New tools for health data analysis

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Data

System is structured to process claims and pay benefits

150m Encounters between patients and healthcare providers

65m Pharmacy visits, with Nappi codes

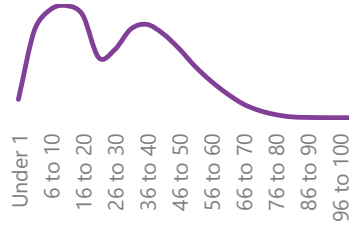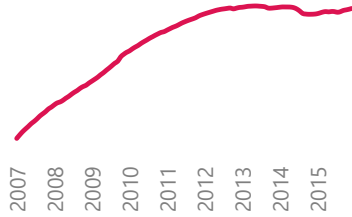We have enormous amounts of data in the healthcare system that can be used to improve performance

30m Family practitioner visits, with RPL and ICD codes

2.5m Hospital admissions with ICD and CPT code strings, Nappi codes and utilisation data
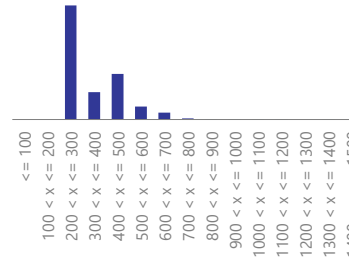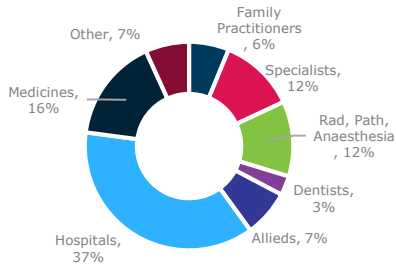
Conventional reporting

PLPM cost comparisons

Traditional age and gender

"Keeping score of a losing game"

Lack insight

"So what?"

Clinical data hierarchy

Risk scores provide a way of monitoring risk profiles of populations over time, and comparing risk profiles between regions, considering the state of health and sickness of each patient in a summarized but meaningful way

Capturing diagnostic codes for all interventions allows tracking of disease burden. In South Africa this is done using **ICD 10**.

Treatment coding keeps track for the activity level in the health systems – how many consultations, how many hospital admissions with supporting detail like days in ICU wards and time in theatre.

Medicines and consumables are individually coded so as to be able to identify volumes , track efficacy, and ensure compliance with protocols and formularies.

Granular demographic and clinical data are aggregated in actuarial and clinically sound algorithms such as:

Population Risk Classification for monitoring changes in burdens of disease and risk profile

Diagnosis Related Groups to classify hospital admissions, quantify case mix, understand hospital efficiency and outcomes on a like for like basis
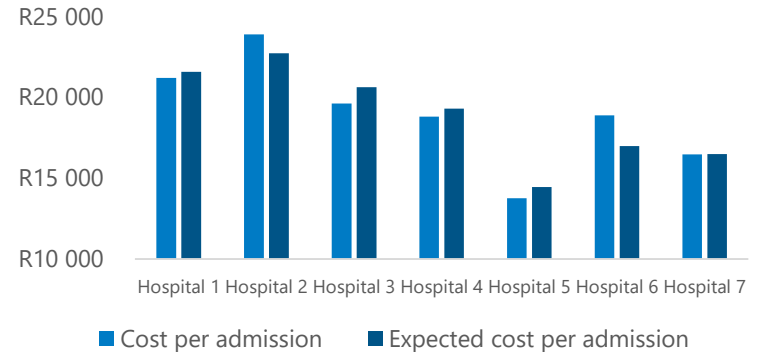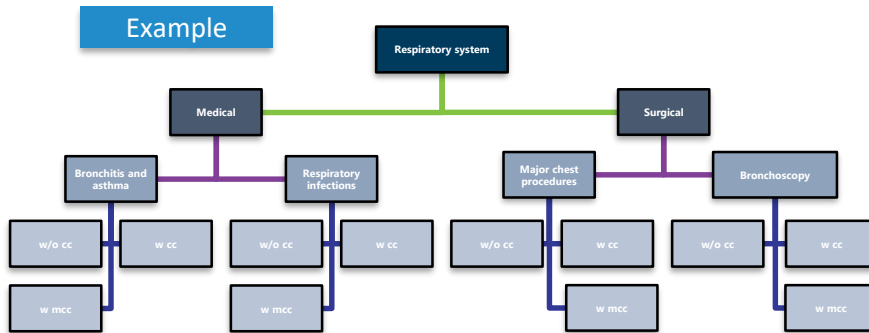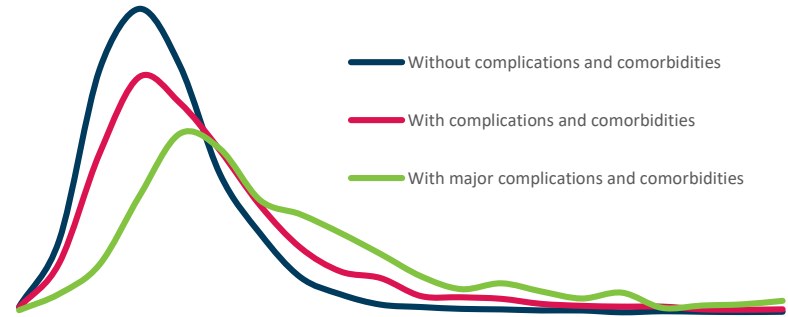
Episode Groupers to monitor treatments plans, compliance to protocols and analyse clinical pathways.

Pyramid

- Risk scores
- Data groupers and analytical tools
- Diagnostic coding, treatment coding, medicines and consumables

Diagnostic related groups (DRGs)

DRGs are a grouping tool that categorise hospital admissions into *clinically and actuarially meaningful groups*.

The applications of DRGs are primarily to quantify and monitor *cases mix* – changes in case mix over time, and comparisons of case mix differences between facilities.

This allows *like for like* comparisons to be done when comparing financial efficiency and outcomes over time or between two hospitals.

— Without complications and comorbidities

— With complications and comorbidities

— With major complications and comorbidities

Example

Respiratory system

Medical — Surgical

Bronchitis and asthma — Respiratory infections — Major chest procedures — Bronchoscopy

w/o cc | w cc | w/o cc | w cc | w/o cc | w cc | w/o cc | w cc

w mcc | w mcc | w mcc | w mcc

R25 000

R20 000

R15 000

R10 000

Hospital 1 | Hospital 2 | Hospital 3 | Hospital 4 | Hospital 5 | Hospital 6 | Hospital 7

■ Cost per admission ■ Expected cost per admission

Episode grouper

The episode grouper groups encounters with healthcare providers, as captured by claims to the medical scheme, into coherent episodes of care.

Encounters with healthcare providers

Claims

Episodes of care
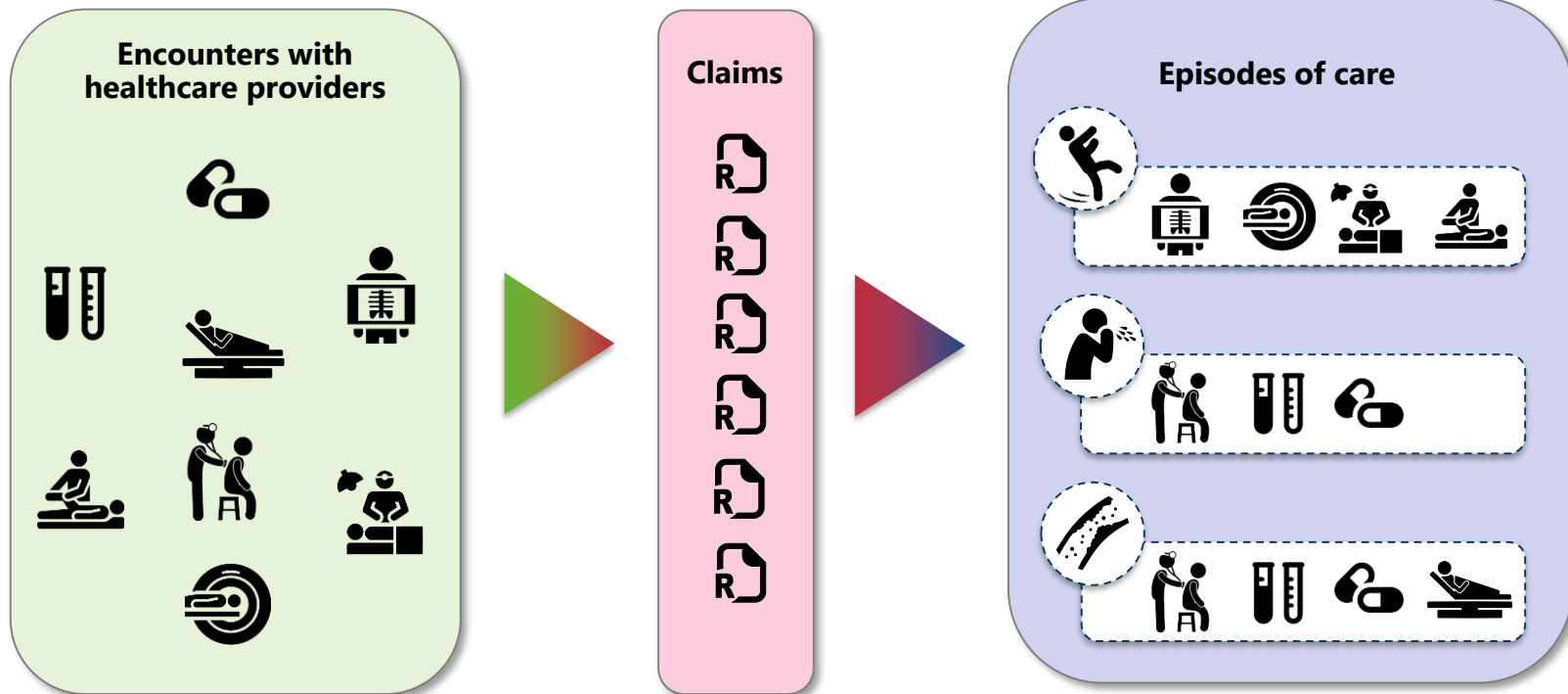
Patient grouper

Assigns each beneficiary to a clinically intuitive risk cell

Used for risk adjustment or risk stratification

Considers: Demographics i.e. Age, Package,

Primary and Secondary clinical categories, number of clinical categories

Strata 1

1% of sickest lives,
Multi-morbidity
PLPM: +- 15 x average scheme PLPM

Strata 2

5% of lives,
Single chronic condition
PLPM: +- 5 x average scheme PLPM

Strata 3

20% of lives,
Lifestyle risks i.e. obesity, fitness levels,
poor diet- pre-disease population
PLPM: +- 2 x average scheme PLPM

Strata 4

74% of lives,
Generally healthy lives, young and
healthy or relatively good lifestyle
PLPM: +- 0.5 x average scheme PLPM

The Signal Model

Cost pmpm

12 000

10 000

8 000

6 000

4 000

2 000

-

50%   60%   70%   80%   90%   100%

Benefit Value (Signal)

The Signal model compares benefit richness and price to allow for meaningful comparisons of value-for-money in the medical schemes market using objective quantitative methods.

The model allows for:
- Medical savings accounts
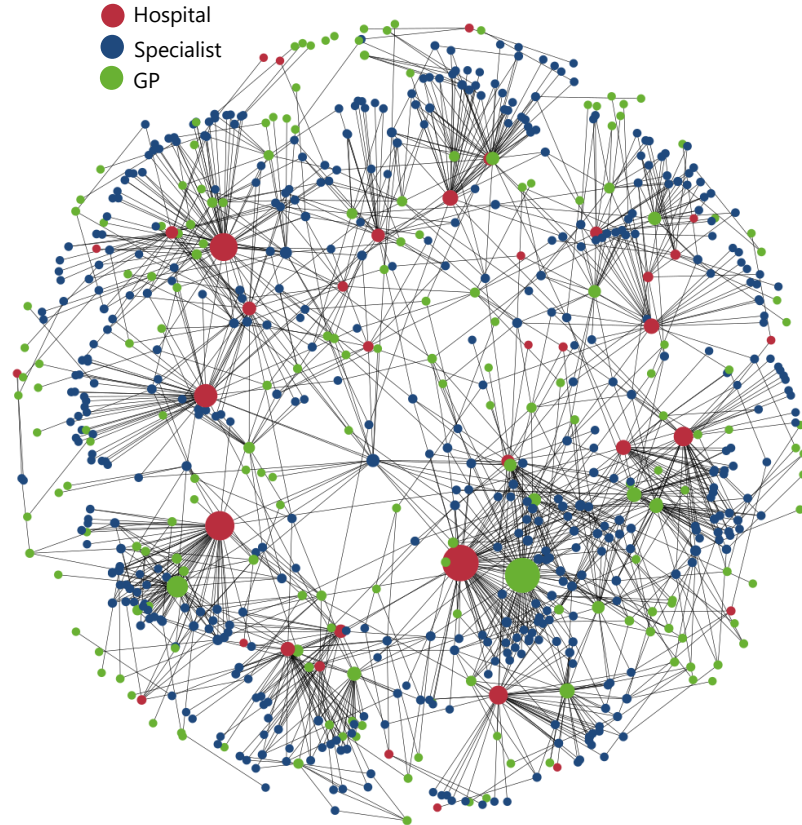- Benefit limits
- Co-payments
- Self-payment gaps
- Above-threshold benefits

Network analysis

This is a visualisation of the referral network of GPs, specialists and hospitals in the Cape Town metro and surrounds.

Lines represent referral relationships and circles represent practices.

Legend:
- Hospital
- Specialist
- GP

The size of a circle indicates how much "influence" that practice has.

In a social networking setting **influence** would relate to how many friends you have. Here it indicates how many different providers a practice has a referral relationship with

Regional Analysis
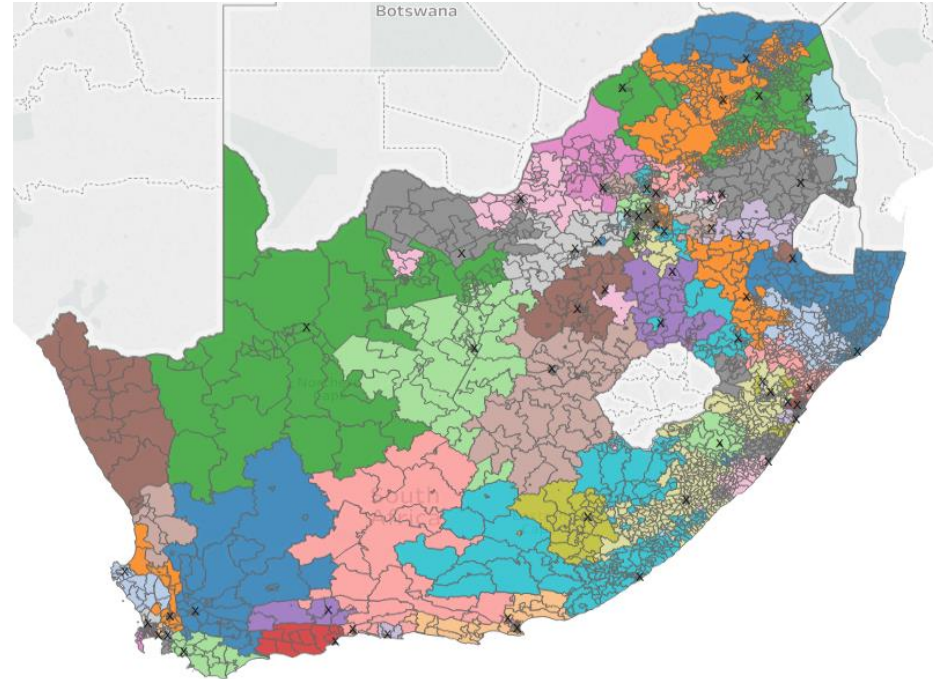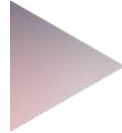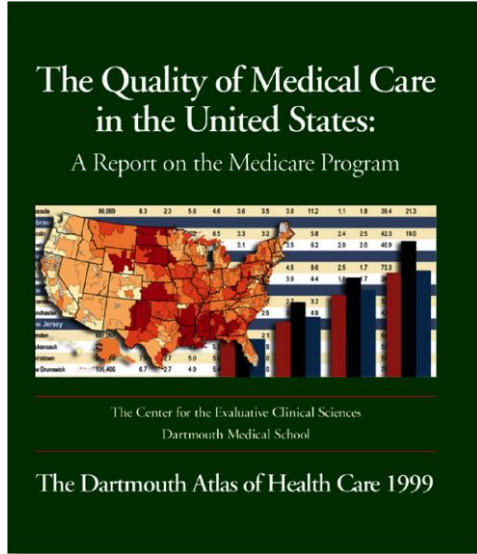
"It is not just who you are as a patient that determines what healthcare you receive but also where you live."

"There is a lot of unwarranted variation in clinical practice that is not explained by illness, medical need or the dictates of evidence based medicine."

Patients don't always travel to the facility that is closest to them.

Sometimes patients travel through or around the closest centre to access care.

National roads and freeways are important

Referral regions are not bound by municipal or provincial borders.

A note from PPO Serve

"For the regional analysis, a referral area is the defining the unit of analysis (comparison) for the health system at work.
The objective of the exercise is understand variation, and therefore areas of improvement.

We achieve this by defining the correct numerator and denominator for each competing health system"

Population baseline

Proportion of population
0,000   1,000
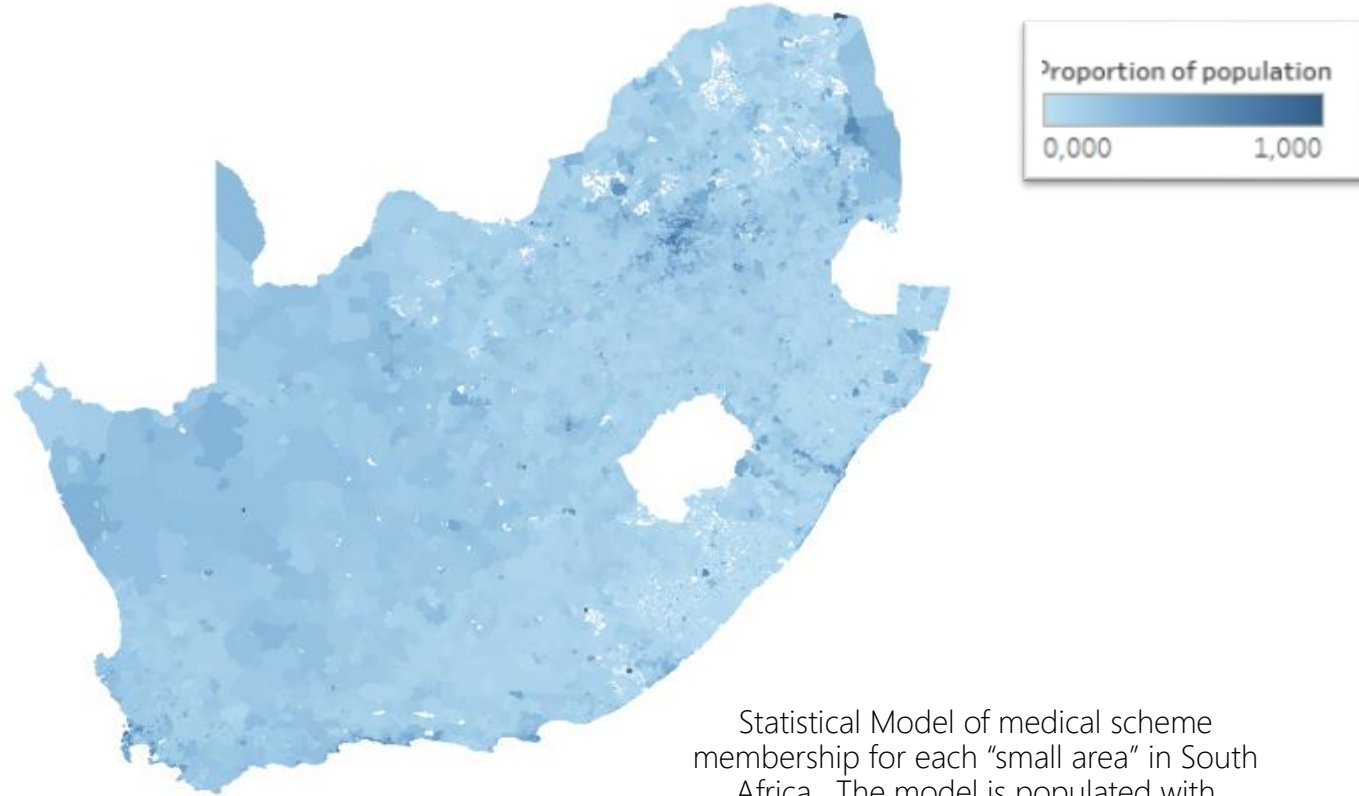
Statistical Model of medical scheme membership for each "small area" in South Africa. The model is populated with information from public data sources.

Estimated medical scheme population in Cape Town

Proportion of population
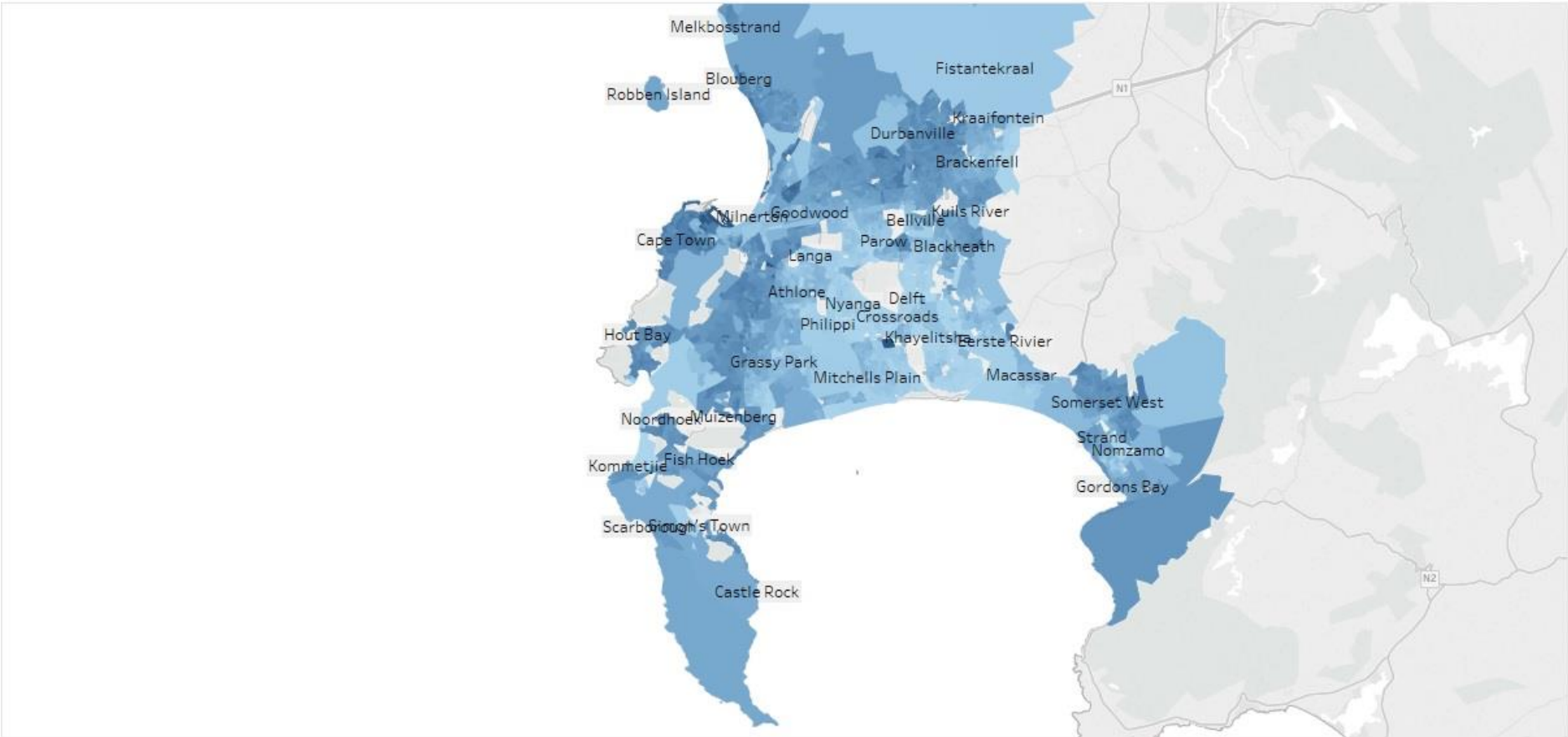
0,000   1,000

Applications – Benchmarking providers

Integrated tool set and applications for data driven decision making

Hexagon cluster: DRG, Network Mapping, Episode Grouper, Healthcare Atlas, Signal model, Population Grouper
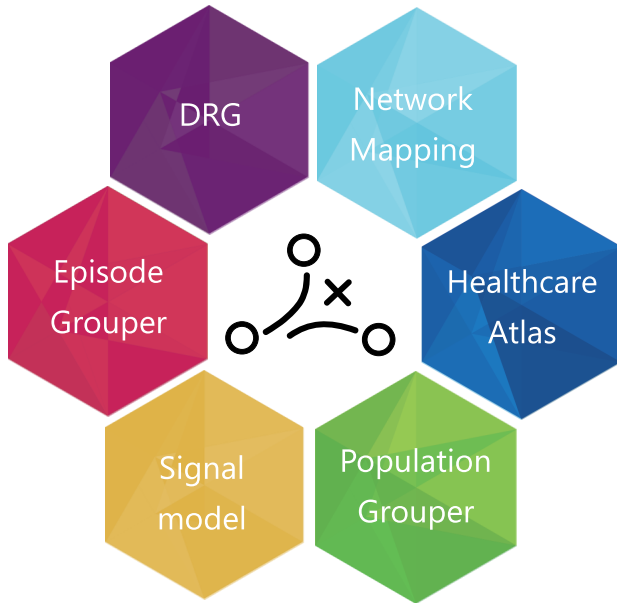
Membership monitoring

Family Practitioner benchmarking

Specialist benchmarking

Hospital benchmarking

Solutions deployed through an online dynamic system; with slice and dice functionality to empower users.

Sophisticated risk adjustment and attribution

Health provider network design

Market share and regional analytics

Alternative reimbursement models

Benefit richness analysis and benchmarking

Sophisticated tools to manage a complex environment. Applied through actuarial services, managed care analytics, and strategic advisory services.

Episodes

Associated data (provides useful insights)

Risk factors Aetiology

Pathophysiology Anatomy

Disease progression

Minor acute

Major acute

Acute additive

Chronic - intermittent

Chronic - persistent

Acute on chronic

Organ failure

Episodes that have sudden onset and limited duration

Repeated episodes have a cumulative impact on health

Chronic implied on third acute event in absence of coding

Chronic conditions that present symptoms intermittently

Chronic conditions that require continuous management

Flare-up of underlying chronic condition

Organ dysfunction that occurs to such a degree that homeostasis cannot be maintained without external clinical interventions (such as an organ transplant)
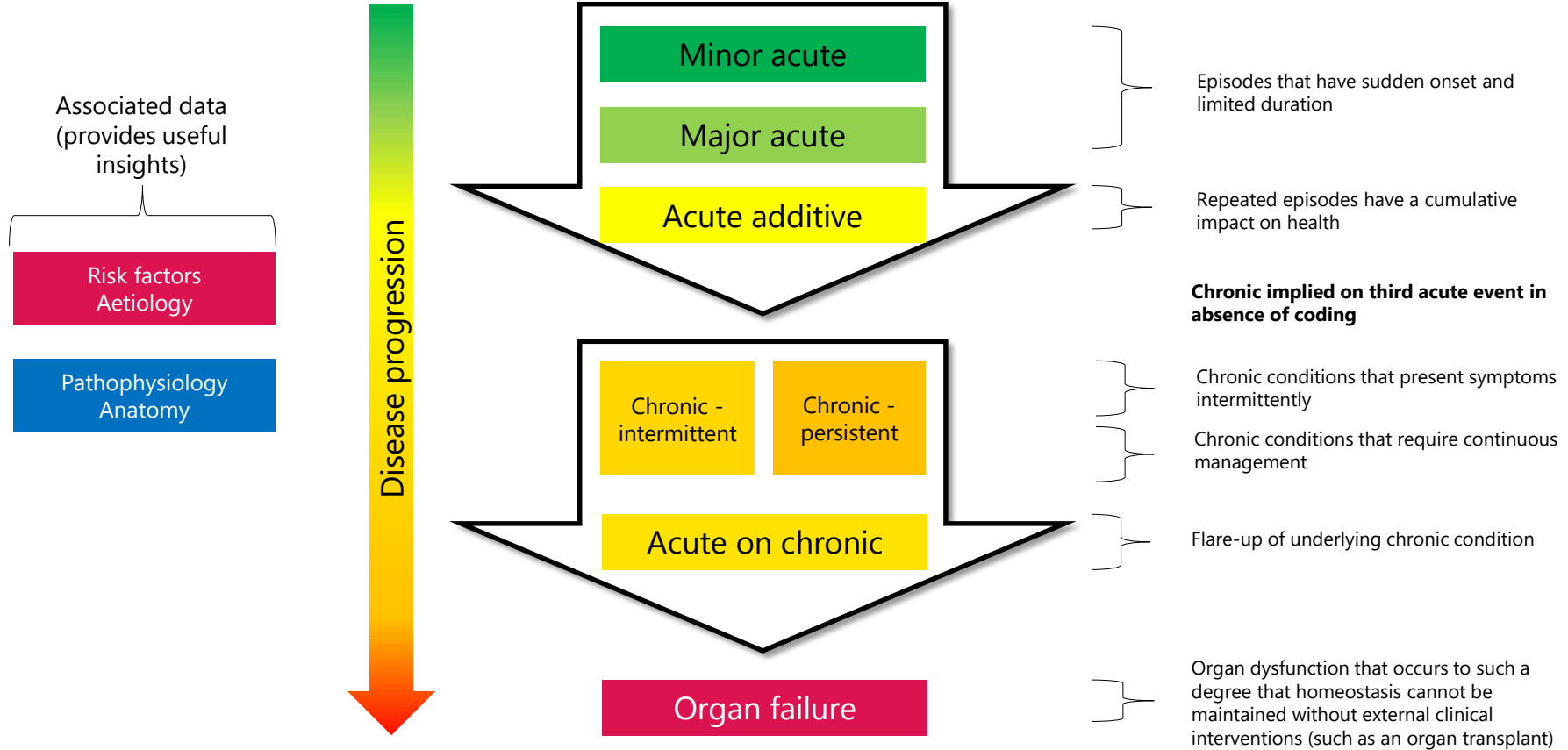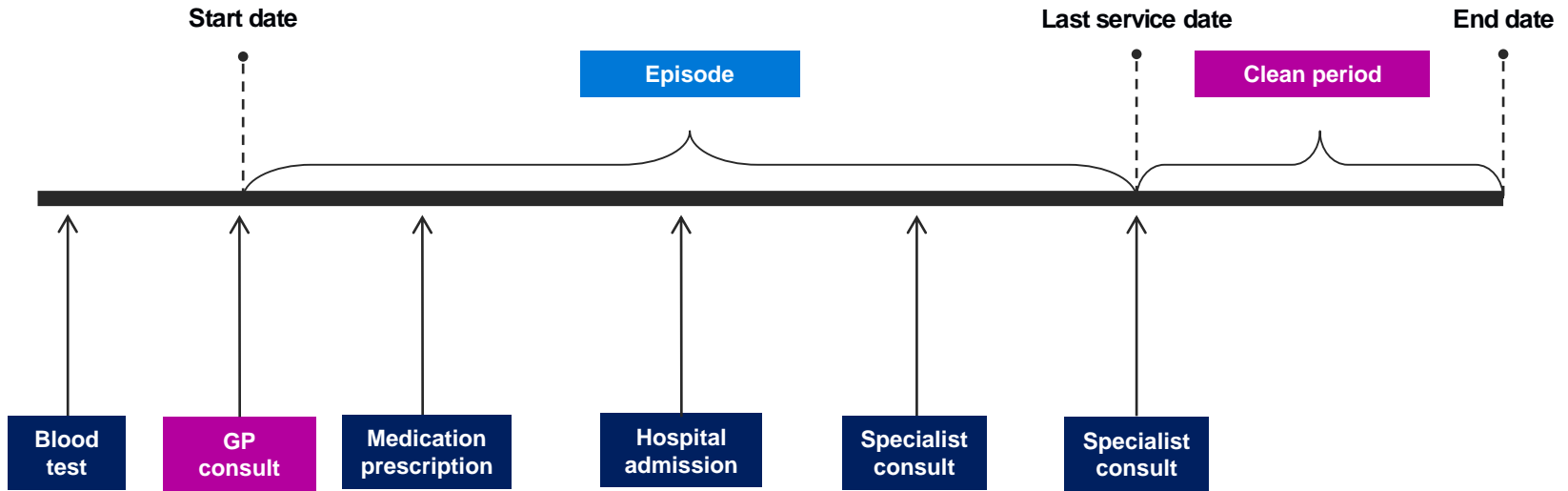
Constructing an episode

Multiple claim lines are linked to a single episode. Asynchronous information summarised into single health events. Clinical complexity retained.

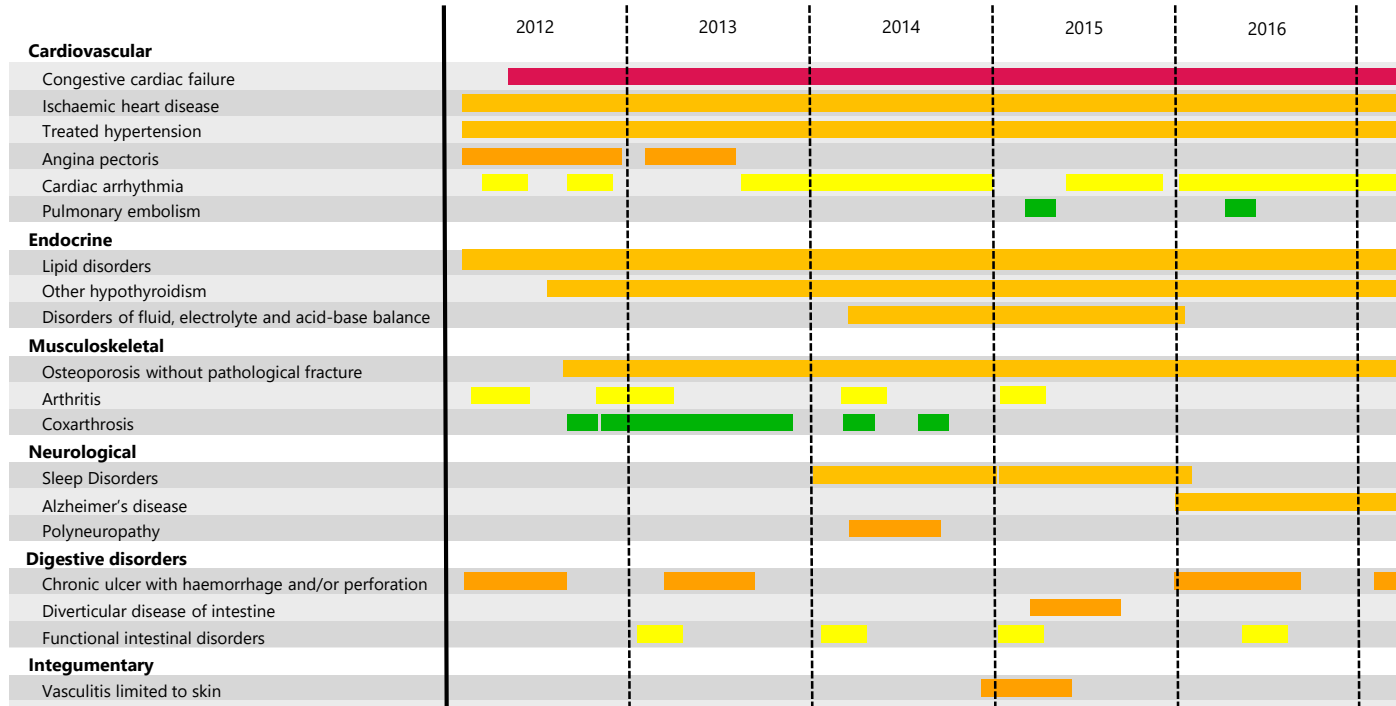# Clinically intuitive, rich patient views

Name: Mr M   Option: Galaxy Plus   Gender: Male   Age: 86   Date joined: 1 Mar 2012

Legend: Limited – major acute (green) | Acute additive (yellow) | Chronic - persistent (amber) | Chronic - intermittent (orange) | Organ failure (pink)

	2012	2013	2014	2015	2016
Cardiovascular					
Congestive cardiac failure					
Ischaemic heart disease					
Treated hypertension					
Angina pectoris					
Cardiac arrhythmia					
Pulmonary embolism					
Endocrine					
Lipid disorders					
Other hypothyroidism					
Disorders of fluid, electrolyte and acid-base balance					
Musculoskeletal					
Osteoporosis without pathological fracture					
Arthritis					
Coxarthrosis					
Neurological					
Sleep Disorders					
Alzheimer's disease					
Polyneuropathy					
Digestive disorders					
Chronic ulcer with haemorrhage and/or perforation					
Diverticular disease of intestine					
Functional intestinal disorders					
Integumentary					
Vasculitis limited to skin					

Disaggregate spend across episodes for individuals over time

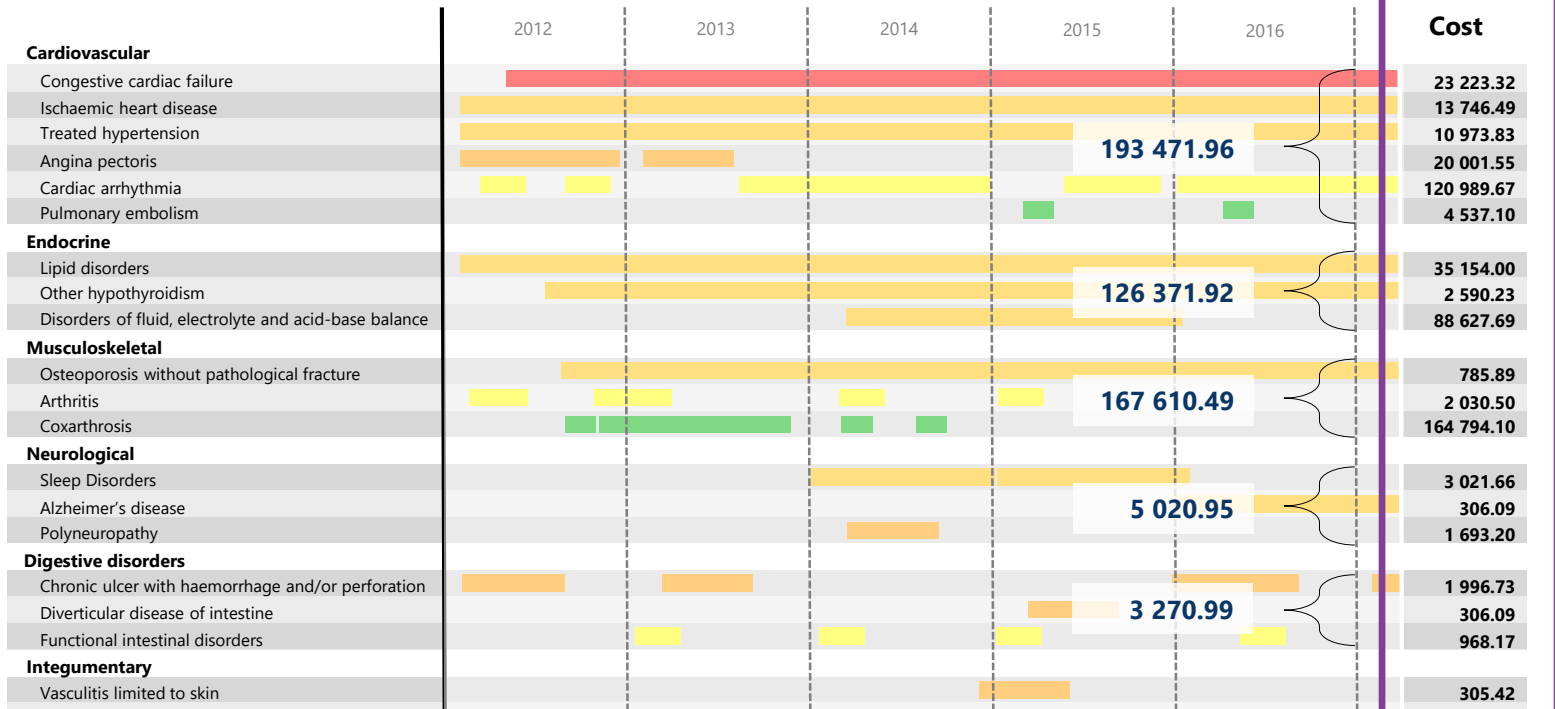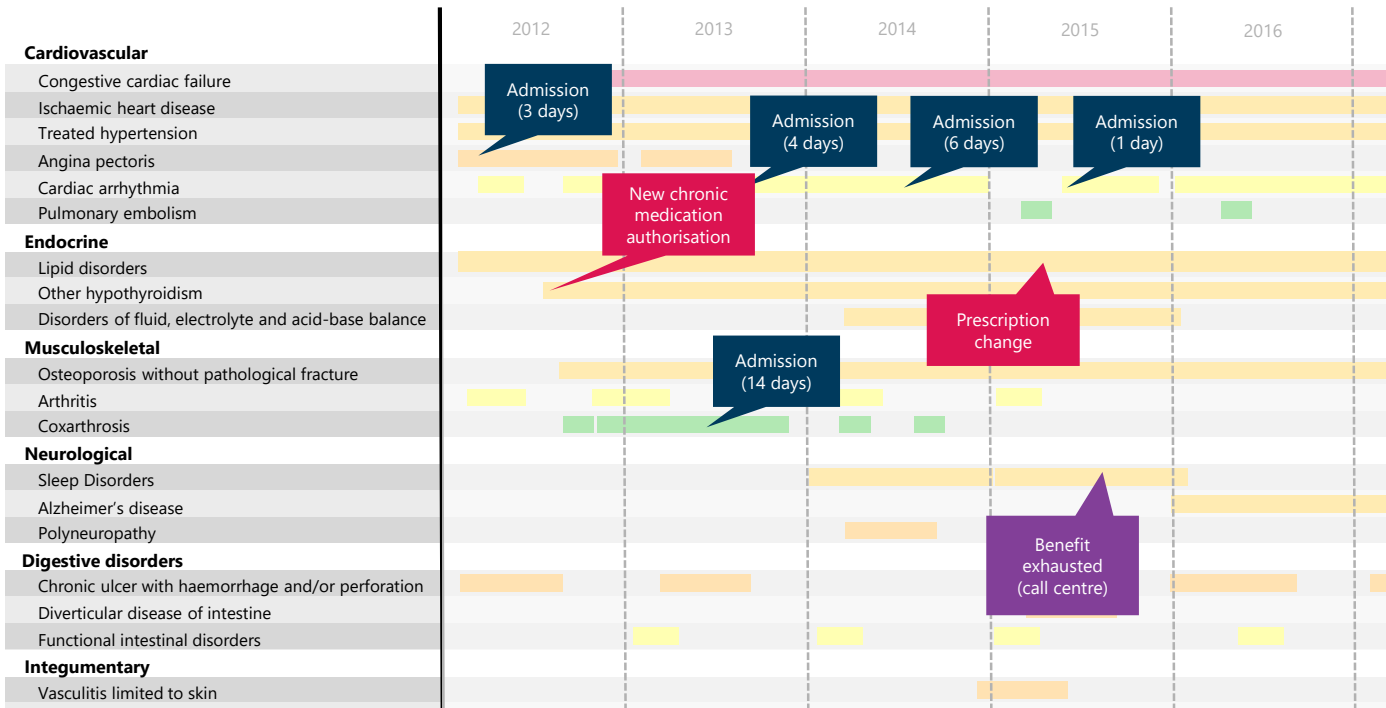Name: Mr M   Option: Galaxy Plus   Gender: Male   Age: 86   Date joined: 1 Mar 2012

Legend: Limited – major acute | Acute additive | Chronic - persistent | Chronic - intermittent | Organ failure

	2012	2013	2014	2015	2016	Cost
Cardiovascular						
Congestive cardiac failure						23 223.32
Ischaemic heart disease						13 746.49
Treated hypertension				193 471.96		10 973.83
Angina pectoris						20 001.55
Cardiac arrhythmia						120 989.67
Pulmonary embolism						4 537.10
Endocrine						
Lipid disorders						35 154.00
Other hypothyroidism				126 371.92		2 590.23
Disorders of fluid, electrolyte and acid-base balance						88 627.69
Musculoskeletal						
Osteoporosis without pathological fracture						785.89
Arthritis				167 610.49		2 030.50
Coxarthrosis						164 794.10
Neurological						
Sleep Disorders						3 021.66
Alzheimer's disease				5 020.95		306.09
Polyneuropathy						1 693.20
Digestive disorders						
Chronic ulcer with haemorrhage and/or perforation						1 996.73
Diverticular disease of intestine				3 270.99		306.09
Functional intestinal disorders						968.17
Integumentary						
Vasculitis limited to skin						305.42

Improves risk prediction through built-in observed disease specific progression
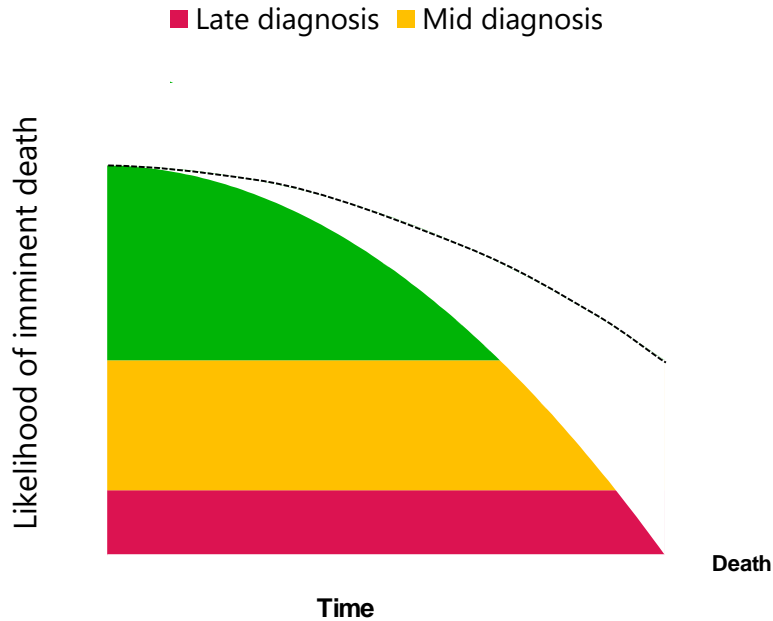
- Inference analytics

- Improved disease management (different kind of ROI)

- Monitoring and alerts

- Live, interactive dashboards

- Product design considerations

Determine future episode relevance / significance

Understand and treat patients according to their specific needs

Patient A
Progressive Angina
Costs: R50 000

45 year old male

Co-morbidities: Hypertension, minimal

Relative risk index: 2.5
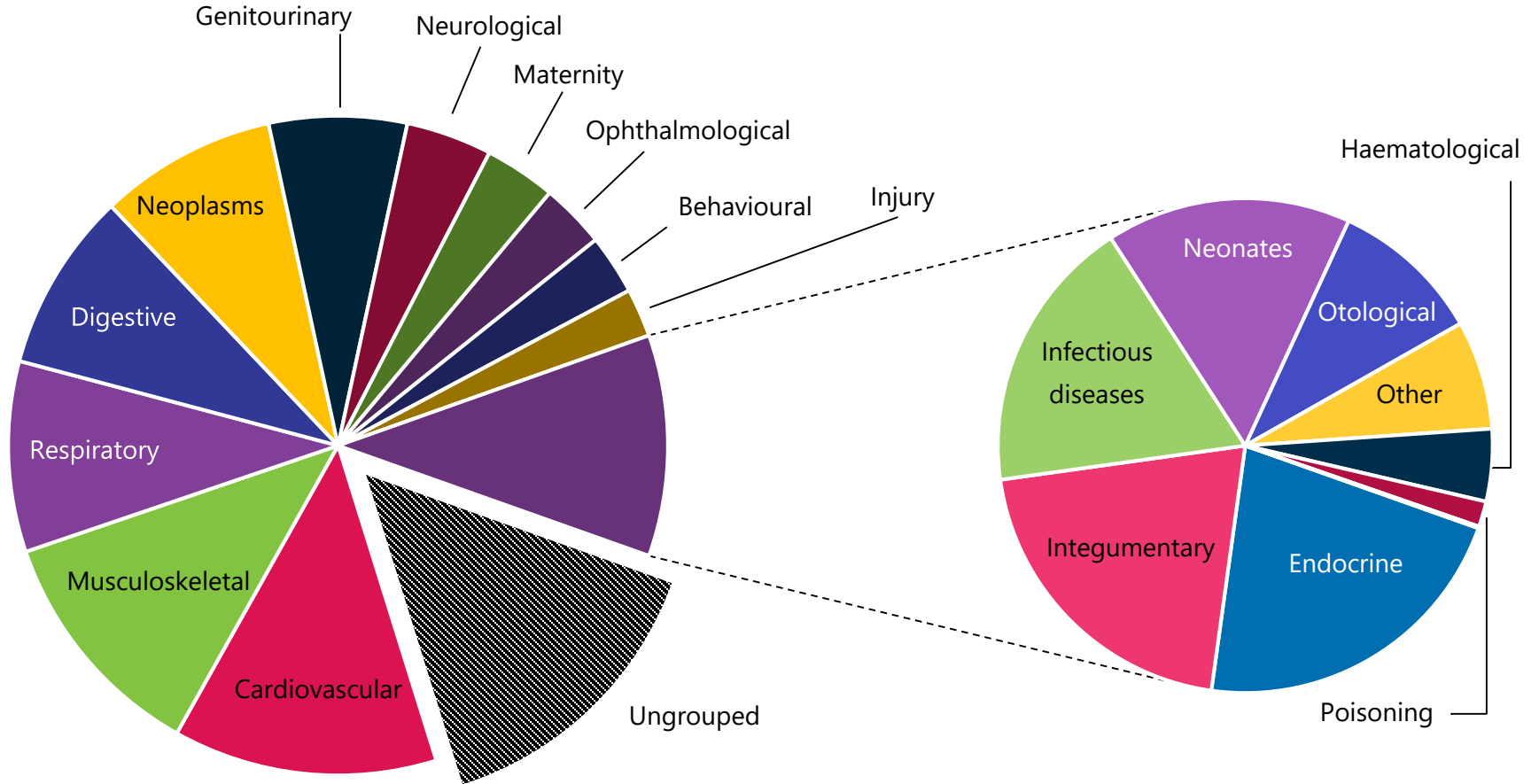
Patient B
Progressive Angina
Costs: R500 000

65 year old male

Co-morbidities: Congestive hearth failure, Type I Diabetes, Vascular diseases, Renal failure
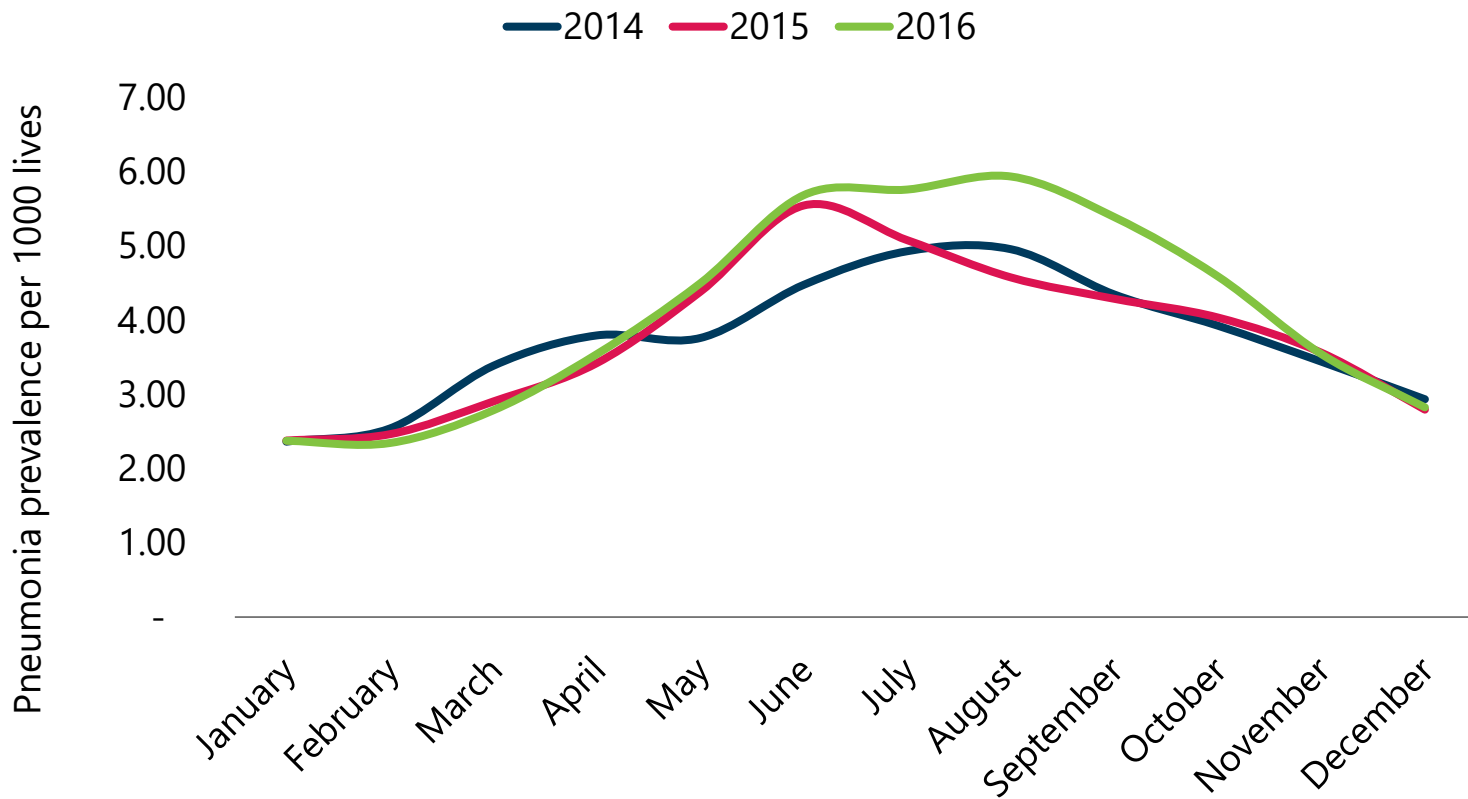
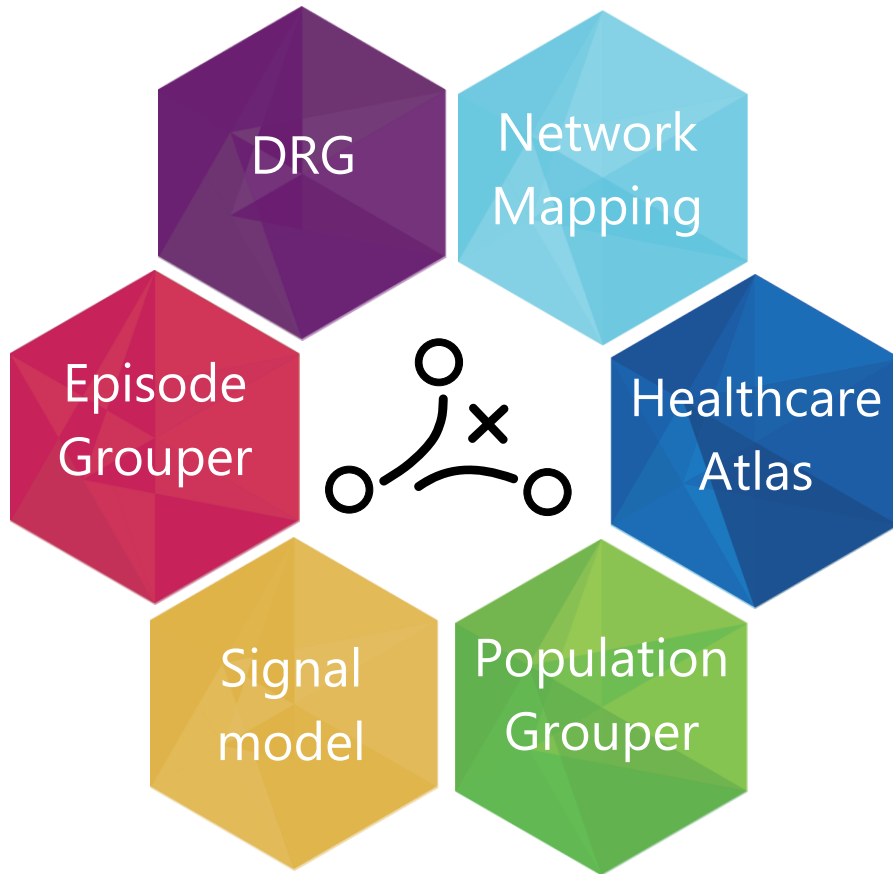**Relative risk index:** 30.5

Analyze claims by disease chapter

Observe developmental patterns (episode views) over time

Legend: 2014, 2015, 2016

Y-axis: Pneumonia prevalence per 1000 lives (scale: 1.00 to 7.00)

X-axis: January, February, March, April, May, June, July, August, September, October, November, December

DRG

Network Mapping

Episode Grouper

Healthcare Atlas

Signal model

Population Grouper

A comprehensive toolbox that can be used to analyse healthcare data in the appropriate manner, with the necessary risk adjustment and grouping to arrive at the right conclusions in order to make the best decisions.

insight

PLEASE NOTE

▶ **This presentation is incomplete without the accompanying narrative**

foresight
dialogues 2017