

The role of actuaries in the healthcare system

Presented to World Health Organisation

Ken Buffin, Emile Stipp, Denis Garand



Agenda



The role of actuaries in different healthcare systems around the world



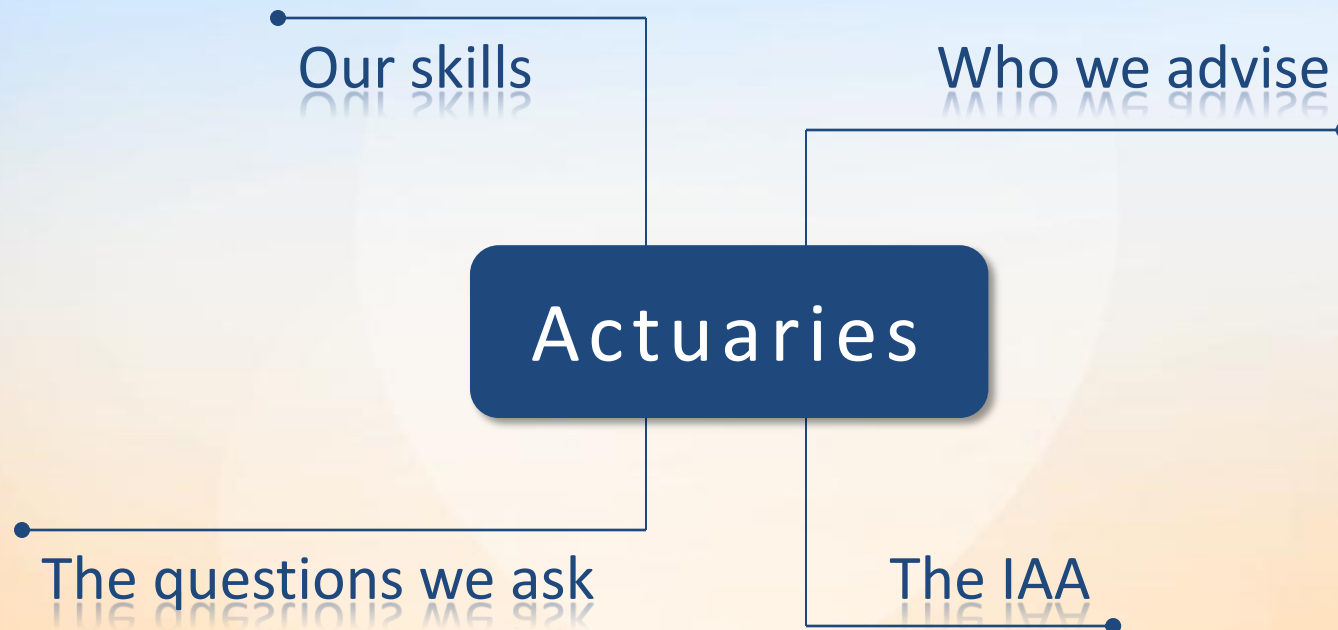
Providing understanding: The drivers of healthcare inflation



Developing solutions: Health micro-insurance



The role of actuaries



Define actuary

ac·tu·ar·y, noun

A person who compiles and analyzes statistics and uses them to calculate insurance risks and premiums

Defining characteristics

- Pragmatic
- Numerate, including good understanding of statistics
- But we are data skeptical, and often accept that we work with imperfect data
- We have a very good understanding of how healthcare systems, or administration of healthcare arrangements, impact on costs and risks, and we incorporate this in our analysis and projections
- We have a deep understanding of demographic trends and how they impact on costs and risks
- Strong emphasis on professional standards and ethics
 - Avoid conflicts of interests
 - Balanced, objective advice
 - With full disclosure
 - Doing our work for the benefit of Society



The actuarial toolkit

Projecting mortality & morbidity & financial outcomes

Exposure

Frequency / severity analyses

Good statistical understanding

Reserving for liabilities incurred



Matching of assets and liabilities

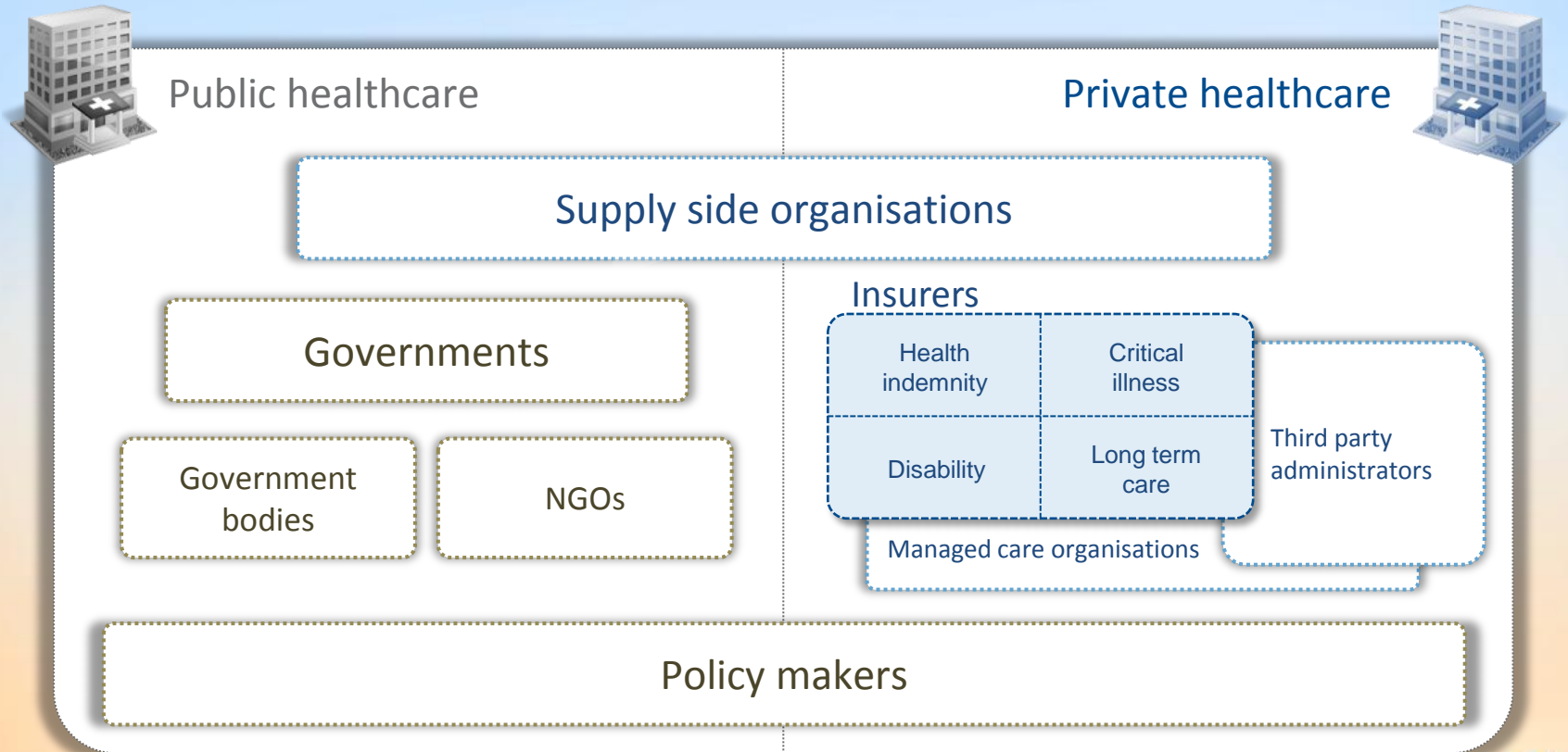
Risk immunisation & mitigation

Optimisation

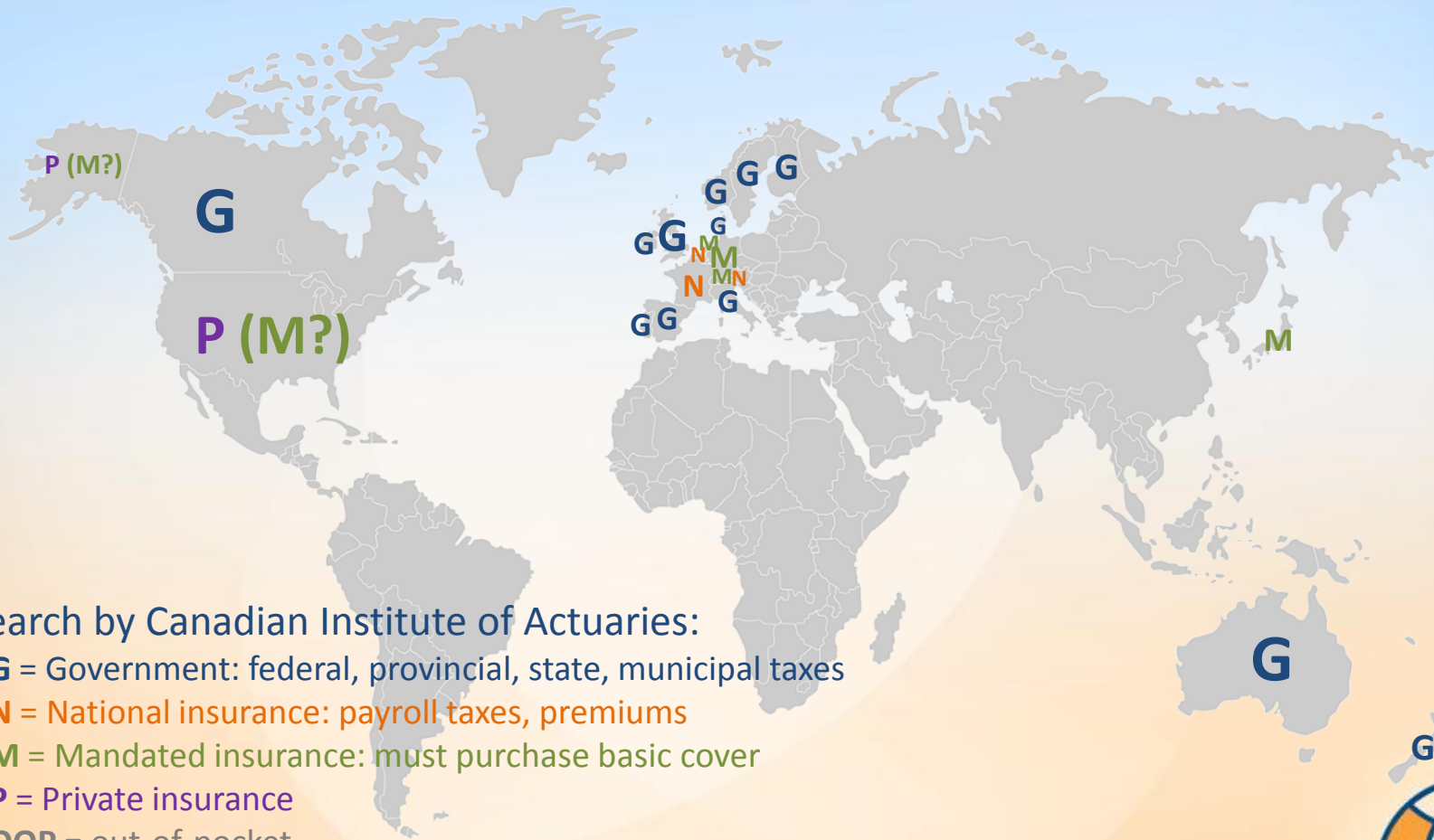
Anti-selection and its antidotes



Advisory services



Different healthcare systems



- Research by Canadian Institute of Actuaries:

- G = Government: federal, provincial, state, municipal taxes
- N = National insurance: payroll taxes, premiums
- M = Mandated insurance: must purchase basic cover
- P = Private insurance
- OOP = out-of-pocket

- Countries use different models for different segments of population



Differences between models

Role of Private Insurance

22

Source of Funds (%)						
Funding Type	HC as % GDP	Gov't	N+M	Private	OOP	Private +OOP
G	9.8	73.0	3.5	6.8	16.7	23.5
N	11.0	17.2	59.5	9.3	14.0	23.3
M	11.1	11.2	63.2	7.9	15.8	23.7
P	17.6	13.4	39.7	35.1	11.8	46.9
OECD 20	10.7	49.3	25.7	8.8	15.9	24.7
Canada	11.4	69.2	1.3	14.9	14.7	29.5
France	11.6	7.4	70.5	14.8	7.3	22.2
Germany	11.6	8.9	68.1	10.0	13.0	22.9
Sweden	9.6	81.1	-	1.9	17.0	18.9
Switzerland	11.4	18.2	40.8	10.1	30.9	41.0
UK	9.6	83.9	-	6.1	10.0	16.1
USA	17.6	13.4	39.7	35.1	11.8	46.9
OECD 7	11.8	40.3	31.5	13.3	14.9	28.2

GROW BEYOND RISK

AVANCER AU-DELÀ DU RISQUE



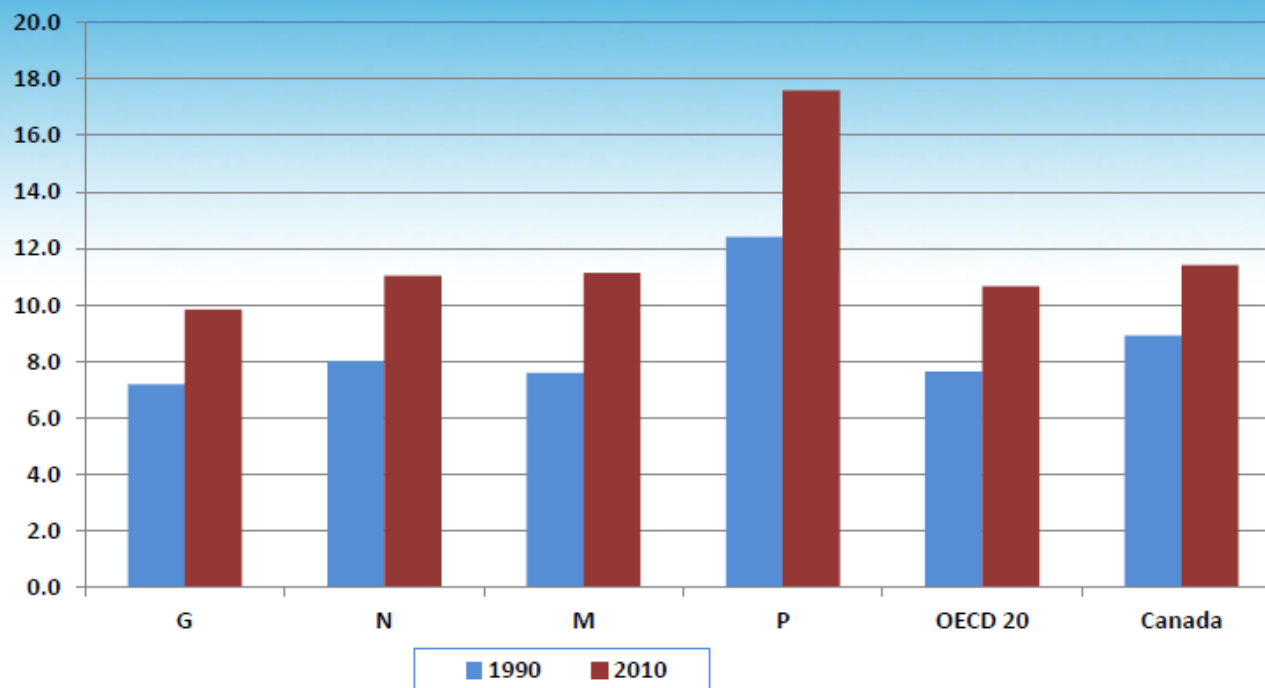
CIA Annual Meeting
Assemblée annuelle de l'ICA



Differences between models

Total Healthcare Expenditure - % of GDP

8



GROW BEYOND RISK

AVANCER AU-DELÀ DU RISQUE



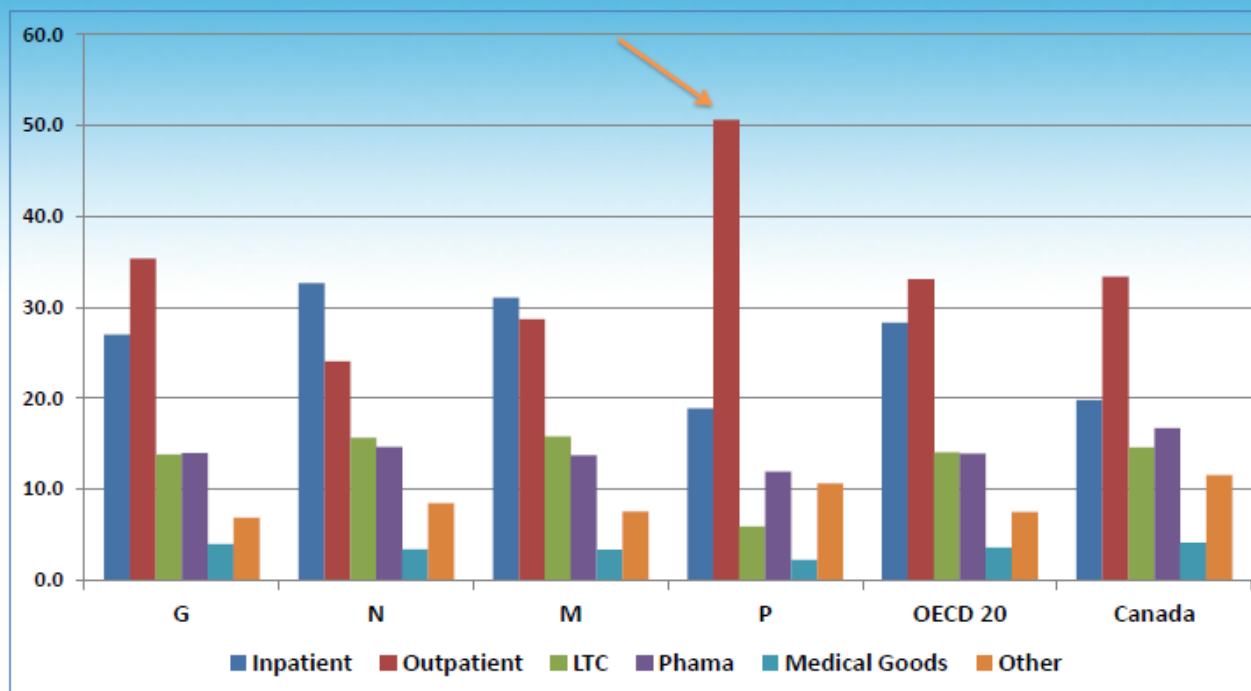
CIA Annual Meeting
Assemblée annuelle de l'ICA



Differences between models

2010 Use of Funds (%)

10



GROW BEYOND RISK

AVANCER AU-DELÀ DU RISQUE



CIA Annual Meeting
Assemblée annuelle de l'ICA



The role of health actuaries



Public healthcare

- Budgeting and risk adjustment
- Risk equalisation
- Demographic and financial projections
- Funding sustainability
- Public Private Partnerships
- Analysis of cost drivers



Private healthcare

- Analysis
- Capital
- Disclosure
- Valuation
- Product design
- Pricing
- Risk management & managed care
- Optimisation
- Projections

The questions actuaries ask

- What is the current and prospective burden of healthcare in the context of GDP, household income, and other economic indicators
- What drives disability claims experience?
- What drives healthcare inflation?
- What is the impact of anti-selection on health insurance risks?
- How can costs be managed?
- Can wellness programmes make a real difference to medical inflation?

- How should products be designed to introduce the right incentives?
- What premium should be charged? How to optimise it?
- How do we design and select networks of providers to improve efficiencies and quality?
- Can alternative reimbursement models be designed to control costs without compromising on quality?
- What is the best way to detect and prevent health fraud and abuses in healthcare?
- What are risk-adjusted cost differentials between different service providers?

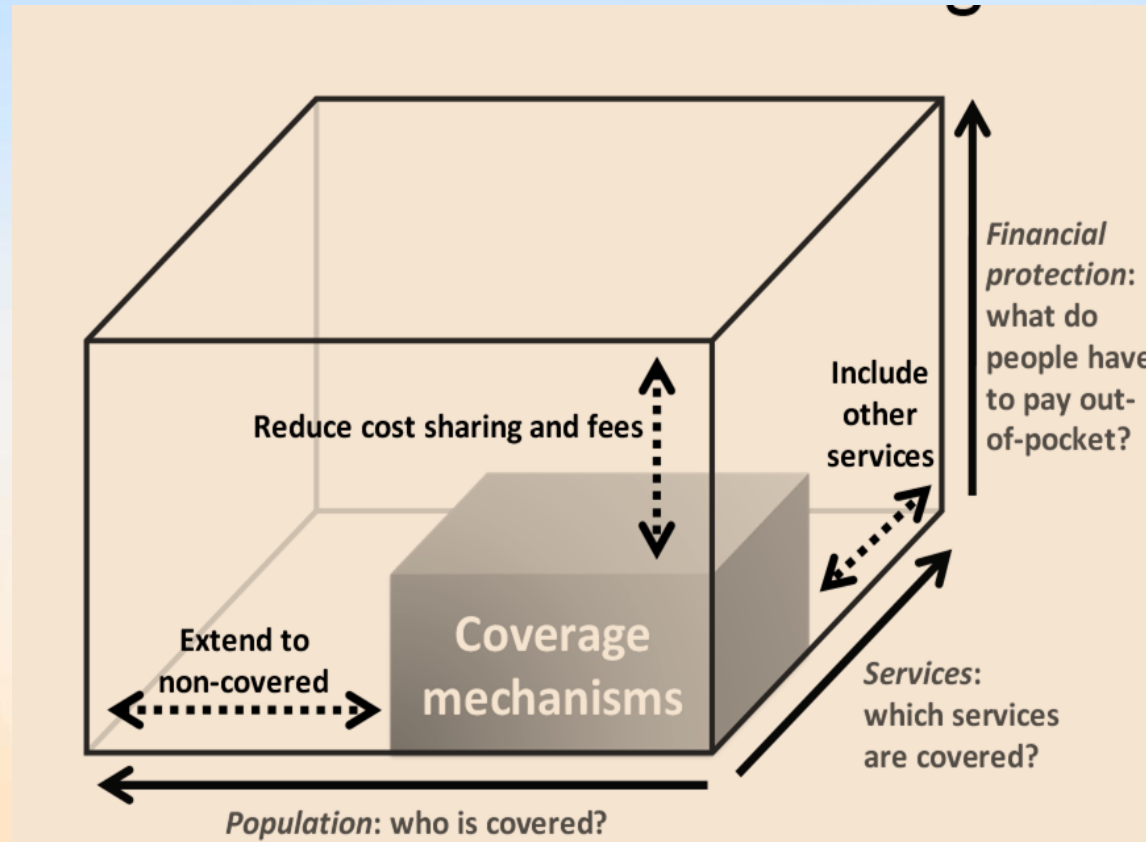
- How can private / public partnerships be structured?
- How do we insure low income individuals?
- Are out-of-pocket expenses equitably distributed between different levels of income?

- What are the risk consequences of catastrophic events, such as a pandemic?
- What capital is required to protect against adverse events?
- How will the HIV epidemic affect insurance costs?

- How do we ensure that more people have access to health services and do not suffer financial hardship paying for them?



The 3 dimensions of Universal Coverage



Source: WHO WHR 2010.



Our contribution

- Applying the Mathematical / statistical skills of actuaries to the quantification of cashflow and capital and their associated risks
- Our role is to support policy makers and managers by quantifying expected outcomes and the risks of deviations both in terms of costs and demand on resources
- Expected outcomes are estimated by applying actuarial methodology to factual data and assumptions including the presumed impact of policy decisions
- Enabling decision makers and managers to compare ex-ante the expected impact of policy decisions or strategic interventions facilitate optimisation
- As outcomes are explicitly linked to the various drivers there is value added in the possibility of monitoring the actual outcomes against the expected to identify the causes of the deviations and apply the feed back to improve the decision making
- Our methodology helps understand how incentives of role players affect risks and outcomes
- Our modelling approach tends to be bottom-up & stochastic, rather than top-down & deterministic. We typically don't assume equilibrium.



The role of the IAA

Association of worldwide **actuarial professional associations**, with **special interest sections** for individual members

Mission:

- ❖ To promote the profession to the benefit of Society
- ❖ Promote professionalism, develop education, encourage research



Six strategic objectives:

- ❖ Build relationships with key supranational organisations
- ❖ Expand scientific knowledge and skills of actuaries
- ❖ Promote common standards of actuarial education and professional conduct
- ❖ Develop actuarial profession worldwide
- ❖ Provide a forum for discussion for actuaries
- ❖ Improve recognition of actuarial profession



The role of the IAA

IAA Health Committee:

- Representatives of member associations
- Purpose to :
 - Represent the IAA in international debates on health actuarial matters
 - Raise profile of health actuaries
 - Support actuaries working in private and public health systems



IAA Health Section:

- Individual membership
- Main objectives: library of actuarial papers, research presented at conferences and webcasts
- See example papers on risk equalisation
(http://www.actuaries.org/IAAHS/Webcast/RiskAdjustment/RiskAdjustment_Slides.pdf)
- And on stochastic modelling
(http://www.actuaries.org/IAAHS/Webcast/Stochastic/IAAHS_11-15-2010-wocartoons.pdf)



Agenda



The role of actuaries in different healthcare systems around the world



Providing understanding: The drivers of healthcare inflation



Developing solutions: Health micro-insurance



Using inflation as an example....

- Of how actuaries analyse problems
- Insights to be gained from actuarial analysis, and techniques used
- Using South African private health for illustration, with some references to international experience



Some preliminaries

- Adjusting for exposure is crucial
- Consider Simpson's Paradox:
 - In the context of a health insurer with two benefit plans / levels

	Number of members in Year 1	Contribution per member in Year 1	Number of members in Year 2	Contribution per member in Year 2	Increase in per member contribution from Year 1 to Year 2
Plan 1	100	1000	200	1100	10%
Plan 2	50	2000	54	2200	10%
Insurer	150	1333.33	254	1333.86	0%

Some preliminaries

- Simpson's paradox is relevant to:
 - health insurers with more than one plan,
 - policymakers, considering health inflation across a health insurance markets
 - Governments, considering health inflation in a country (e.g. public and private spending)
- It implies:
 - All inflation studies should adjust for demographic movements between insurance markets / insurers / benefit packages
 - And not look only at overall average
 - Otherwise it will understate inflation where there are downgrades and overstate where there are upgrades



Some preliminaries

- Consider frequency and severity separately
 - As this could provide insight into the *reasons* for cost increases
- Consider price and utilisation separately
 - Price measures tariff increases
 - And how that is set by legislation / competition
 - And utilisation should be broken down into
 - demand side factors and
 - supply side factors



Some preliminaries

- One method of quantifying components:
 - First determine overall increase *after* adjustment for exposure
 - Overall medical inflation = tariff inflation + demand side + supply side
 - Tariff increases are usually known
 - Fit Generalised Linear Model with PLPM cost as target variable, and all available demographic variables as input variables
 - Measure how demographic variables change from one period to the next: this is demand side inflation component
 - The rest of inflation is attributable to supply side factors
 - Looking at frequency and severity measures separately, after tariffs, and after demand side adjustments, points to whether supply side inflation is driven by e.g. whether doctors admit more patients to hospitals (frequency) or whether they charge more per patient (severity)



SA healthcare inflation exceeds CPI but relatively low compared to other countries

Net healthcare costs inflation in 2011

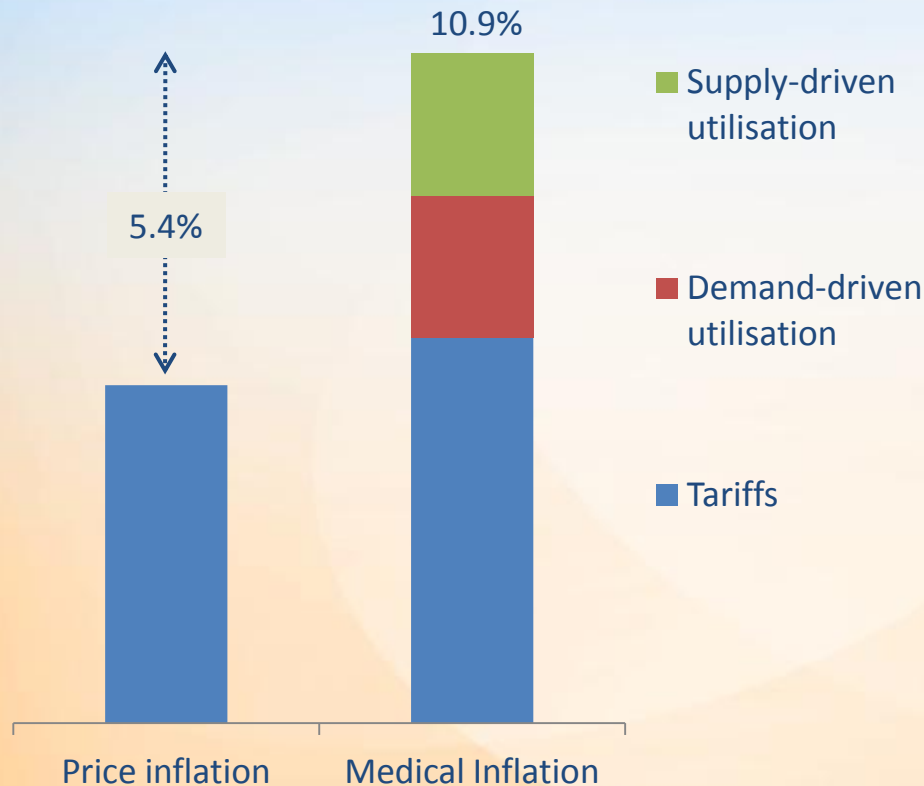


Out of 52 countries surveyed, SA had the 8th lowest net healthcare cost inflation. Only India, Philippines, Bulgaria, Cyprus, Romania, Ukraine and Egypt had lower levels



Utilisation is the key driver of the healthcare inflation differential (after exposure adjustment)

3 year average annualised inflation rates (2011)



Drivers of the medical inflation differential



Supply-side:

- Fee for service system
- Undersupply of doctors
- New technology and procedures
- New hospitals

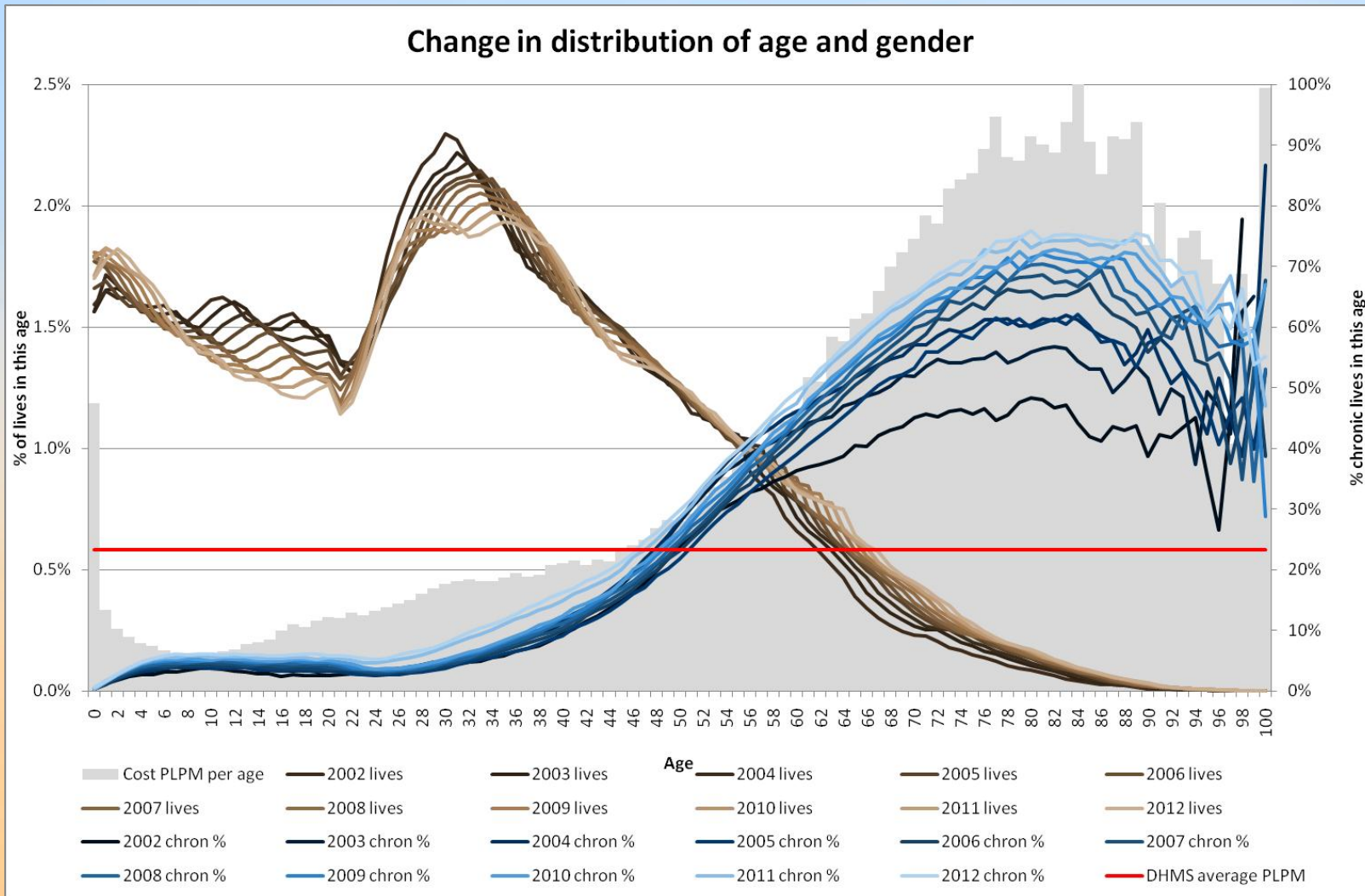


Demand-side :

- Adverse selection
- Increased disease burden
- Ageing

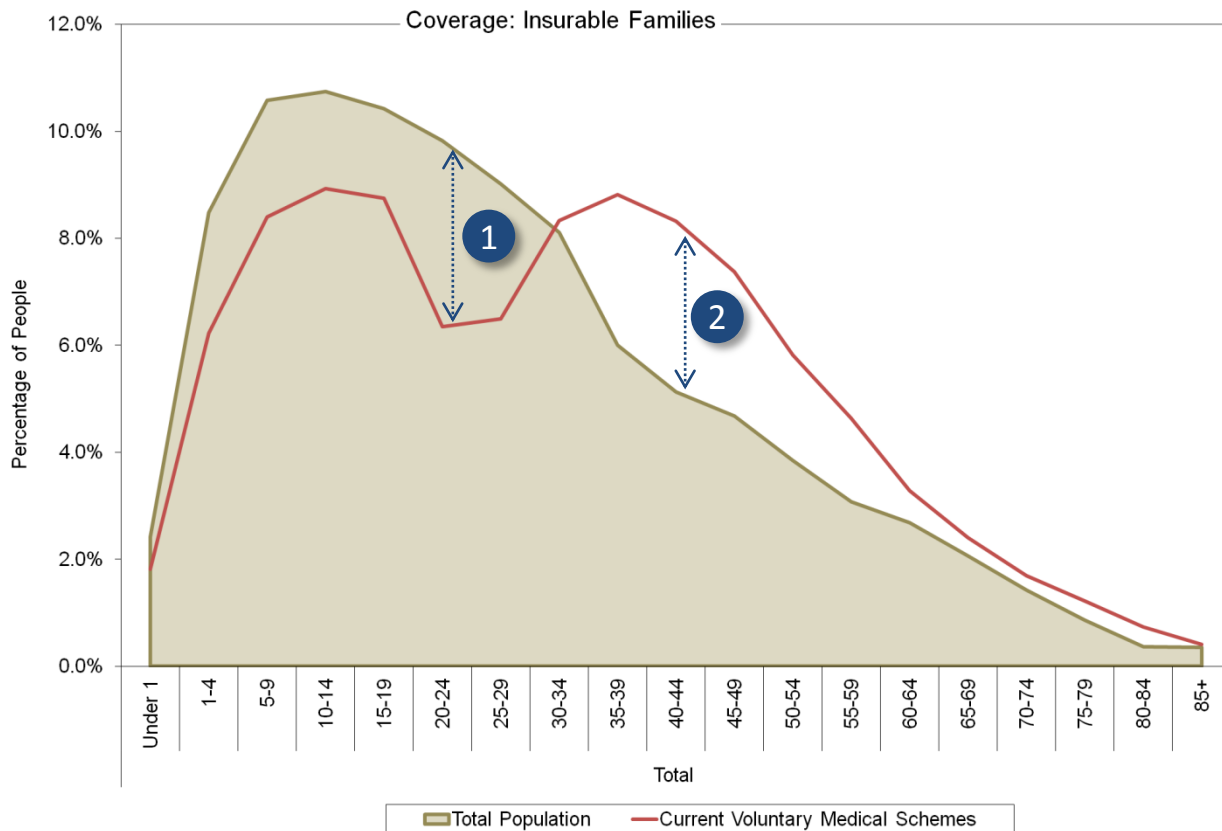


Demand side: 2002 to 2012



Demand-side: Adverse selection conundrum

Adverse selection in open medical schemes



- 1 Young people opt out of medical schemes
- 2 Medical schemes have higher proportions of older people

“Impact of adverse selection estimated at R13.5bn – 23% of total contributions for open medical schemes”

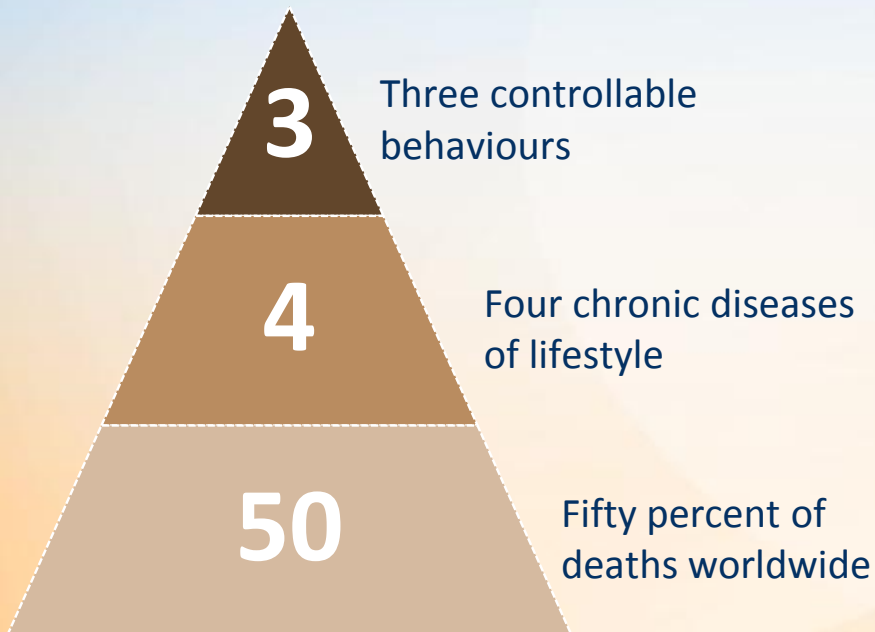
Barry Childs, Lighthouse Actuarial Consulting



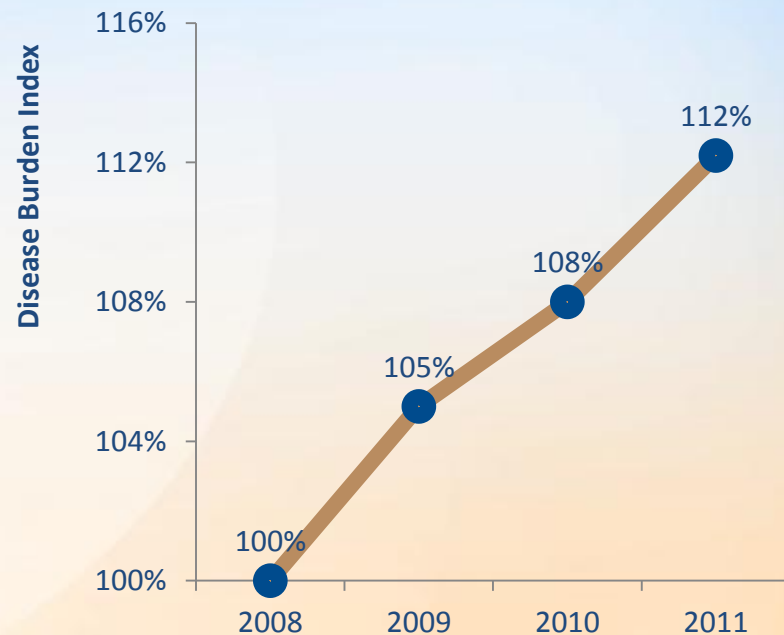
A

Demand side: Increasing burden of disease

Epidemic of lifestyle diseases



Increasing disease burden in medical schemes



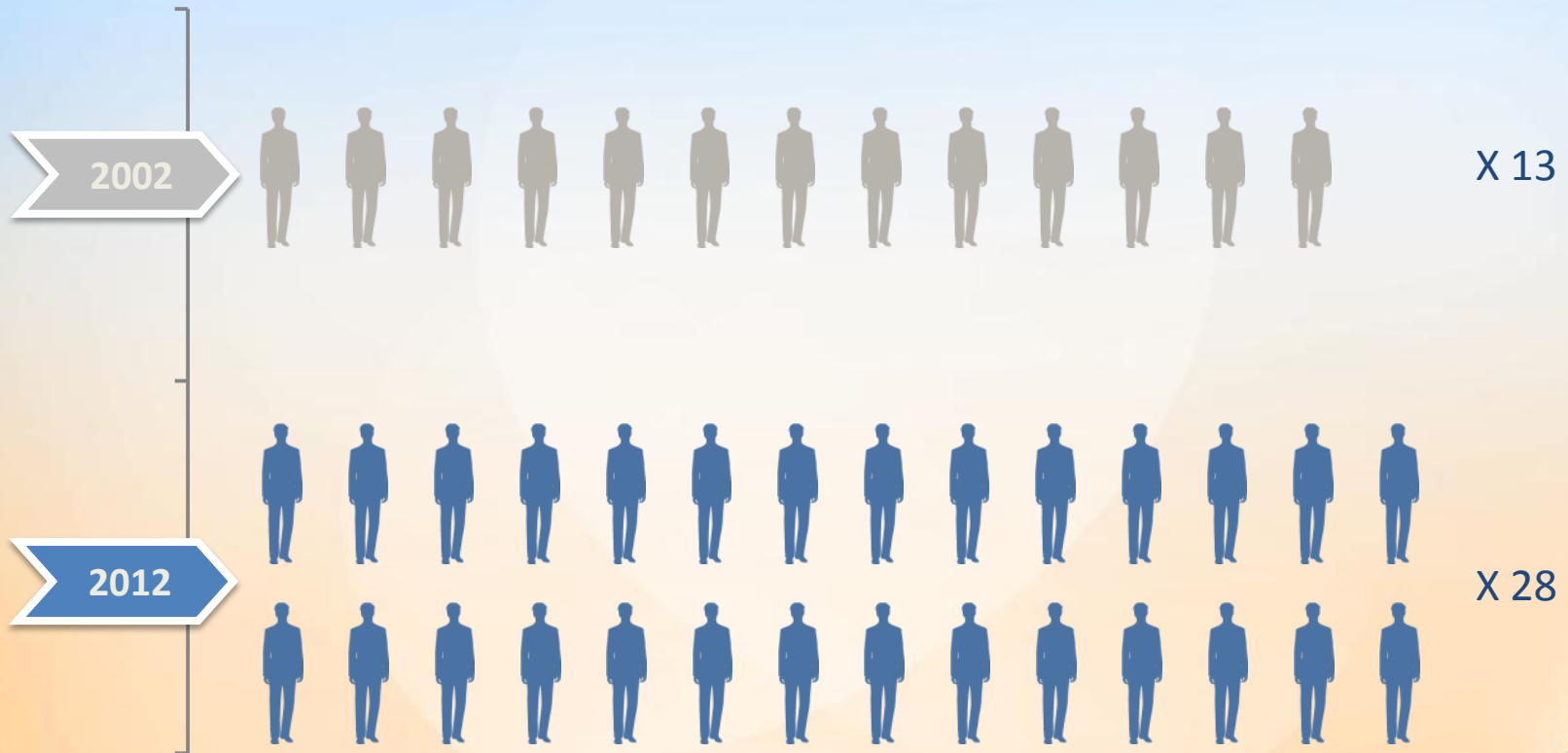
- Chronic prevalence has increased by 60% over the last 4 years
- Chronic patients cost 4 x non-chronic



A

Demand side: Significant increase in high cost patients

Number of claimants per 10,000 claiming more than R500,000
(2012 money terms)



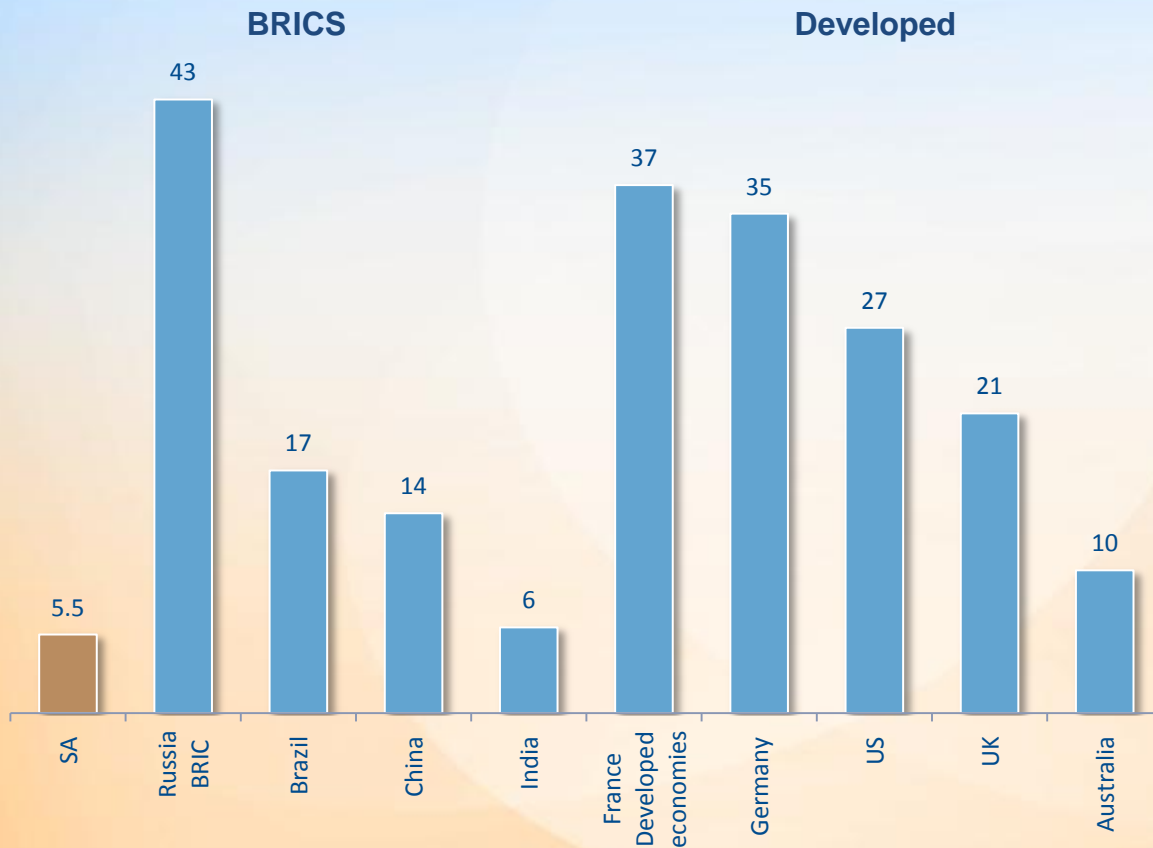
Demand side inflation in South Africa

- Attributable to:
 - Lack of a mandate
 - Open enrolment, guaranteed acceptance and community rating
 - Very limited underwriting allowed
 - Resulting adverse selection – age and chronic
- Roughly 2% to 3% *per year* attributable to demand side inflation



Supply side: Shortage of doctors

Doctors per 10,000 lives

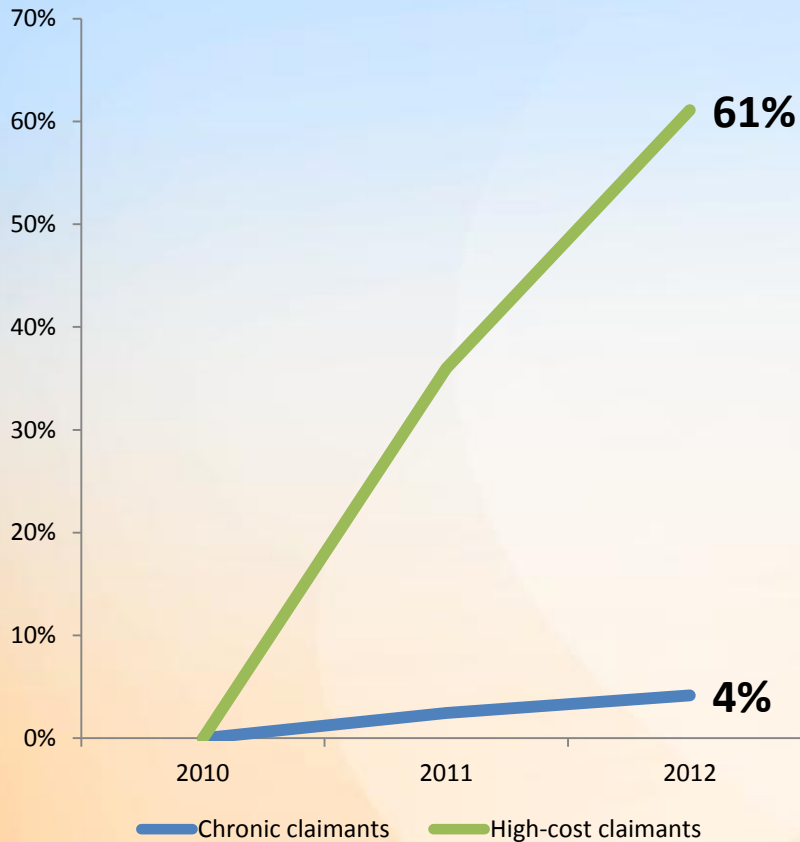


- SA needs to train 2,400 doctors p.a. just to remain on par with current low figures
- Average age of specialists in SA = 55 years
- SA's graduates have remained at 1,200 p.a. for the last 2 decades

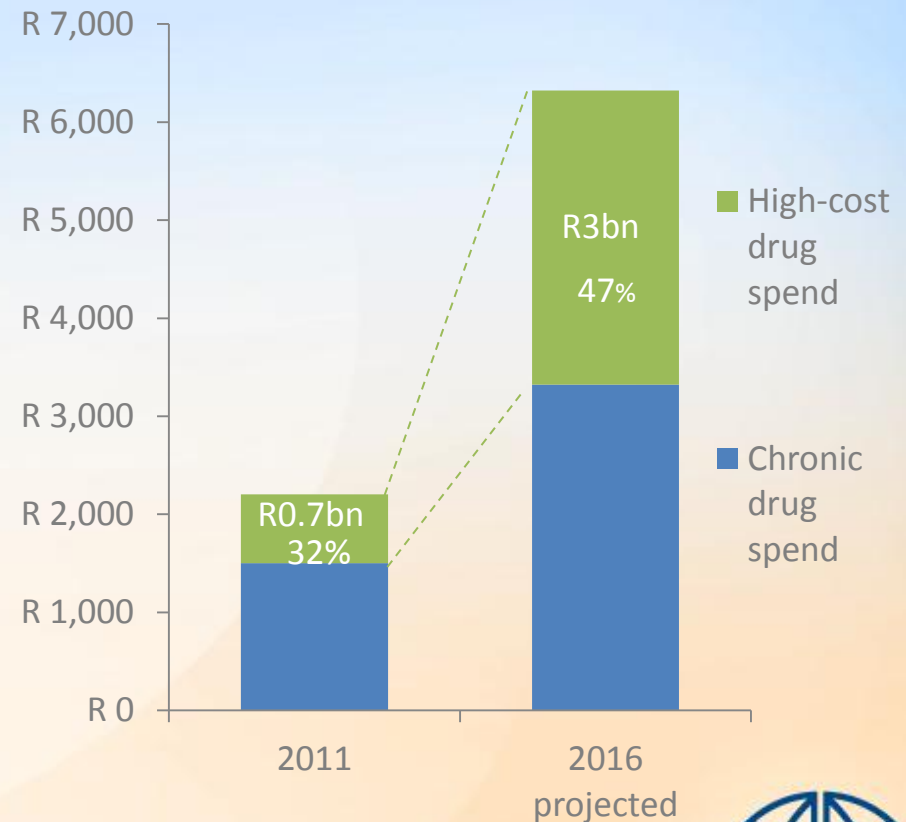


Supply side: High cost of new medicines

Growth in claimants for high-cost drugs exceeds growth in chronic claimants



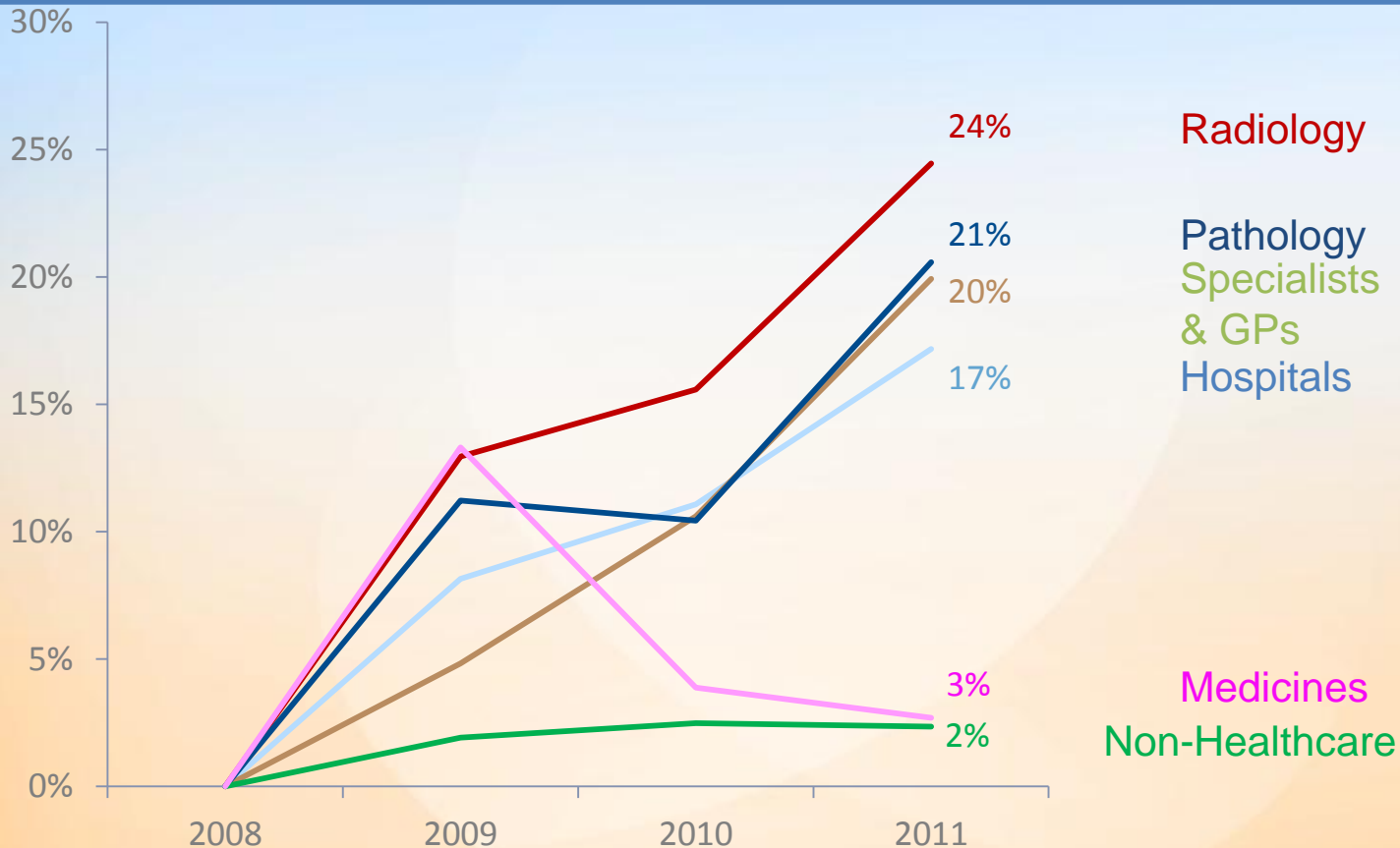
Increases proportional expenditure on high-cost drugs



6% of chronic patients will need biologics and will require 47% of chronic medicine spend in 2016

Supply side: Investigations and healthcare services driving inflation

Open medical schemes cumulative real increases in expenditure

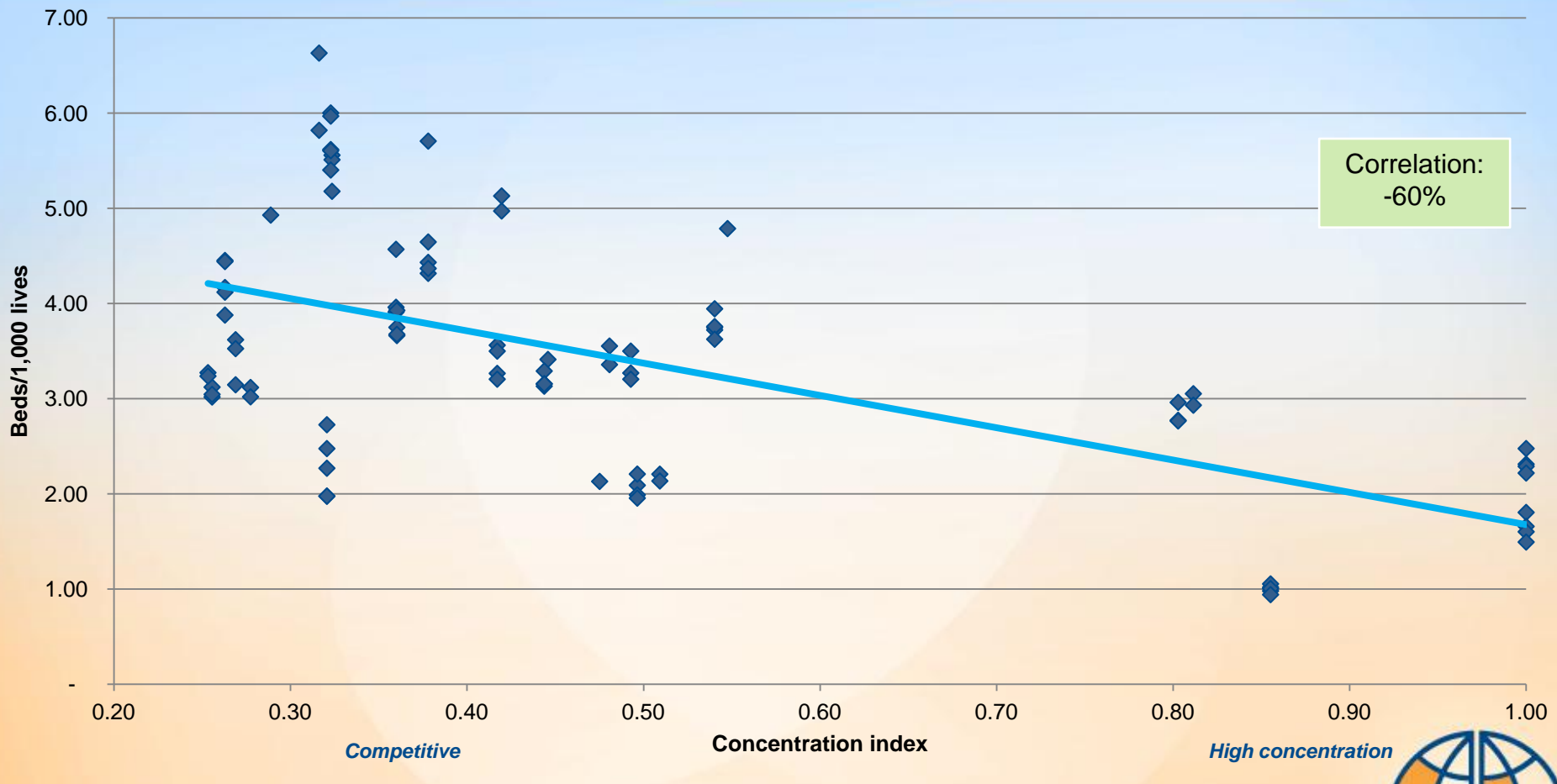


Recent experience

- 24 new facilities in South Africa in 18 months including 7 private hospitals
- Admission rate increased
- Hospitals around new hospital respond:
 - Admission rate ↑
 - Case mix ↓
 - Length of stay ↑
- Was the new hospital even required from a demand perspective?

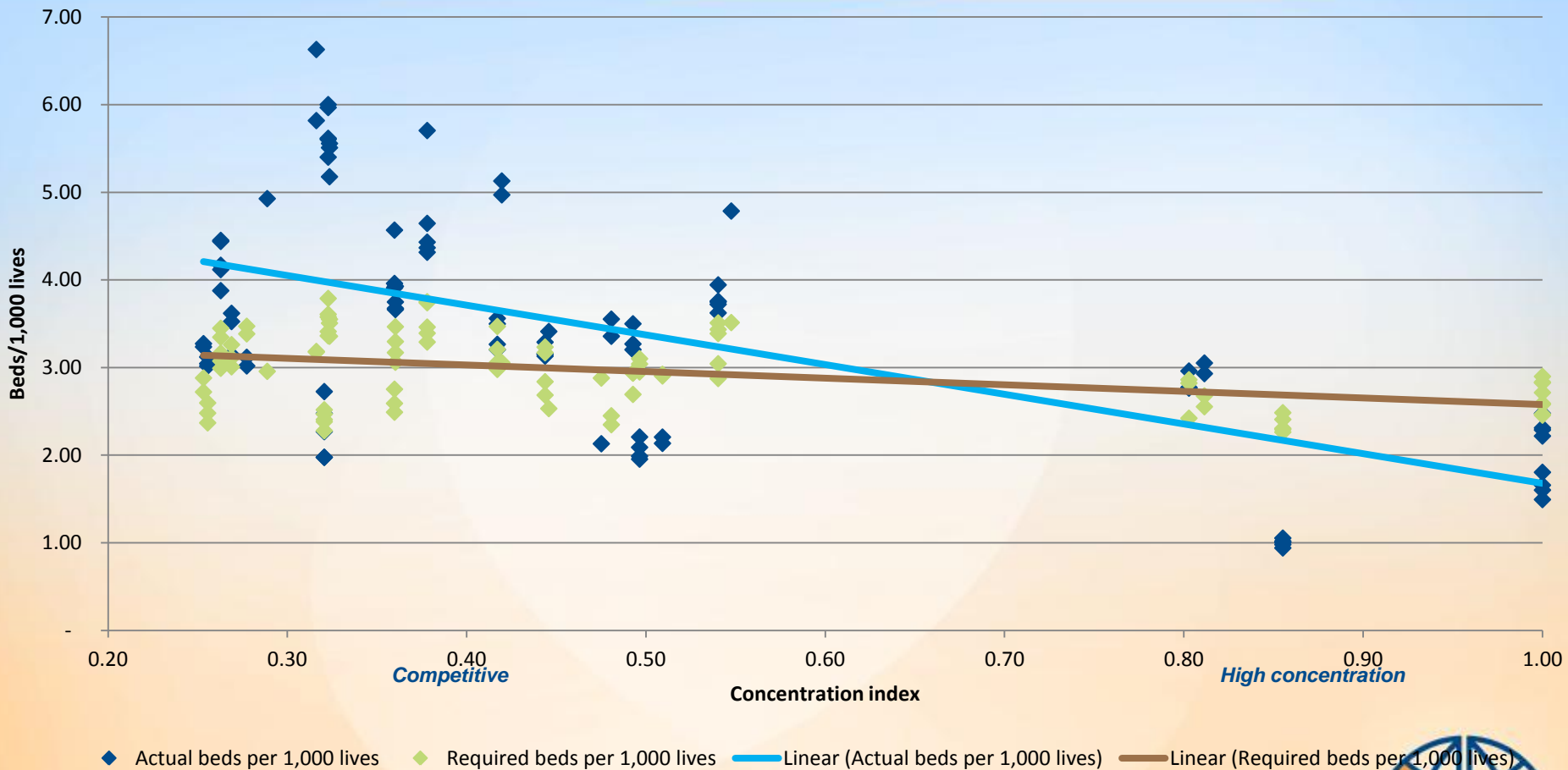


Does competition impact the supply of beds?



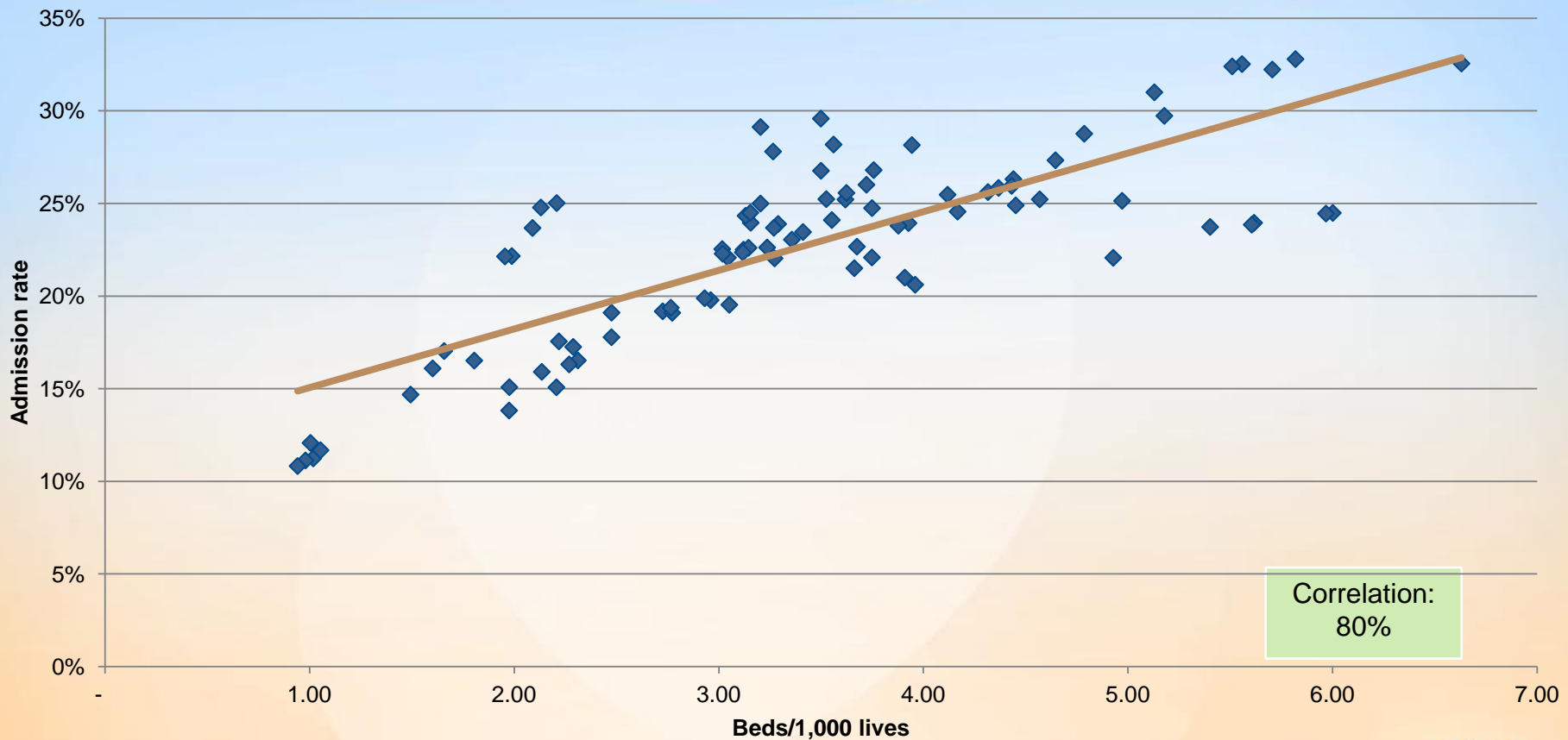
More beds in highly competitive areas
Is this required based on disease burden?

Does competition impact the supply of beds?



Disease burden does not explain the difference in number of beds between competitive and concentrated areas

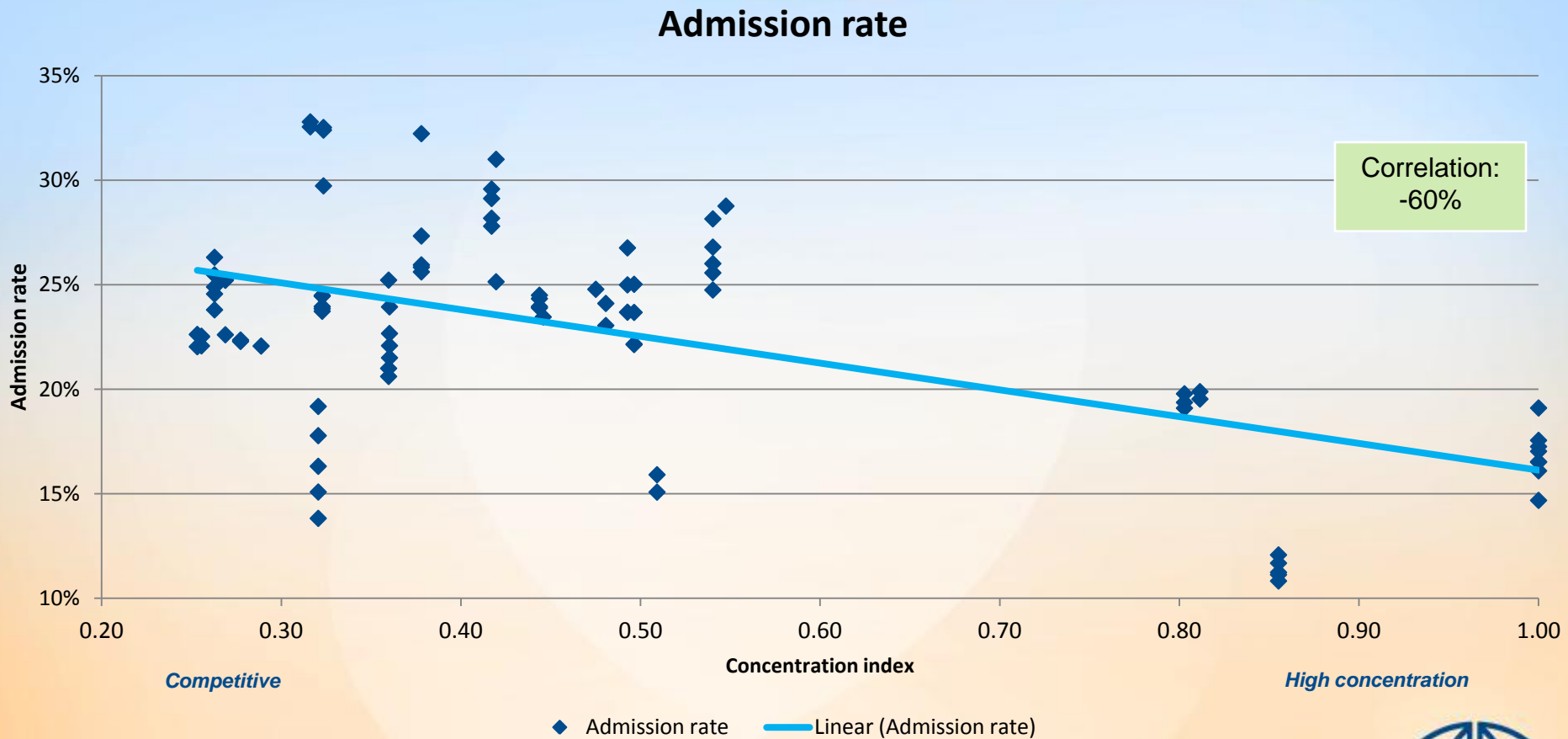
Correlation between admission rate and supply of beds



Admission rate is positively correlated to supply of beds

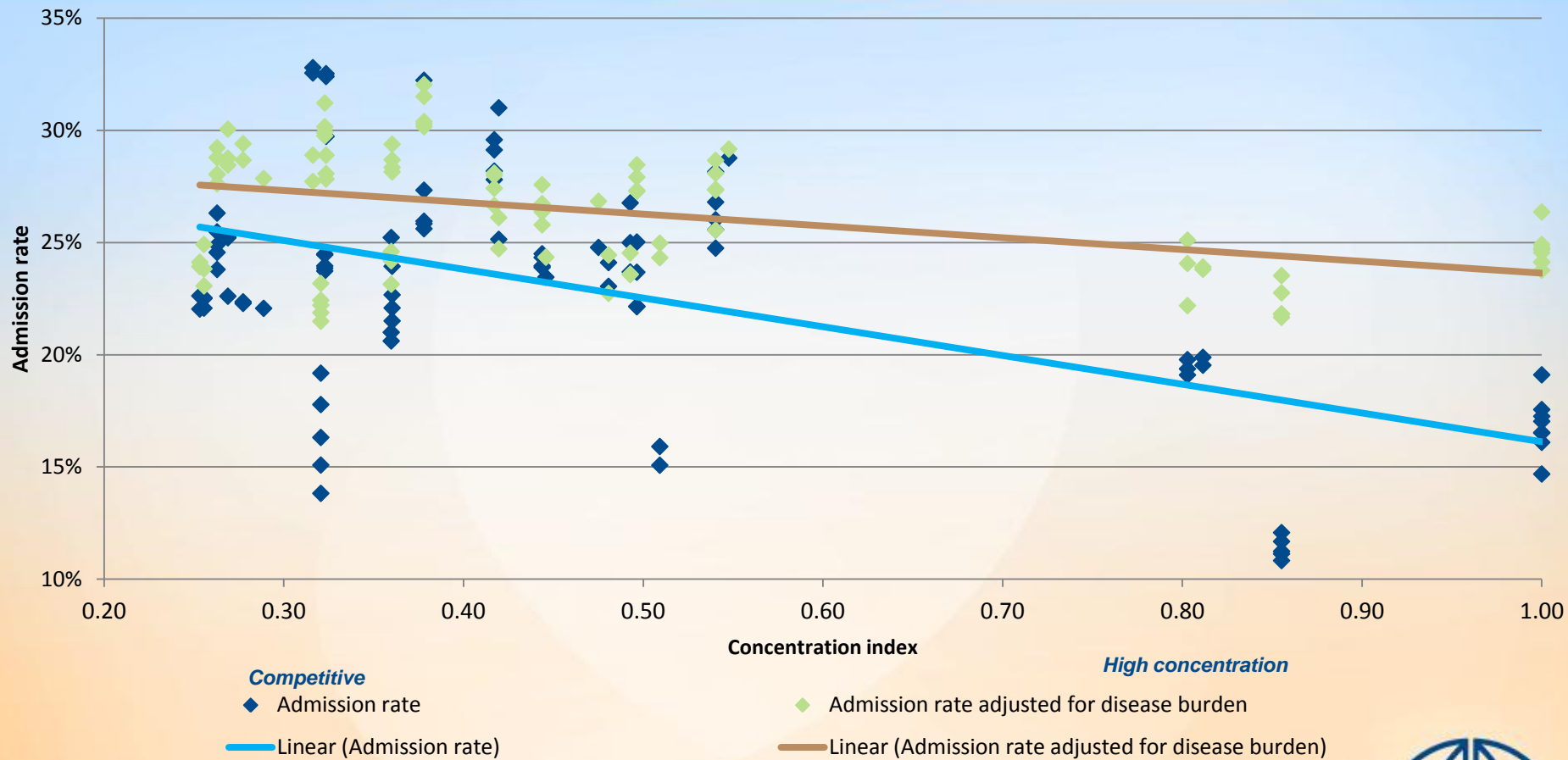
Combination of supply and demand factors

Does competition impact the admission rate?



More admissions in areas with high competition:
Is this real demand?

Does competition impact the admission rate?



Even after adjusting for disease burden, the admission rate is higher in areas with high competition (low concentration)

Supply side inflation in South Africa

- Attributable to:
 - Radiology / pathology
 - Increases in hospital beds
 - Price of new technologies
- About 1% to 2% per year
- Overall utilisation therefore 3% to 5% per year above inflation



Another view of healthcare inflation

- CPI is an *average* of different inflation indices
- Some components of inflation are *always* higher than others, e.g. healthcare vs electronic consumer goods
 - Especially those aspects linked to skilled services
- Wages generally keep up with inflation
- Hence all that happens is that people devote a larger proportion of their salaries to healthcare over time
- “The Baumol Effect”, after William Baumol’s “The cost disease”, 2011

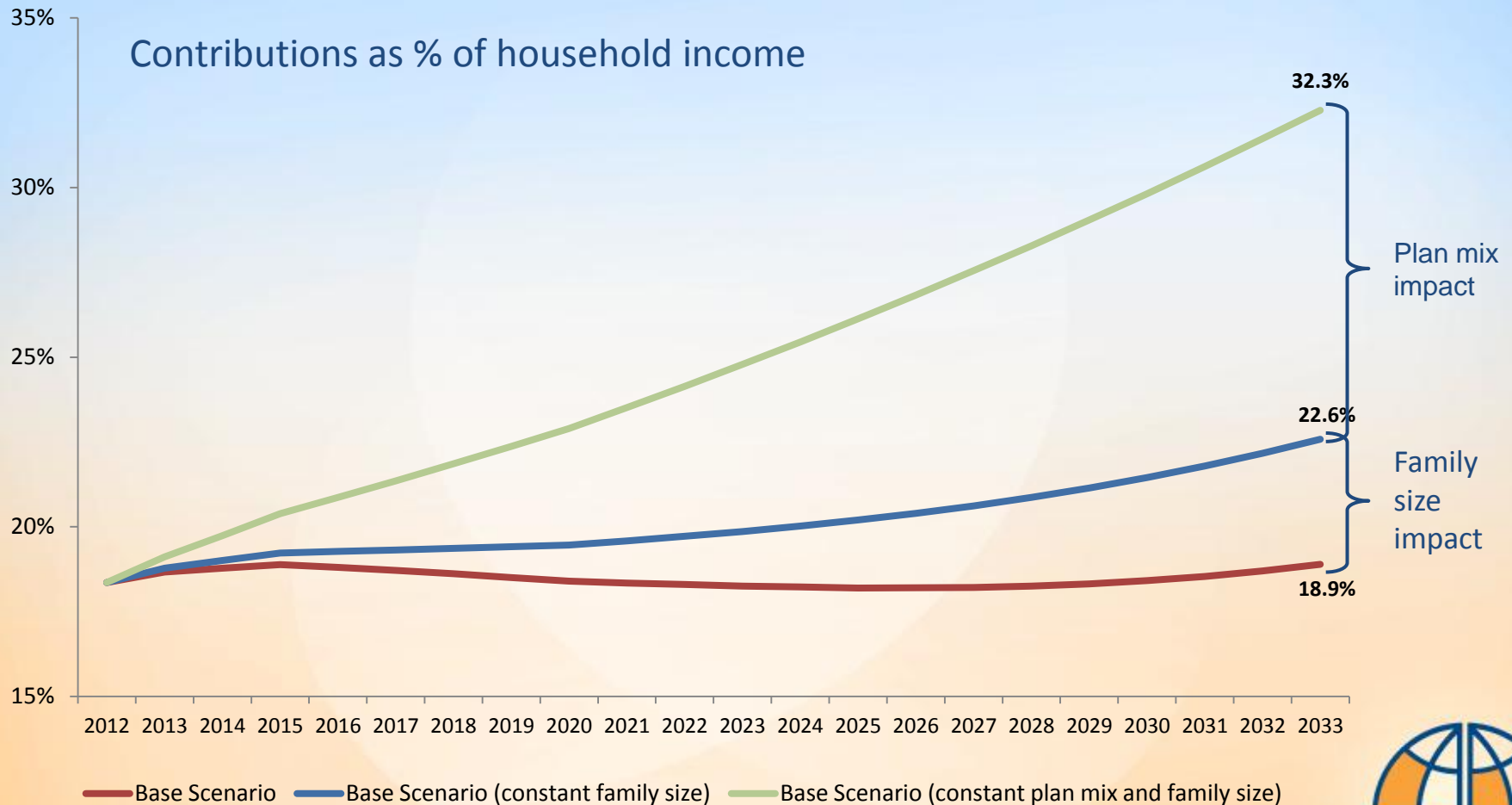


But....

- It may be true that healthcare inflation is and always will be higher than average inflation
- But it is not true that people will continue to spend a larger proportion of their salaries on healthcare
- In South Africa, we see that people effectively buy down their cover to maintain a roughly similar percentage of their salaries devoted to healthcare



Affordability – projecting current trends



Observed plan mix changes and family size changes *compensate* for above CPI contribution increases – Baumol effect not observed!



Inflation drivers in Canada

- Consider an actuarial study of New Brunswick's future healthcare costs:
 - Inflation drivers:
 - 1.99% medical price inflation
 - 1.27% for ageing
 - 1.1% for utilisation
 - Utilisation driven by: new medical technologies, but also:
 - Obesity, smoking, alcohol usage



Inflation drivers in Canada

- Obesity one of the most important drivers of utilisation increases in New Brunswick:
 - If BMI>30 reduced to 17.1% from NBs current level of 24.2%....
 - Hospital acute days will reduce by between 8% to 10%
 - And so will costs
 - If BMI>30 is reduced, so will BMI>25



Agenda



The role of actuaries in different healthcare systems around the world



Providing understanding: The drivers of healthcare inflation



Developing solutions: Health micro-insurance



What is HMI?

- Financial protection and health service delivery. E.g. Financing of health service and effective models to deliver to improve health of the population.
- Creating access to services via community based organizations.
- Managed by a promoting organization, with emphasis on monitoring all aspects. Analytical skills essential



Models of HMI

- Varied in Public/Private mix
 - Can be part of the public system (Rwanda)
 - Or totally private Gonoshathya Kendra (Bangladesh)
- Can be via Government/Insurer/Mutual
 - Yeshasvini (India)
 - RSBY/ICICI Lombard (India)
 - Uplift (India)
- Importance is efficiency and effectiveness



Issues that have to be resolved by HMI

- With limited dollars decide where to spend
- Health Continuum:
 - nutrition, public health measures, access to care, primary care and hospitals
- In developing countries the disease burden is heavy on preventable disease.
- Must decide impact of limited purchasing power



Why HMI

- In many countries Out of Pocket Payment is over 50% or countries lack universal health coverage for the majority of self-employed population.
- HMI can help expand coverage to the Developing countries that hold 90% of the global disease burden but on 12% of the health care expenditures (World Bank 2006)
- Lack of financial resources cause delay in health care and can result into spiral into poverty. (Xu et al, 2007)



The lenses of HMI



1) Reaching Poor Households

A) Need and Demand

- Insurance can increase utilization of health services and can improve quality of care they access.
- Need for HMI does not necessarily translate into demand.
- How-to steps
 - Research behaviour, coping skills and utilization
 - Identify barriers and plan to mitigate barriers



1) Reaching Poor Households

B) Distribution Partners

- Use existing community organizations to instill trust.
- Channel should have mission to push product, provide information and education.
- How-to steps
 - Work with groups with aligned vision
 - Work with target market on “product”
 - Develop capacity to educate clients



1) Reaching Poor Households

- C) Educating Consumers and promoting the product
 - Need to increase knowledge and alter seeking behaviour.
- How-to steps
 - Plan
 - Focus on risk management and insurance, use data to direct priorities
 - Measure effectiveness of education on utilization (Vimo SEWA, India)



1) Reaching Poor Households

D) Enrolling and retaining clients

- Simple process, with use of technology (RSBY, India)
 - Value added services
 - Demonstrate impact with actual service provided on clients
- How-to steps
 - Plan
 - Focus on risk management and insurance, use data to direct priorities
 - Measure effectiveness of education on utilization (Vimo SEWA, India)



2) Expanding product benefits

A) Focus on client value

- This should be major focus of HMI
- How-to steps
 - Manage and review claims process, quality medical care and impact on households



Gonoshathaya Kendra (GK) Model

- Paramedics as the foundation of a health care team.
 - on a full range of preventive and basic curative services including immunizations, sanitation, nutrition, reproductive health and family planning, as well as the use of 50 essential medicines.
 - GK pairs the paramedics with traditional birth attendants to offer maternal health care including deliveries and counseling on breast-feeding.
 - Besides offering medical care, they promote insurance in the community and collect premiums.
 - The paramedics are trusted in the community and have easy access into homes of people from different social classes (Interview with GK).
- Work to make medical model more effective using subsidiarity in medical staff and monitoring to improve efficiency and effectiveness



2) Expanding product benefits

- B) Design high-value, tangible products
 - Clients must be involved in product design
 - Clients value simple access and tangible service
- How-to steps
 - Meet with clients in design and review stage
 - Payment method to meet client revenue cycle



2) Expanding product benefits

C) Package an optimum mix of benefits

- Prevention, primary and secondary care package influences health seeking behaviours
- Go beyond hospitalization
- How-to steps
 - Consider discounts on Rx and Consultations if offering hospitalization
 - Consider telephone service



2) Expanding product benefits

D) Pricing products and balancing coverage with affordability

- Price base on true health service cost for long term
- How-to steps
 - Understand data and efficient health care delivery models
 - With Willingness to Pay surveys determine client affordability



2) Expanding product benefits

E) Address indirect costs and other barriers

- Indirect cost can be large, loss wages, transport, food in hospital and other fees (Ranson, 2005)
- How-to steps
 - Surveys to get information
 - Develop strategies to mitigate barriers



3) Deliver High Quality Medical Services

- A) Medical information and service quality
 - HMI improves access and potentially can improve quality
 - Health education and other benefits
- How-to steps
 - Work with provider groups in area
 - Develop services if necessary
 - Work with clients based on their needs



3) Deliver High Quality Medical Services

B) Networking with medical facilities and health workers

- Choice of health providers and how used impacts viability
- How-to steps
 - Understand the current health resources and provision of service
 - Survey cadres to understand willingness to join
 - Start with homogeneous network and expand



3) Deliver High Quality Medical Services

- C) Accreditation of providers and standard of care
 - Often a lack of standardize health care delivery
 - Combine rewards and penalties to enforce quality standards
- How-to steps
 - Appoint a medical professional to lead quality assurance and standardization
 - Monitor clinical protocols (Brac, Bangladesh)
 - Identify support needed to improve providers



3) Deliver High Quality Medical Services

- D) Pharmacy Management and drug supply
 - Rx a major cost
 - Rationalize to generics
 - Work with clients on perception on generics
- How-to steps
 - Appoint a medical professional to rationalize prescriptions
 - Advocate with clients on rational drug use



3) Deliver High Quality Medical Services

E) Use Technology to deliver information and care

- Technology can provide significant gains
- How-to steps
 - Engage specialist technology partners
 - Field test before roll out



4) Achieving Institutional Sustainability

A) Organisational Model

- Chose model that is effective
- How-to steps
 - Experiment with different models and partners
 - Define clear performance driven terms of engagement with partners, public and private



4) Achieving Institutional Sustainability

B) Provider contracts and payment mechanisms

- Align financial and service incentives.
- How-to steps
 - Determine partners
 - Assess capacity to manage different payment methods
 - Determine incentives and disincentives to optimise client and provider behaviour
 - Institute clear collaborative contracts with checks and balances



4) Achieving Institutional Sustainability

C) Administering policies and claims

- Use IT
- How-to steps
 - Streamline processes on continuous basis
 - Analytics of data to ensure early warnings and provide management guidance



4) Achieving Institutional Sustainability

D) Control costs, Moral hazard and fraud

- Need robust management information system
- How-to steps
 - Understand current problems
 - Product limits consider how to reduce problems
 - Use Technology to improve controls and early warning indicators
 - Assign responsibility to monitor and manage.



4) Achieving Institutional Sustainability

E) Continuous monitoring and evaluation

- Management responsibility
- How-to steps
 - Develop plan and responsibilities
 - Routine data on performance ratios and utilisation
 - Regular onsite facility checks for quality assurance
 - Periodic one-off studies



4) Achieving Institutional Sustainability

F) Interfacing with regulations and policy

- Link to current system in country
- How-to steps
 - Understand laws, and regulations
 - Identify opportunities to engage in policy-level debates to strengthen the health of the population.



Agenda



The role of actuaries in different healthcare systems around the world



Providing understanding: The drivers of healthcare inflation



Developing solutions: Health micro-insurance



Conclusion

- We believe actuaries have deep insight into healthcare systems that could be of value to WHO
 - Whether in the Public or Private sector
- Our insights are based on detailed but pragmatic analyses, and we are “data sceptical”
- We emphasise context: role players’ incentives, impact of administration arrangements



Conclusion

- We place strong emphasis on professionalism and ethics, and we are objective and balanced in our advice
- We focus on understanding long and short term risks and how to mitigate them
- We aim to do our work to the benefit of Society

