Discovery

Optimising shared-value through

PERSONAL HEALTH PATHWAYS

A behavioural science framework for members and insurers

SEPTEMBER **2024**

Contents

The science behind
PERSONAL HEALTH PATHWAYS

As longevity increases and chronic diseases become more prevalent, healthcare systems must transition to focus on prevention and proactive disease management. This requires identifying simple, personalised actions that build healthy habits driving improved health outcomes and lower healthcare costs.

Executive summary

Global challenge of increasing non-communicable disease

Healthcare systems and insurers worldwide are facing the dual pressures of aging populations and rising chronic disease prevalence, compounded by the escalating costs of new treatments and technologies. This creates significant strain on the sustainability of healthcare systems. Within Discovery Health Medical Scheme (DHMS), for example, members with chronic conditions incur, on average, 3.8 times higher annual costs than healthy members, and spend 32.7% more of their life expectancy in poor health. This impacts both individual health outcomes and healthcare costs, driving long-term increases in insurance premiums.

Healthy habits lead to better health outcomes and reduced cost

Habits play a crucial role in shaping health outcomes. By coupling healthy lifestyle behaviours, such as regular physical activity and a balanced diet, with proactive health-seeking actions, such as medicine adherence, regular health checks, and screening, individuals can significantly improve their health trajectory, enhancing their chances of living healthier and longer lives. Leveraging Discovery Health and Vitality's extensive dataset, combined with advanced causal inference methodologies, has led to a breakthrough in understanding the direct impact of healthy habits on both mortality and morbidity.

Evidence from this study shows that improving one's clinical and physical activity habit from a poor habit to a strong habit results in a **13%** and **16%** reduction in in-hospital costs respectively. The impact of habit formation is thus significant. This paper shows that incentivising the formation of clinical habits generates **R2.50 of actuarial surplus**, and the formation of physical activity habits generates **R3.90**, **for every R1 invested** in a chronic member base.

Precision and personalisation improves healthy habit formation

While the evidence of healthy habits improving health outcomes and reducing healthcare costs is clear, the challenge lies in driving targeted and sustained behaviour change. Key to behaviour change is personalisation - delivering precise and personalised health and lifestyle recommendations, customised communication and individualised rewards, based on each individual's specific needs, preferences, and circumstances. This approach makes interventions more specific and relevant, ultimately improving uptake and engagement and leading to better habit formation and improved health outcomes.

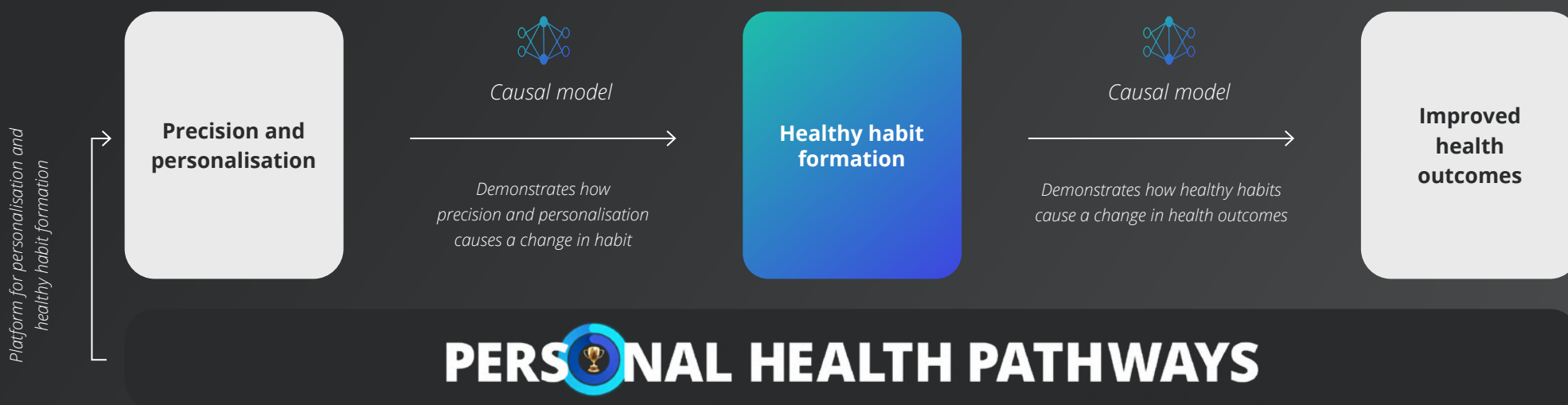### Personal Health Pathways as the platform for personalisation and healthy habit formation

Developing personalised health recommendations for a large population, optimised to reduce morbidity, mortality, and healthcare costs, requires extensive data, advanced analytics, and machine learning, alongside expertise in behavioural science and health economics. Leveraging Discovery's rich data, data science, and behavioural science capabilities, we have created Personal Health Pathways, delivering customised healthcare journeys for 2.2 million adult members of Discovery Health Medical Scheme. Through an intuitive digital platform, Personal Health Pathways delivers personalised health and lifestyle actions, communication, and rewards that foster engagement and lasting behaviour change, driving better health outcomes.

This paper explains the science behind Personal Health Pathways and how it works – for you, for society, and for us as a purpose-led, shared-value business.
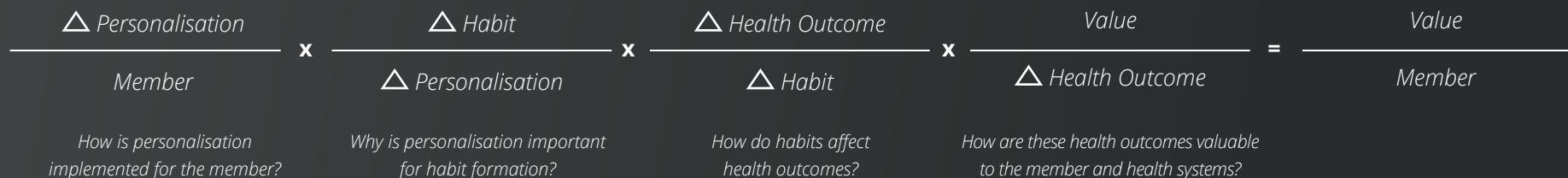
Optimising shared-value in healthcare

A behavioural science framework underpins the approach to optimising shared-value in healthcare. This framework shows that healthy habits lead to better health outcomes and reduced healthcare costs, emphasises the importance of personalisation in driving sustainable behaviour change, and positions Personal Health Pathways as the platform for personalisation and healthy habit formation.

A behavioural science framework for improved health outcomes:

Platform for personalisation and healthy habit formation

| **Precision and personalisation** | *Causal model*

Demonstrates how precision and personalisation causes a change in habit | **Healthy habit formation** | *Causal model*

Demonstrates how healthy habits cause a change in health outcomes | **Improved health outcomes** |

PERSONAL HEALTH PATHWAYS

Alignment between improving individual health outcomes and delivering economic benefits for both insurers and members forms the foundation of the shared value proposition:

$$\frac{\triangle\ Personalisation}{Member} \times \frac{\triangle\ Habit}{\triangle\ Personalisation} \times \frac{\triangle\ Health\ Outcome}{\triangle\ Habit} \times \frac{Value}{\triangle\ Health\ Outcome} = \frac{Value}{Member}$$

| *How is personalisation implemented for the member?* | *Why is personalisation important for habit formation?* | *How do habits affect health outcomes?* | *How are these health outcomes valuable to the member and health systems?* | |

01

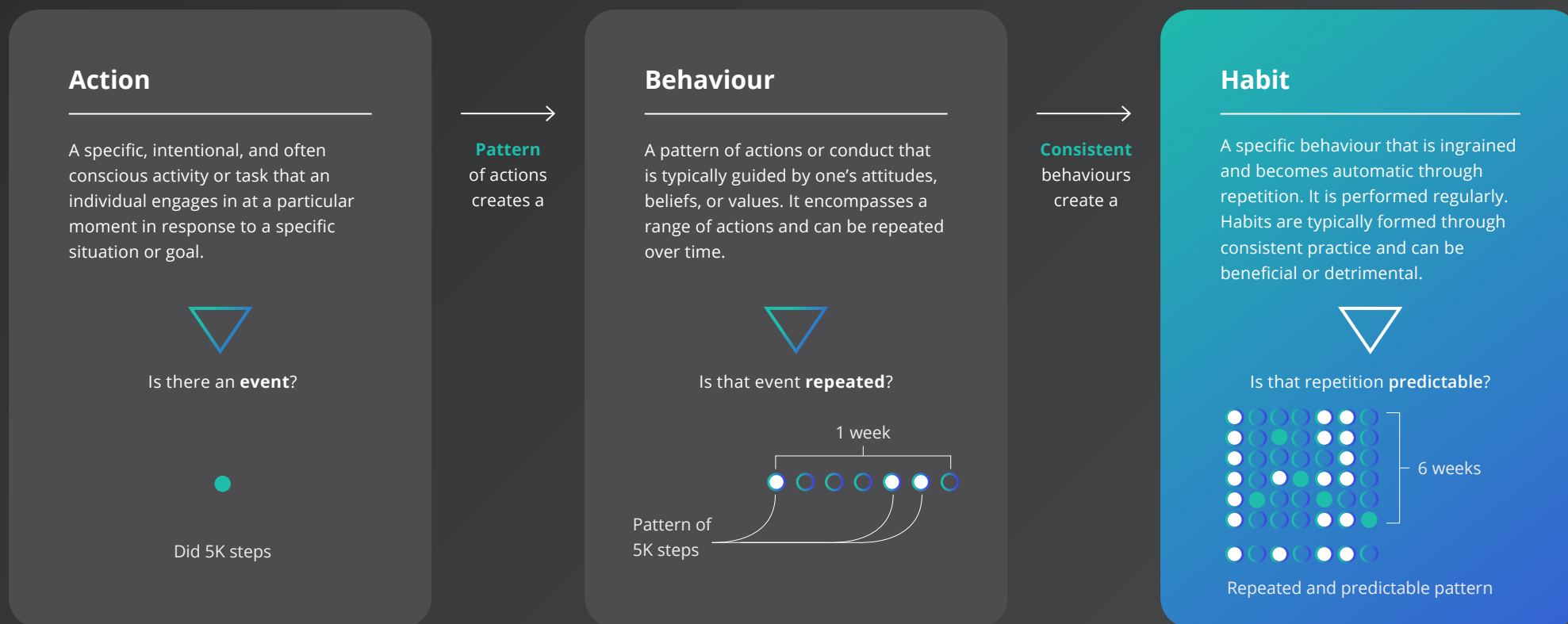# Understanding habits: a path to lasting behaviour change

The psychology of habits and how habit changes drive improvement in health outcomes

△ *Habit*   x   △ Personalisation   =   △ Health Outcomes

Habit theory | A path to lasting change

A habit is formed when an action is consistently completed to the point where it becomes automatic and predictable. By focusing on this progression from action to behaviour to habit, Personal Health Pathways aims to make proactive clinical and physical activity habits an automatic and sustainable part of all individuals' lives.

What is a habit?

Action

A specific, intentional, and often conscious activity or task that an individual engages in at a particular moment in response to a specific situation or goal.

Pattern of actions creates a

Is there an **event**?

Did 5K steps

Behaviour

A pattern of actions or conduct that is typically guided by one's attitudes, beliefs, or values. It encompasses a range of actions and can be repeated over time.

Consistent behaviours create a

Is that event **repeated**?

1 week

Pattern of 5K steps

Habit

A specific behaviour that is ingrained and becomes automatic through repetition. It is performed regularly. Habits are typically formed through consistent practice and can be beneficial or detrimental.

Is that repetition **predictable**?

6 weeks

Repeated and predictable pattern

Members can improve their health outcomes by establishing and maintaining physical activity and health-seeking or clinical habits — consistent routines that drive long-term well-being. Physical activity habits, such as regular exercise or daily steps, improve cardiovascular health, manage weight, and boost mental well-being. Clinical habits, including routine check-ups, following medical advice, and undergoing preventive screenings, enable early detection and effective management of health conditions. By engaging in these habits regularly, members can reduce their risk of chronic diseases, improve their overall quality of life, and take a proactive approach to health management. The strength of habits lies in their capacity to transform intentional actions into automatic behaviours, making it easier for individuals to sustain healthy lifestyles effortlessly over time.

What is a **clinical habit?**

A clinical habit is defined by the consistent completion of a clinically relevant action. To identify a clinical habit, past healthcare utilisation data is analysed to determine the predictability of an action's completion. When actions are consistently completed over a fixed time frame, it suggests that a clinical habit has been established.

What is a clinical habit?

A clinical habit refers to the consistency with which health-seeking actions are completed over a particular time frame. These habits are examined across a broad range of clinically relevant actions that support the prevention, early detection, and management of health conditions.

Guided by clinical standards, each clinical action has a recommended frequency referred to as a "cycle", to maintain ongoing health and prevent complications, referred to as a 'cycle.'

Clinical recommendations for a member living with diabetes

CLINICAL ACTION	CATEGORY	CYCLE
Collect medicine	Pharmacy	Monthly
Go for an HbA1c test	Pathology	Biannually
Consult with your primary care GP	Provider	Biannually
Go for a liver function test	Pathology	Annually
Go for a kidney function test	Pathology	Annually
Go for a cholesterol test	Pathology	Annually

Forming a clinical habit

To determine if a clinical habit has been established, it is important to assess how many past cycles should be reviewed before the action's completion becomes predictable. For diabetes-related clinical actions, evidence suggests that if a member completes the action in each of the previous three cycles, there is, on average, an 80% chance of completion in the next cycle. Consistent completion across three cycles indicates that the member has likely formed a habit of performing that action.

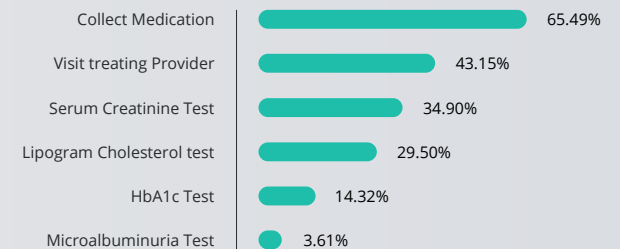*Probability of completing actions in next cycle given previous cycle completions*
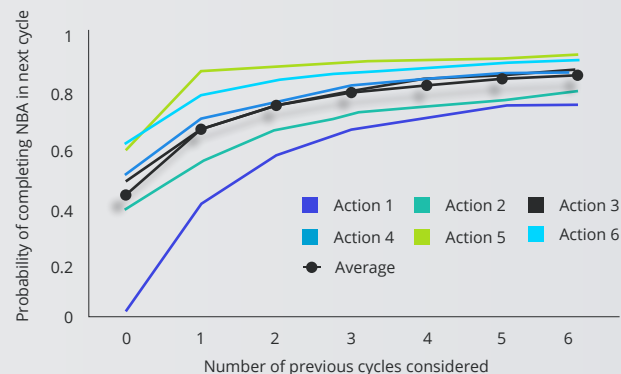
Most individuals do not complete their clinical actions regularly

Habits provide valuable insights into the behaviours of members living with diabetes, revealing which actions they consistently engage in and identifying opportunities for improvement.

A large proportion of DHMS members living with diabetes are consistently collecting their medication and visiting their treating provider; however, many are not completing their pathology tests as recommended.

Proportion of DHMS members living with diabetes in a habit of each clinical action

Collect Medication	65.49%
Visit treating Provider	43.15%
Serum Creatinine Test	34.90%
Lipogram Cholesterol test	29.50%
HbA1c Test	14.32%
Microalbuminuria Test	3.61%

Understanding clinical habits

To gain a deeper understanding of how individuals manage their chronic conditions, habits across clinically relevant actions are combined into a value-weighted composite measure called the Clinical Habit Index (CHI). This index summarises the overall habits displayed in managing the condition.

Developing the Clinical Habit Index

The CHI summarises the overall habits displayed in managing a chronic condition, with a score of 0 indicating poor management and a score of 1 reflecting consistent completion of all clinically relevant actions.

Clinical Habit Index Formula

$$\frac{1}{N} \sum_{i=1}^{N} \frac{w_i \times completed\ cycles}{min(cycle\ exposure, 3)^*} = w_1\left(\frac{1}{3}\right) + w_2\left(\frac{2}{3}\right) + w_3\left(\frac{1}{3}\right) + w_4\left(\frac{3}{3}\right) + w_5\left(\frac{2}{3}\right) + w_6\left(\frac{3}{3}\right)$$

Action 1   Action 2   Action 3   Action 4   Action 5   Action 6

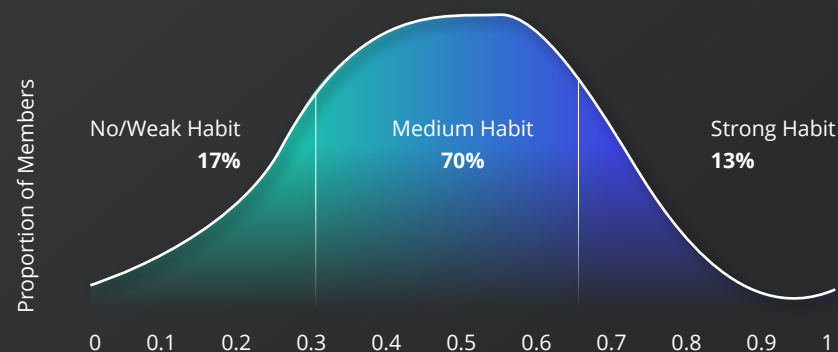N: The total number of clinically relevant actions available for a member.

w_i: The normalized value-weight of the ith clinical action captures its relative importance in shaping the overall Clinical Habit Index. This weight is determined by sophisticated models that evaluate the economic impact of each action, assigning higher weights to actions that generate greater economic value. By doing so, the Clinical Habit Index is more significantly influenced by high-value actions.

*Each action contributes to the CHI from the first cycle of exposure, ensuring immediate inclusion without requiring three full cycles, thereby providing a comprehensive view of the member's management habits.

Most individuals take action to manage their chronic condition but very few manage them consistently

Using the CHI, only ~13% of the DHMS diabetic population are in a strong habit across all clinically relevant actions

CHI distribution of DHMS members living with diabetes

Proportion of Members

No/Weak Habit **17%**   Medium Habit **70%**   Strong Habit **13%**

0   0.1   0.2   0.3   0.4   0.5   0.6   0.7   0.8   0.9   1

- **No/Weak Habit (0-0.33):** Minimal engagement; the upper range suggests at least one completion per action
- **Medium Habit (0.34 – 0.66):** Moderate engagement; the upper range indicates at least two completions per action.
- **Strong Habit (0.67 – 1):** High engagement; a score of 1 reflects consistent completion of all clinical actions.

There is a strong link between care management programmes and clinical habits

Despite many members living with diabetes making efforts to manage their chronic condition, few are doing so consistently. Our analysis shows that members enrolled in Discovery care management programmes demonstrate higher Clinical Habit Index scores, underscoring the positive influence of these programmes on health-seeking habits.

Significant progress has been made through care management programmes developed by Discovery Health. These programmes are established, integrated mechanisms aimed at enhancing clinical outcomes for targeted segments of chronic patients, with a primary focus on provider-driven healthcare coordination to improve health outcomes.

Members enrolled in care management programmes such as Diabetes Care or Cardio Care demonstrate higher Clinical Habit Index scores compared to eligible members who are not enrolled, underscoring the positive influence of these programmes on clinical habits.
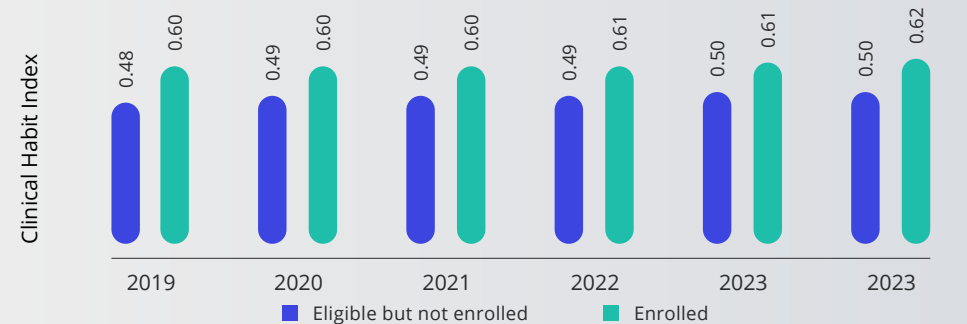
In 2023, stronger clinical habits among members in care management programmes correlated with an 11% reduction in healthcare utilisation per life per month, after adjusting for age, gender, plan type, and comorbidities. This reduction underscores the powerful impact of cultivating clinical habits.

For chronic members and beyond, Personal Health Pathways seeks to harness the power of habit, reaching a broader and more diverse range of members with unique health needs and circumstances. Looking ahead, there is a hypothesis that strengthening health-seeking habits will reduce morbidity and mortality. To confirm or challenge this hypothesis, causal techniques are essential to validate the broader impact of these behavioural interventions on long term health outcomes.

Clinical Habit Index before and after Diabetes Care programme enrolment

Clinical Habit Index

Year	12 months prior to joining	12 months after joining
2019	0.52	0.57
2020	0.53	0.58
2021	0.53	0.60
2022	0.50	0.59
2023	0.53	0.61

■ 12 months prior to joining ■ 12 months after joining

Members enrolled on Diabetes Care have improved health-seeking habits

Clinical Habit Index

Year	Eligible but not enrolled	Enrolled
2019	0.48	0.60
2020	0.49	0.60
2021	0.49	0.60
2022	0.49	0.61
2023	0.50	0.61
2023	0.50	0.62

■ Eligible but not enrolled ■ Enrolled

What is a **physical activity** habit?

A physical activity habit is defined as the consistent completion of physical activity actions with a high degree of predictability. To identify a physical activity habit, at least six weeks of data are required to determine if a particular pattern is predictable. We label the pattern of behaviour a strong habit when we can predict it with a high degree of accuracy. This identification and classification of habits for each individual becomes a powerful and critical data point in managing health outcomes.

For the purposes of this research, we have classified physical activity habits to understand the health benefits of improving them.
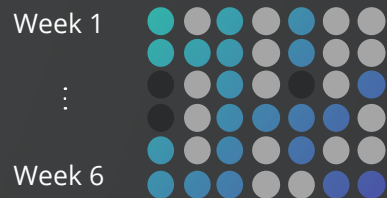
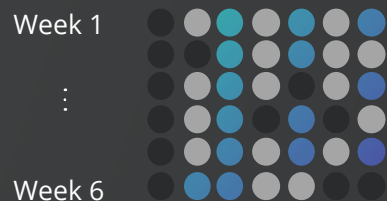**The classification is based on three core characteristics:**

- The action: what you do.
- The frequency of the action: how often you do it.
- The predictability of the action: how consistently you do it.

Member 1 Training data

Week 1
⋮
Week 6

We build a predictive model per individual member

Lasso Logistic Regression Model

Member 2 Training data

Week 1
⋮
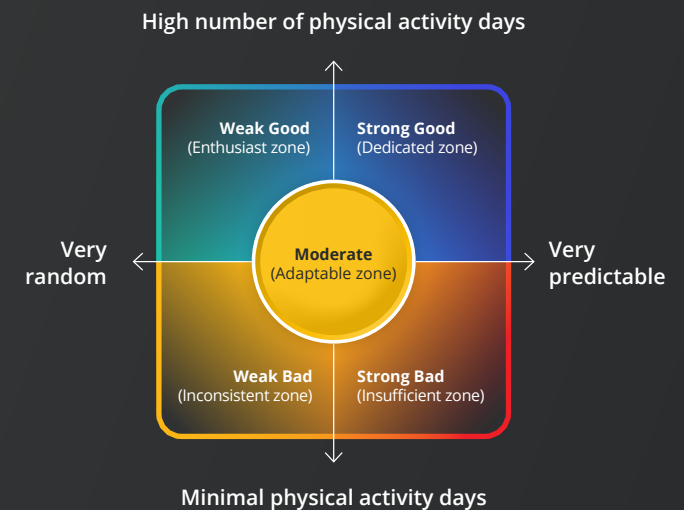Week 6

R^2
(model score)

How well past behaviour predicts future behaviour

Classification of habits based on model score

High number of physical activity days

Weak Good
(Enthusiast zone)

Strong Good
(Dedicated zone)

Very random

Moderate
(Adaptable zone)

Very predictable

Weak Bad
(Inconsistent zone)

Strong Bad
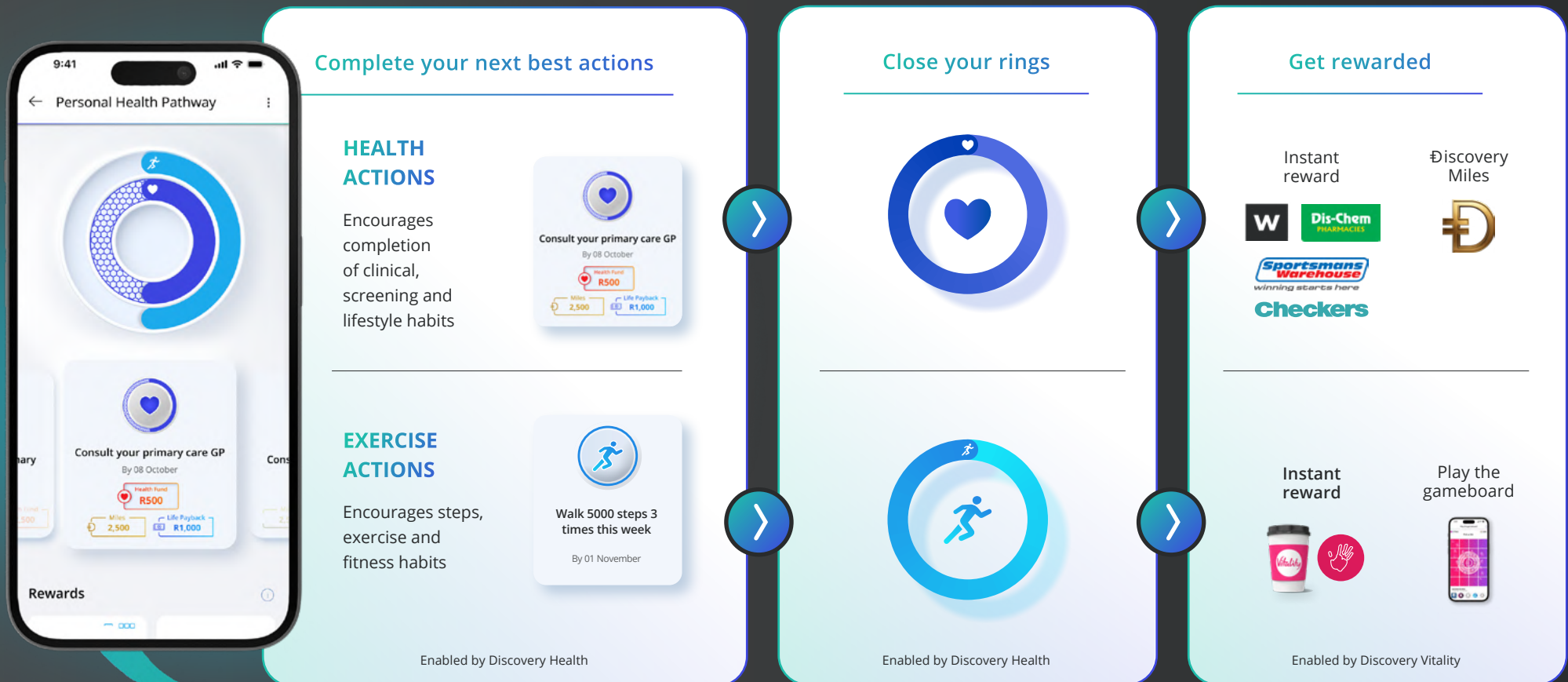(Insufficient zone)

Minimal physical activity days

Personal Health Pathways as the platform for personalisation and healthy habit formation

How sophisticated data science and machine learning capabilities enable hyper-personalisation of actions, rewards, and communication to drive healthy habits and sustained engagement

△ *Habit* **x** △ ***Personalisation*** **=** △ *Health Outcomes*

Introducing Personal Health Pathways | A personalised programme that encourages healthy habits

Personal Health Pathways operationalises shared-value by guiding medical scheme members through personalised healthcare pathways towards healthier habits and rewarding them along the way. Personal Health Pathways manifests in a simple personalised healthcare pathway through the Discovery Health app and an intuitive WhatsApp journey, making it easy for members to form healthy habits and improve their long-term health.

Complete your next best actions

HEALTH ACTIONS

Encourages completion of clinical, screening and lifestyle habits

Consult your primary care GP
By 08 October

Health Fund R500

Miles 2,500   Life Payback R1,000

EXERCISE ACTIONS

Encourages steps, exercise and fitness habits

Walk 5000 steps 3 times this week
By 01 November

Enabled by Discovery Health

Close your rings

Enabled by Discovery Health

Get rewarded

Instant reward
W   Dis-Chem PHARMACIES
Sportsmans Warehouse winning starts here
Checkers

Discovery Miles

Instant reward

Play the gameboard

Enabled by Discovery Vitality

Phone screen

9:41

Personal Health Pathway

Consult your primary care GP
By 08 October

Health Fund R500

Miles 2,500   Life Payback R1,000

Rewards

Personalising rewards, actions and communication

Personal Health Pathways harnesses personalised rewards, tailored actions, and targeted communication to foster meaningful and lasting behaviour change. By aligning interventions with individual needs and preferences, Personal Health Pathways enhances member engagement and drives positive health outcomes.

Actions

$$\uparrow \textit{Precise action}$$
$$\uparrow \triangle \textit{Habit}$$

Actions

Personalised communication

A sophisticated communication engine ensures that members receive their actions at the optimal time, in the style and through the channel that most resonates with them, encouraging them to complete the actions.

$$\uparrow \triangle \textit{Habit} \rightarrow \downarrow \triangle q_x$$

Communication

$$\uparrow \textit{Comms}$$
$$\uparrow \triangle \textit{Habit}$$

Rewards

$$\uparrow \textit{Reward}$$
$$\uparrow \triangle \textit{Habit}$$

$$\triangle \textit{Habit} \longrightarrow \textit{Reward cost} \leq \textit{Value}_{\triangle \textit{Habit}}$$

Personalised and precise actions

By leveraging the world's largest clinical and lifestyle data set, combined with advanced risk segmentation, machine learning, and data science capabilities, next best actions are personalised, precise, and dynamic for every member.

Personalised rewards

To drive engagement, members are rewarded for completing their next best actions with actuarially-matched, compelling incentives. These rewards are personalised for each member, adjusting dynamically based on the likelihood of completion and the potential impact on the member's long-term health outcomes

Personalised and precise actions

Discovery Health has created bespoke and dynamic healthcare pathways for each member, ensuring that every action is precisely targeted and personalised. Engagement is driven by delivering clinically relevant actions at the right moment and in the correct sequence. These actions are tailored to each member's health status and unique engagement patterns, enhancing the overall impact and relevance of the healthcare journey.

With the example of just **12** possible actions there are over **7 million** ways to present a health pathway

Personal Health Pathways can create the most optimal healthcare pathway for each of the **2.2 million** adult lives on Discovery Health Medical Scheme
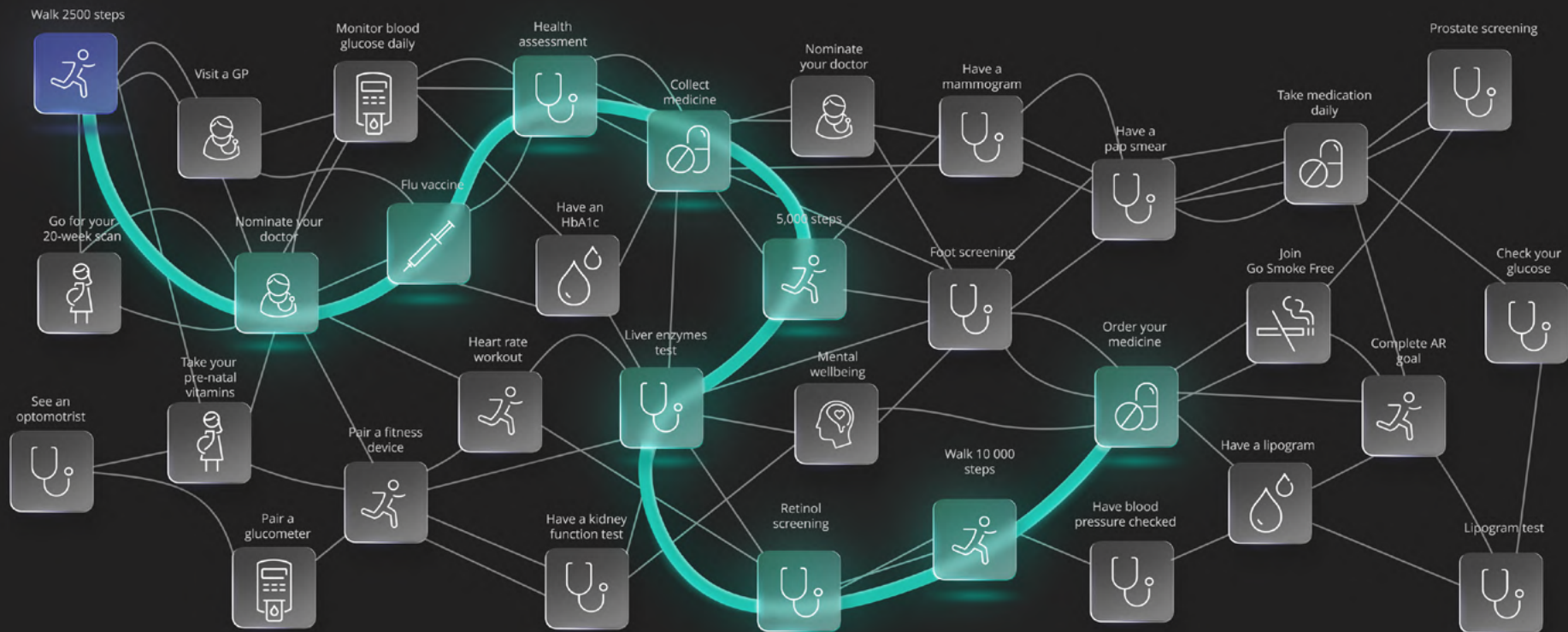
Building personalisation requires a science-based approach

Discovery Health has over 30 years of clinical, lifestyle and behavioural data, and uses advanced actuarial analysis, data science modelling, artificial intelligence and behavioural economics to converge multiple clinical and lifestyle actions into a personalised health pathway for every member. Personal Health Pathways are enabled by a number of unique assets and skills, including:
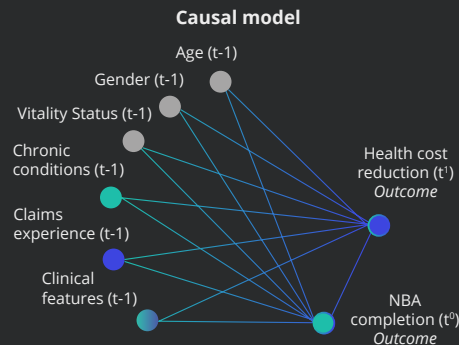
Unparalleled data set enabling risk segmentation

World's largest lifestyle, clinical and behavioural data set to better understand every member's health risks, preferences and habits.
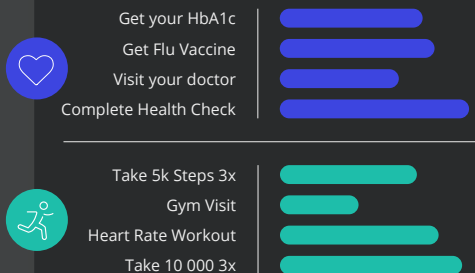
Age	50
Gender	Male
Vitality Status	Bronze
Registered Conditions	Diabetic
FUB	6
RUB	3
BMI	Overweight
Blood Pressure	Normal
Cholesterol	High
Past NBA Completions	Frequent

Value models

Sophisticated causal model to determine the contribution of each action to long-term health improvement.
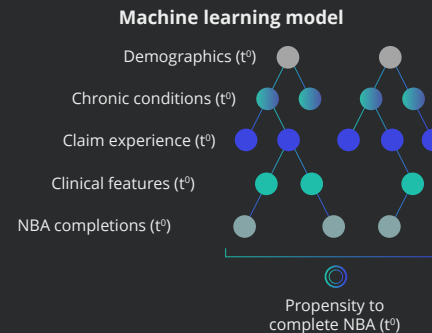
Causal model

Age (t-1)
Gender (t-1)
Vitality Status (t-1)
Chronic conditions (t-1)
Claims experience (t-1)
Clinical features (t-1)

Health cost reduction (t¹) *Outcome*
NBA completion (t⁰) *Outcome*

Relative contribution to health improvement

Get your HbA1c
Get Flu Vaccine
Visit your doctor
Complete Health Check

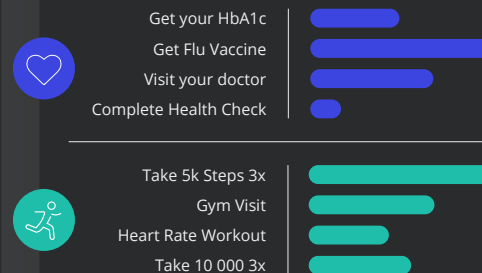Take 5k Steps 3x
Gym Visit
Heart Rate Workout
Take 10 000 3x

Propensity models

Machine learning model incorporating prior engagement data to estimate the probability of a member completing a next best action.

Machine learning model

Demographics (t⁰)
Chronic conditions (t⁰)
Claim experience (t⁰)
Clinical features (t⁰)
NBA completions (t⁰)

Propensity to complete NBA (t⁰)

Relative probability of completing an action

Get your HbA1c
Get Flu Vaccine
Visit your doctor
Complete Health Check

Take 5k Steps 3x
Gym Visit
Heart Rate Workout
Take 10 000 3x

Personalised Health Pathway

Personalised and responsive pathways that dynamically respond to changing preferences, health status and life stage.

The modelling determines the next best actions to be presented to a member.

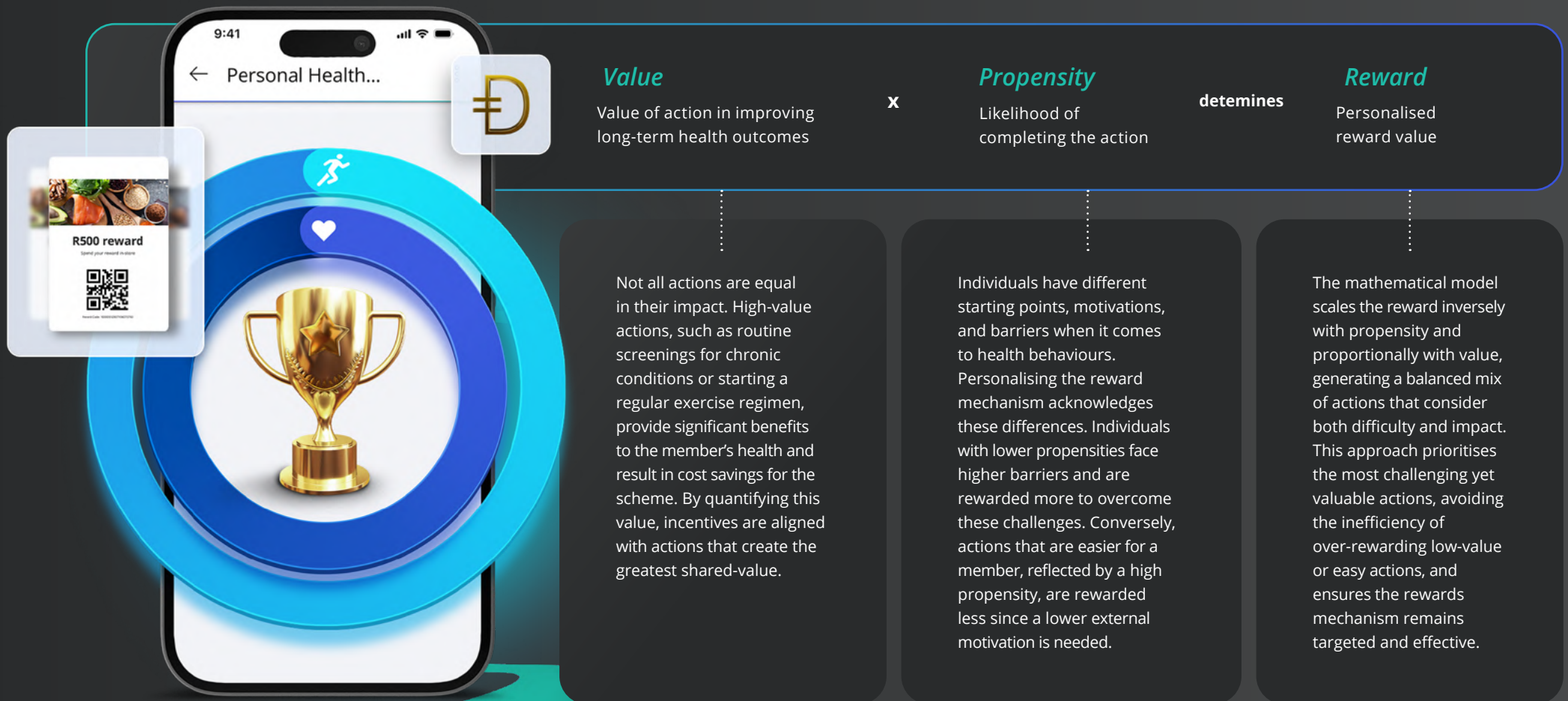| 01 Get flu vaccine	02 Get your HbA1c
03 Visit your doctor	04 Complete VHC
05 Colon cancer screening	06 Podiatrist
07 Vitality Age assessment	08 Mental wellbeing assessment

01 Take 5k Steps 3x this week	02 Take 10k Steps 3x this week
03 Complete heart rate workout	04 Visit the gym

— — — Shown to member

Personalised rewards

To drive engagement, members are rewarded for completing their next best actions with actuarially-matched, compelling incentives. These rewards are personalised for each member, adjusting dynamically based on the likelihood of completion and the potential impact on the member's long-term health outcomes.

Personalised rewards leverage the dual understanding of the value of the action and the member's propensity to complete the action based on past behaviour. By carefully calibrating rewards, Personal Health Pathways not only motivates members to adopt healthier habits but also ensures that resources are used efficiently to maximise the shared-value between members and Discovery Health Medical Scheme.

Value	**x**	**Propensity**	**detemines**	**Reward**
Value of action in improving long-term health outcomes		Likelihood of completing the action		Personalised reward value

Not all actions are equal in their impact. High-value actions, such as routine screenings for chronic conditions or starting a regular exercise regimen, provide significant benefits to the member's health and result in cost savings for the scheme. By quantifying this value, incentives are aligned with actions that create the greatest shared-value.

Individuals have different starting points, motivations, and barriers when it comes to health behaviours. Personalising the reward mechanism acknowledges these differences. Individuals with lower propensities face higher barriers and are rewarded more to overcome these challenges. Conversely, actions that are easier for a member, reflected by a high propensity, are rewarded less since a lower external motivation is needed.

The mathematical model scales the reward inversely with propensity and proportionally with value, generating a balanced mix of actions that consider both difficulty and impact. This approach prioritises the most challenging yet valuable actions, avoiding the inefficiency of over-rewarding low-value or easy actions, and ensures the rewards mechanism remains targeted and effective.

R500 reward
Spend your reward in-store

Personalised communication

Globally, personalised communication is essential for building trust and fostering deeper connections with audiences. Messages that acknowledge individual circumstances and speak directly to personal needs are more likely to resonate, driving higher engagement and response rates. This is particularly important in healthcare, where personalised communication can guide members through their health journeys, improve adherence to treatments, and support behaviour change in ways that generic advice cannot achieve.

Multi-channel engagement approach

To optimise engagement, Personal Health Pathways uses a multi-channel approach to ensure that all relevant stakeholders can access the programme in a way that aligns with their preferences.

Health App		Doctors
Bank/ Corporate App		Health Coaches
WhatsApp		Service Agents

Personalised communication

Personalised channel, timing and frequency supported by sophisticated communication engine

By leveraging available member data, a sophisticated communication engine personalises various aspects of member engagement including the communication **channel, messaging, timing, and frequency.**

By segmenting members into categories such as highly engaged, moderately engaged, or disengaged, channel choices are personalised to match each members' responsiveness and preferences.

There are some members who currently do not interact digitally with Discovery Health's suite of digital tools. Given the proliferation of WhatsApp as a preferred channel of communication, Personal Health Pathways offers members a seamless and intuitive user-experience through WhatsApp. This channel's ease of use makes it ideal for initial interactions, reminders, and nudges. Once a member has engaged on the platform, a glide path strategy guides the member from WhatsApp to the Discovery Health app, ensuring a seamless transition.

Continuous and adaptive optimisation further refines these strategies, ensuring communication remains effective and aligned with member behaviours.

Leveraging Large Language Models to create hyper-personalised messaging

Large Language Models (LLMs) will enable highly personalised communication by generating contextually relevant and empathetic messages tailored to individual member needs. These models use data from health records, past interactions, and engagement patterns to craft dynamic, context-aware messages that resonate on a personal level, fostering trust and enhancing member engagement. The adaptability of LLMs allows the programme to maintain relevant and supportive communication throughout a member's health journey, ensuring the messages evolve in response to changing circumstances and health requirements.
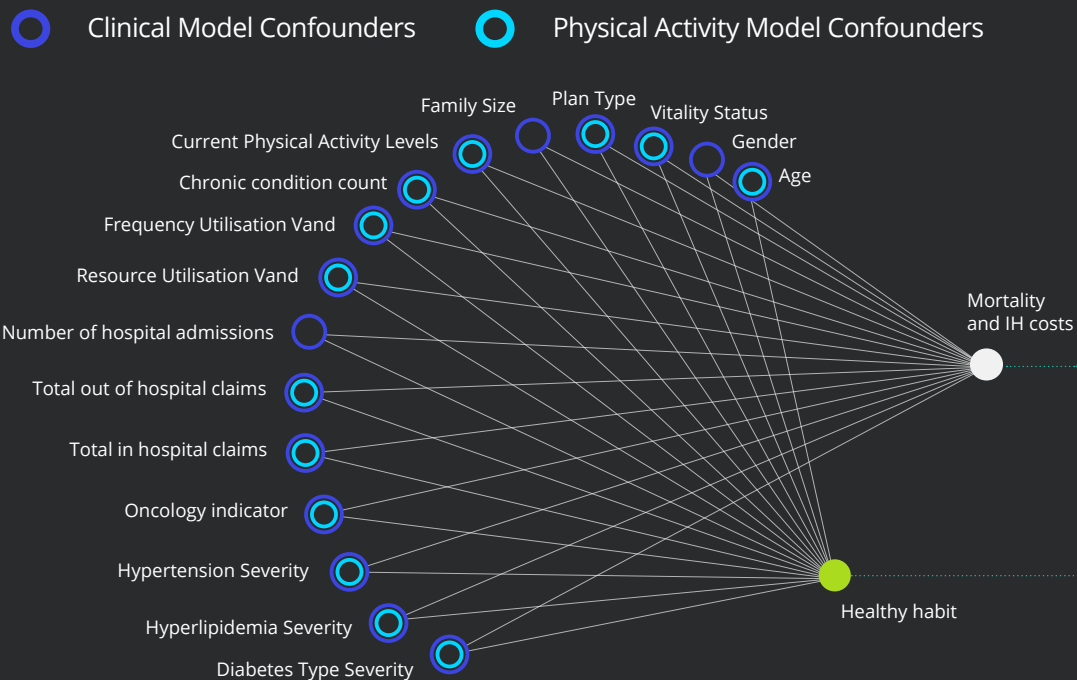
03

Shared-value impact of Personal Health Pathways

The methodologies and evidence supporting the value of habit changes in improving long-term health outcomes and economic benefits.

△ Habit x △ Personalisation = △ *Health Outcomes*

Causal modelling methodology to determine the impact of improving habits

Causal modelling within Personal Health Pathways focuses on uncovering the cause-and-effect relationships between factors that impact an individual's health outcomes. This approach helps identify and quantify the interventions that are most effective in enhancing health outcomes over time. Causal modelling provides a structured framework for understanding these relationships, guiding targeted and effective interventions. This approach ensures that interventions consider the complex, real-world factors impacting health outcomes, enhancing the precision and impact of health strategies.

Causal model

○ Clinical Model Confounders   ○ Physical Activity Model Confounders

Family Size
Plan Type
Vitality Status
Current Physical Activity Levels
Gender
Chronic condition count
Age
Frequency Utilisation Vand
Resource Utilisation Vand
Number of hospital admissions
Total out of hospital claims
Total in hospital claims
Oncology indicator
Hypertension Severity
Hyperlipidemia Severity
Diabetes Type Severity

Mortality and IH costs

Healthy habit

Outcome

The outcome is the variable that the intervention aims to influence, specifically targeting improvements in morbidity and mortality. Causal modelling seeks to measure how specific interventions lead to these crucial health improvements, whether through clinical changes or behavioural modifications.

Intervention

In causal modelling, an intervention is an action or treatment designed to affect an outcome. In Personal Health Pathways, interventions are tailored, personalised next best actions. The aim of modelling these interventions is to understand how completing these actions can directly influence health-related outcomes.

Confounders

Confounders are variables that influence both the intervention and the outcome, potentially distorting the true causal relationship between them. In the context of Personal Health Pathways, a confounder could be disease severity, which might affect both an individual's likelihood of participating in a health intervention and their overall health outcome.

Significant improvements in **mortality** through healthy habit formation

A retrospective mortality study on the Discovery Health South African book was conducted to determine the impact of clinical and physical habits on mortality.

156,655 observations

4191 deaths
(64,363 unique members living with diabetes)

Study length

2013-2019

Baseline period	2013
	2014
Observation period	2015
	2016
Outcome period	2017

*timeline repeated for 2014-2018, 2015-2019

Model used

Casual Forest

Study results

The results show that changing a clinical habit from a poor habit to a strong habit results in a **16% reduction** in mortality.

Changing a physical activity habit from a poor habit to a strong good habit results in an **18% reduction** in mortality.

Relative mortality reduction moving from a poor habit to a strong habit

Clinical habits: -16%

Physical activity habits: -18%

Relative mortality improvement (y-axis: -0% to -18%)
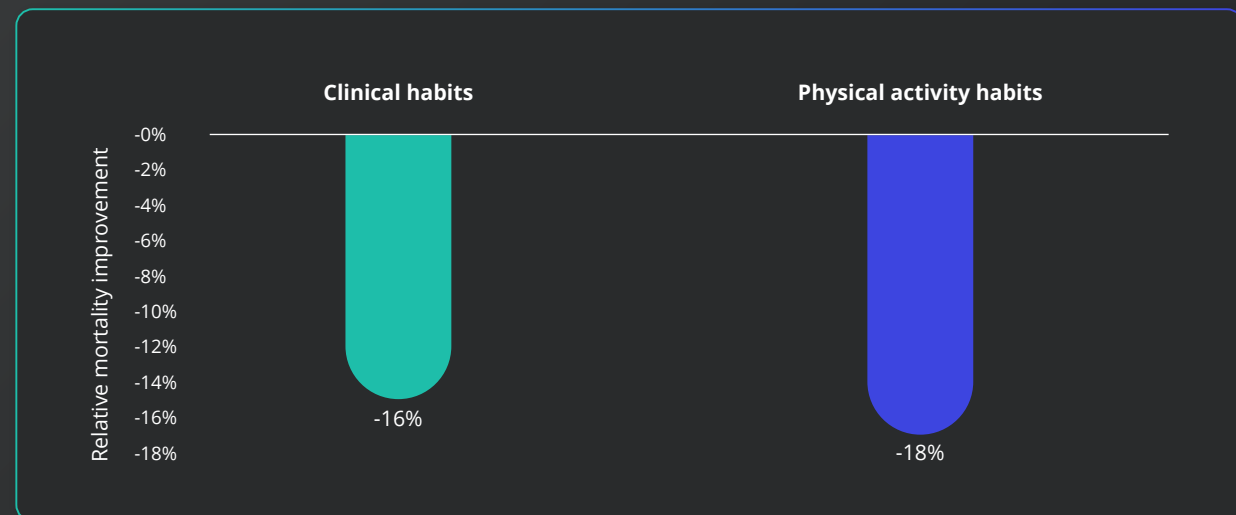
*PA: excluding strong bad due to low death exposure

Significant improvements in **morbidity** through healthy habit formation

A retrospective morbidity study on the Discovery Health South African book was conducted to determine the impact of clinical and physical habits on morbidity, measured as in-hospital costs.

156,655 observations

(64,363 unique members living with diabetes)

Study length

2013-2019

Baseline period	2013
	2014
Observation period	2015
	2016
Outcome period	2017

*timeline repeated for 2014-2018, 2015-2019

Model used

Casual Forest

Study results

The results show that changing a clinical habit from a poor habit to a strong habit results in a **13% reduction** in morbidity.

Changing a physical activity habit from a poor habit to a strong good habit results in a **16% reduction** in morbidity.

Relative reduction in morbidity (in-hospital costs) moving from a poor habit to a strong habit

Clinical habits — -13%

Physical activity habits — -16%

Relative morbidity improvement

-0%
-2%
-4%
-6%
-8%
-10%
-12%
-14%
-16%
-18%
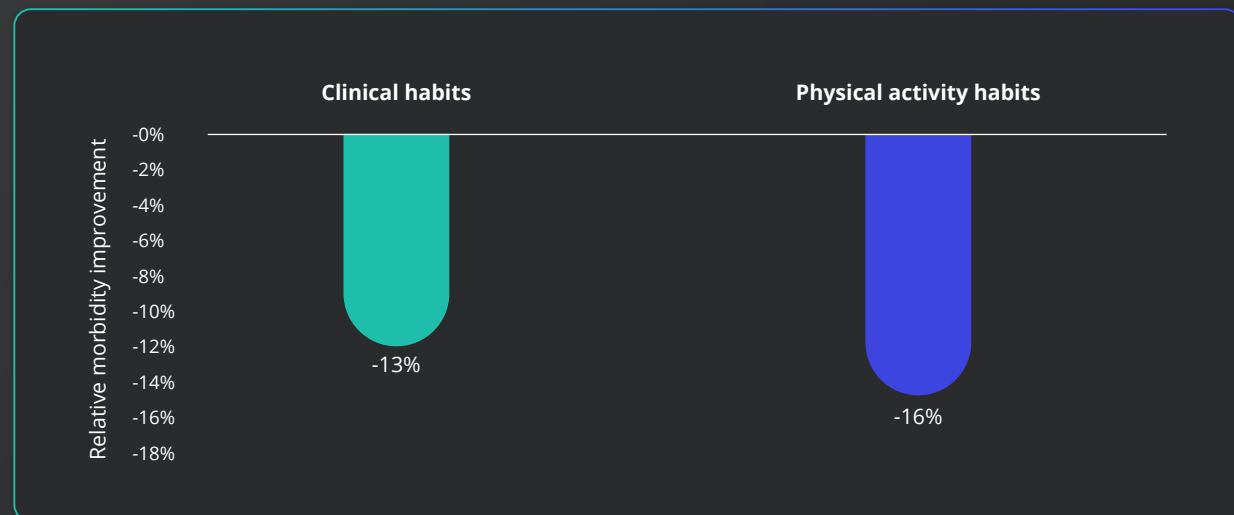
Return on investment for Discovery Health Medical Scheme

Investing in Personal Health Pathways, a comprehensive managed care programme focused on disease prevention and management, delivers a significant return on investment for DHMS by driving lasting behavior change and optimising shared-value in healthcare.

The impact of clinical habits on morbidity (in-hospital costs)

Cost of Reward

Net Savings for DHMS

Cost of Action Completion

R1: R2.50 For every R1 invested in rewards, R2.50 of value is generated for the Scheme

Mortality result: relative reduction of 16%, distinct from morbidity savings

The impact of physical activity habits on morbidity (in-hospital costs)

Cost of Reward

Net Savings for DHMS

R1: R3.90 For every R1 invested in rewards, R3.90 of value is generated for the Scheme

Mortality result: relative reduction of 18%, distinct from morbidity savings

Download the Discovery Health app