SCOR Sweden Re:s Nordic Life Insurance Conference
October 12th 2018

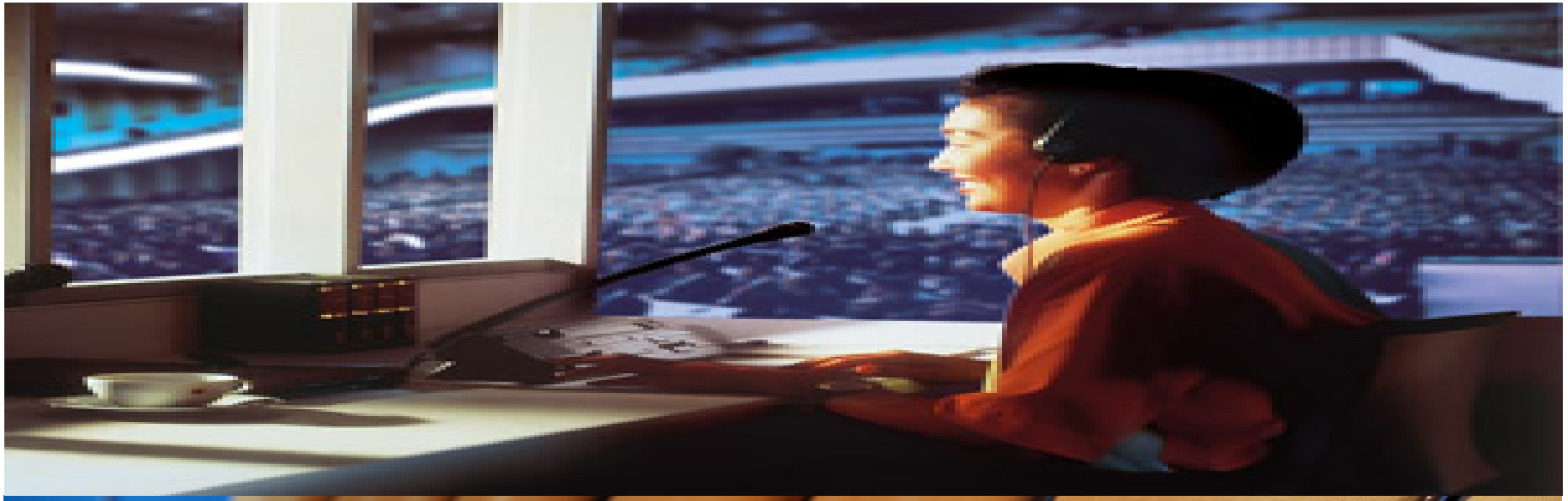
WELCOME

Svein Børre Solvang

SCOR
The Art & Science of Risk
Sweden Re


Traditional Solutions
Distribution Solutions
Financial Solutions
SCOR
The Art & Science of Risk
Client Training
Digital Solutions
Product Development

Translation Service



Program & list of attendees are now available online

www.beekast.com/nordic18

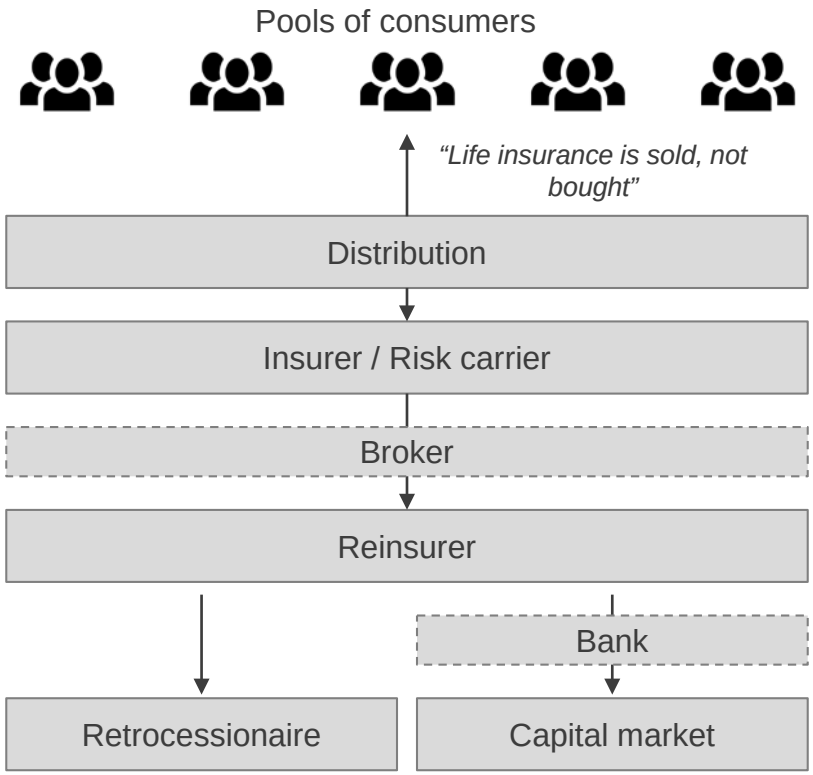
Improving Health and Wellness will contribute to the society as a whole

Health is the new wealth

As we believe in the active role of the life (re)insurance industry in offering policyholder benefits that promote healthy lifestyle choices and help manage medical conditions

Pace of change increasing in the Life insurance industry

Moving from traditional risk-driven value chains…



…to new consumers' needs ecosystem

The change in the life insurance industry is challenging the traditional role of life reinsurers while offering new opportunities for growth

SCOR continues to leverage on its proven strategic cornerstones

Strong Franchise

Make SCOR the preferred choice for its clients

- Strong client relationships
- Best-in-class services
- Product innovation
- Consistent expansion into new markets

High Diversification

Increase the return on equity through required capital diversification benefits

- Between Life and P&C
- By geography
- By lines of business
- By types of retrocession

Robust Capital Shield

Improve the stability of results

- No annuities in the Life portfolio
- Limited U.S. casualty business
- Low U.S. cat exposure
- Conservative asset management

Controlled Risk Appetite

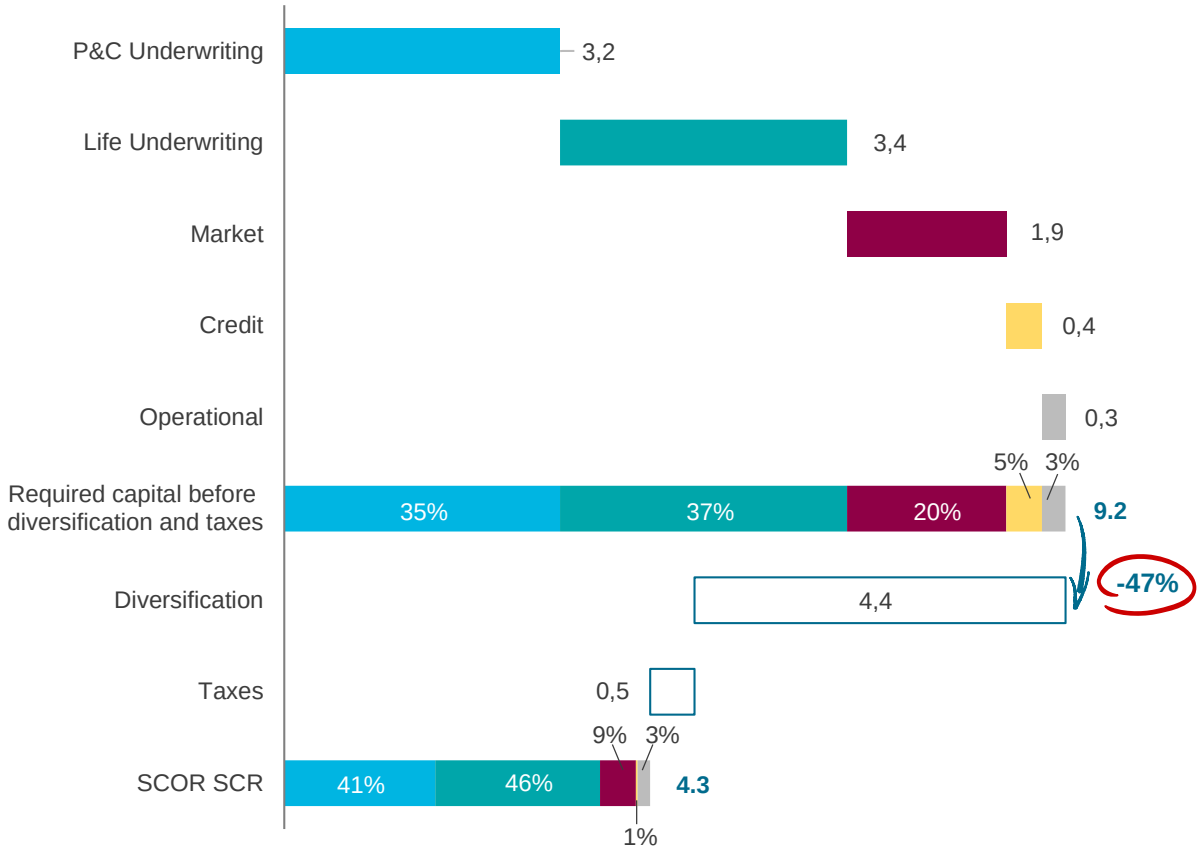
Protect shareholders' equity

- Traditional retrocession
- Alternative risk transfer solutions
- Buffer capital
- Contingent capital facility

SCOR maintains a well-balanced risk composition that provides superior diversification benefit

H1 2018 risk capital breakdown by risk category

In EUR billions (rounded) – as at the end of H1 2018



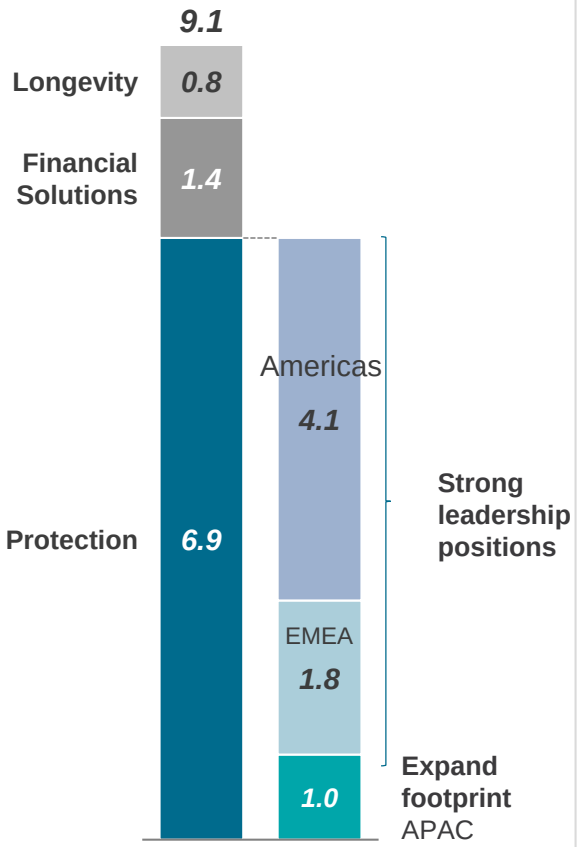
Remarks

- SCOR's balanced P&C and Life portfolio and business model strength reflect a very strong diversification benefit which is stable since YE 2017
- There is further substantial diversification within the risk categories shown
- SCOR's required capital is mainly driven by underwriting risks
- Market, credit and operational risks make a minor contribution to required capital

SCOR Global Life business is built on a strong protection base

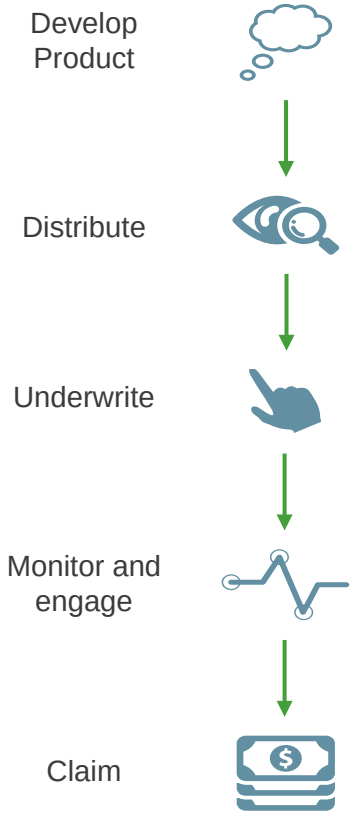
A diversified book with a core Protection business

2018E GWP – in EUR billions



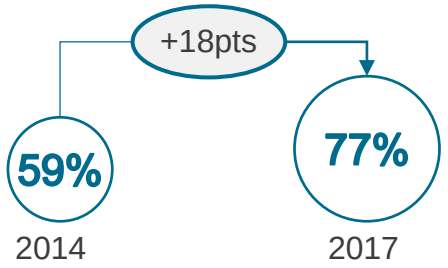
A complete offering to support our clients

Helping our clients accross the entire product lifecycle

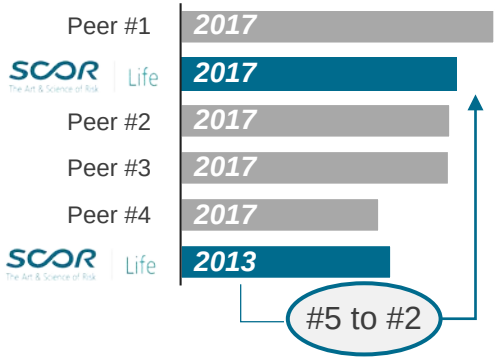


A customer centric approach to the way we do business

Significant uplift in advocacy scores over the last three years as cited by clients[1)]



Significant improvements in capability ratings as perceived by clients[2)]



Note: growth rates at constant FX – 2018 estimate at June 30, 2018 FX

1) NMG Consulting Global Life & Health Reinsurance Study 2017 Client Advocacy Score (CAS) - SCOR Target market; CAS = (Promoters – Detractors) / All citations

2) NMG Consulting Global Life & Health Reinsurance Study 2017 Business Capability Index - SCOR Target market

Medical Underwriting

Leading provider of medical underwriting services in the Nordic market

PRIO

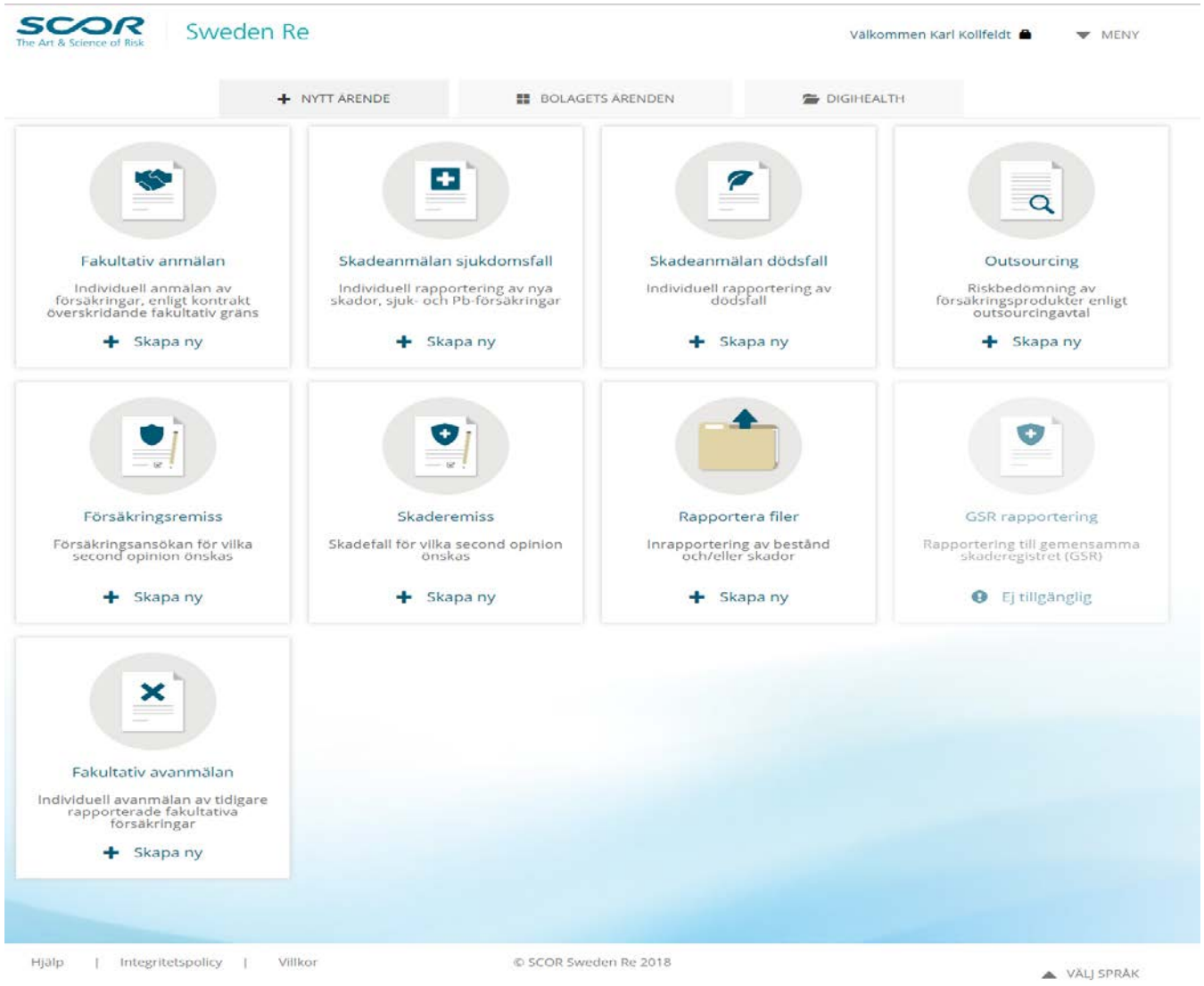
Web based juvenile medical manual

solem

Web based medical manual

Via outsourcing we do everything from **Second Opinion** to a full **Medical Underwriting Service.**

Customer Portal



- A quick, secure and reliable way of exchanging files and information with SCOR Sweden Re
- Provides functionality to report
  - Individual life
  - Claims
  - Outsourcing
  - Referrals
  - Digihealth
  - Files
  - Etc.

ON THE ROAD OF DIGITALIZATION

How does it work?

Client logs in on Cedent website and applies for insurance.

Client clicks on a link to reach the health declaration.

Client answers questions in the dynamic form.

Client clicks **Send** and is asked to sign the form electronically.

Complete health declaration is available on SCOR Sweden Re Customer Portal.

Cedent views the health declaration in SCOR Sweden Re Customer Portal.
Any remarks?

NO

Cedent contacts the Client and finishes the application.

YES

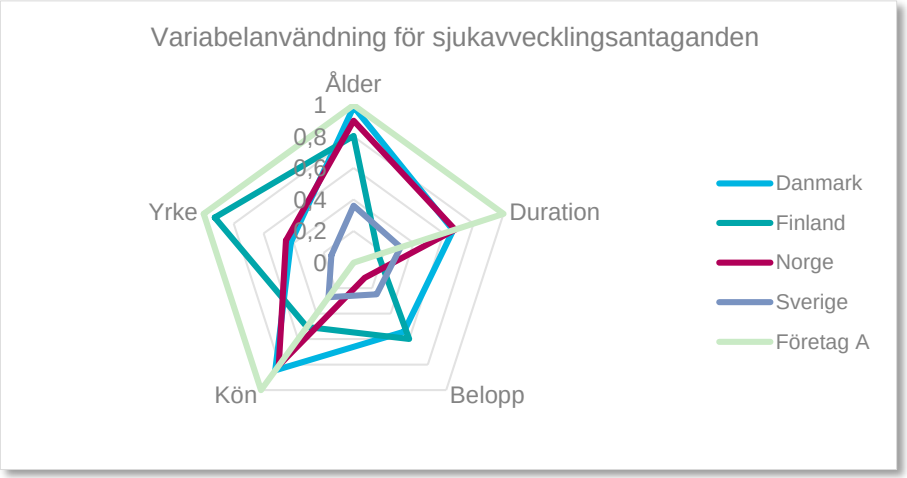
SCOR Sweden Re Medical Underwriter picks up the case and gives a recommendation.

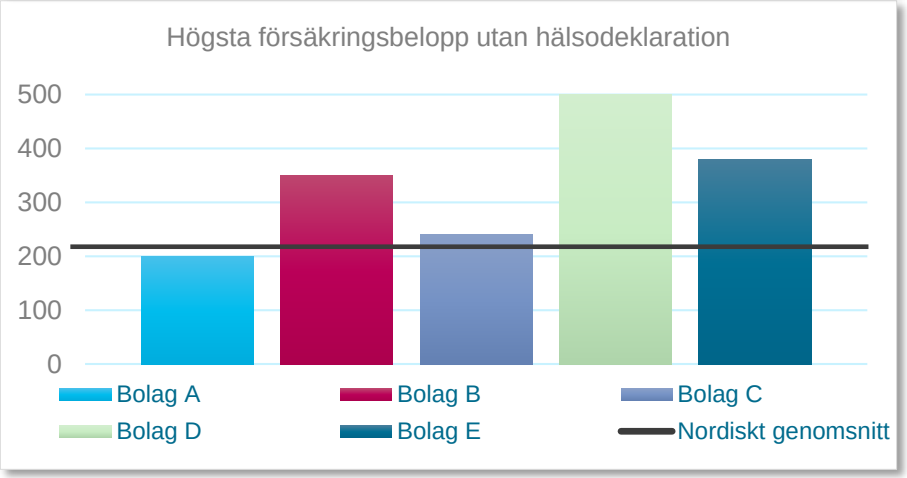
Cedent receives recommendation on SCOR Sweden Re Customer Portal and contacts the Client.

SCOR Sweden Re Customer Portal

Marknadsanalyser, Benchmarking och Aktuariellt stöd

Nordiska och landspecifika benchmarksurveys





Kundexklusiva analyser och service

Ad hoc analyser

- Sjukavvecklingsantaganden
- Dödlighet och insjuknande
- Tariff-benchmarking
- Produktjämförelser

Knowledge sharing

- Marknadsöversikter och rapporter
- Produktutveckling
- Stöd vid villkorsskrivning
- Perspektiv från flera marknader

Kontinuerlig service

- Resultatanalyser
- Reservsättning
- Avräkningar

Workshops, Seminars & Trainings


Traditional Solutions
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Sweden Re

SCOR Sweden Re Seminar
October 12, 2018, Stockholm

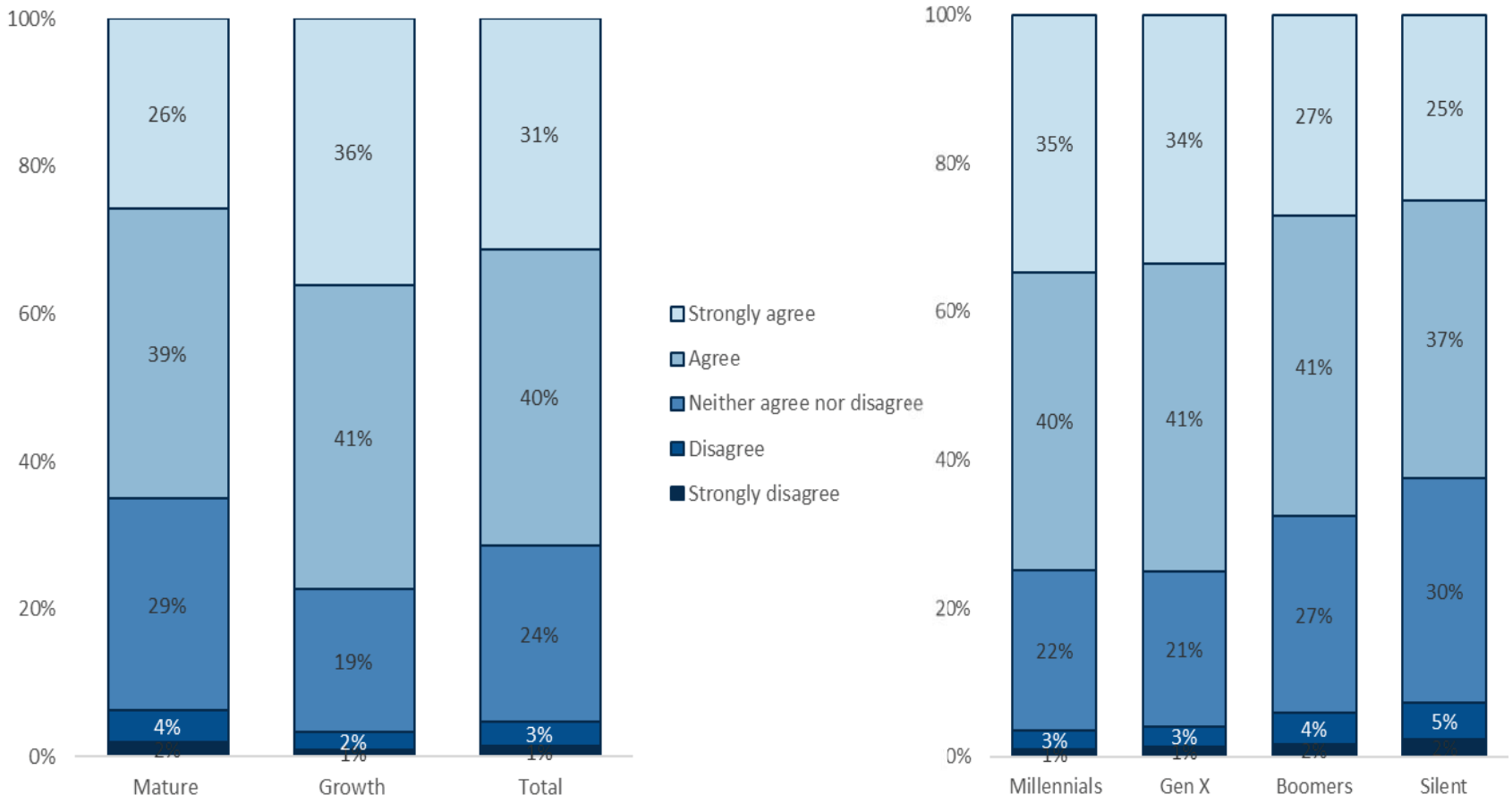
SCOR Innovations From Around the World

Gavin MAGUIRE
Marketing Actuary – UK & Ireland

SCOR The Art & Science of Risk | Life

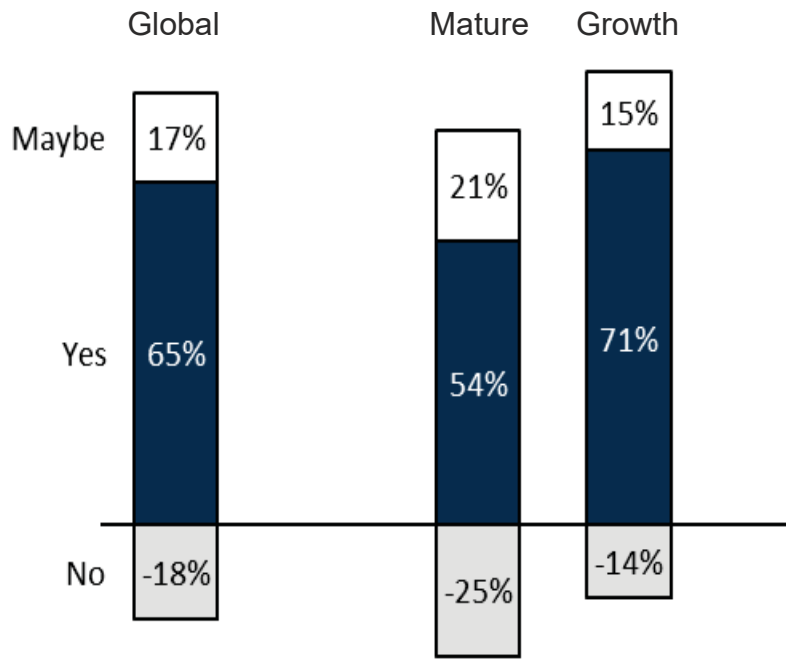
Consumers are looking for insurers to help them being healthy…

Support for shift in insurer focus to keeping people healthy

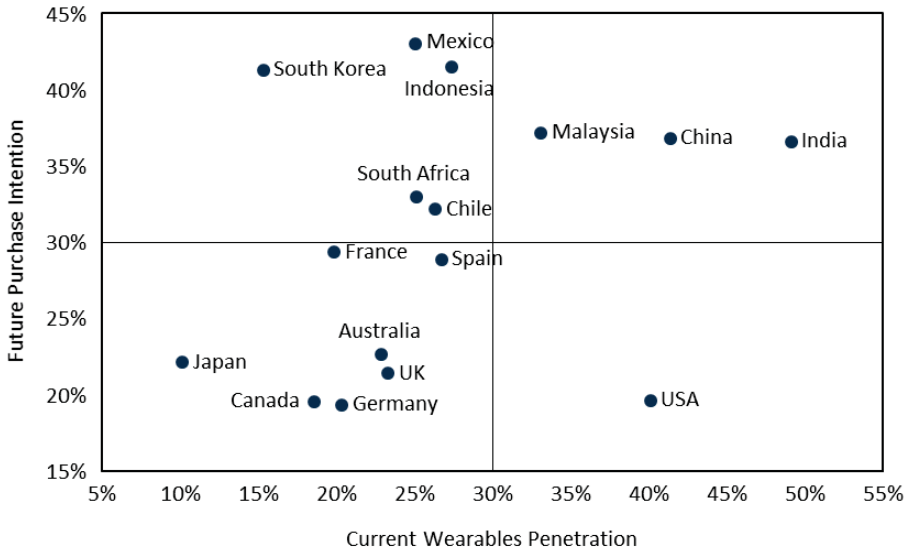


... willing to share data with a potential wearable adoption > 50% in most countries

Willingness to Share Wearable Data



Current Ownership & Future Momentum of Wearables, by Country (2018)



WHAT ROLE DO WE WANT TO PLAY?

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HONG KONG - diabetes

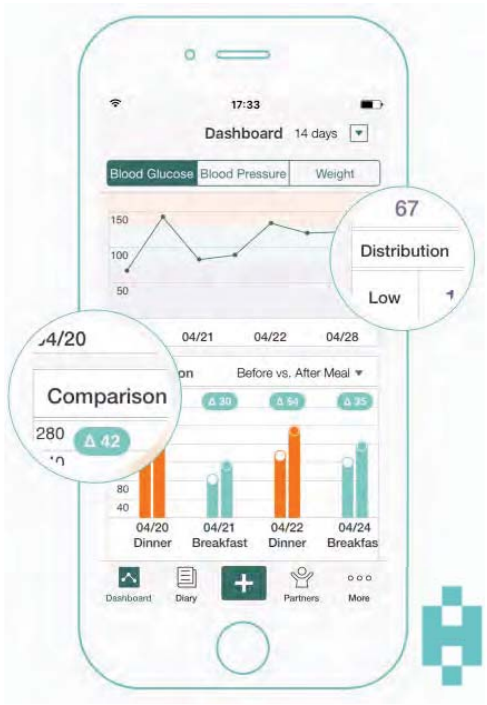
10%

OF THE POPULATION HAS THE DISEASE

HONG KONG - diabetes

App providing tracking of blood glucose

Collects data and personalize care service



Health 2 Sync

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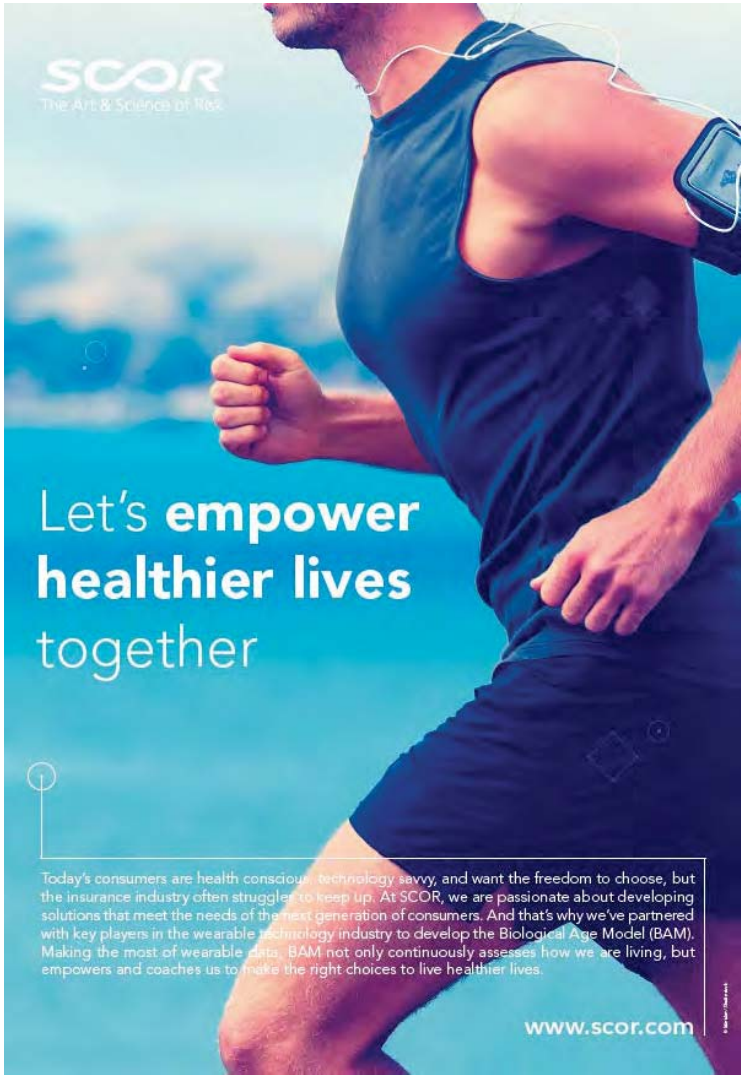
SOUTH EAST ASIA - Biological Age Model (BAM)



vivametrica

DAILY STEPS
DAILY ACTIVITY

↓

Enables high-level of accuracy in mortality risk

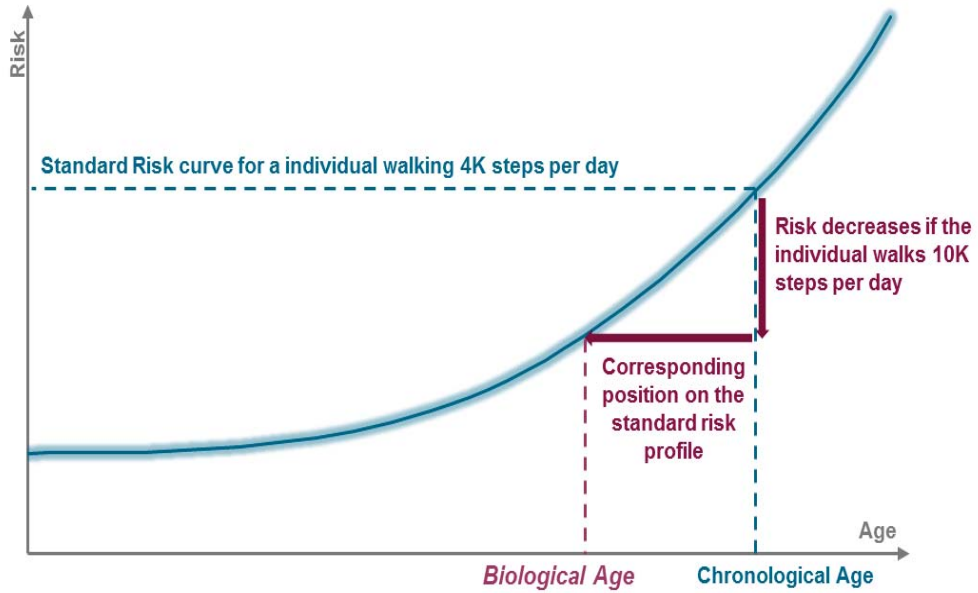
Reinventing underwriting with the simple input of 7 days of lifestyle data predicting a tailored mortality and morbidity risk.

Transforming the customer experience by refunding to the customer the savings from the insurance risk through premium discount.

SOUTH EAST ASIA - Biological Age Model

Concept

- Use input from wearables to determine a ‘biological age’ from which premiums are calculated; and reward healthy lifestyles
- Simplify Underwriting and enable Continuous Underwriting
- Greater consumer engagement which can lead to improved lapse and claim experience



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UNITED STATES OF AMERICA - iBeat

In the U.S. working with iBeat to increase survival rates in case of cardiac arrest

A device that monitors heart rate, detects cardiac arrest and triggers emergency response

475 000

Deaths from sudden cardiac arrest in the U.S. every year

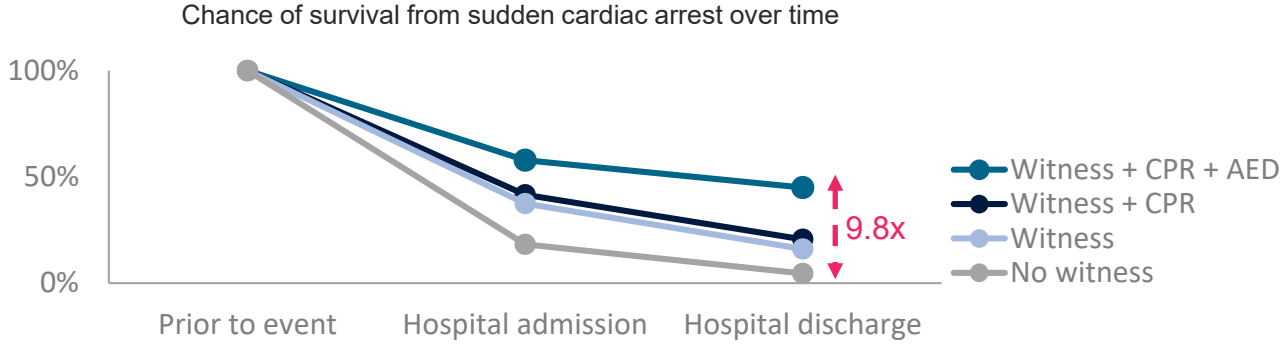
"Hero network" (voluntary) of 1.3 million people with CPR Knowledge already in place

Target network to reach 2-3M people in order to cover ~80% of the U.S. population

Connecting "heroes" with victims – "heroes" get a notification and directions to the victim

Improving survival rates by bringing help earlier to victims of cardiac incidents

Providing a 24/7 witness, CPR, and a defibrillator can multiply chances of survival by 9.8x



SCOR The Art & Science of Risk | Life

Note: *SCOR Global Life launches SCOR Life & Health Ventures and announces the venture's first strategic investment in and partnership with iBeat* - https://www.scor.com/fr/medias/actualites-communiques-de-presse/scor-global-life-launches-scor-life-health-ventures-and
CPR = Cardiopulmonary Resuscitation; AED = Automated External Defibrillator

IRELAND – In Ireland, SCOR Global Life partnered with a global insurer to launch a wearable-enabled wellness proposition

In Ireland, SCOR Global Life partnered with a global insurer to launch a wearable-enabled wellness proposition

Partnering in development with leading companies

GARMIN

Market leader in wearable technology devices

HeiaHeia

Platform & social web service that motivates to exercise

Step-by-step market penetration and analysis

Experiment
Experiment within SCOR London with 70 employees

Launch
650 customers received a free wearable device (up from the 500 planned)

Encourage the adoption
Brokers promote to customers

Connect to the Heia Heia platform
Retrieves the data from the device and passes it on to the insurer

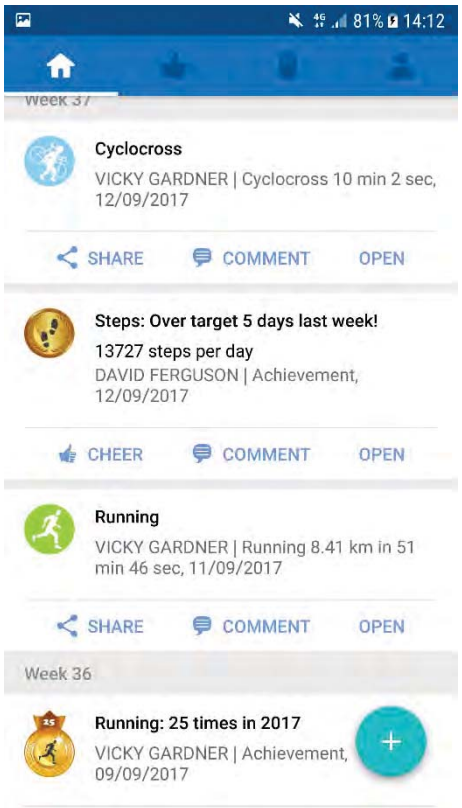
Customer incentive
Premium reimbursement

Follow-up
Customer feedback collected

Completed stages Stages to be completed

IRELAND - Advantages of using a platform such as Heia Heia

- For pilot Heia Heia brought a platform to the pilot that will:
  1. Handle all data collection and aggregation
  2. Invite and issue reminders to Zurich customers to join the pilot group
  3. Capture consents
  4. Allow bespoking of apps and pilot groups
  5. Allow Zurich target marketing messages at participants during the course of the pilot.
- End to end and customisable solution for the pilot.
- **Zero impacts on the Zurich Life Ireland IT department!!!**



Life


Digital engagement for better
life and lower risk

Our Customer Segments

Insurance & Service Providers

Digital engagement solutions for wellbeing promotion at scale

High Performance Organisations

Coaching of leaders and knowledge workers in high-performance industries

Formula 1 & Motorsport

Coaching and medical services for Formula 1 drivers, teams and factories

New Customer Value through Digital Engagement

Personalized Health Improvement &
Gratifying Customer Experience

Better Interaction
Personalized Experience
New Products

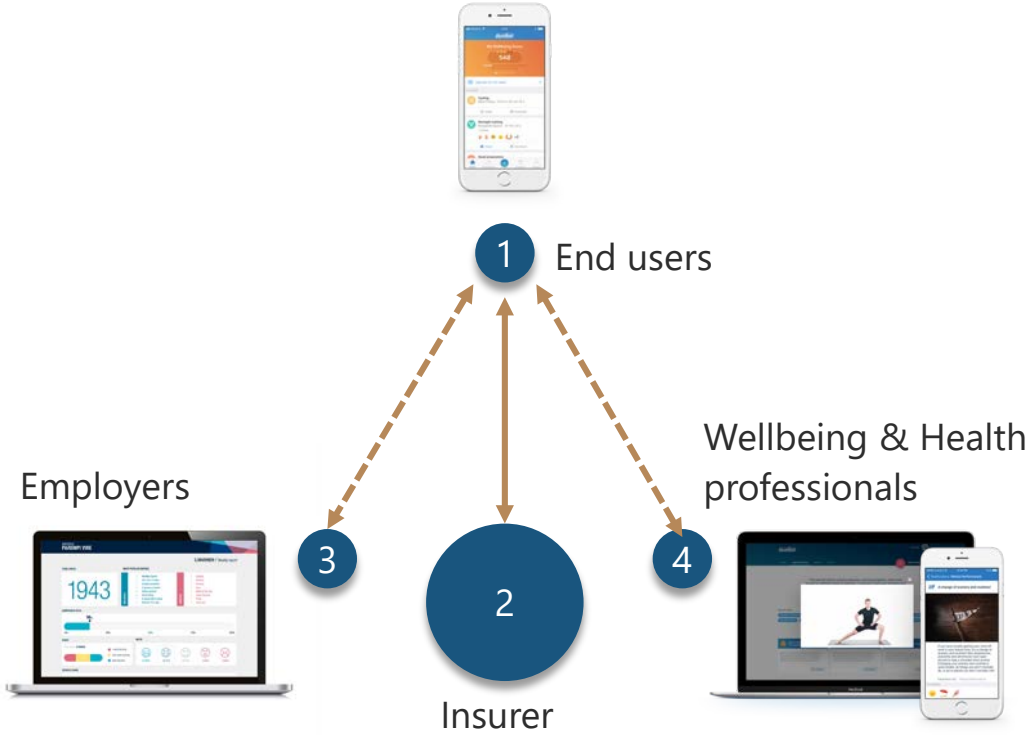
1

Improved Loyalty & Satisfaction
Data
Higher Premiums & New Revenue Streams

2

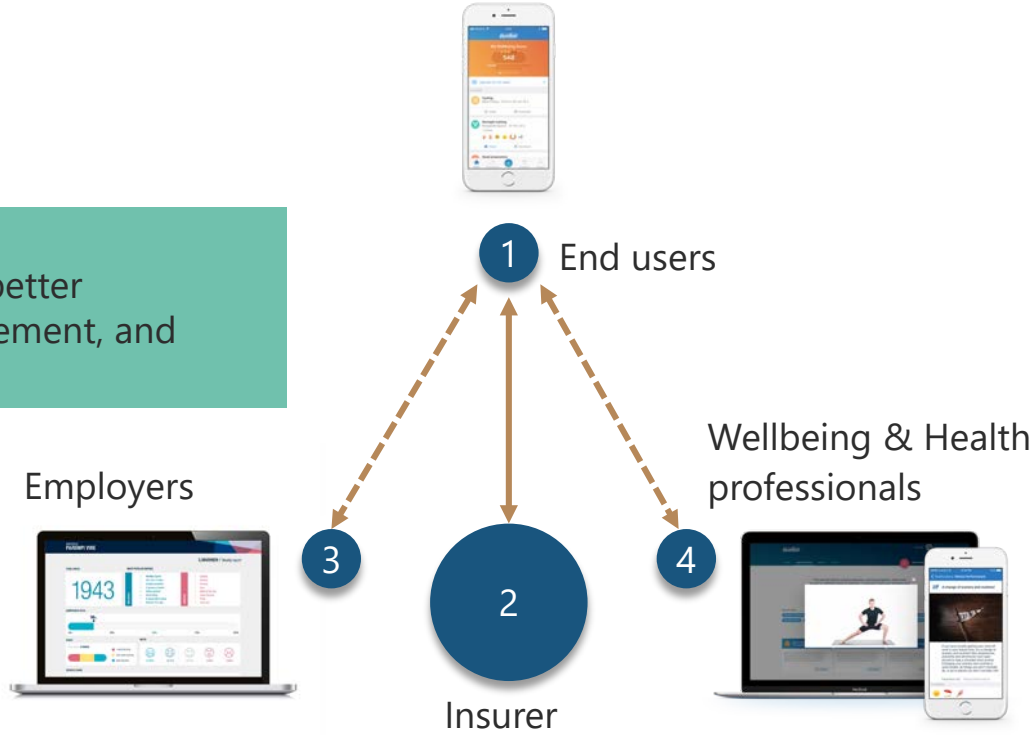
Insurer

Enabling Value Ecosystems

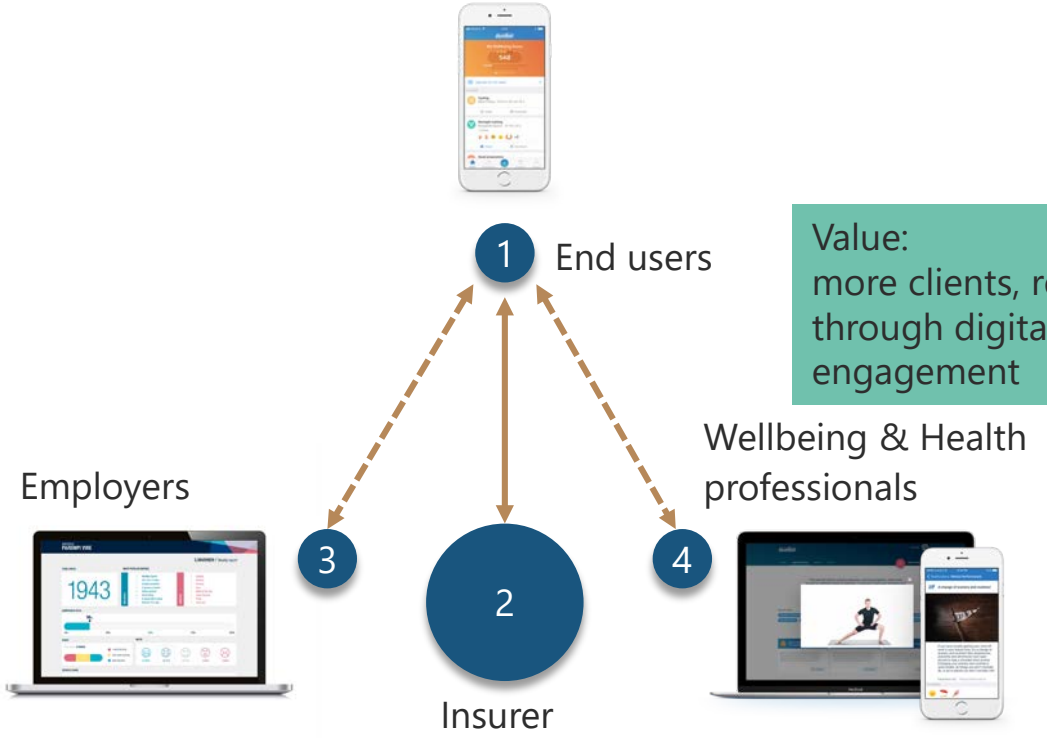


Enabling Value Ecosystems

Value:
Lower health cost, better productivity, engagement, and employer brand

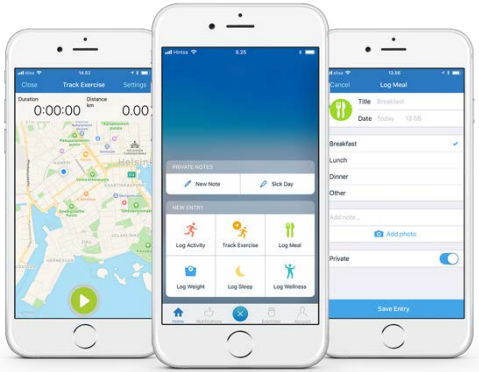


Enabling Value Ecosystems

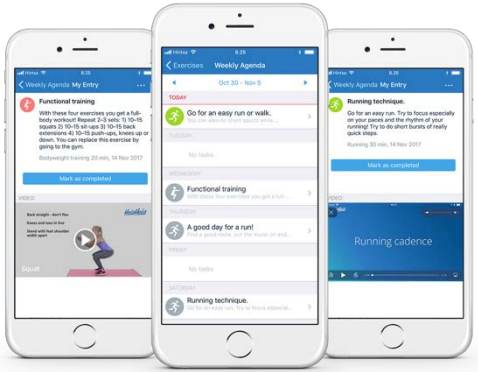


Promoting healthy habits

A true daily companion



Log activities



Start training programs

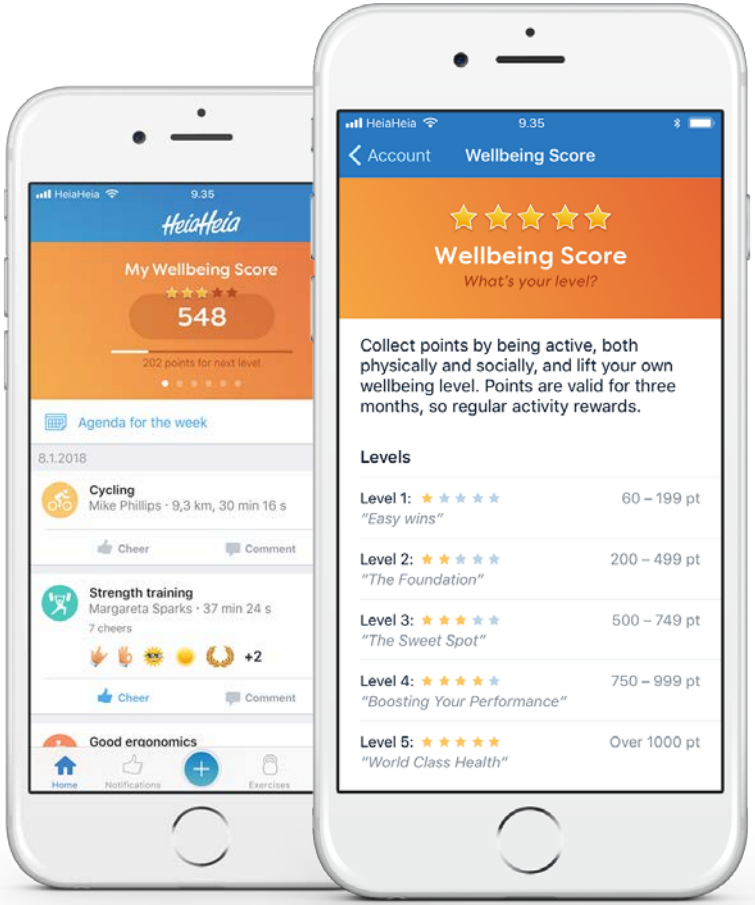
Connect your wearable

Everything counts

Rewarding long term success

Users earn points and unlock levels by being active.

The scoring system supports personal long-term holistic wellbeing goals and can be linked to the insurer’s pricing and policies.

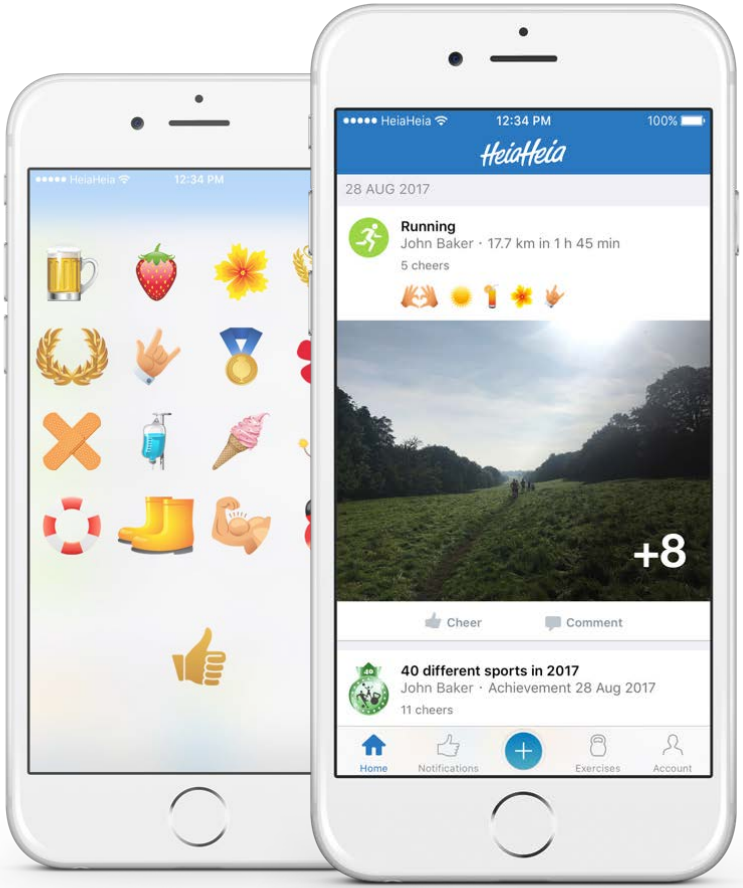


Social by nature

The strength of peer support

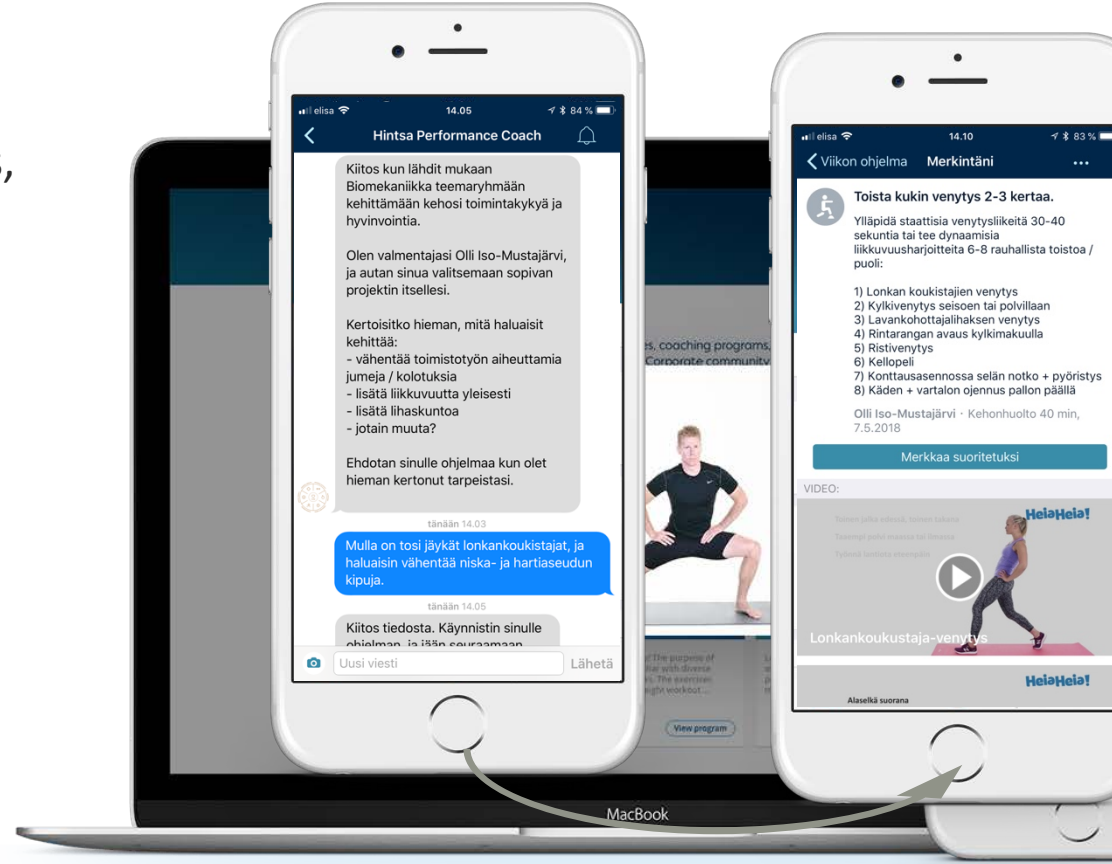
Support from your like-minded friends, family and colleagues increases engagement and sense of achievement.

Sharing accomplishments big and small and cheering friends also makes wellbeing fun and social.



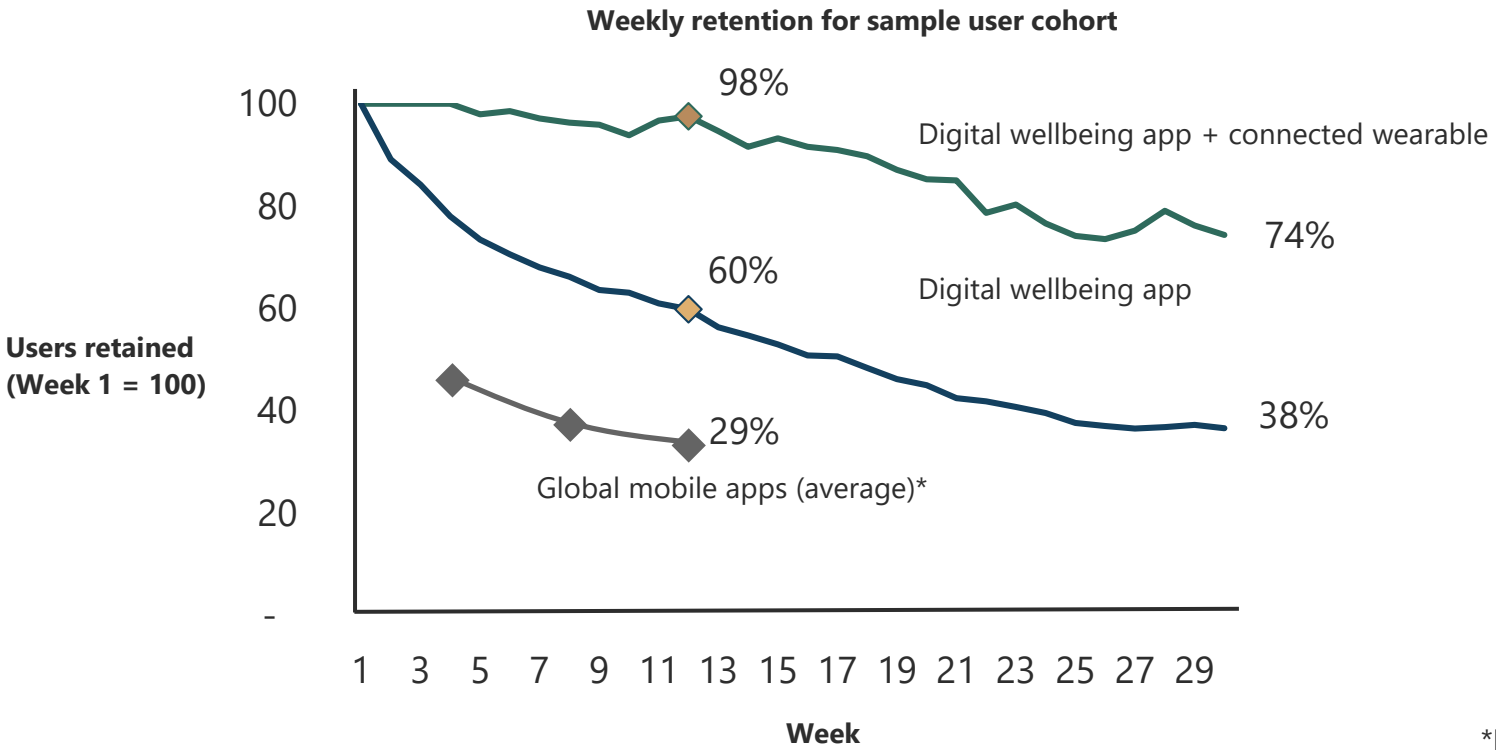
Professional tools for coaching & interventions

- Managing client base (individuals, groups)
- Group coaching & comms
- Monitoring client activity
- Planning tasks for clients



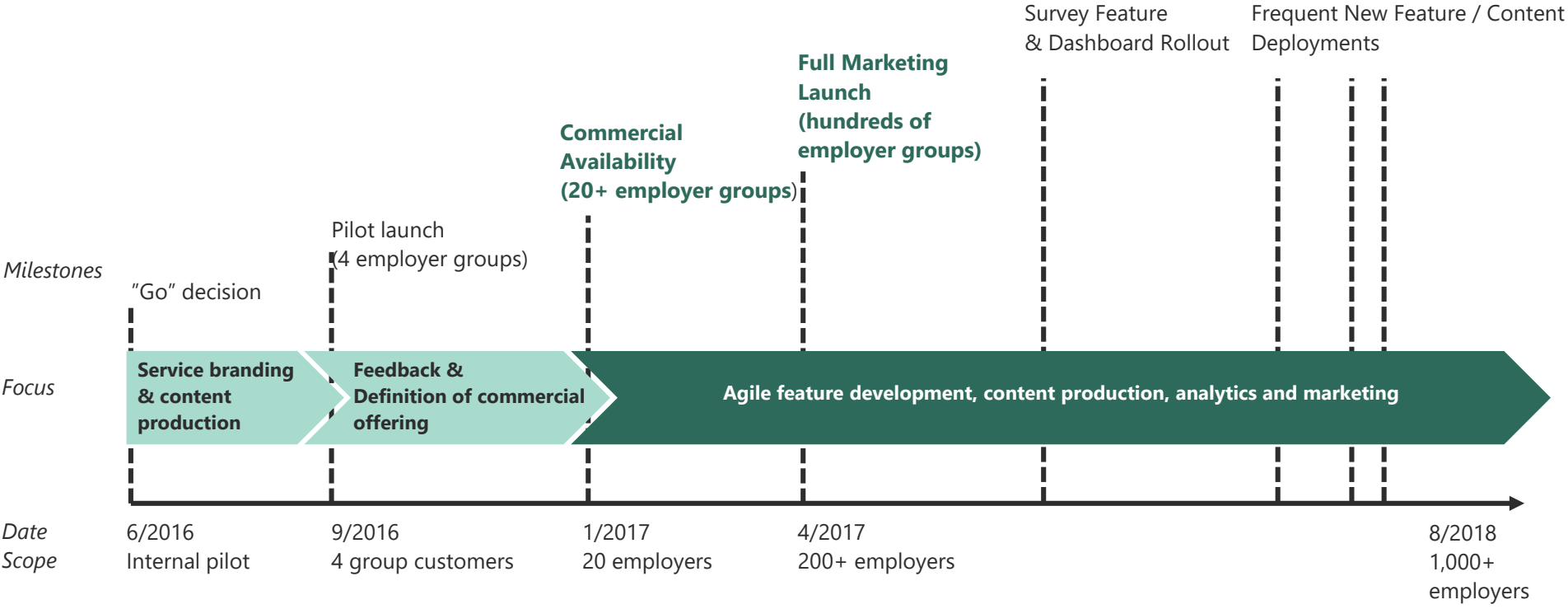
Case Studies & Data

Wellbeing Is a Sticky Digital Concept



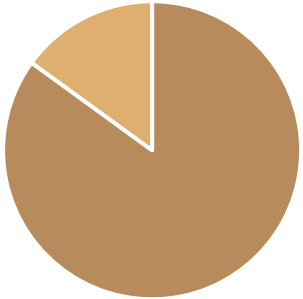
*Localytics 2017

Engaging 1,000+ Group Insurance Customers: Case Ilmarinen

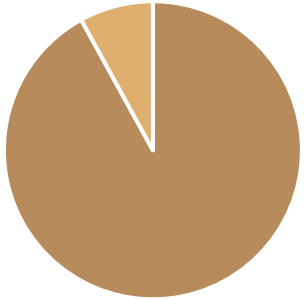


Case Deloitte

85% report
positive lifestyle changes



92% consider
the service useful



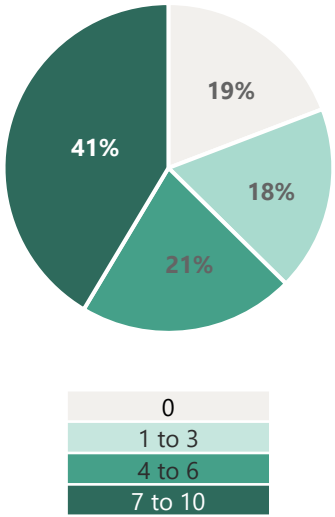
"I use the mobile application every day and also follow updates from other users. Thanks to its social nature, the app creates community spirit across team boundaries and brings colleagues together. It's also really easy to use."

– HR Talent Partner, Deloitte

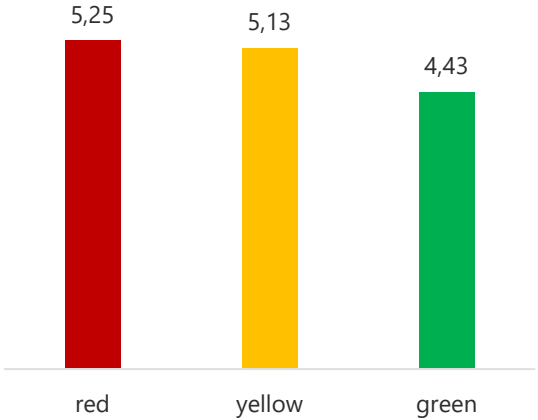
https://www.hintsa.com/case/deloitte/

Impact of Digital Habit Change Programs

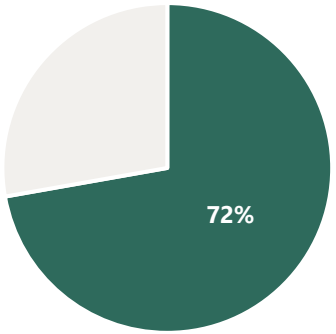
Impact on wellbeing



Average impact on program participant wellbeing, by initial wellbeing profile



More than 70% of program participants would like to start a new program



Digital platform user survey 9/2018

Wrapping it up: recommendations

- **Pick the low-hanging fruit**
  - Major opportunity: the proactive wellbeing megatrend
  - Digital tools enable personalized, scalable and sticky concepts
  - Insurers well positioned to promote solutions
- **Start soon, start small; experiment and expand**
  - Immediate benefits from positioning, reference customers, data
  - Expand gradually based on learnings + keep iterating

Thank you

Doping as a public health issue.

Professor Arne Ljungqvist

Stockholm, October 12th 2018

Fundamental principles

Practically all doping substances and and methods are medicines and/or medical interventions which have been developed for the prevention and cure of disease, or alleviation of symtoms.

Their administration in the absence of medical indications (e.g, to healthy sportsmen) is medicl malpractice against which legal action should be taken.

Two different aspects

- Doping in elite sport
- The use of doping substances in society

Doping in elite sport

- Ephedrines/Amfetamines 1940s – 60s
- AAS 1960s – 70s
- Hormones 1980s
- Oxygen carriers 1990s
- Gene transfer 2000 - (?)

Some key years

- 1928 IAAF-rules on stimulants
- 1960 Rome Olympic Games
- 1961-67 IOC Medical Commission
- 1968/72 Testing för stimulants at OG
- 1972 IAAF Medical Committee

Arnold Beckett

Manfred Donike

Further key years

1974 AAS banned and tested for by IAAF

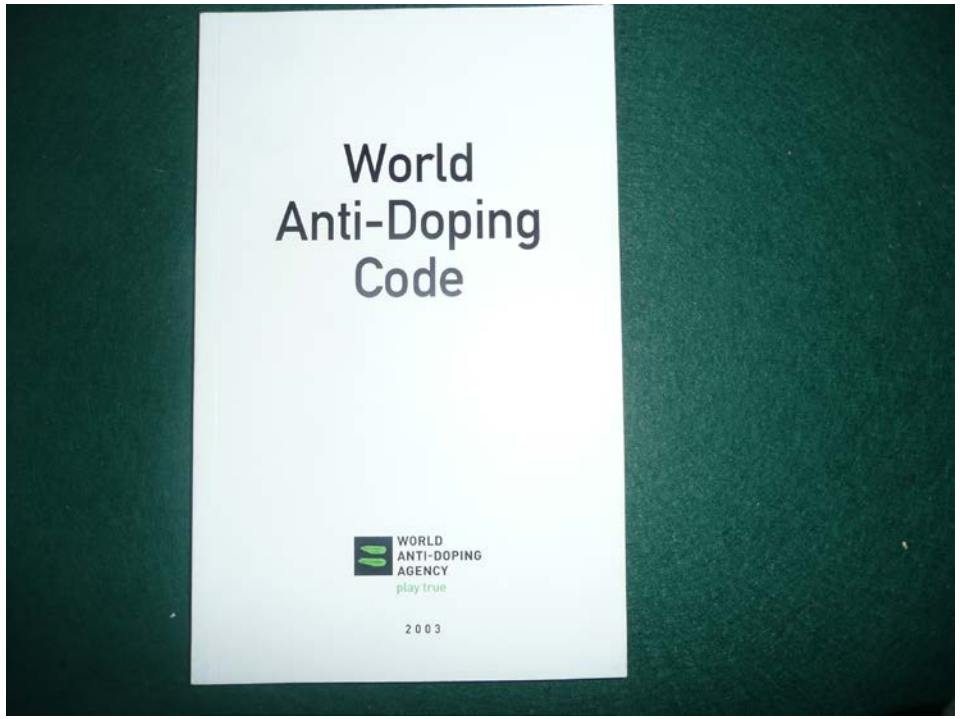
1979 Doping control laboratories by IAAF

1984 Court of Arbitration for sports (CAS)

1988 Seoul OG

Further key years

1989	”Cold war” fades
1999	WADA
2004	WADA Code
2005-07	UNESCO Convention



2000 Sydney Games

The IAAF/ US story

Bush´s ”address to the nation”

Scandals

2002
Salt Lake City-OG
New generation
of Epo (Aranesp)

2003
Balco

2004
Aten-OG

Scandals

2006

Torino Olympic Games


РОССИЯ
How will sport answer the
Russia question?
Russian doping has rarely been away from the headlines in recent times,

Sochi 2014

Kula, Diskus, Slägga

- Endast 3 av de15 medaljörerna vid Rio-OS 2016 i dessa grenar hade kommit på prispallen i Seoul 28 år tidigare.

- Alla världsrekord i dessa kastgrenar – män och kvinnor – är över ett kvarts sekel gamla (det yngsta från 1990 - mäns kula).

Summary

- An interesting 45 years´ journey from almost complete unawareness to general understanding and support, and to……..
- The creation of WADA in 1999
- USA president´s ”address to the nation” in 2004
- An international anti-doping code 2004 (2009, 2015)
- Global support in the form of a UNESCO-convention in record time 2005-2007
- National antidoping-organisations all over the world

Use of doping substances outside sport

International studies

”The use of doping agents, particularly anabolic androgenic steroids (AAS), has changed from being a problem restricted to sports to one of public health concerns”.

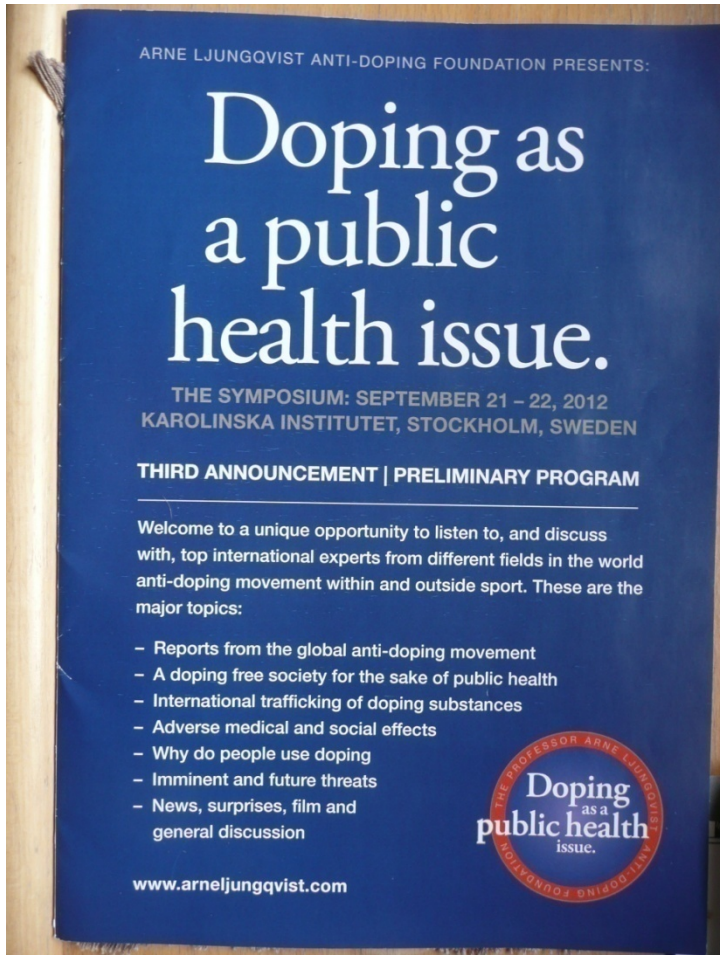
Sjöqvist F, Garle M & Rane A. Lancet 2008 May 31; 371 (9627) 1872-82.

”Use of Anabolic Androgenic Steroids and other similar doping substances is a substantial problem in Europe – primarily among young men – which until recently has not been given much attention.”

In *Strategy for stopping steroids*, Anti-Doping Denmark, 2012

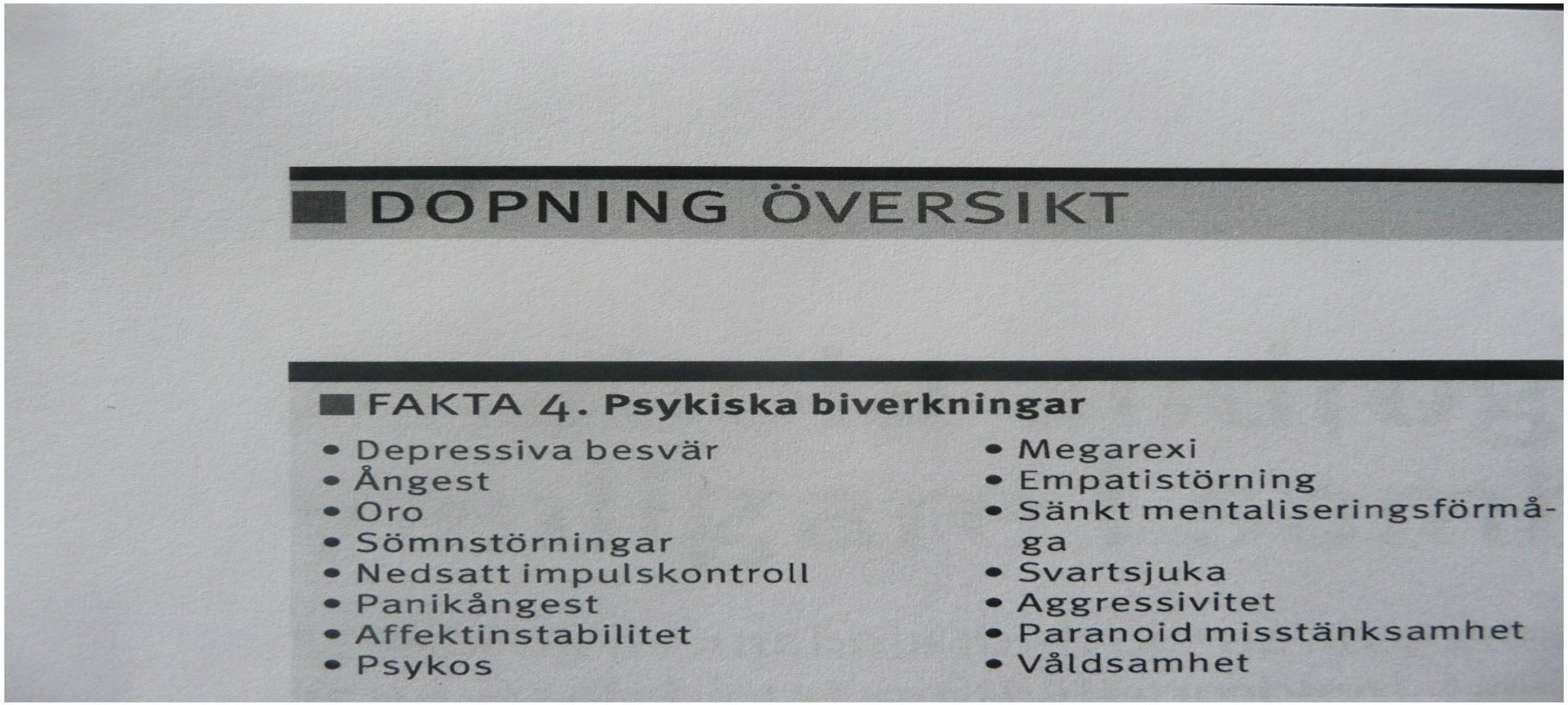
International Doping symposium, Stockholm 2012

(IOC, WADA, WHO, UNESCO, INTERPOL and others)



- ***"The misuse of doping substances in the broader society is a health and security issue. Action must be taken by governments and organizations within a harmonized legal framework and policies."***

Stockholm Sept. 2012.



DOPNING ÖVERSIKT

FAKTA 4. Psykiska biverkningar

- Depressiva besvär
- Ångest
- Oro
- Sömnstörningar
- Nedsatt impulskontroll
- Panikångest
- Affektinstabilitet
- Psykos
- Megarexi
- Empatistörning
- Sänkt mentaliseringsförmåga
- Svartsjuka
- Aggressivitet
- Paranoid misstänksamhet
- Våldsamhet

Rane,A. et al. *Steroider ett växande problem på gymen.*

Läkartidningen Nr 39-40, 2013, vol 110

Food supplements

- *” Det är vetenskapligt klarlagt att c:a 20 – 25% av alla kosttillskott som saluförs till idrottsmän som prestationsförhöjande innehåller dopingklassade substanser”.*

Larsson, G. et al. Doping – översikt, vård och behandling. Slutrapport från nationellt kompetensutvecklingsprojekt (NKD) 2013-2015, Region Örebro Län, 2016

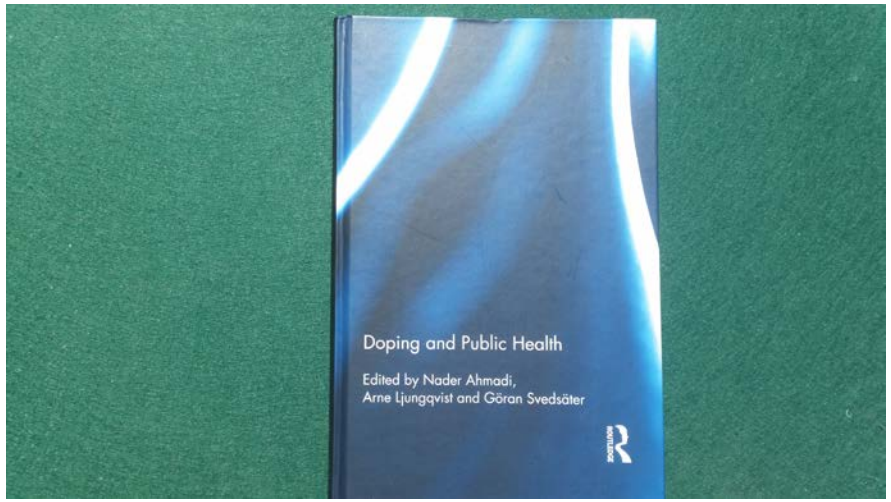
Food supplements ctd.

- 1. ”14 av 85 undersökta kosttillskott bedömdes utan anmärkning. 21 av preparaten borde ha varit läkemedelsklassade och därmed förbjudna att saluföra.”
- 2. ”Bara 2 av 43 förpackningstexter uppfyllde märkningskraven. I 30 av 43 produkter ingick växtextrakt som kan innehålla hälsofarliga substanser. 8 av produkterna skulle kunna klassificeras som läkemedel.”
- www.rf.se/Antidoping/Kosttillskott. 31 jan 2018

Food supplements ctd.

”New sources of doping substances are the market of adulterated nutritional supplements and unapproved pharmaceuticals. These are extremely fast-growing markets because of the readily available raw materials needed for doping substances and the ease of trading the products via Internet”.

Geyer, H. Adulterated nutritional supplements and unapproved pharmaceuticals are new sources of doping substances for fitness and recreational sports. In Ahmadi, N, Ljungqvist, A & Svedsäter. G. *Doping and public health. Routledge, London and New York, 2016, pp. 64-70.*



Food supplement sales in Sweden

År	Millions (SEK)
2015	4 569,0
2016	4 669,4
2017	4 876,2

Source: ”Svensk Egenvård”. Pressrelease, 3 April 2018

Recent statement

- ***”Dagens utseendefixerade och prestationsinriktade samhälle har skapat en lukrativ illegal marknad för anabola steroider (AAS). Denna omfattande men samtidigt nedprioriterade kriminella subkultur är betydande och de fysiska och psykiska skadeverkningarna av steroidmissbruket är ett folkhälsoproblem som samhället väljer att inte se.”***

Hermansson, G. *Fokus på AAS-missbruket*. Svenska Narkotikapolisens Tidskrift,5: 58-63, 2017.

Hermansson var tidigare narkotikapolis med särskilt ansvar för dopingområdet.

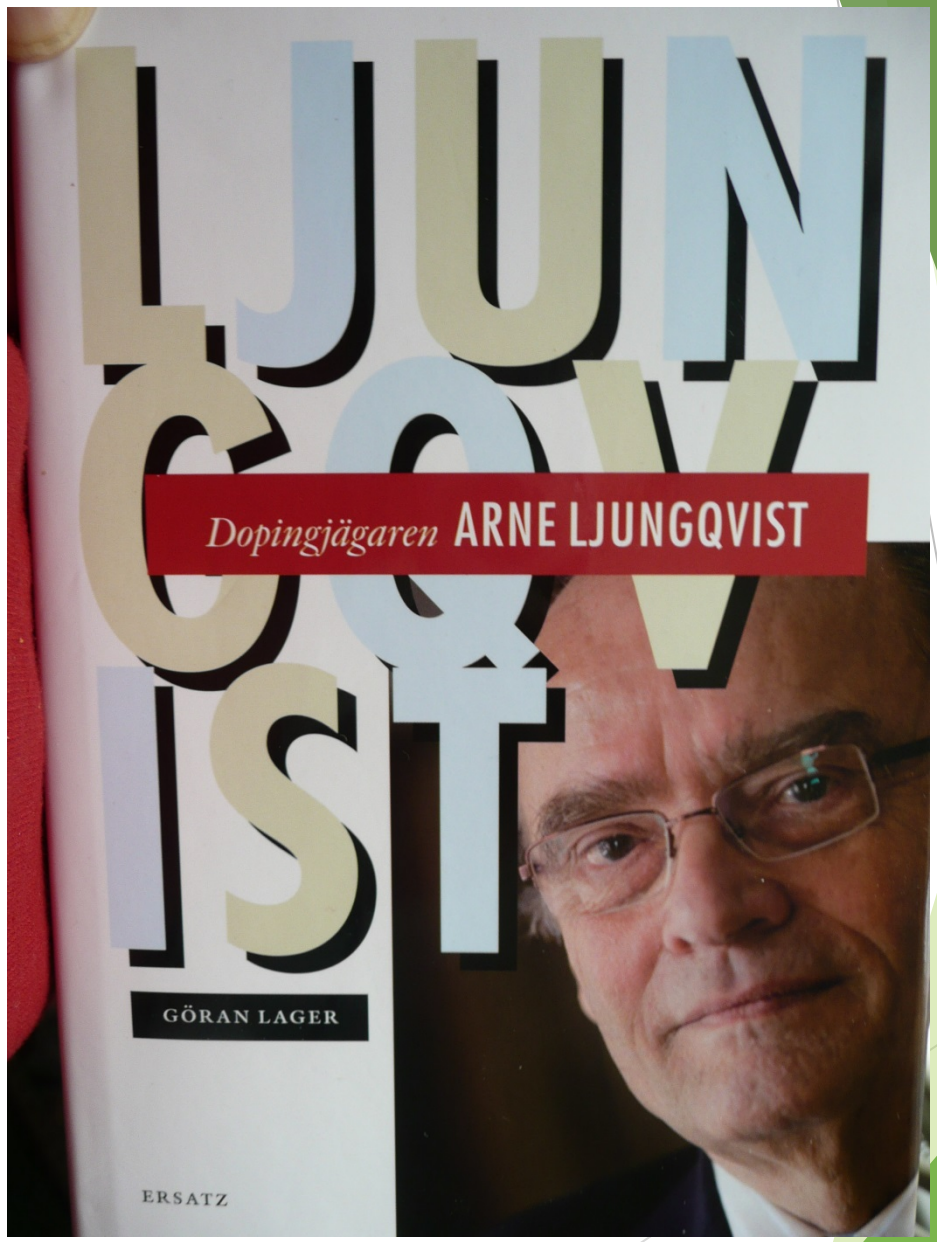
Conclusion

- Sport has conducted a fight against doping for about 50 years with reasonable success

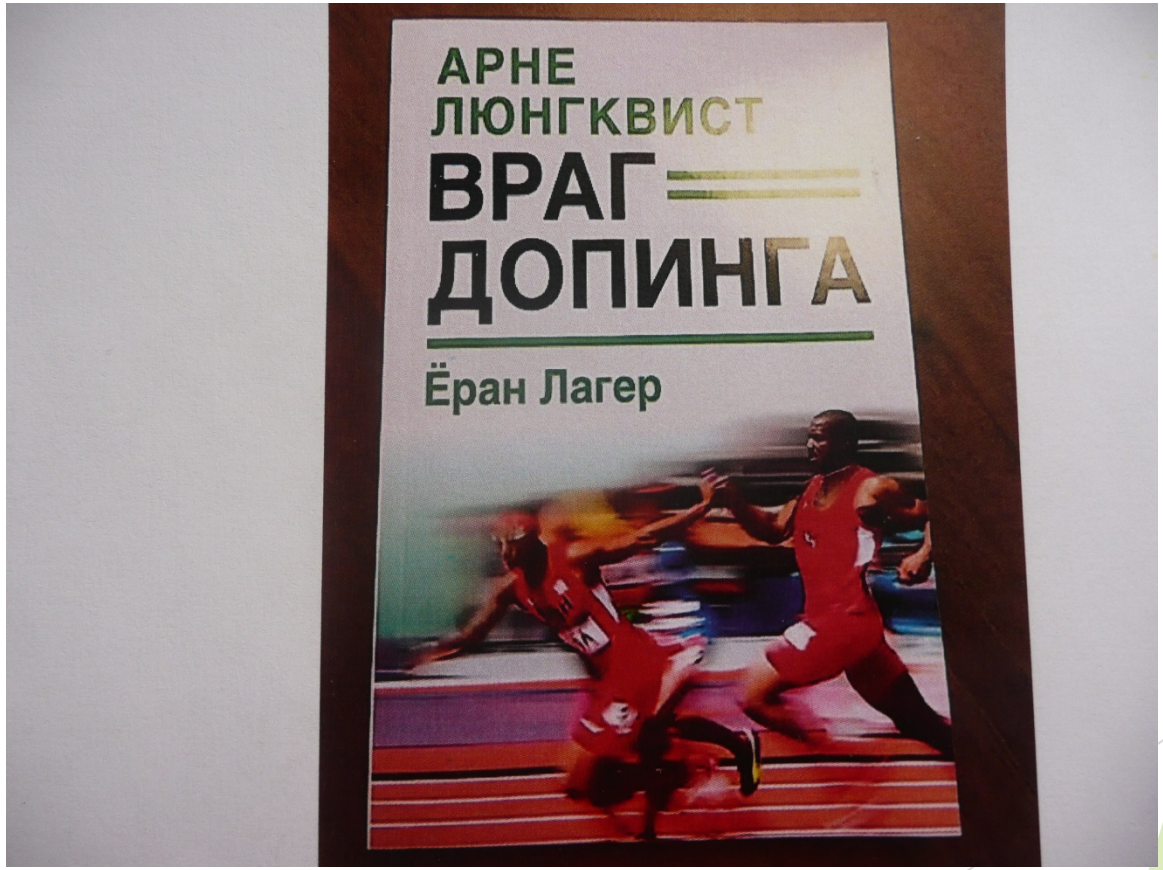
- Society has remained largely passive as the use of doping substances outside sport has become an increasingly important public health issue

TACK!

”For pure health and clean sport”



”Doping´s Nemesis


АРНЕ
ЛЮНГКВИСТ
ВРАГ
ДОПИНГА
Ёран Лагер

An Extension of Generalized Linear Models for dependent frequency and severity

Masar Al-Mosawi

October 12, 2018

Länsförsäkringar Fondliv

Table of contents

Introduction

Introduction

In non-life pricing the pure premium is modeled as the product of the two estimates: Claim frequency and claim severity. A general problem is that the frequency and severity are traditionally assumed to be independent.

This assumptions is not always vindicated, car insurance policyholders who tend to file several claims per year are often associated with lesser claim amounts than policyholder who tend to file lesser claims per year.

There is thus a need to account for potential association between claim frequency and claim severity. In this thesis we will construct and analyze the classical model, and a proposed extension of the classical model where claim frequency and claim severity are dependent.

Model building

Model building

Variations can be estimated by a set of covariates. The range for each covariate are called classes. Let M be the number of covariates, and let m_i be the number of classes for covariate i. A tariff cell is denoted by the vector $(i_1, \ldots, i_M)$. We use the multiplicative model for the expected value of a response variable Y:

$$E[Y_{i_1,\ldots,i_M}] = \mu_{i_1,\ldots,i_M} = \gamma_0 \gamma_{1 i_1} \gamma_{2 i_2} \cdots \gamma_{M i_M}, \tag{1}$$

where, the γ is called the relativities. The relativities measure the effect when all other variables are held constant

Model building

Generalized Linear Models (GLMs) is a class of statistical methods which generalizes the linear models. GLM solves two problems that occurs with linear models when applying it to non-life insurance pricing:

- GLM assumes general class of distribution instead of normal distribution
- GLM has a link function instead of the mean being a linear function. Multiplicative model is more reasonable for pricing

GLMs uses Exponential Dispersion Models (EDMs) that generalize the normal distribution, that are used in linear models, into a family of distributions for the GLMs.

$$f_{Y_i}(y_i, \theta_i, \phi) = exp\left\{ \frac{y_i\theta_i - b(\theta_i)}{\phi/w_i} + c(y_i, \phi, w_i) \right\}, \tag{2}$$

Inference

Inference

To estimate the parameters in GLM we use the maximum-likelihood estimation (ML):

The method of maximum likelihood is based on the log-likelihood function $l(\theta, \phi, y)$, which is a function of the parameters of a statistical model.

- Given a family of distributions, the method of ML finds the values of the model parameter θ, that maximize the log-likelihood function
- Intuitively, the ML selects the parameters that make the data y most probable

Inference

For testing a ML-estimated parameters significance, we use the null hypothesis method:

The null hypothesis method is the use of statistics to determine the probability that a given hypothesis is true

1. Formulate the null hypothesis $\theta = \theta_0$
2. Identify a test statistic that can be used to assess the truth of the null hypothesis
3. Compute the *p*-value, which is the probability that a test statistic at least as significant as the one observed would be obtained assuming that the null hypothesis is true. The smaller the *p*-value, the stronger the evidence against the null hypothesis
4. Compare the *p*-value to an acceptable confidence level $1 - \alpha$. If $p \leq \alpha$, the null hypothesis is rejected

Inference

In GLM a generalization of the idea of using the sum of squares of residuals for a good measure of goodness-of-fit is the deviance function. It can asses which model fits the data best.

$$D(y, \mu) = 2(l(\theta, \phi, y) - l(\theta, \phi, \mu)). \tag{3}$$

- The saturated model is used as a benchmark in measuring the goodness-of-fit of other models, since it has the perfect fit
- One can view the deviance function as a distance between two probability distributions and can be used to perform model comparison
- The deviance functions will generate deviance plots for model validation, they can asses which model fits the data best

Inference

Another criteria for estimating the quality of models in purpose for model selection is the Akaike information criteria (AIC).

$$AIC = -2l(\hat{\theta}, \phi, y) + 2K, \tag{4}$$

- AIC rewards goodness of fit (as assessed by the log-likelihood function), but it also includes a penalty that is an increasing function of the number of estimated parameters
- In other words, AIC value is used to determine which model minimizes the loss of information when approximating reality given the data at hand
- $\Delta_i = AIC_i - AIC_{min}$ is a measure of each model relative to the best model

Generalized Linear Models

Generalized Linear Models

For a fixed time period $w = 1$, the total amount paid out in claims is: $S = \sum_{j=1}^{N} Y_j$. S the total amount paid out in claims, N is the number of claims, Y_j is the claim amount for the jth incurred claim.

Assuming that the claim frequency and claim severity is independent: $E[S] = E[N]E[Y]$.

- The number of claims is assumed to be poisson distributed, $N \sim P(v_i)$
- The claim amount is assumed to be gamma distributed, $Y \sim G(\alpha, \beta)$

The poisson distribution and the gamma distribution are members of the EDM family.

Generalized Linear Models

For number of claims N_i, let $v_i = E[N_i]$. Then:

- The ML-equations: $\sum_i x_{ij}(n_i - v_i) = 0$.
- The deviance function: $D(n, v) = 2\sum_i (n_i log(n_i/v_i) + (v_i - n_i))$.

For claim amount Y_i, let $\mu_i = E[Y_i]$. Then:

- The ML-equations: $\sum_i \frac{x_{ij}}{\mu_i}(y_i - \mu_i) = 0$.
- The deviance function: $D(y, \mu) = 2\sum_i (-1 + \frac{y_i}{\mu_i} + log(\frac{\mu_i}{y_i}))$.

Generalized Linear Models extension

Generalized Linear Models extension

For a fixed time period $w = 1$, the total amount paid out in claims is: $S = \sum_{j=1}^{N} Y_j$. S the total amount paid out in claims, N is the number of claims, Y_j is the claim amount for the jth incurred claim.

To account for dependence, the mean of the severity distribution is allowed to depend on N

$$E[S] = E[NE[\overline{Y}|N]], \tag{5}$$

where $\overline{Y}|N = (Y_1 + \cdots + Y_N)/N$ is the average claim severity, S is the aggregate losses incurred and N is the number of claims.

Generalized Linear Models extension

Two reflections on the dependent setup:

- Claim count N is modeled in exactly the same way as in the classical GLM approach.
- The average claim severity $\overline{Y}$ using claim N as both covariate in the GLM, and weight factor in the EDM.

One has $E[S] = E[NE[\overline{Y}|N]] \neq E[N]E[Y]$.

- Independence: $E[S] = E[N]E[Y] = v\mu$
- Dependence: $E[S] = E[NE[\overline{Y}|N]] = v\mu e^{v(e^{\theta}-1)+\theta}$

An dependence factor emerges: $e^{v(e^{\theta}-1)+\theta}$, together with a dependence parameter θ. It is the estimate of the covariate N.

Generalized Linear Models extension

For number of claims N_i, let $v_i = E[N_i]$. Then:

- The ML-equations are same as in the classical GLM: $\sum_i x_{ij}(n_i - v_i) = 0$.
- The deviance function is same as in the classical GLM: $D(n, v) = 2\sum_i (n_i log(n_i/v_i) + (v_i - n_i))$.

For average claim severity $\overline{Y}_i$, let $\mu_{\theta i} = E[\overline{Y}_i]$. Then:

- The ML-equations: $\sum_i^m \frac{n_i x_{ij}}{\mu_{\theta i}}(\overline{y}_i - \mu_{\theta i}) = 0$.
- Additional ML-equations: $\sum_i^m \frac{n_i^2}{\mu_{\theta i}}(\overline{y}_i - \mu_{\theta i}) = 0$.
- The deviance function: $D(y, \mu) = 2\sum_i^m n_i(-1 + \frac{\overline{y}_i}{\mu_{\theta i}} + log(\frac{\mu_{\theta i}}{\overline{y}_i}))$.

Results

Results

Data from the former Swedish insurance company Wasa, and concerns partial casco insurance for motorcycles.

Covariates	Description	Classes
Zon	Geographic zone	(1,2,3,4,5)
MC class	Mc class	(1,2,3,4)
Vehicle age	The vehicle age	(1,2,3,4)

Table 1:

Claim count	Frequency	Percent	Average amount (Kr)
0	412	67 %	0
1	178	29%	83 372
2	26	4% (13%)	84 674

Table 2:

Results

The dependence parameter θ was estimated to $\hat{\theta} = -0.3472$. The null hypothesis method yields:

1. The null hypothesis $H_0 : \hat{\theta} = \theta_0 = 0$
2. A statistic is identified as the test statistic for the underlying distribution.
3. p-value $= 0.0245$
4. Hence we reject the null hypothesis on confidence level of 97.5% with a $\alpha = 0.0250$, since $p < \alpha$

Results

For the GLM extension, the AIC value is computed to:

- $AIC_{min} = 2637$
- but when we drop the claim count as an covariate the AIC value increases to $AIC_i = 2641$
- $\Delta_i = AIC_i - AIC_{min} = 4$

Results

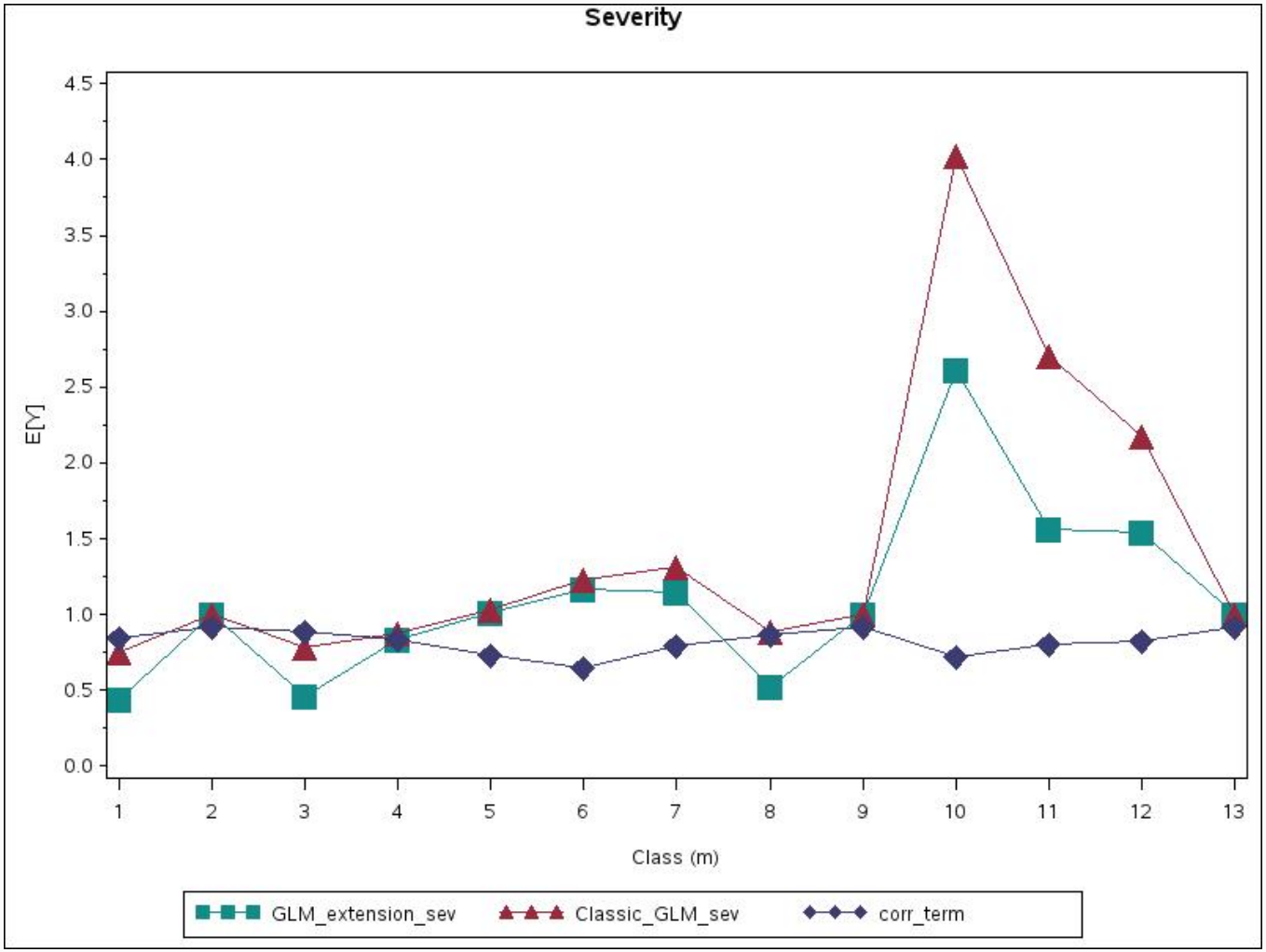


Figure 1: Comparison of the claim severity between the classic GLM and the GLM extension.

Results

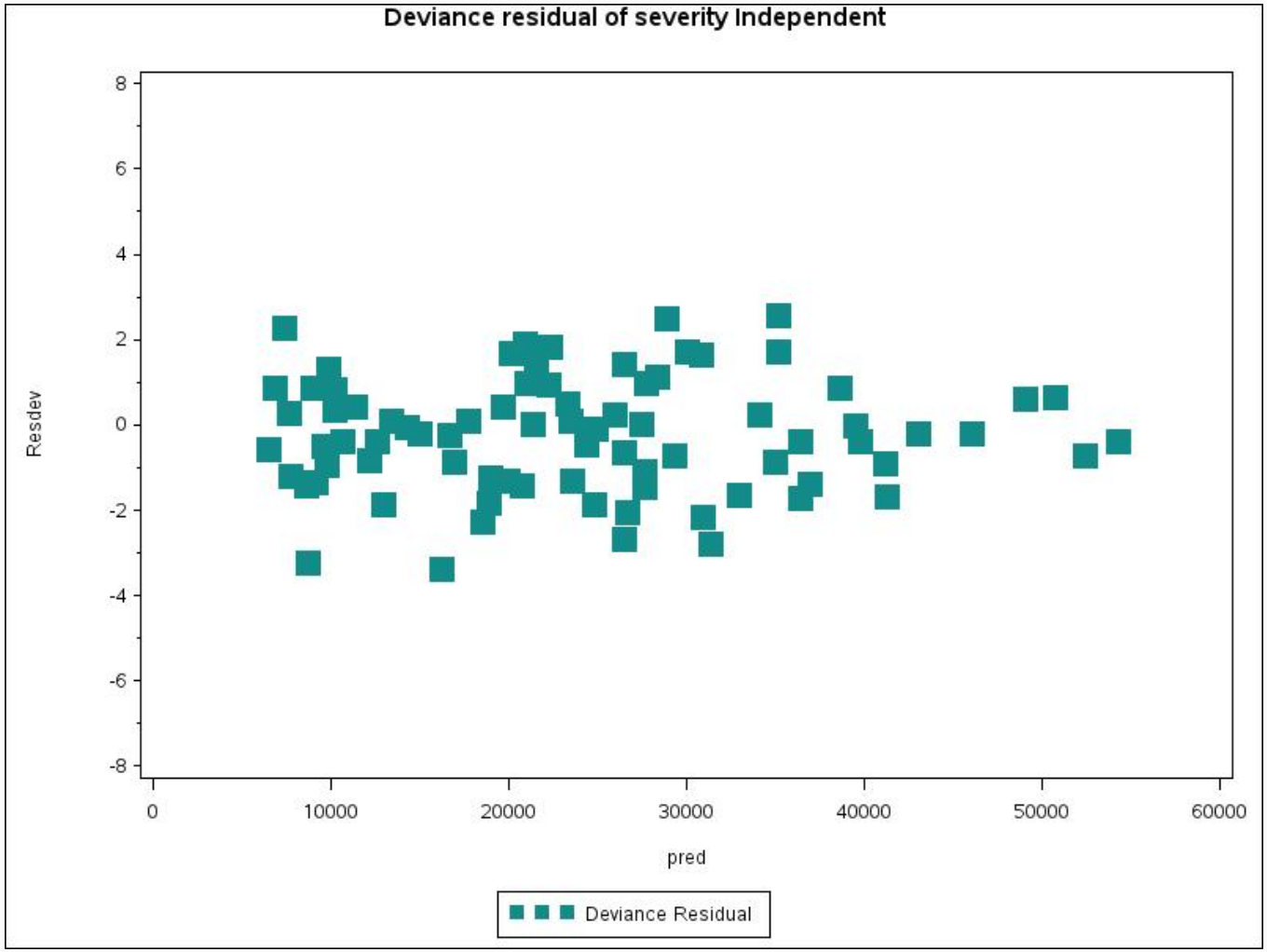


Figure 2: The deviance of the claim severity for the classical GLM.

Results

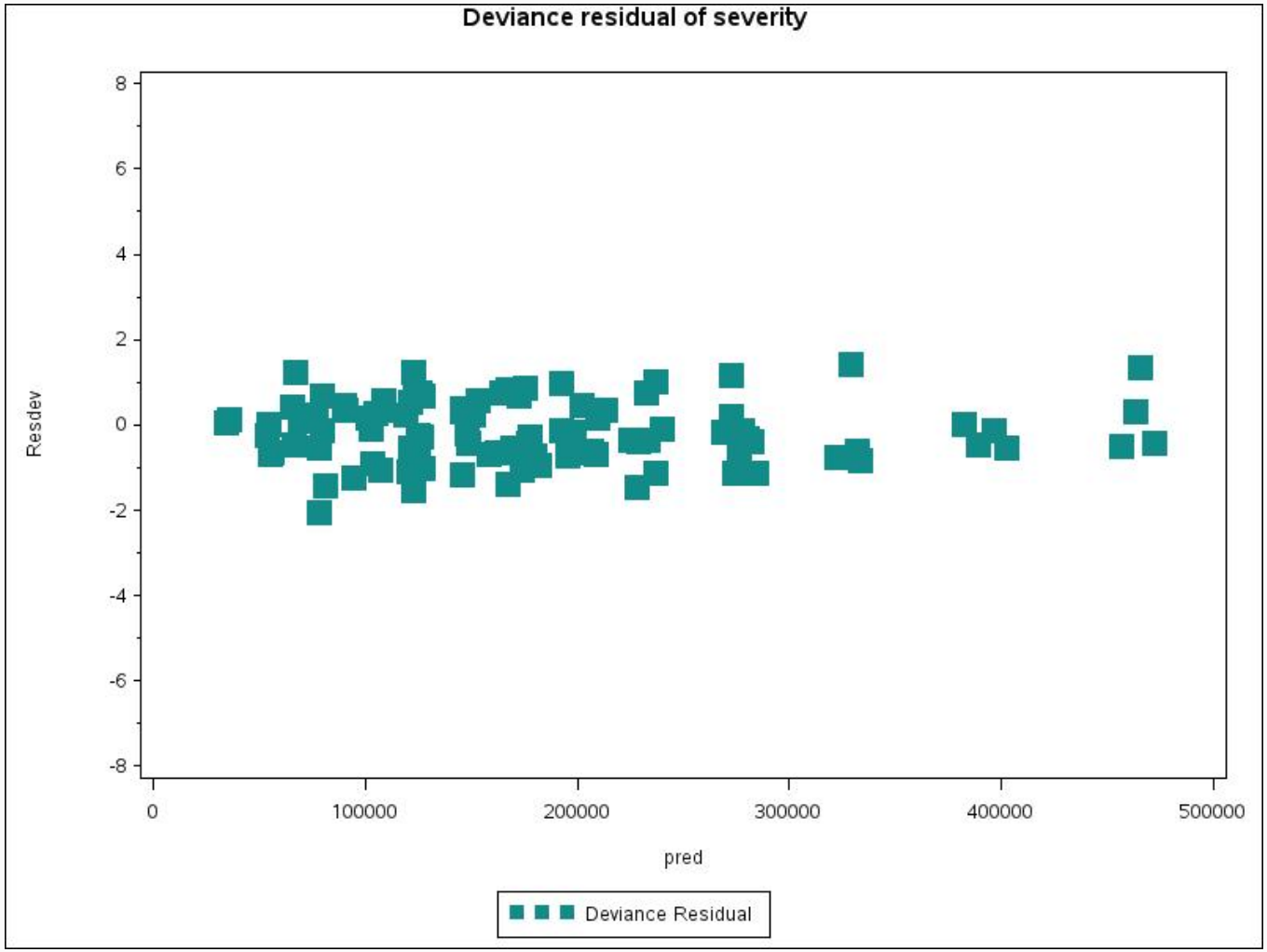


Figure 3: The deviance of the claim severity model for the GLM extension.

Conclusion

Conclusion

- Claim count is a significant covariate for the GLM extension.
- $\Delta_i = 4$ indicates that GLM extension model with claim count is the better model, than without the claim count. But it is not big enough to fully accept claim count as a covariate.
- Deviance figure for the severity has a lower variance, showing that the GLM extension model fit the observations better than the classical GLM.

- Small data to fully confirm that the GLM extension is the better model than the classic GLM, but we have strong evidence to support it.
- The structure for the dependence approaches makes it very easy to implement
- Further studies can be made with greater data and different distributions on claim count and claim amount

Thank you!

masar.al-mosawi@lansforsakringar.se

SCOR Sweden Re:s Nordic Life Insurance Conference
October 12th 2018

CLOSING

Svein Børre Solvang


Traditional Solutions
Distribution Solutions
Financial Solutions
SCOR
The Art & Science of Risk
Client Training
Digital Solutions
Product Development

Health is ~~the~~ ~~new~~ wealth

Health is ~~the~~ ~~new~~ wealth

Health is ~~the~~ ~~new~~ wealth

Health is ~~the~~ ~~new~~ wealth

Münchenbryggeriet 13 oktober 2017

- Enkät på 8 frågor med fritext

Vad tyckte du?

Stort tack för ditt deltagande i SCOR Sweden Re's Livförsäkringskonferens i förra veckan.
Vi hoppas att du uppskattade årets program och innehåll.

Jag skulle vara tacksam om du kunde ta någon minut och ge oss feedback på konferensen och dess innehåll, då dina synpunkter är viktiga för oss.

Vänligen klicka här för utvärderingen

Vi kommer att skicka ut en dokumentation av konferensen till dig om några veckor. Årets presentationer kan du redan hitta på vår hemsida (www.swedenre.se) under publikationer.

Bästa hälsningar
Svein Børre Solvang, VD

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Eventenkät 2017

Kära konferensdeltagare, tack för ditt deltagande i årets konferens!

Vänligen svara i skala 1-5 där 1 anger dålig och 5 anger jättebra.

1. Introduktion och sammanfattning - Svein Børre Solvang, VD SCOR Sweden Re

Hur bra var detta föredrag?

○1. ○2. ○3. ○4. ○5.

Övriga kommentarer:

2. Peter Nowell - Solvency II - in full force

Hur bra var detta föredrag?

○1. ○2. ○3. ○4. ○5.

Vill du att vi kontaktar dig med ytterligare information? (om ja, vänligen ange kontaktuppgifter nedan)

○Ja ○Nej

Övriga kommentarer / kontaktuppgifter:

3. Jan Eliasson - Utveckling och hälsa i ett globalt perspektiv

Hur bra var detta föredrag?

○1. ○2. ○3. ○4. ○5.

Övriga kommentarer:

4. Mouna Esmaeilzadeh - Långlevnad och framtidens hälsa

Hur bra var detta föredrag?

○1. ○2. ○3. ○4. ○5.

Övriga kommentarer:

Feedback on the 2017 Conference

- Good speakers and a very nice venue
- The waiters heavily underperformed. No red wine
- Very good waiters and staff
- As always a fantastic conference. SCOR Sweden Re is best in class
- Not good to have similar brain speeches 2 consecutive years
- Finally an Actuary who could explain Solvency 2 (Peter Nowell) and his English was just beautiful……ahhhh
- Do you really need to have actuaries as speakers?
- Great to have a variety of speakers with different professions
- Difficult to find the venue
- Mouna (Esmaeilzadeh) & German (Ramirez) were pure entertainment, fun but nothing more
- Brilliant from German Ramirez. The old dinosaurs in the audience needed to hear this
- Get rid of paper. Bad for environment
- Jan Eliasson absolutely world class
- Keep the time better. Went over several times
- The CEO is definitely not a comedian. Not funny at all
- The CEO cannot spell. A lot of words are incorrect
- The CEO is nice to look at (and listen to)…

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Please give us your valuable feedback also in 2018

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LUNCH


Traditional Solutions
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Product Development