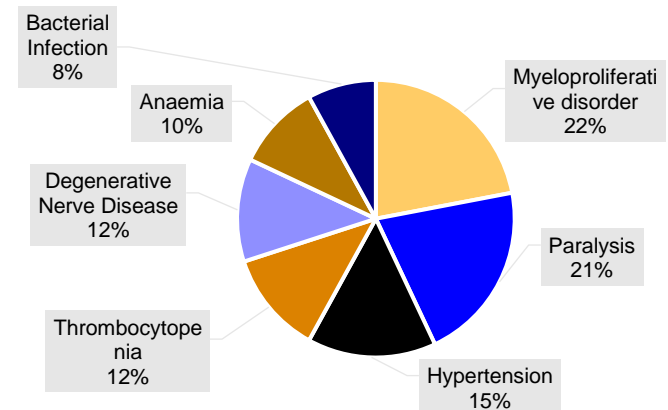
Application of risk stratification tools

Identify drivers of healthcare resource utilisation.

Measure change in disease burden over time.

Support business decisions, product development, provider relationships and claims management initiatives.

Clinical analytics

Care management programmes

Identify target populations.

Monitor programme effectiveness and calculate ROI.

Applications

Provider profiling

Calculate capitation fees.

Measure risk profile changes over time.

Understand variation in risk profile between providers and sub-populations.

Risk-share arrangements

Pricing

Like-for-like comparisons between providers' allocated populations.

Create benchmarks to measure provider efficiency and quality.

Can be used to inform benefit design, pricing and monitoring process.

5.4 **GLM: Generalised Linear Modelling**

General linear modelling (GLM)
What?

- GLMs have become the global industry standards for pricing segmentation.

- In running GLM, we can use a blend of statistical diagnostics, practical tests and our business acumen to select rating factors.

- Can be used beyond rate making – customer behaviour analysis; underwriting; marketing.

- Below is an example of age/sex factors derived using GLM techniques.

Example age/sex factors
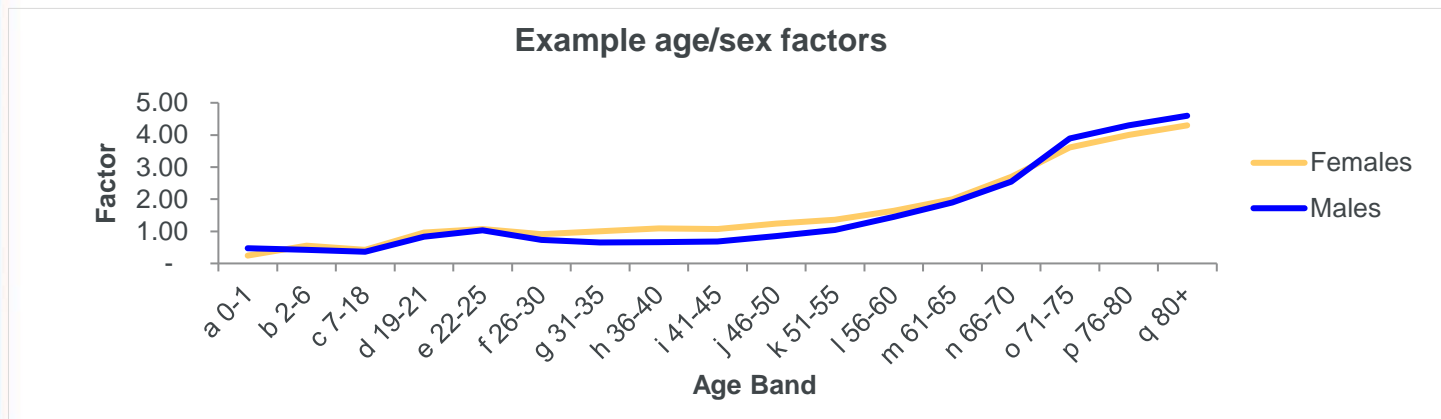
5.5 Machine Learning and AI

Machine Learning and AI
What?

- New techniques of data-driven decision-making, automation, and enhanced customer experiences.

- Involves a combination of data analysis, predictive modeling, automation, and decision support.

- Can be used for –

  - Risk assessment and underwriting

  - Pricing Optimisation

  - Claims processing

  - Fraud analysis

  - Customer service

6 **Final Thoughts**

Conclusions

- Identify the business question that you are trying to answer with the performance review:
  - Pricing and re-pricing.
  - Profitability and market share.
  - Risk stratification / customer segmentation.
- Identify the data needed to answer that question.
- With due consideration to the business question, data available and data needed, identify the most suitable analysis.

CAVEAT

Decision confidence will only come from data confidence!!!!

References

A look into international private medical insurance market
July 2017

Looking at Cancer Trends through Milliman Health Cost Guidelines
February 2017

Risk Adjustment in the UK PMI market
March 2018

- **Creating a Data-Driven Organization – by Carl Anderson**

Thank You

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