

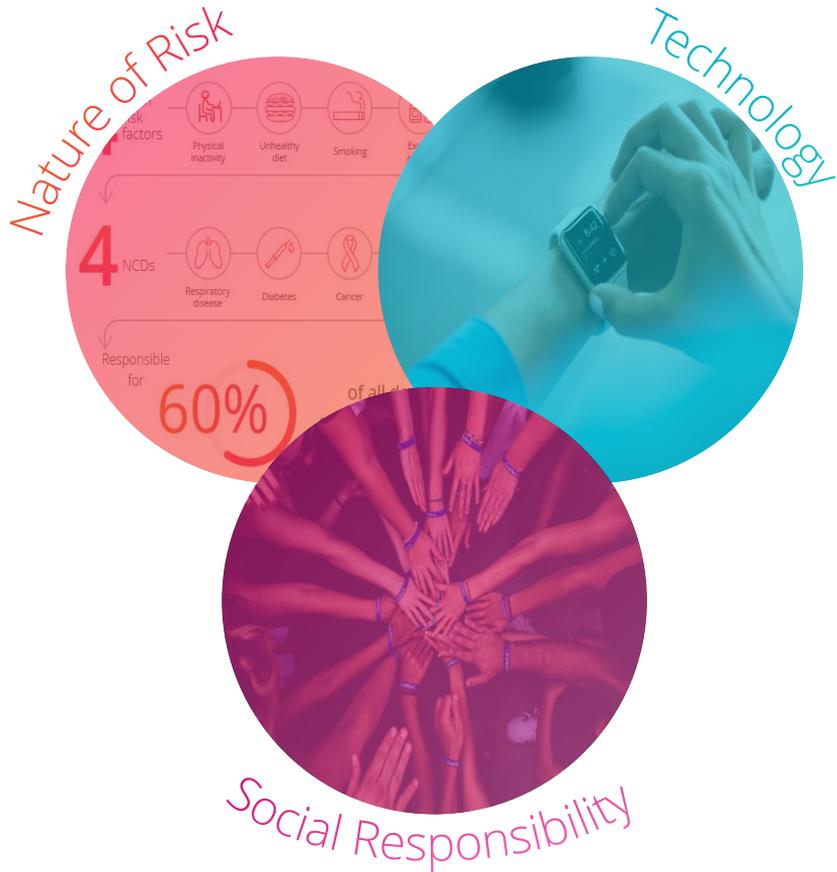
The Last-Mile Problem: Linking Data, Design & Behavior

A person stands on the peak of a mountain, arms raised in triumph, overlooking a vast valley with a large lake and distant mountains under a cloudy sky. The scene is captured from a high angle, looking down the mountain ridge.

Vitality®

Francois Millard FIA, FSA, MAAA
May 3, 2019

Powerful forces are changing the way insurance companies operate



The **nature of risk is behavioral** and solutions are becoming increasingly personalized



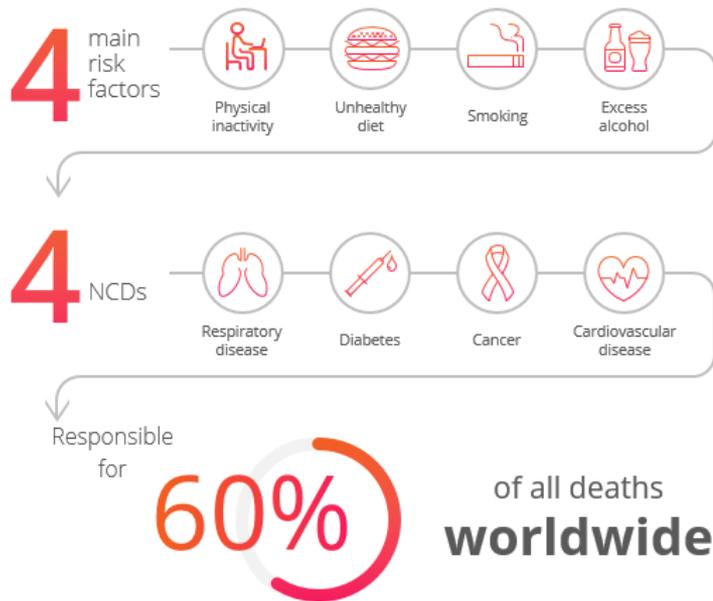
Societies require companies to fulfil a **socially progressive core purpose**



Consumers live in a technology-dominated world and seek **solutions instead of services**

At its core, there is a profound need to tackle behavioral-driven health risk

The rise of non-communicable diseases is impacting mortality rates



And individual behavior remains irrational with 95% of decisions made subconsciously

Hyperbolic discounting



Healthcare

Benefits are immediate, price is hidden

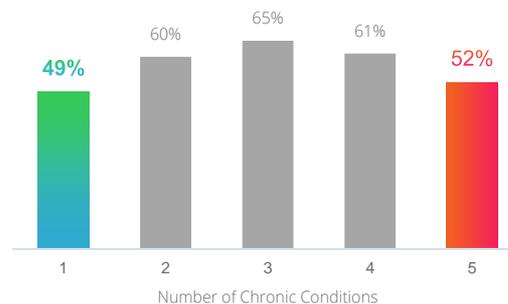


Wellness

Benefits are hidden, price is immediate

Over optimism

% of Members Rating Their Health as "Good"



MEDICAL CONDITION

BEHAVIOR

 Smoking

-  Cardiovascular Disease
-  Cancers (lung and related)
-  Cancers (other)
-  Alcohol related trauma
-  Alcohol use disorder
-  Diabetes
-  Hypertension
-  Hypercholesterolemia
-  COPD
-  Mental & nervous disorders
-  Osteoarthritis



1-24% explained by risk factor



25-49% explained by risk factor



50%+ explained by risk factor

SCIENCE WATCH

Smoking and mental illness

People with behavioral health conditions are more likely to smoke. Psychologists are among those working to understand why and helping them quit.



Smoking linked to increased risk of chronic back pain

By Honor Whiteman | Published Tuesday 4 November 2014

People who smoke are much more likely to experience chronic back pain than those who do not smoke, according to a new study by researchers from Evanston, IL.

By Kirsten Weir
2013, Vol 44, No. 6
Print version: page 36

Chad Morris, PhD, didn't begin his career with tobacco in mind. His wake-up call came while reviewing research practices for treating bipolar disorder.

"I had this aha moment when I realized: What's the one thing you have to be to benefit from the best services?" says the associate professor in the psychiatry department at the University of Colorado Denver. "The bottom line is, you have to be alive."



Behavioral Mechanisms Underlying the Link Between Smoking and Drinking

HILARY J. LITTLE, PH.D.

Original Article

March 2005

Smoking and the Risk of Suicidal Behavior: A Prospective Study of a Community Sample

Naomi Breslau, PhD; Lonni R. Schultz, PhD; Eric O. Johnson, PhD; [et al](#)

[» Author Affiliations](#) | [Article Information](#)

Arch Gen Psychiatry. 2005;62(3):328-334. doi:10.1001/archpsyc.62.3.328

[Home](#) > [Quit Smoking Resources](#) > [Smoking and Truck Drivers](#)

Smoking and Truck Drivers: One Risk Too Many

Truck drivers have a stressful, challenging job and suffer from many health problems more often than the general population. This makes the link between smoking and truck drivers especially problematic, so helping them to quit should form part of a comprehensive strategy to help improve their health overall.

Philip Morris joins UK insurance market

by Terry
Ganguangco
24 Apr 2019

SHARE
f t in e



Free e-newsletter - get the

On average, people who switch to e-cigarettes will receive a 2.5% discount on premiums, people who switch to Philip Morris' heated tobacco product iQOS for three months will receive a 25% discount, and people who quit smoking for at least a year will receive a 50% discount, the company said. Premiums for a 20-year-old nonsmoker run about £5 (\$6.47) per month for a life insurance policy that pays £150,000 (\$194,125). The same premium would buy a £60,000 (\$77,650) policy for a 40-year-old nonsmoker.

Marlboro maker Philip Morris has launched an insurance subsidiary in the UK that promises to slash premiums by half under one condition.

Smokers insured by Philip Morris unit Reviti are offered a 50% discount if they kick the habit for a minimum of one year. If that sounds too hard, two other options are available under the new life insurance proposition.

Order contains steps firms must
client privacy

**Marsh and JLT combination
not 'a steamroller merger'**

Warning - this feature includes
executive bromance

Submit a press release

MEDICAL CONDITION

BEHAVIOR

 Smoking

 Overweight, obese

 Physical inactivity

 Alcohol abuse

 Low fruit & vegetable intake

 Cardiovascular Disease

 Cancers (lung and related)

 Cancers (other)

 Alcohol related trauma

 Alcohol use disorder

 Diabetes

 Hypertension

 Hypercholesterolemia

 COPD

 Mental & nervous disorders

 Osteoarthritis

1-24% explained by risk factor

25-49% explained by risk factor

50%+ explained by risk factor

1: Bolnick H, Millard F, Dugas P. Medical Care Savings from Workplace Wellness Programs. *JOEM* Jan 2015; Vol 55, Number 1

Why?

Our core purpose:

**To make people
healthier and to
enhance and
protect their lives.**

By blending smart tech, data, incentives, and behavioral science, we inspire healthy changes in individuals and organizations around the world.

The Vitality logo is displayed in white, cursive script on a red rectangular background. The word "Vitality" is followed by a registered trademark symbol (®).



The last-mile problem: How data science and behavioral science can work together

Deloitte Review Issue 16



Jim Guszczka



If we want to act on data to get fit or reduce heating bills, we need to understand not just the analytics of the data, but how we make decisions.

Why?

Make people healthier and enhance and protect their lives

How?



What?

Life & Disability insurance

Health insurance

Corporate wellness

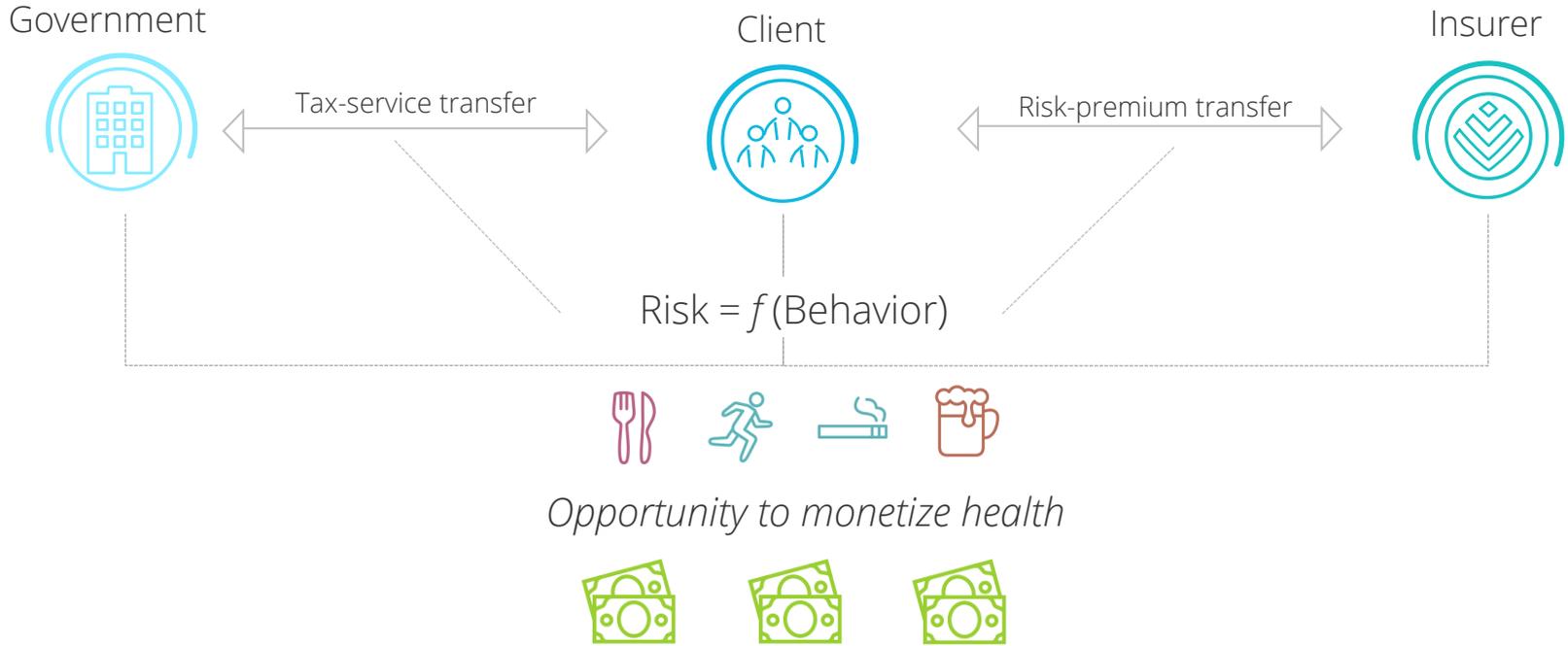
Short-term insurance

Long-term savings

Banking

Vitality®

Insurance companies have the unique ability to monetize health



Shared Value Framework

$$\frac{\text{Value Member}}{\text{Member}} = \frac{\text{Incentive Member}}{\text{Member}} \times \frac{\Delta \text{ Behaviour}}{\text{Incentive}} \times \frac{\Delta \text{ Risk}}{\Delta \text{ Behaviour}} \times \frac{\text{Value}}{\Delta \text{ Risk}}$$



=



- Vitality Age
- Vitality Points
- Vitality Status
- Rewards



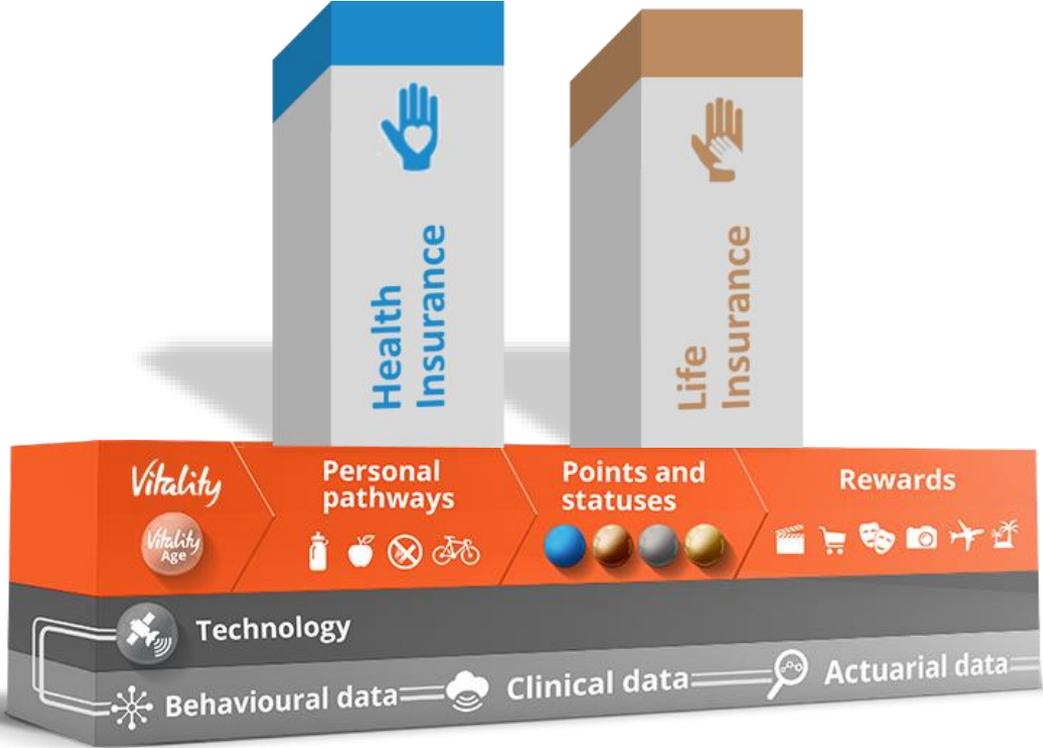
- Screening
- Exercise
- Nutrition
- Weight Loss



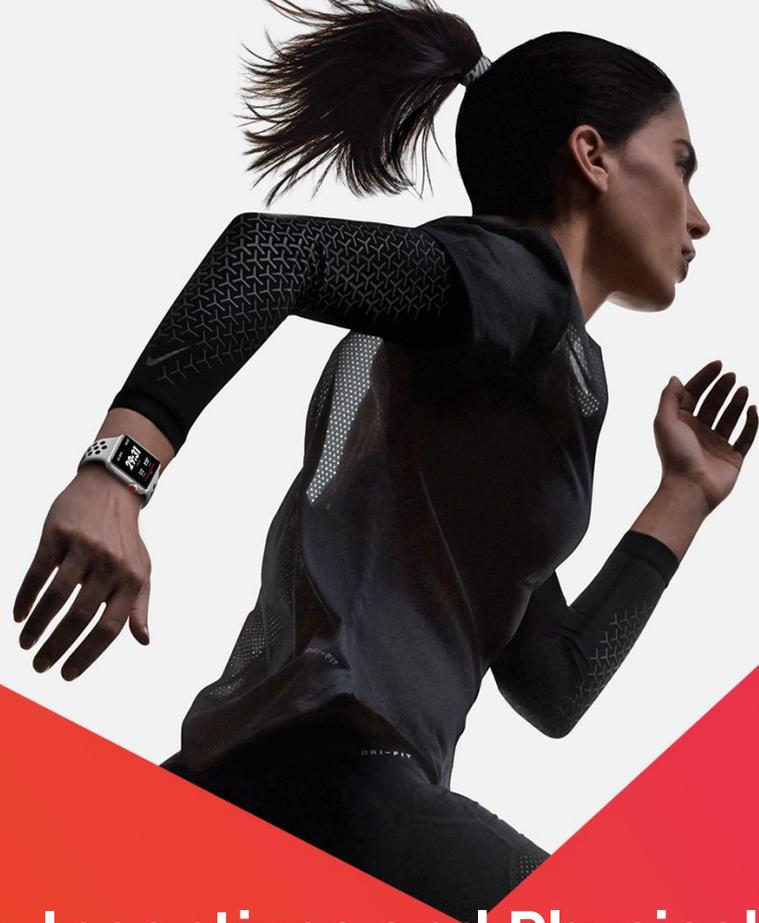
- Morbidity, mortality & driving
- Productivity
- Absenteeism



- Product Integration
- Shared Risk
- Aligned Incentives







Personalized Algorithms, Incentives and Physical Activity

A Vitality Active Rewards with Apple Watch Case Study

Technology can help, but it is not easy to scale

Annals of Internal Medicine

OBSERVATION: BRIEF RESEARCH REPORT

Using Wearable Devices and Smartphones to Track Physical Activity: Initial Activation, Sustained Use, and Step Counts Across Sociodemographic Characteristics in a National Sample

Background: Interest in using wearable devices and smartphones to monitor daily health behaviors, such as physical activity, is growing (1, 2). Many large employers are using these technologies in workplace wellness programs (3). The precision medicine initiative has described how data collected by these technologies can be used to better target interventions. However, the characteristics of persons who use these devices are poorly understood.

Objective: To describe rates of initial use of activity trackers, sustained use after 6 months, and step counts across different sociodemographic characteristics from a wellness program offered across the United States.

Methods and Findings: Data on activity tracker use, mean daily step counts, and sociodemographic characteristics between 2014 and 2015 were obtained from Humana for insured persons with access to HumanaVitality (now Go365), a wellness program offered across the United States. Median household income from U.S. Census data was linked using ZIP code. Data were received deidentified and deemed exempt from review by the University of Pennsylvania Institutional Review Board.

The program supported more than 60 wearable devices and smartphone applications. Activity trackers needed to be connected to the wellness platform once, and then data were transmitted automatically as the device was used. The program had a daily goal of 10 000 steps and used gamification with points and levels. Points were earned for reaching goals or logging workouts. Commercial insurance plans offered additional points for the first and fifth workout each week. Achieving higher levels made points redeemable for gift cards or other prizes more valuable. The maximum expected daily incentive value ranged from approximately \$0.25 to \$0.40.

Initial activation rates were evaluated during the 2-year period. To allow for 6 months of follow-up for sustained use and step counts, we evaluated persons who activated by 30 June 2015. We estimated the proportion of persons still transmitting step data at 6 months and their mean daily step counts and the proportion who had achieved mean step count goals (10 000 steps per day). The top and bottom first percentiles of step counts were removed as outliers. All analyses were conducted using SAS, version 9.4 (SAS Institute).

The sample ($n = 4\ 402\ 853$) was 53.0% female and 37.4% elderly (aged ≥ 65 years) (Table 1). During the 2 years, 1.2% of persons activated a device (0.2% in 2014 and 1.0% in 2015). Initial activation was done by 1.8% of women and 0.9% of men, 2.8% to 3.1% of younger adults (aged 23 to 49 years) and 0.1% of elderly persons, and 1.2% to 1.6% of those with a median annual household income of \$50 000 or higher and 0.7% to 1.0% of those with a lower income. Among those who activated a device, 69.2% (84.1% among elderly persons)

LETTERS

used a Fitbit and 13.7% (14.3% to 17.2% among younger adults) used an Apple product.

Six months after activation, 80.0% overall, 90.4% of elderly persons, and 85.0% of Fitbit users had sustained use of the activity tracker (Table 2). The mean daily step count was 7633 overall, 8420 among men, 7291 among women, and 8085 among Fitbit users.

Discussion: This study had 3 main findings. First, activity tracker activation, sustained use, and step counts varied across sociodemographic characteristics. Second, initial activation was low, particularly among older and lower income persons; however, overall activation rates increased between 2014 and 2015. Programs should consider ways to better engage older persons and those who may be less able to afford these devices. Third, sustained use and mean step counts were high among those who initially activated their devices, perhaps partly because of the program's use of gamification and incentives. We have previously shown that these approaches can be effective in other settings (4, 5). Programs should consider testing these types of engagement strategies to improve device use and physical activity outcomes.

This study has limitations. Data were from a single insurer, incentives and program promotion could vary by insurance and employer, racial/ethnicity was unavailable, and data from persons who used a device but did not activate it with the program were not captured. Sustained use over longer periods needs further study.

To our knowledge, our study is 1 of the first national evaluations of activity tracker use among a large, diverse sample. Our findings offer new insights to better design interventions using wearable devices and smartphones.

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Disclaimer: Dr. Patel had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Grant support: By the University of Pennsylvania Health System through the Penn Medicine Budget Unit. Dr. Patel is supported by career development awards from the U.S. Department of Veterans

During the 2 years, **1.2%** of persons activated a device (0.2% in 2014 and 1.0% in 2015).

Programs should consider ways to better engage older persons and those who may be less able to afford these devices.

Wearable devices act as facilitators not drivers of behavioral health

VIEWPOINT

Wearable Devices as Facilitators, Not Drivers, of Health Behavior Change

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Several large technology companies including Apple, Google, and Samsung are entering the expanding market of population health with the introduction of wearable devices. This technology, worn in clothing or accessories, is part of a larger movement often referred to as the “quantified self.” The notion is that by recording and reporting information about behaviors such as physical activity or sleep patterns, these devices can educate and motivate individuals toward better habits and better health. The gap between recording information and changing behavior is substantial, however, and while those devices are increasing in popularity, little evidence suggests that they are bridging that gap.

Only 1% to 2% of individuals in the United States have used a wearable device, but annual sales are projected to increase to more than \$20 billion by 2016. Some of these devices aim at individuals already motivated to change their health behaviors. Others are being considered by health care organizations, employers, insurers, and clinicians who see promise in using these devices to better engage less motivated individuals. Some of these devices may justify that promise, but less because of their technology and more because of the behavioral change strategies that can be designed around them.

Most health-related behaviors such as eating well and exercising regularly could lead to meaningful improvements in population health only if they are sustained. If wearable devices are to be part of the solution, they either need to create enduring new habits, turning external motivations into internal ones (which is difficult), or they need to sustain their external motivation (which is also difficult). This requirement of sustained behavior change is a major challenge, but many mobile health applications have not yet leveraged principles from theories of health behavior.¹

Feedback loops could be better designed around wearable devices to sustain engagement, by using concepts from behavioral economics.² Individuals are often motivated by the experience of past rewards and the prospect of future rewards. Lottery-based designs leverage the fact that individuals tend to assign undue weight to small probabilities and are more engaged by intermittent variable rewards than with constant reinforcement. Anticipated regret, an individual's concern or anxiety over the reward he or she might not win, can have a significant effect on decision making. Feedback could be designed to use this concept by informing individuals what they would have won had they been adherent to the new behavior. Building new habits may be best facilitated by presenting frequent feedback without appropriate framing and by using a trigger that captures the individual's attention at those moments when he or she is most likely to take action.

Identifying and Addressing the Gaps

Using wearable devices to effectively promote health behavior change is a complex, multistep process. First, a person must be motivated enough to want a device and be able to afford it; this is a challenge, because some devices cost hundreds of dollars. Perhaps for these reasons, wearable devices seem to appeal to groups that might need them least. In a survey of wearable device users, 73% described themselves as “early adopters of technology,” 48% were younger than 35 years, and 29% reportedly earn more than \$100 000 annually.³ The individuals who might have the most to gain from these devices are likely to be older and less affluent, to better engage these individuals, wearable devices must be more affordable, or new funding mechanisms are needed. For example, employers and insurers might pay for a device that helps individuals better adhere to their medications, potentially yielding significant downstream health care savings. Or, devices that demonstrate effectiveness could be financed in a manner similar to that for prescription drugs.

Second, once a device is acquired, a person needs to remember to wear it and occasionally recharge it—additional behaviors required from individuals who may have a difficult time already. Many wearable devices require data to be sent to a phone or computer, adding additional steps and more equipment. According to one survey of 6229, more than half of individuals who purchased a wearable device stopped using it, and of those, one-third did so before 6 months.⁴ One potential solution might be to better leverage smartphones, most people with these phones carry them often. Ideally, using a smartphone does not require any effort beyond setup—like an app that gets its power from the phone that people are already accustomed to regularly charging. Because data can be transmitted passively via cellular connections, there is no need for individuals to actively update their data. Although smartphones are expensive, many people already have them, and the reach of those devices is increasing.

Third, the device must be able to accurately track its targeted behavior. Accelerometers, commonly found within wearable devices, have been well studied for tracking step counts. However, newer technologies, such as those that measure heart rate or sleep patterns, have not been well validated. Similar to mobile health applications, the increase in the availability and types of wearable devices has not been matched by appropriate testing or oversight to make sure they work.⁵ Wearable devices are unlikely to have the same capabilities as home devices that measure blood pressure or track medication adherence. However, a smartwatch may facilitate feedback from those devices, forming a better



Using wearable devices to effectively promote health behavior change is a complex, multistep process. First, a person must be motivated enough to want a device and be able to afford it; this is a challenge, because some devices can cost hundreds of dollars.

Although wearable devices have the potential to facilitate health behavior change, this change might not be driven by these devices alone. Instead, the successful use and potential health benefits related to these devices depend more on the design of the engagement strategies than on the features of their technology.

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jama.com

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Vitality Active Rewards with **Apple Watch**



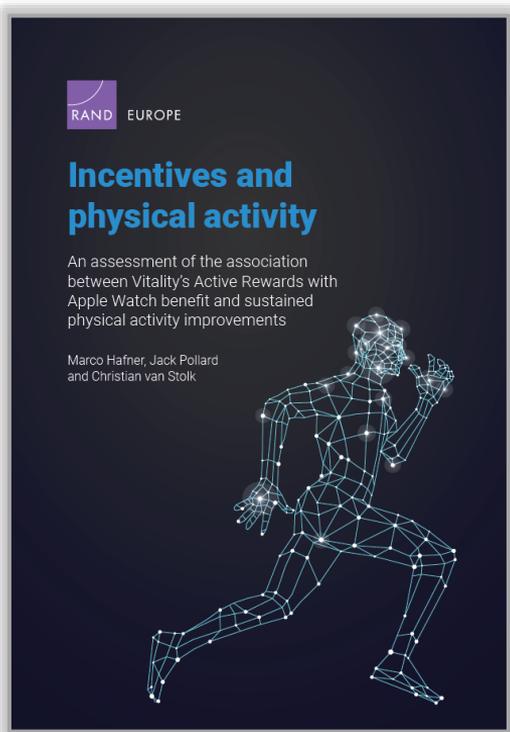
amazon.com

+

Monthly points	Amount due		
Band 1	£12.50	\$12.50	R254
Band 2	£ 10	\$ 10	R254
Band 3	£7.50	\$ 6	R191
Band 4	£5	0	R127
Band 5	0	0	0



The largest behavior change study on physical activity



Three countries

422 643 people, **91 000** Apple Watch users



Longitudinal tracking

Before and after taking up Apple Watch



Granular data

Demographic data + Biometric information + Physical activity engagement



Age



Body mass index



Gender



Place of residence



Gym day



Step event



Heart rate event



Calorie event



Intensity

PRESENT TIME BIAS

LOSS AVERSION

FINANCIAL INCENTIVES

FRAMING

PRE-COMMITMENT



Broadening Access

Incentivizing Behavior Change

Sustaining Improvements

3 countries on 3 continents



United States



United Kingdom



South Africa



Addressing the Pitfalls of Previous Studies

- **Anti-Selection**, or the tendency for those at least risk to take up activity incentives
- **Small Study Population**
- **Tracker Effect**, or confusing more accurate tracking with actual behavior change



Testing the Power of Loss-Framed Incentives

The study compared the difference between two populations in each market:

1. People who received gain-framed incentives **gain-framed incentive**: Vitality Active Rewards
2. People who received an additional **loss-framed incentive**: Apple Watch



Statistically Speaking, $y_{i,my} = \alpha_i + \gamma_{my} + \delta_{i,qy} + \beta VARWAW_{i,my} + \varepsilon_{i,my}$

The study applied a **fixed-effects Poisson regression**, adjusted for diverse characteristics and context of the study population, including:



Demographics



Types of Physical Activity



Starting Fitness Level



Intensity



Health Status



Seasonality

+34%

INCREASE IN PHYSICAL
ACTIVITY

+4.8 DAYS

PER MONTH
OR ALMOST

**ONE FULL
WORK WEEK**

Increase in physical activity for Apple Watch members
per month

	%	Days
	31%	4.7
	28%	3.6
	44%	6.1

Incentivizes the right type of activity and appeals to at-risk groups

HIGHEST INCREASE IN INTENSIVE PHYSICAL ACTIVITY

Increase in physical activity for Apple Watch members per month

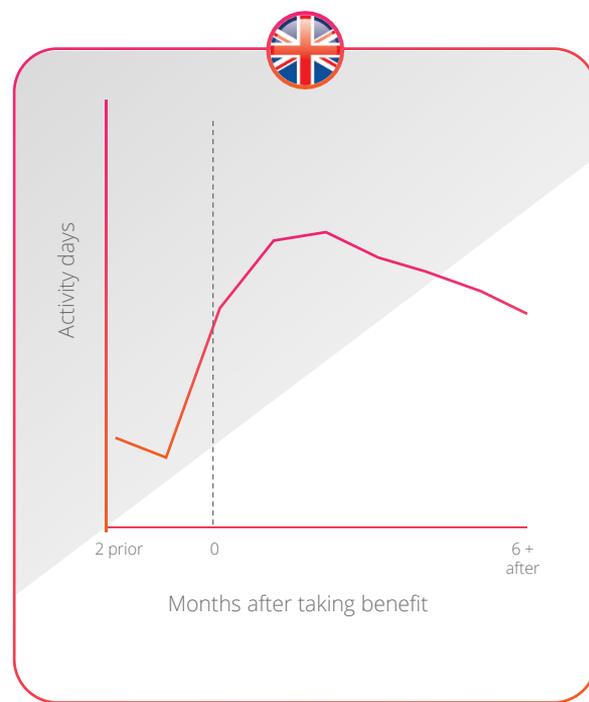
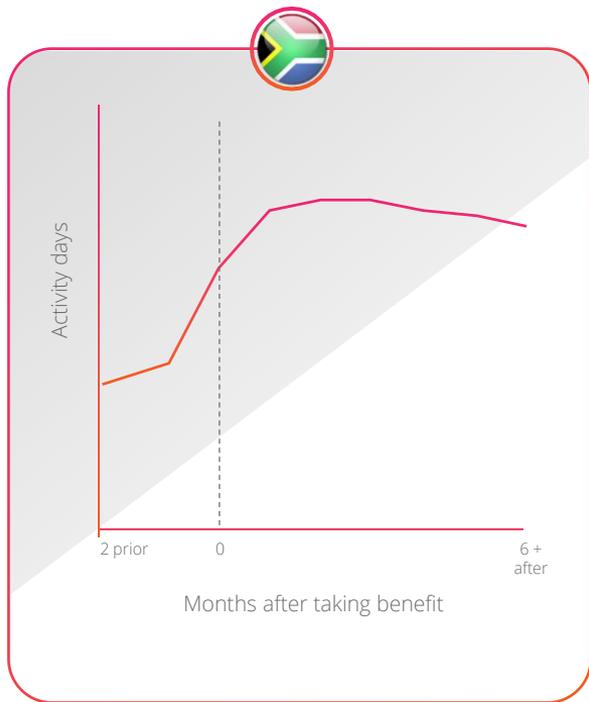
 Light	+27%
 Standard	+31%
 Advanced	+49%

SIGNIFICANT INCREASE FOR HIGHER-RISK MEMBERS

Increase in physical activity for members with a BMI > 30 and lowest activity quartile

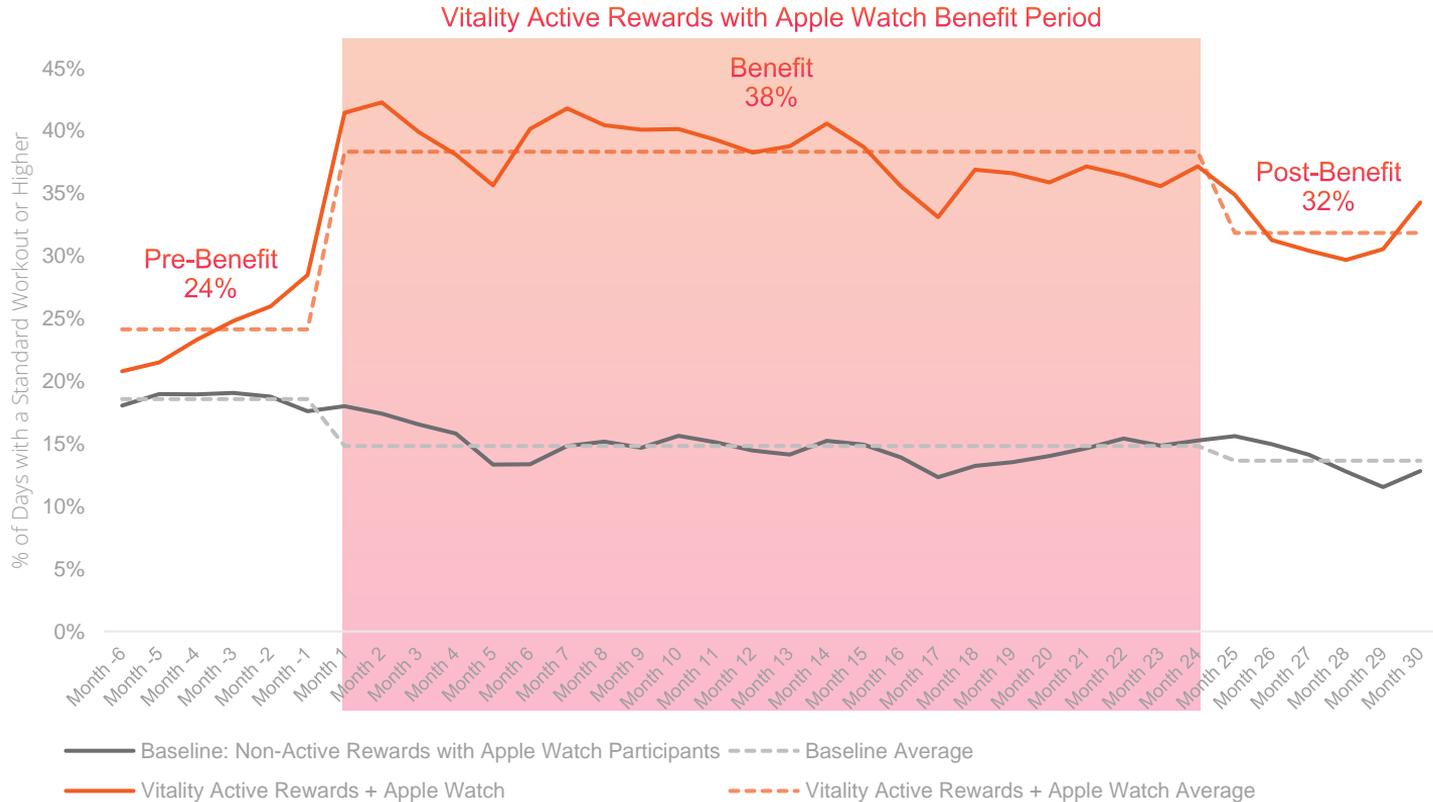
 USA	+206%
 UK	+160%
 South Africa	+109%

Increase in physical activity is sustained



Good Activity Behaviors Persist Post the Benefit Period^{1,2}

Though there is a slight decline in activity following the completion of the benefit, members maintain activity profiles higher than their pre-benefit levels



1. The eligible population is comprised of employees who participated in the Vitality Active Rewards with Apple Watch program and continued to engage with Vitality for six months following the completion of their initial 24-month goal cycle. Individuals also had to have been device users prior to their engagement in the benefit to eliminate the tracker effect.

2. The Vitality Active Rewards with Apple Watch population consisted of 608 individuals, whilst the baseline or reference population consisted of 969 individuals. Samples are derived from two large Vitality clients.

Vitality **Active Rewards**



Personalized

Dynamic

Gamified

Vitality Active Rewards is a proven driver of behavior change in its own right

Active Rewards is associated with a 33% increase in tracked activity



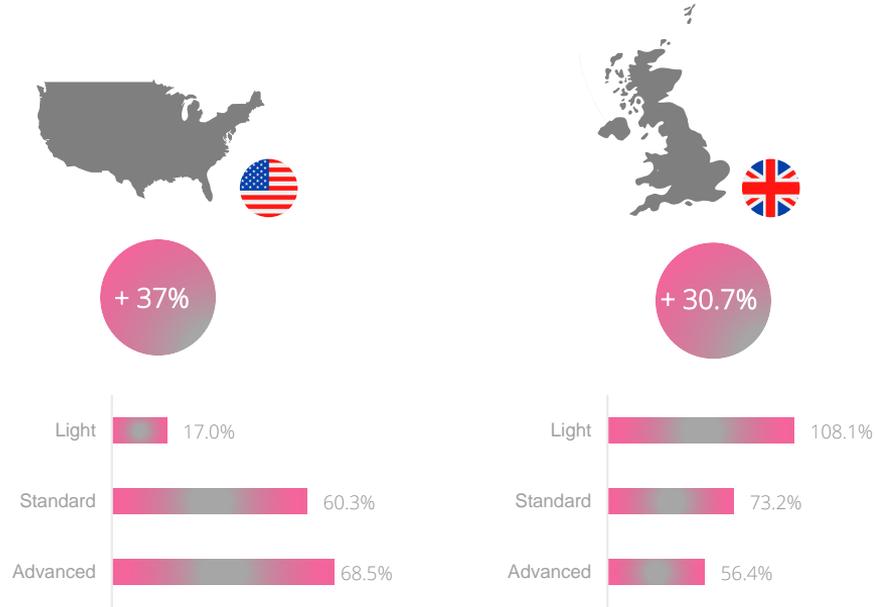
This diagram is for illustrative purposes only, and does not form part of the study conducted by RAND Europe

Loss-framed incentive:

Increase in activity after taking up Active Rewards with Apple Watch

Gain-framed incentive:

Increase in activity after taking up Active Rewards



“Empirical findings for the United Kingdom and the United States suggest that on average, participating in **Vitality Active Rewards** is associated with an increase in total tracked activity of about 33 percent (UK: 30.7 percent; US: 37 percent) compared to when participating in the **Vitality** program alone, without either activating Active Rewards or taking up the Active Rewards with Apple Watch benefit.”

-RAND Europe



What's for lunch?

Vitality uses rich incentives to tackle poor nutrition

Scientific process of healthy food selection

	Fruits and vegetables 3 000 products
	Grains and cereals 1 425 products
	Lentils and legumes 373 products
	Chicken, fish, meat 479 products
	Milk, dairy 479 products
	Vegetable oils, nuts 536 products

89 000 products assessed

Material discounts and easy in-store visibility and access



BUY BETTER

COOK MORE OFTEN

Benefit is felt at the point of sale



Pick n Pay
Inspired by you

PLEASE RETURN AS YOUR GUARANTEE
CUSTOMER CARE LINE: 0800 11 22 88

MINERAL WATER STILL 000		12.99
WHITE GRAPES BOX 000 # VIT		24.99
F/F STRAWBERRY YOG 000 VIT		14.99
CHICKEN STIRFRY 000		10.09
LOW FAT CHEESE VP 000		25.99
BABY MARROWS 000 # VIT		11.99
PRETZELS SESAME RING000		18.39
CHIPS CARIB/ONION&B/000		7.29
ITEMS	8 TOTAL	126.72
BANK CARDS		126.70
CARD-NO	*****3013	
Rounding		0.02

TAX EXEMPT INDICATOR *
NON-TAXABLE INDICATOR #
DISCOVERY VITALITY VIT

TAX INVOICE
VAT REG NO. 4390107474

*7576 2621/012/032 10.01.09 11:58 AC-00

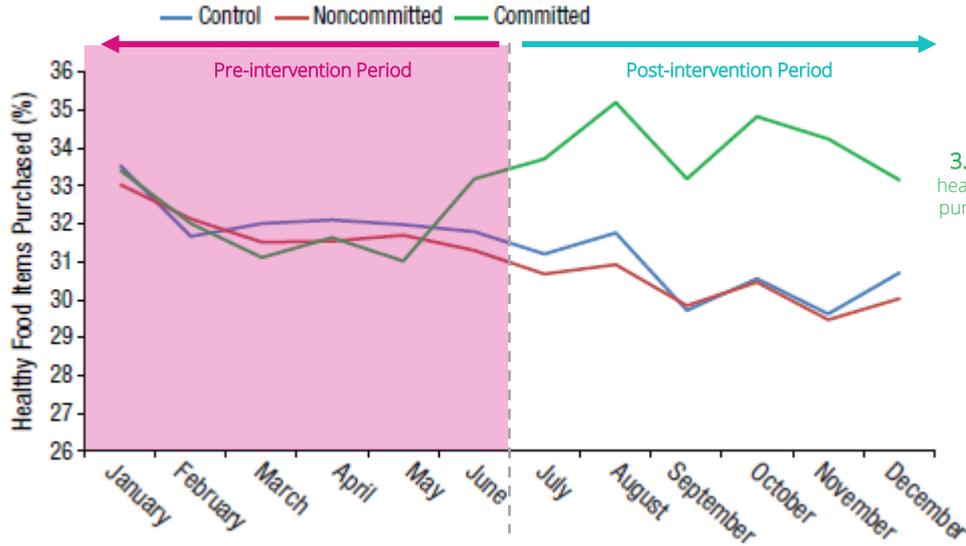
Discovery Vitality members save up to 25% on HealthyFood™.
Visit www.discovery.co.za
Now more than ever it pays to be healthy!

A Vitality Case Study: HealthyFood Program

Study 3

Voluntary self-control commitment tested within a sample of 6,570 households

Self-aware consumers will seize opportunities to create restrictive opportunities to create restrictive choice environments for themselves.



3.5% increase in healthy grocery items purchased in each of the 6 months

Groceries and private companies are increasingly offering incentive programs to encourage healthier lifestyles (e.g., Patient Protection and Affordable Care Act, 2010). Motivated consumers will undoubtedly be drawn to these programs with good incentives of eating healthier foods, smoking less, and exercising more. A long stream of research from the behavioral sciences, however, suggests that standardizing good intentions into real behavior requires precisely the type of persistent self-control that proves to be quite challenging (e.g., Muraven & Baumeister, 2000) and might not be fully achieved by rewards alone. This raises an important question regarding what types of incentive designs are necessary to activate and maintain engaging self-control.

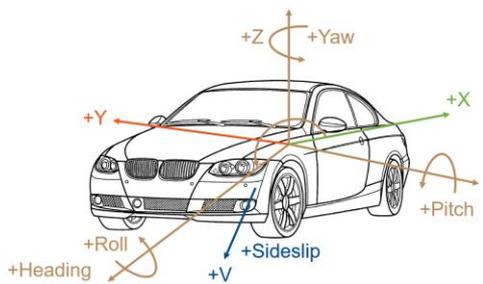
Financial incentives are a long-standing and attractive approach to improving self-control, particularly in situations in which restraint is needed in the present, the deleterious effects of poor choices are cumulative rather than immediately punishing, and the rewards are irrevocable or delayed (Mazur & Michael, 1990). This may be especially true in the health domain, where the immediate gratification of any one instance of overeating, drinking, or smoking is pined against an elusive reward of

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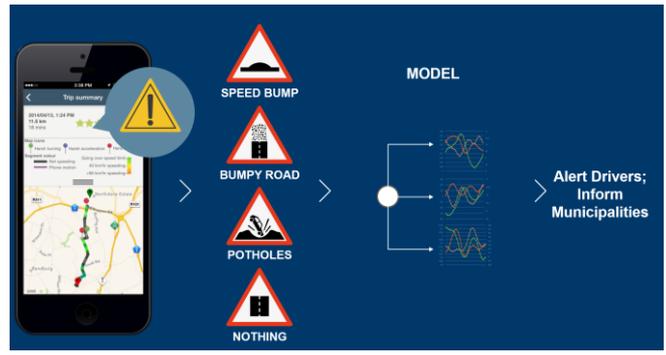
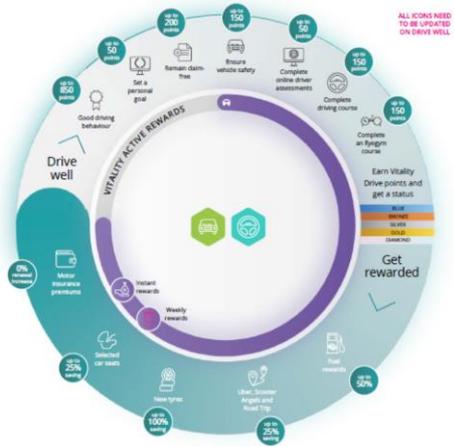


Discovery Insure

Pothole detection with telematics data



The Vitality Drive programme



Be Responsible

GUIDELINE

01

Build health technologies informed by science



It is absolutely critical that health technology is based on sound evidence.

—Michael Sagner, President, European Society of Human Genetics, Paris, France

GUIDELINE

02

Scale affordable health technologies



Healthcare improvement and innovation efforts must be efficient, scalable, equitable, and transparent.

—Andrey Ostrovsky, Co-Founder, Care at Hand, MA, USA

GUIDELINE

03

Guide interpretation of health data



The people who can benefit the most ... often have troubles with the usability and utility of many personalized health technologies.

—Ryan Shaker, Assistant Professor, Duke University, NC, USA

GUIDELINE

04

Protect and secure health data



Privacy-by-design and integrated security mechanisms are the way to go.

—Bartha Knoppers, Director of the Centre of Genomics and Policy, McGill University, Quebec, Canada

GUIDELINE

05

Govern the responsible use of health technology and data



Markets can incentivize irresponsible behaviors. Companies need to build their trustworthiness to gain our trust.

—Hillary Sutcliffe, Director, MATTER – Making New Technologies Work For Us All, England, United Kingdom

SCIENCE

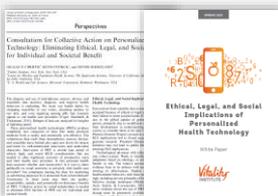
SCALABILITY

INTERPRETABILITY

DATA PROTECTION

GOVERNANCE

Source: Vitality Institute. *Ethical, Legal, and Social Implications of Personalized Health Technology*. Available from: <http://thevitalityinstitute.org/projects/personalized-health-technology/>.





Thank You.

francois.millard@vitalitygroup.com

Vitality®