The Impact of Wellness Engagement on Morbidity and Mortality – a Big Data Case Study

Emile Stipp, November 2016

Agenda

Discovery Health

01	**The Vitality Shared Value Model and Big Data**

02	Wellness Engagement and Morbidity Improvements

03	Wellness Engagement and Mortality Improvements

NETWORK TODAY

Totalling 15 markets and 4 million Vitality clients

Singapore (2013)
Australia (2014)
Hong Kong
(2015)
Philippines
(2015)

Malaysia
(2016)
Thailand (tbd)

SA (1997)
UK (2004)

Germany (2016)
France (2017)
Austria (tbd)

US (2015)
Canada (2016)

China (2009)

Japan (2016)

Vitality – a shared value contract with members

Vitality is based on ongoing health activities and rewards to drive continued member engagement

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Getting Healthy

250 000
Vitality Health Checks

10 million
discounted gym visits

20 million
HealthyFood baskets bought

Over 10 000
Team Vitality members

Getting Rewarded

R1 billion
HealthyFood cash back

1 million
discounted flights booked

2.5 million
discounted movies

1.8 billion
Discovery Miles earned

Vitality Shared-Value Insurance Model

$$\frac{\text{Value}}{\text{Member}} = \frac{\text{Incentive}}{\text{Member}} \times \frac{\Delta \text{ Behaviour}}{\text{Incentive}} \times \frac{\text{Risk improvement}}{\Delta \text{ Behaviour}} \times \frac{\text{Value}}{\text{Risk improvement}}$$
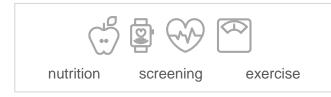
A business model that generates Big Data

Wellness data
- nutrition
- screening
- exercise

Operational data
- Emails
- Calls
- web / app

Morbidity & Mortality data
- Health & Life insurance data

Demographic data
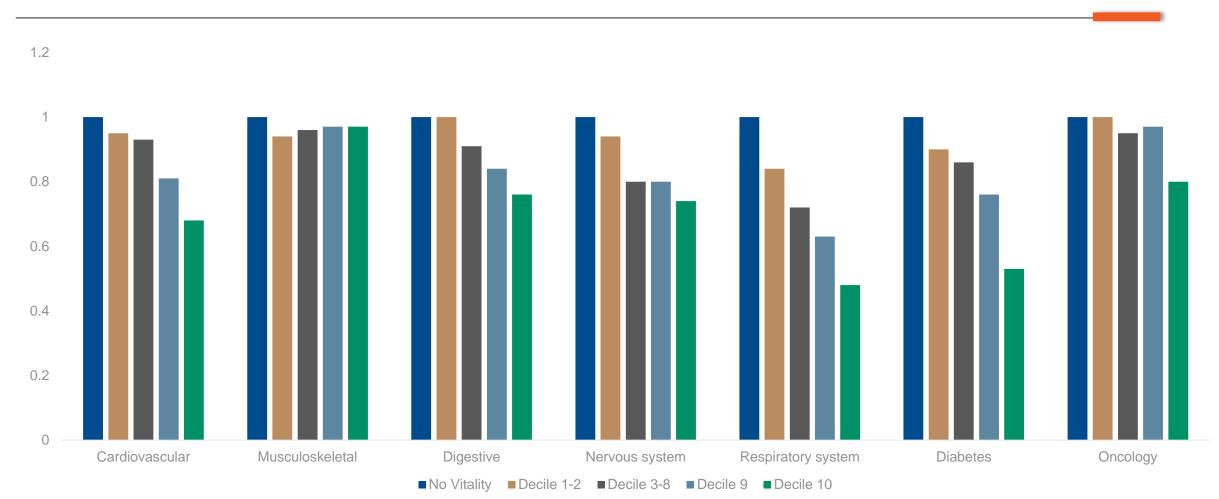- Family
- Age
- Geography

Agenda

01 | The Vitality Shared Value Model and Big Data

02 | **Wellness Engagement & Morbidity Improvements**

03 | Wellness Engagement and Mortality Improvements

Vitality impact by disease: snapshot view

Vitality impact by disease (Adjusted for age, gender, option and SES)

Vitality impacts claims in 3 ways - longitudinally

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KNOW YOUR HEALTH → IMPROVE YOUR HEALTH → GET REWARDED

Vitality Age

01 | Age Selection Effect

- Vitality enables DHMS to attract and retain younger people than competitors
- What is the impact of this younger profile on the claims experience on DHMS?

02 | Initial Engagement Selection Effect

- Vitality enables DHMS to attract and retain healthier people than competitors.
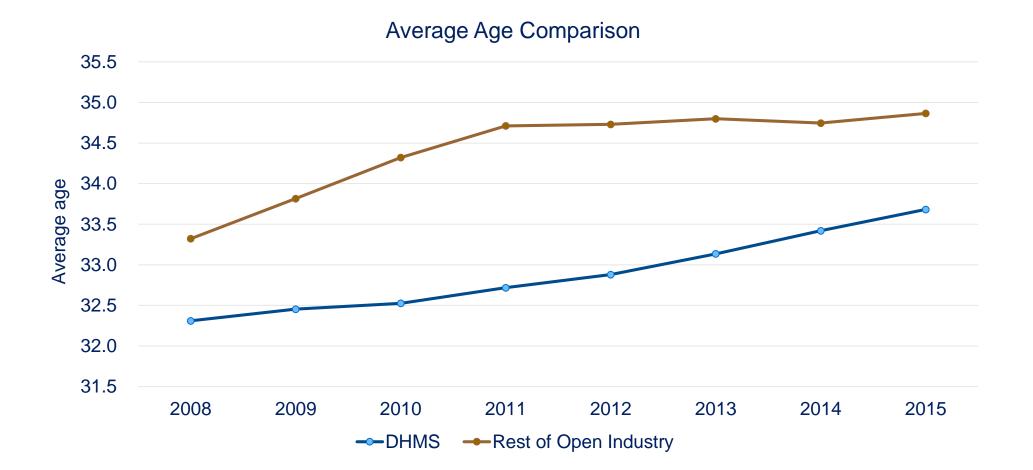- What is the impact of this healthier profile on the claims experience on DHMS?

03 | Behaviour Change Effect

- Vitality encourages members to increase engagement in healthy behaviour
- What is the impact of this behaviour change on the claims experience on DHMS?
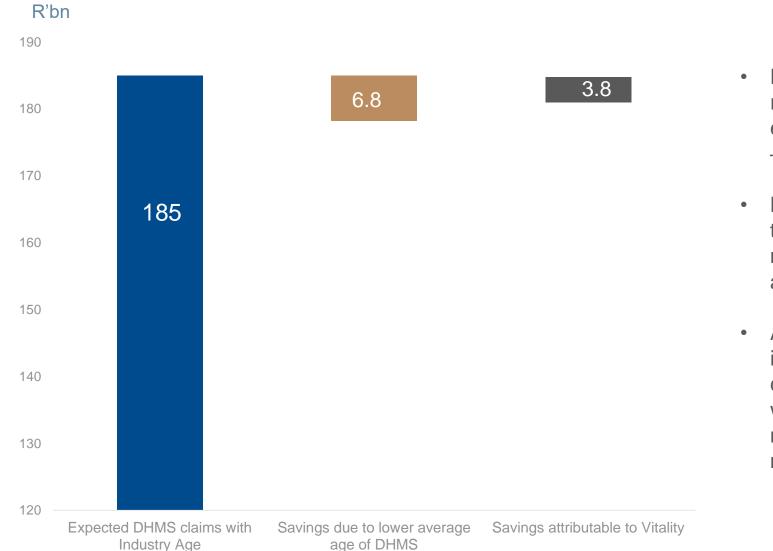
Age Selection Effect

Average claims of a medical scheme increase by 2.5% for every year that the average age of a medical scheme increases

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Average Age Comparison

Legend: DHMS, Rest of Open Industry

Age selection effect: Best Estimate Scenario

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R'bn

Bar chart:
- Expected DHMS claims with Industry Age: **185**
- Savings due to lower average age of DHMS: **6.8**
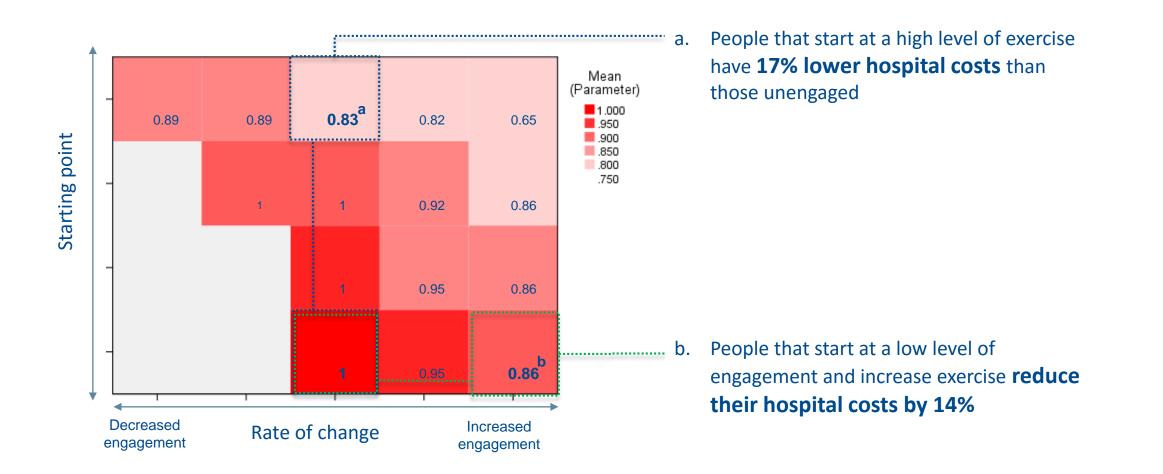- Savings attributable to Vitality: **3.8**

- DHMS is 1.5 years younger than the industry, resulting in claims savings of 3.7%. This is equivalent to R6.8bn in claims between 2008 – 2015.

- Not all of these savings may be attributable to Vitality, as DHMS may attract younger members by offering certain benefits that appeal to the younger market, for example.

- An adjustment was made to isolate the impact of Vitality, based on the difference in claims experience between new members who joined Vitality immediately upon DHMS membership, and those members who did not join Vitality.
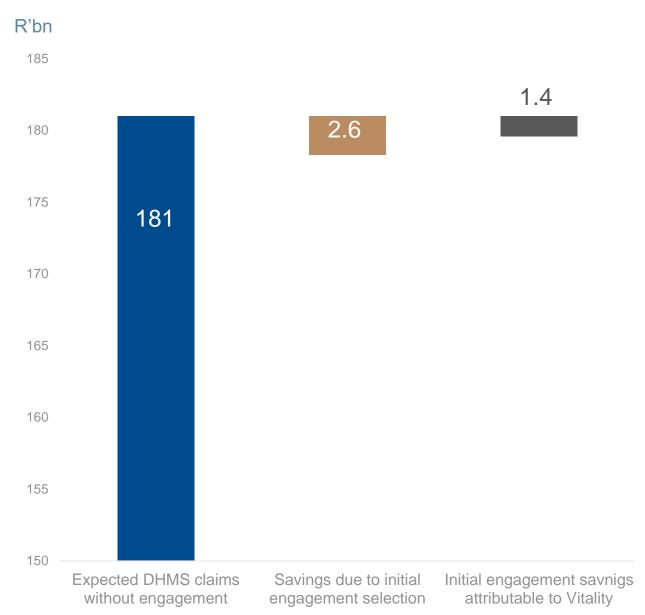
Engagement results in lower healthcare costs

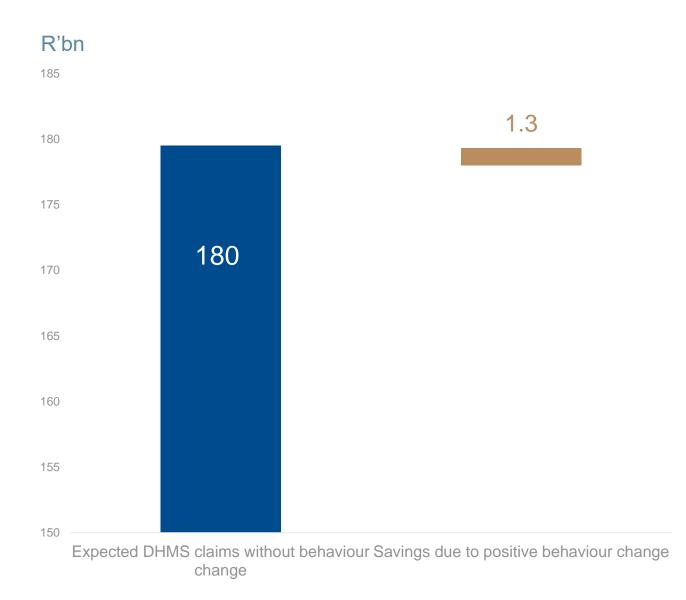## Example of GLM results: The Year 5 model for IH hospital costs

a. People that start at a high level of exercise have **17% lower hospital costs** than those unengaged

b. People that start at a low level of engagement and increase exercise **reduce their hospital costs by 14%**

Initial engagement selection effect

R'bn

Chart values:
- Expected DHMS claims without engagement: 181
- Savings due to initial engagement selection: 2.6
- Initial engagement savnigs attributable to Vitality: 1.4

- The distribution of new members by VEM points in their first semester of joining (or the beginning of 2008 for those members inforce) was applied to the factors from the GLMs.

- Initial engagement selection includes behaviour maintenance and any effect of a decrease in engagement.

- This was done for an 8 year period based on the actual PLPM claims, assuming no change in the distribution of members by VEM status over the period.

- An adjustment was made to the savings to allow for the level of natural exercise using data from the Healthy Company Survey to isolate the impact of Vitality.

Behaviour change effect

R'bn

185
180
175
170
165
160
155
150

180

1.3

Expected DHMS claims without behaviour change

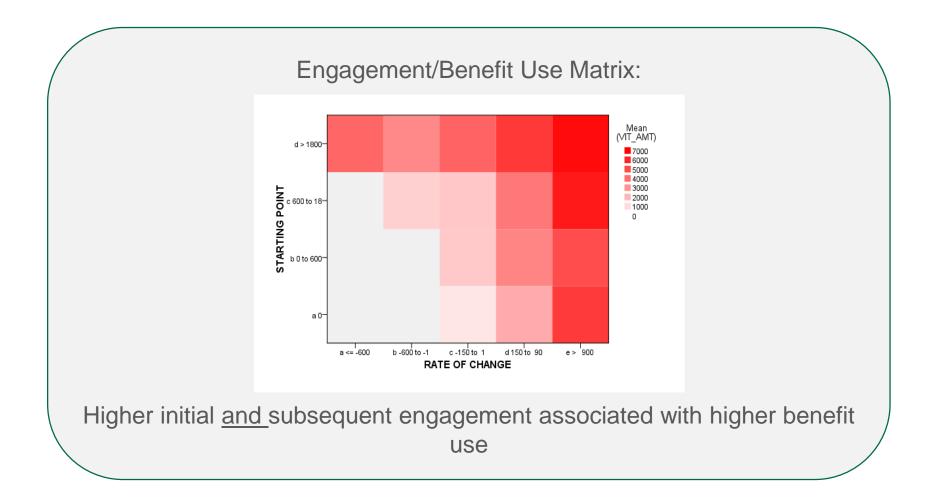Savings due to positive behaviour change

- The distribution of members by VEM points was applied to the factors from the GLMs.

- This was done for a 7 year period based on the actual PLPM claims, given the change in the distribution of members by VEM points over the period.

- The savings estimated only included the positive effects of those members who increased engagement over the period.

- The savings were not offset by the increase in claims of those members who decreased engagement, as members who decrease their engagement would have done so irrespective of their Vitality status.
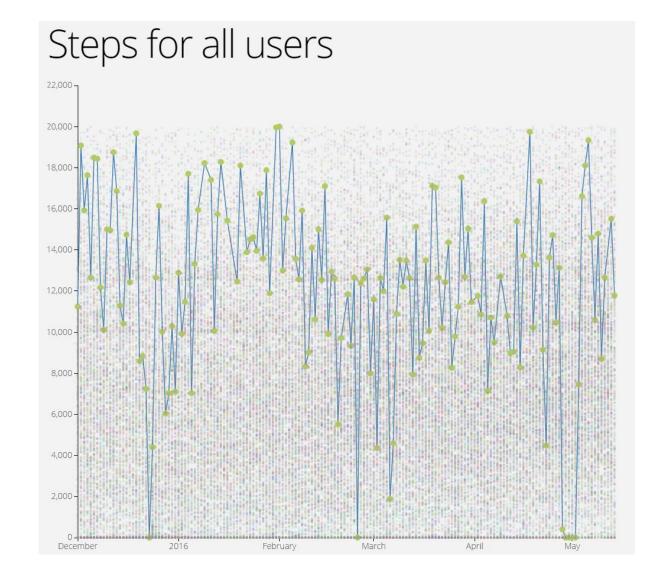
Behaviour change effect

There is strong correlation between Vitality reward utilisation and Vitality engagement, but this could purely be selection. Can we say that the rewards *change* behaviour?

Engagement/Benefit Use Matrix:

Higher initial <u>and </u>subsequent engagement associated with higher benefit use

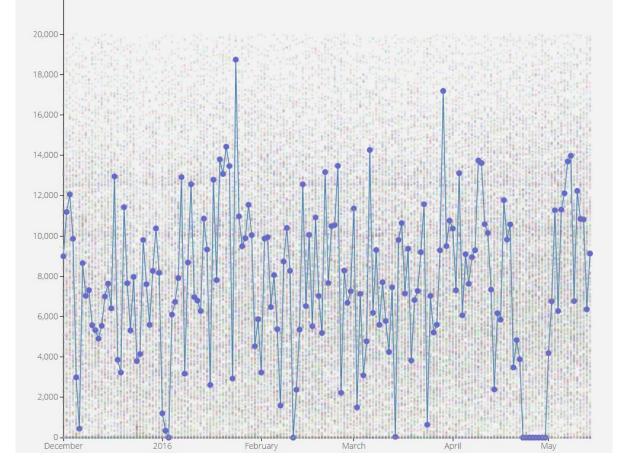# Evidence from Device Data: single users vs all users

Steps for all users

Hard to see a pattern in a single user's step data

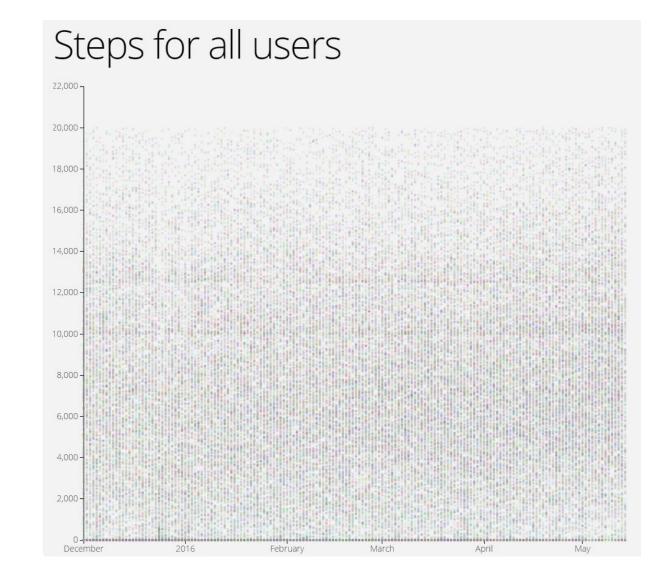# Evidence from Device Data: single users vs al users

Steps for all users

Hard to see a pattern in a single user's step data

Setting up a randomized control trial in a commercial environment difficult; and hard to avoid observation bias
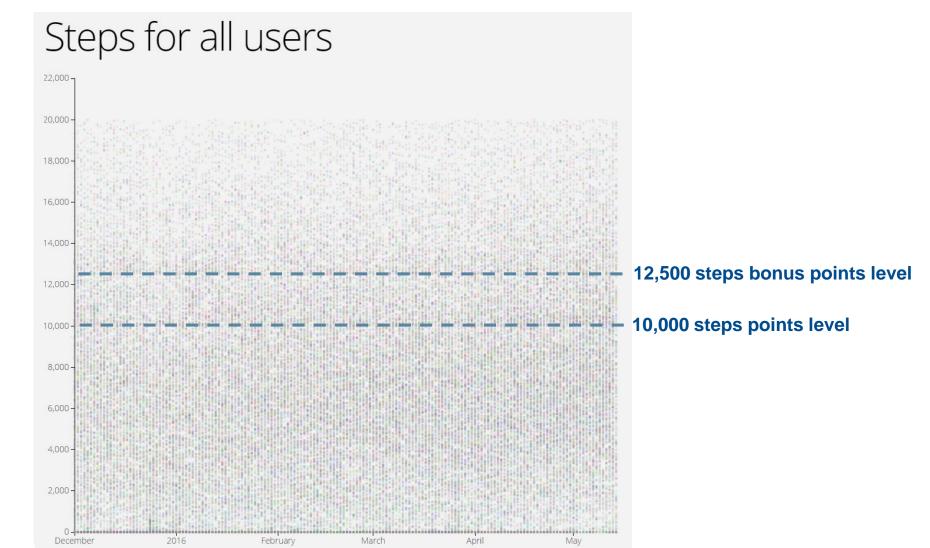
Evidence from Device Data: look at *all* the data

Steps for all users

Evidence from Device Data that Vitality *changes* engagement behaviour:

Steps for all users

- - - - 12,500 steps bonus points level

- - - - 10,000 steps points level

Agenda

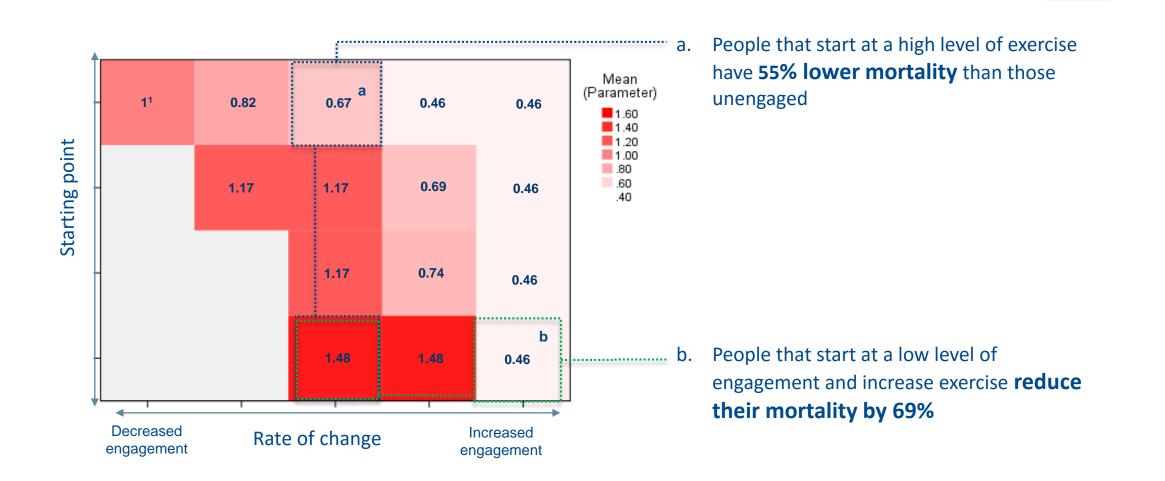| 01 | The Vitality Shared Value Model and Big Data |

| 02 | Wellness Engagement & Morbidity Improvements |

| 03 | **Wellness Engagement & Mortality Improvements** |

Mortality – initial selection and behaviour change

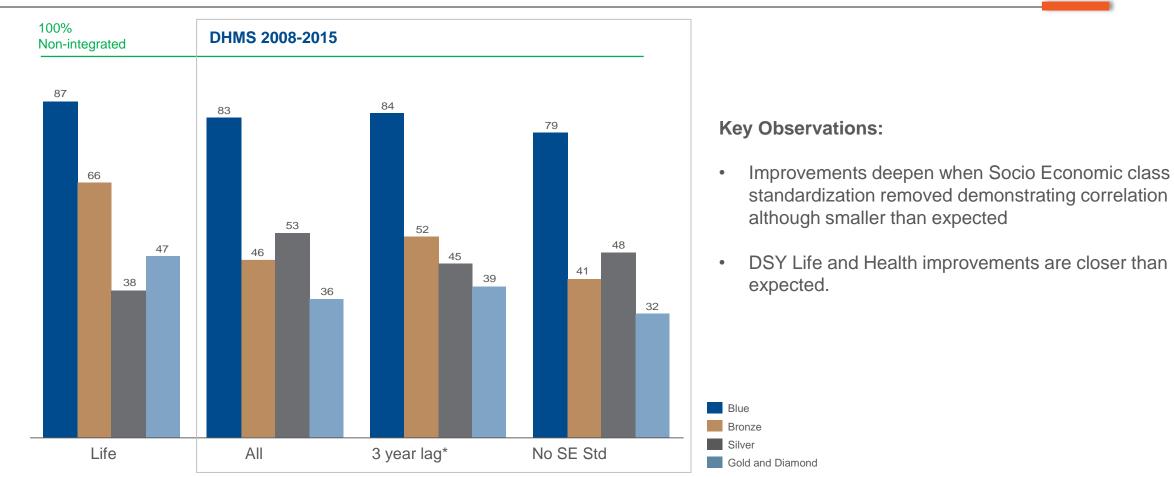Heat map of relative effect on **mortality**

a. People that start at a high level of exercise have **55% lower mortality** than those unengaged

b. People that start at a low level of engagement and increase exercise **reduce their mortality by 69%**

Mortality investigation using health insurance data: Comparison of improvements

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Mortality relative to non-integrated
Percentage

100% Non-integrated

DHMS 2008-2015

Life: 87, 66, 38, 47

All: 83, 46, 53, 36

3 year lag*: 84, 52, 45, 39

No SE Std: 79, 41, 48, 32

Legend:
- Blue
- Bronze
- Silver
- Gold and Diamond

Key Observations:

- Improvements deepen when Socio Economic class standardization removed demonstrating correlation although smaller than expected

- DSY Life and Health improvements are closer than expected.

* Lag between status used and period in which mortality measured

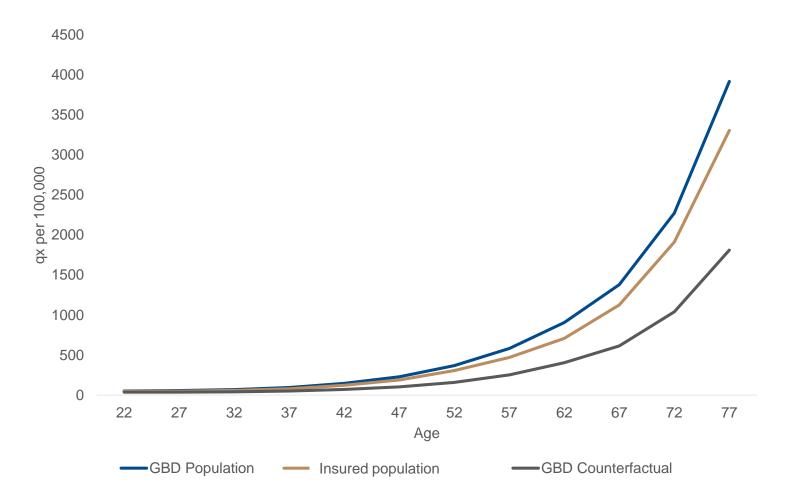# Insights from Global Burden of Disease: Drivers of excess mortality

Cause of death

Causes of death vary by country

Risk factor distribution

Exposure of risk factors vary across populations

Males aged 45-49 in one Population

Systolic Blood Pressure distributed Log-Normally

Mean: 128.13
Std dev: 13.27

Bone Mineral Density distributed Normally

Mean: 0.936
Std dev: 0.226

Relationship between heightened risk factors and excess mortality

Raw qx comparison by country

Case Study: Cardiovascular disease

Legend (Cause of death stacked bars):
- Unintentional injuries
- Transport injuries
- Self-harm and interpersonal violence
- Other non-communicable diseases
- Other communicable, maternal, neonatal, and nutritional diseases
- Nutritional deficiencies
- Neurological disorders
- Neoplasms
- Neonatal disorders
- Neglected tropical diseases and malaria
- Musculoskeletal disorders
- Mental and substance use disorders
- HIV/AIDS and tuberculosis
- Digestive diseases
- Diarrhea, lower respiratory, and other common infectious diseases
- Diabetes, urogenital, blood, and endocrine diseases
- Cirrhosis
- Chronic respiratory diseases

Legend (Raw qx comparison):
- Australia population
- UK Population
- Australia Counterfactual
- UK Counterfactual
- South Africa Population
- Japan Population
- US Population
- Japan Counterfactual
- US Counterfactual
- South Africa Counterfactual

Estimate relative improvements

Comparison of the Insured population to country counterfactual (theoretical minimum mortality – after removal of all lifestyle risk factors
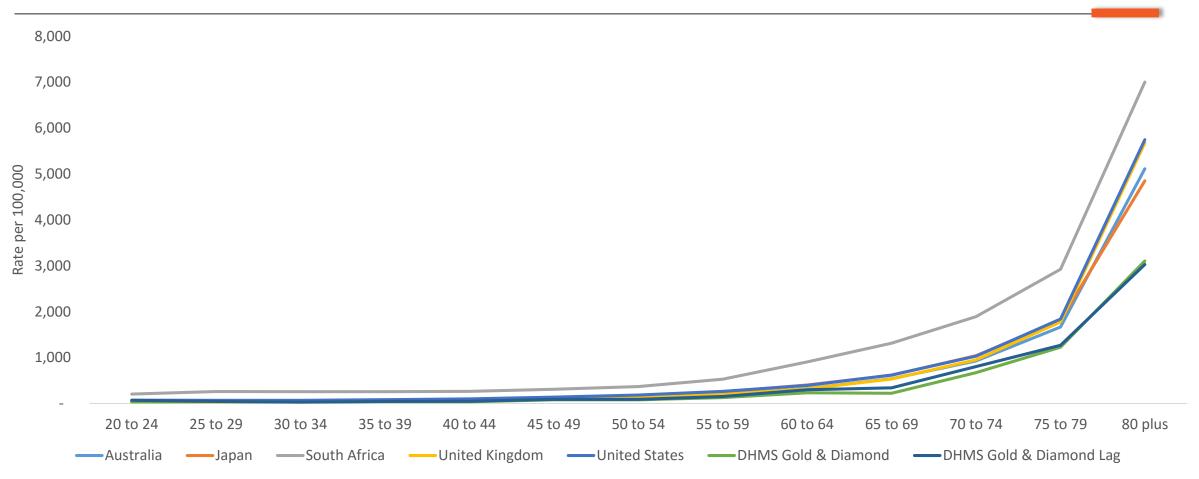
Age band	Improvements Relative to Insured Population
20 to 24	28%
25 to 29	25%
30 to 34	31%
35 to 39	35%
40 to 44	42%
45 to 49	46%
50 to 54	48%
55 to 59	46%
60 to 64	43%
65 to 69	45%
70 to 74	46%
75 to 79	45%

—— GBD Population   —— Insured population   —— GBD Counterfactual

Gold and Diamond vs country counterfactuals

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Comparison of gold and diamond Discovery Health Raw Qx to counterfactual (Males)
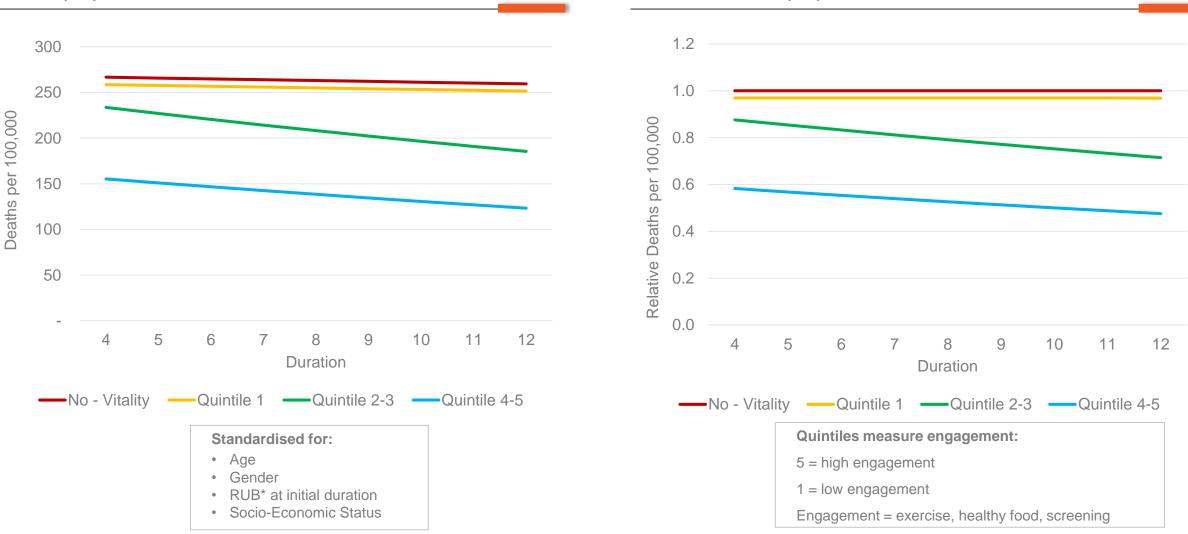

High engagement results at older ages: limited Vitality data, but also counterfactuals doesn't adjust for public health, quality of care, social, economic and cultural factors

Mortality – further improvement by *duration* of engagement

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Mortality by Duration

Deaths per 100,000

| Duration | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

— No - Vitality   — Quintile 1   — Quintile 2-3   — Quintile 4-5

Standardised for:
- Age
- Gender
- RUB* at initial duration
- Socio-Economic Status

Relative Mortality by Duration

Relative Deaths per 100,000

| Duration | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

— No - Vitality   — Quintile 1   — Quintile 2-3   — Quintile 4-5

Quintiles measure engagement:

5 = high engagement

1 = low engagement

Engagement = exercise, healthy food, screening

RUB = Resource Utilisation Band – clinical measure of how healthy or sick a person is

Conclusion

- Many sources of new data – but need technology & tools & skills required to ingest, curate and analyse structured and unstructured data

- Multi-disciplinary teams required to understand:
  - What is in the data
  - How to interpret the results

- Shared value provides enabling ethical framework for access to consumer data, and the ways in which it is used

- Incentivised wellness programmes result in positive behavior change which result in significant morbidity and mortality improvements
  - This effect increases with duration
  - And, at high levels of engagement, appears consistent with theoretical minimum mortality rates

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Good health
can change the world