



# APPLYING BEHAVIOURAL INSIGHTS IN HEALTH

## TACKLING KEY NON COMMUNICABLE DISEASES

Report of the WISH Policy Briefing on  
Behavioural Insights 2018

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# FOREWORD

Planning and preparing to host the FIFA World Cup is a momentous task for any host nation. The spotlight of the world is directed toward your country and delivering a successful event that leaves behind a lasting legacy is of paramount importance. The 2022 FIFA World Cup is the first time the event will be held in the Middle East and we are cognisant of the responsibility we have to ensure that we maximise the enormous potential that an event of this magnitude has for improving people's lives in Qatar and beyond.

Many of the challenges we face as we implement our various initiatives encompass a variety of themes: encouraging healthy lifestyle, environmental sustainability, worker welfare, entrepreneurship, inclusion and accessibility. All of these themes have behavioural roots. We decided to inaugurate the B4development Foundation (formerly QBIU) – the first Nudge Unit in the Middle East – to complement our work on these themes and to supplement the traditional levers that often overlook the importance of human behaviour in successfully implementing policy.

Encouraging healthier lifestyle is an important pillar in our World Cup vision. Sport and sporting events can serve as an important experimentation ground for behavioural insights when it comes to tackling non-communicable diseases. The connection between sport and healthy lifestyle is obvious. Physical activity reduces the risk of diabetes and cardiovascular disease. What we seek to find out through the B4development (B4d)'s work is what are the behavioural instances that lead people to choose not to exercise or to exercise less? How can we provide the right 'nudges' to assist our local population to prioritise physical activity?

This report outlines an experiment undertaken at a Mosque during the holy month of Ramadan, in which health practitioners set up diabetes tests for worshippers. The results are telling. One third of those tested discovered they had diabetes. Bringing the test to a large public gathering proved far more effective than relying on solely on people's own initiative. Sporting events provide a similar opportunity to set up experiments relating to non-communicable diseases.

B4development (formerly QBIU) is already supporting other regional behavioural insights units on similar initiatives around sports events. In one case, marathon runners were "nudged" in an easy and timely way to screen for high blood pressure which provided continuous monitoring for some participants and early warning or detection for others.

It is important that policymakers and health practitioners recognise this opportunity and work collaboratively to ensure that such tests become a regular occurrence at sporting events.

Leaving a legacy of a better future for the people of our country and our region is the vision that drives us. Behavioural insights is a vital tool in ensuring that vision is implemented to its fullest. I am already encouraged to see that future events are building upon this work. The successful 'United' (United States, Mexico, and Canada) bid for the 2026 FIFA World Cup included a specific section on behavioural insights, underlining its importance in attaining a sustainable legacy. The trend will surely continue to strengthen in the future as society and decision-makers recognise the value that behavioural insights provide, and in particular when combined with sport and sporting events.



H.E. Hassan Al Thawadi  
Secretary General  
Supreme Committee for Delivery & Legacy

## EXECUTIVE SUMMARY

Behavioural science is a field that draws on insights and methods from many disciplines including psychology, economics, sociology, anthropology and neuroscience. Fundamentally, it challenges the view that people always behave with rational self-interest. Evidence shows that people often make decisions intuitively, effortlessly and with little conscious awareness. Over the past decade, the use of what are referred to as ‘Behavioural Insights’ as the application of evidence and theory from behavioural science to public policy issues, has risen to prominence, thanks in large part to the work of pioneers such as Herbert Simon, Daniel Kahneman and Richard Thaler, who were awarded the Nobel Prize in Economics in 1978, 2002 and 2017, respectively. Behavioural science has moved from a fringe activity to one that is increasingly valued by policymakers and regulators. In fact, “nudge” units and behavioural insights initiatives have been established around the world, to tackle policy challenges that have behavioural roots, such as a wide range of health issues, including Non-Communicable Diseases (NCDs).

Non-Communicable Diseases (NCDs) are responsible for about two thirds of deaths worldwide, mostly in low- and middle-income countries. In contrast to communicable diseases, NCDs require a different policy approach – one that involves promoting healthy behaviours. This report is focused on the application of behavioural insights to tackle three NCDs: diabetes, cancer and cardiovascular disease (CDVs). We start by looking at the incidence of these NCDs and the risk factors associated with their development, most notably lifestyle related behaviours such as physical inactivity and unhealthy diet. We then share cases where behavioural insights have been used to tackle these NCDs. For each of these NCDs we cover three stages of the “behaviour change pathway”: healthy lifestyle for prevention (primary prevention), screening for early detection (secondary prevention) and adherence to treatment (tertiary prevention).

The number of people with diabetes have increased four-folds in the last 35 years. Physical inactivity and unhealthy eating are among the major risk factors of the disease. Regular screening tests are vital. Early diagnosis reduces the risk of developing diabetes complications and increases the success rate of the treatments. Once diagnosed, metabolic monitoring, medication adherence, healthy eating, and being active are the main recommendations for diabetic patients. Many patients fail to adhere to their prescribed treatment, often leading them to experience costly comorbidities. The use of behavioural insights can play an important role in preventing diabetes through encouraging healthy lifestyle behaviours, encouraging detection of the disease by improving take-up of screening tests and improving treatment adherence of patients.

CVDs are reportedly responsible for 17.9 million deaths globally which makes them the number one cause of death. Even though healthy lifestyle guidelines (e.g. adopting a healthy diet, engaging in regular physical activity, avoiding tobacco) are widely known, people do not abide by them and are slow in adopting healthy lifestyle behaviours. Adherence to medication and health recommendations becomes the most important behaviour once a person is identified as at risk of CVDs or is diagnosed with CVDs. Behavioural interventions addressing the issue of adherence can be useful in the short term, by helping patients to better control their blood pressure but also in the long term, by helping them to avoid costly comorbidities like cardiovascular disease and stroke. For the health care system, reduction in the number of such complications can be associated with significant savings.

Cancer is the second leading cause of death globally and is responsible for an estimated 9.6 million deaths in 2018. Following key health guidelines for lifestyle, such as diet and physical activity, remains a preventative measure for many NCDs including cancer. However, unlike diabetes screening, which can also be preventative, cancer screening is essentially diagnostic: early screening can lead to more timely diagnosis and effective treatment. Therefore, behavioural insights focused on motivating people to attend cancer screenings offer the biggest potential to influence cancer outcomes.

Evidence from a large number of behavioural interventions has shown that the use of behavioural insights to tackle NCDs such as diabetes, cardiovascular diseases and cancer can be a valuable policy lever that complements traditional tools. This said, the focus going forward should include new areas of healthcare, improved and egalitarian access to health services, bringing artificial intelligence, data analytics and big data to health decision making, and finally, new governance models to embed behavioural insights and initiatives inside organizations across the healthcare value chain.

## SECTION 1: APPLICATIONS OF BEHAVIOURAL INSIGHTS TO HEALTH

A significant number of years of healthy life are lost worldwide due to lifestyle factors such as smoking, alcohol misuse and poor diet.<sup>1</sup> For example, around one half of all deaths in the United States are attributable to personal behaviours.<sup>2</sup> Health losses as a consequence of lifestyle are particularly prevalent amongst the poorer in society, and significant gains in population health may be achieved by changes in the choices people make.<sup>3</sup>

Noncommunicable diseases (NCDs) include diabetes, cardiovascular disease, cancer, chronic pulmonary disease, and mental health illnesses. NCDs are the biggest cause of mortality and morbidity, and hence the most important health problem which we face in this century.<sup>4,5</sup> The United Nations and the World Health Organization have made political declarations about the impact of NCDs on human development and urged countries to make voluntary commitments to the goal of reducing global mortality of NCDs. Noncommunicable diseases require a policy approach that involves promoting healthy behaviours.<sup>6</sup>

Given that NCDs are responsible for about two thirds of deaths worldwide, mostly in low- and middle-income countries, nowadays many countries around the world have policies to deal with the burden.<sup>7</sup> It turns out that prevention of NCDs is possible, particularly through population-based approaches that address behavioural risk factors such as unhealthy diet, lack of physical activity, tobacco use, excessive drinking of alcohol and others.<sup>8</sup> Therefore, we need more evidence-based interventions to reverse this pandemic of diseases such as diabetes, stroke, cancer, liver disease, and osteoarthritis. Even though there are some successes (for example, population-wide improvement in diet has been shown to help reducing cardiovascular disease morbidity and mortality), implementing such policies will require governments to redirect their health systems toward population-level behaviour change interventions that prevent NCDs,<sup>9</sup> or create sustainable health systems altogether.<sup>10</sup>

Traditionally, behaviour change policies have tended to focus on providing economic or legal incentives or information to influence behaviour.<sup>11</sup> Such interventions rely on influencing the way people consciously think about their behaviour: if we can change people's motivations and intentions, they will change their behaviour accordingly. These interventions can only get us so far. Take smoking as an example – whilst rises in the tax on tobacco has been seen to reduce overall levels of smoking, they may also serve to increase the proportion of smokers using potentially more harmful smuggled tobacco.<sup>12,13</sup> Moreover, educational campaigns may facilitate attempts to quit but may also further widen the disparities in the prevalence of smoking between higher and lower-educated individuals.<sup>3</sup>



Applying this behavioural insight, a randomised trial of financial incentives for encouraging weight loss found that they could be effective when people are at risk of losing money from a deposit contract, in contrast to offering a financial incentive contingent on people achieving their weight goals which leads to less weight loss.<sup>15,16</sup>

Our new understanding of human decision-making, its ‘rational’ as well as ‘irrational’ aspects, provides us with opportunities to influence choices that take better account of how people actually respond to the context within which they make their decisions – the ‘choice architecture’. This approach is popularised in the Nobel Laureate Richard Thaler and Cass Sunstein’s book ‘Nudge: Improving decisions about health, wealth and happiness’. The theory underpinning many of the policy suggestions is built on decades of research in the behavioural sciences.<sup>17</sup> The revolutionary idea was that the same errors that trip people up can also be used to help them make better choices.

Thaler and Sunstein define ‘nudge’ as any aspect of the choice architecture that alters people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives”, while the term ‘choice architecture’ is defined as the environments within which people make choices.<sup>17</sup>

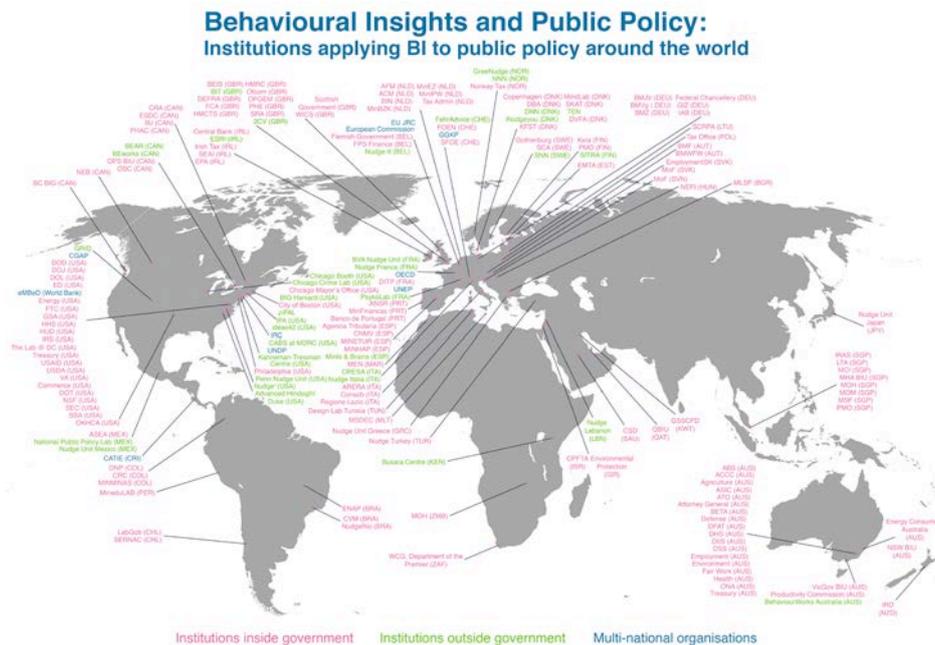
However, just knowing those biases is often not enough to design interventions, because the definitions do not describe specific techniques to change behaviour. At the request of the Cabinet Office (a department of the UK Government responsible for supporting the Prime Minister and the Cabinet), a group of behavioural scientists developed a practical framework for using nudge-type interventions. The framework developed is MINDSPACE which served as the initial operating framework for work of the Behavioural Insights Team - the world’s first government organization devoted to the application of behavioural science to better policy making.<sup>18,19</sup> MINDSPACE (described in [Appendix 2](#)) is an acronym that describes nine robust effects on behaviour (Messenger, Incentives, Norms, Defaults, Salience, Priming, Affect, Commitment, Ego) which operate largely on the automatic processes (in contrast to the reflective processes targeted by more traditional behaviour change techniques).<sup>20</sup> Other similar frameworks have emerged to inform the design of behavioural interventions. For example, SHAPE DIFFERENCE, jointly developed by B4development (formerly QBIU) and Nudge Lebanon, which includes 15 behavioural tools such as feedback, hassle simplification and norms, essentially targeting mostly automatic processes (see [Appendix 2](#)). There are also other popular frameworks for designing effective behaviour change interventions.<sup>21,22</sup>

Given the limitations of traditional approaches, policies that change the context or ‘nudge’ people in particular directions have captured the imagination of policymakers. Behavioural science (also sometimes referred to as behavioural economics) provides new ways to think about the barriers and drivers of a range of behaviours. The attractiveness of using behavioural insights is in part due to the perceived potential to offer low cost, non-paternalistic solutions to societal challenges.<sup>23</sup>

In the UK, after creating the Behavioural Insights Team in 2010 (which has since become a purpose company), Government has continued to take a particular interest in using these approaches in order to encourage and enable people to make better choices. The UK Department of Health also declared at the time that they would explore nudging people in the right direction rather than restricting their choices.<sup>24</sup> When Public Health England was set up, in 2013, it established its own behavioural insights team, Public Health England Behavioural Insights (PHEBI). Other western countries including France, the Netherlands, Australia and the United States have also explored the potential of behavioural science to improve the effectiveness of public policy. Behavioural insights initiatives now exist in many government departments. They are tasked with finding low-cost ways of using behavioural science to change behaviour at a population level. These recent developments have popularised a language of nudges.

Since then, several governmental behavioural insights team and nudge unit have been established across the globe (see [Figure 2](#)). Many of these units – typically consisting of policy experts, economists, behavioural scientists, psychologists, and data analysts – were initially positioned at a very senior level in Government, including offices of Presidents, of Prime Ministers as well as Supreme Councils. Recently, a more focused types of units operating within ministries are emerging.<sup>25</sup> The number of such units with dedicated institutional set-ups has exceeded 50 inside governments.<sup>26,27</sup> Such accounting does not take into consideration many governmental teams involved in applying behavioural insights to their policy challenges that do not call themselves behavioural insights units. Similar initiatives have been launched within academia and non-governmental organizations, as well as the private sector.

**Figure 2: Institutions applying Behavioural Insights (BI) to public policy around the world**



Source: OECD Research 2018<sup>28</sup>

In the Arab region, Qatar set up the first nudge unit, the B4development (formerly QBIU), in 2016, which was incubated within the Supreme Committee for Delivery and Legacy. Sports and healthy lifestyle are at the heart of B4development focus areas. Lebanon and Kuwait followed suit and established their own behavioural set-ups: Nudge Lebanon as a nongovernmental organization, and the Kuwait Policy Appraisal Lab (KPAL) within the General Secretariat for the Supreme Council for Planning and Development.<sup>29</sup>

In this document, we look at applications of behavioural insights to public health, with a particular focus on three non-communicable diseases (NCDs). We start by looking at incidence of these NCDs and risk factors associated with their development, especially lifestyle related factors such as physical inactivity and unhealthy diet. We then share insights from experiments, as case studies, where behavioural techniques have been used to tackle these NCDs. Policy-makers and programme managers could either implement these interventions or use the case studies to stimulate and support development of new interventions and evaluations.

We use a 'behaviour change pathway' approach and cover three stages for each of these NCDs (see [Figure 3](#)):

- Lifestyle & Prevention (primary prevention)
- Detection & Monitoring (secondary prevention)
- Treatment & Adherence (tertiary prevention)

**Figure 3: Behaviour change pathway to preventing NCDs**



Source: B4d

Those three stages are about disease prevention, detection and diagnosis of disease, and the management of disease. The first step should be to focus on lifestyle and prevention through getting people to adopt healthier lifestyles, i.e. making healthier food purchases in restaurants, cafeterias, supermarkets, etc., and engaging in physical activity. In addition to encouraging the adoption of a healthy lifestyle as a primary NCDs prevention method, behavioural science can help in the early detection of NCDs through screening and monitoring. In fact, behavioural insights have been widely used to increase uptake of screening for diabetes, cancer and cardiovascular diseases. Once an individual is diagnosed, adherence to treatment and recommendations given by the physicians becomes a critical behaviour. At this stage, interventions based in behavioural science can be used to steer individuals' behaviour towards better compliance for more effective and successful treatment.

The final section consolidates the key messages by highlighting the behavioural solutions in which countries devoted to combating NCDs should take forward. We propose several 'next steps' and key implications for the region – how to integrate behavioural insights in research and healthcare.

## SECTION 2: FOCUS ON BEHAVIOURAL INSIGHTS AND DIABETES

Diabetes is a chronic metabolic disease characterised by elevated levels of blood glucose (or blood sugar), which, over time, leads to serious damage to the heart, blood vessels, eyes, kidneys, and nerves. There are two types of diabetes: Type 1, which is a chronic condition in which the pancreas produces little or no insulin by itself and Type 2, which occurs when the body becomes resistant to insulin or does not make enough of it. The prevalence of diabetes is drastically increasing around the world. According to the International Diabetes Federation, there were 410 million people living with diabetes worldwide (90% were diagnosed with Type 2 diabetes).<sup>30</sup> The first World Health Organisation (WHO) Global Report on Diabetes stresses the enormous scale of the diabetes problem, and also the potential to reverse current trends given the present political basis for concerted action to address diabetes (evident in the Sustainable Development Goals, the United Nations Political Declaration on NCDs, and the WHO NCDs Global Action Plan).<sup>31</sup>

The prevalence of diabetes has risen considerably in the past three decades in countries at all income levels. The global prevalence of diabetes almost doubled between 1980 and 2014; it has grown from 4.7% in 1980 to 8.5% in 2014. In comparison, prevalence of diabetes in the Eastern Mediterranean Region more than doubled during the same period, as it increased from 5.9% in 1980 to 13.7% in 2014. According to the data provided by the WHO, diabetes prevalence has risen faster in low- and middle-income countries than in high-income countries.<sup>31</sup> The number of people with Type 2 diabetes in the GCC countries has dramatically increased in the past twenty years and is expected to double by 2035, given the current prevalence in adults (20–79 years) in each of the GCC countries (17.6% in KSA; 14.3% in Kuwait; 13.5% in Qatar; 9.9% in Oman; 15.6% in Bahrain; and 14.6% in UAE) which is higher than the global prevalence of 8.8%.<sup>30,32</sup>

## LIFESTYLE AND PREVENTION

Environmental factors play a role in the development of diabetes. Some of these risk factors include unhealthy eating and physical inactivity. An increase in fatty tissue increases the resistance of cells to insulin. On the other hand, physical activity uses up glucose as energy and increases the sensitivity of the cells to insulin. Against this background, healthy lifestyle can prevent diabetes and even reverse it. This truth was revealed by a large, and long-term study: the Diabetes Prevention Programme.<sup>33</sup> This programme's comprehensive diet and lifestyle intervention aimed to change participants' daily habits. It included sixteen sessions teaching nutrition and behavioural strategies for weight loss and physical activity, lifestyle coaches with frequent contact with participants, and supervised physical activity sessions. The results revealed that after three years, this intervention led to 58% lower risk of developing diabetes. This effect of lifestyle change was maintained even after 10 years – the participants still had a 34% lower risk of developing diabetes. An important finding was that older participants (aged 60+) had an even better response, a 71% lower risk of developing diabetes. Another very important finding was that the effect was similar for genders and all racial and ethnic groups. The following case study demonstrates how behavioural design of financial incentives can effectively reduce weight and diabetes risk.

### **Diabetes Case Study 1 - Effectiveness of Financial Incentives in a Worksite Diabetes Prevention Programme<sup>34</sup>**

#### **Executive Summary: Weight Management**

In order to increase adherence to a 16-week weight loss programme (diabetes prevention program), employees in select worksites were offered a choice between two types of financial incentives: a "standard incentive" scheme, and a "standard incentives + deposit" scheme. Employees who were offered the incentives were, on average, more likely to lose weight, reduce their BMI, and reduce their diabetes risk score (DRS) relative to participants in the non-incentive worksites. Additional measures at the end of a 12-week follow-up period revealed that participants in the "standard incentive" scheme were three times more likely to achieve their target weight loss relative to participants who did not receive any incentives. Likewise, those who opted for the "standard incentives + deposit" scheme were two times more likely to achieve their weight loss goal compared to the non-incentivised participants.

## Problem

There is considerable evidence demonstrating the effectiveness and cost-effectiveness of lifestyle changes (weight loss, improved diet, and increased physical activity) in the prevention of chronic diseases such as diabetes. As such, many employers offer employees at risk of developing Type 2 diabetes the opportunity to enrol in wellness programmes designed to improve their health. However, the adherence of employees to these programmes remains a major challenge.

## Solution

A sample of 99 overweight or obese employees (BMI = mean  $34.8 \pm 7.4$  kg/m<sup>2</sup>) who are at risk of developing Type 2 diabetes, participated in a 16-week weight-loss programme, designed to test the impact of behaviourally designed financial incentives on their adherence to the programme. Employees at four worksites (two control worksites; two treatment worksites) voluntarily enrolled into the programme. Those assigned to the incentive group were offered a choice between two options:

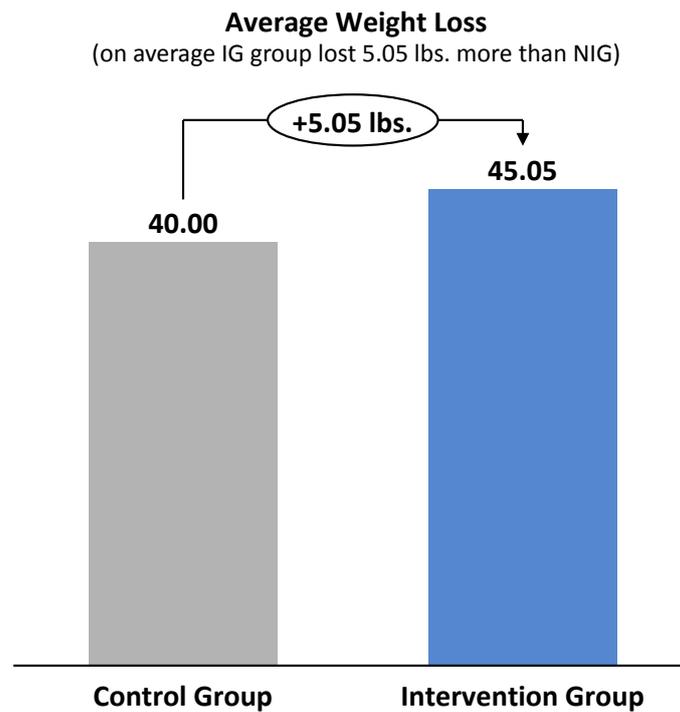
1. A “standard incentive” scheme; in which employees received a cash award if they attained their target weight loss, and
2. A “standard incentive + deposit” scheme; in which overweight employees deposited 1\$-5\$ per pound and obese employees deposited the same amount per pound and a half that they were planning to lose during the programme. This amount was then matched by the company and returned to the participants if the weight loss goal was attained. If not, the money was donated to the worksite health promotion programme.

All participants received a one-hour consultation to learn about healthy weight loss and to set their weekly weight-loss goals. Participants were encouraged to keep track of their daily calorie intake and physical activity records. All of the participants signed a contract committing to the programme.

## Impact

Absolute weight, BMI, waist-to-hip ratio, DRS, and systolic and diastolic blood pressure were measured. On average, participants in the incentive group were more likely to lose weight (MD=5.05lbs,  $p=0.027$ ), reduce their BMI (MD=1.73,  $p=0.04$ ), and their DRS (MD=1.26,  $p=0.011$ ) compared to participants in the control group by week 16. Additional measures 12-week following the programme revealed that participants in the “standard incentive” were three times more likely to achieve weight loss goals than participants in the control group, while participants in the “standard + deposit incentive” group were twice more likely to do so (OR=2.2,  $p=0.042$ ). Moreover, those in the “standard + deposit incentive” group reduced their DRS by 0.4 ( $p=0.045$ ) relative to the control group. This study shows how lifestyle change is achievable by applying

behavioural insights such as loss aversion (our responses to incentives are shaped by predictable mental shortcuts such as strongly avoiding losses because we dislike losses more than we like gains).



## DETECTION AND MONITORING

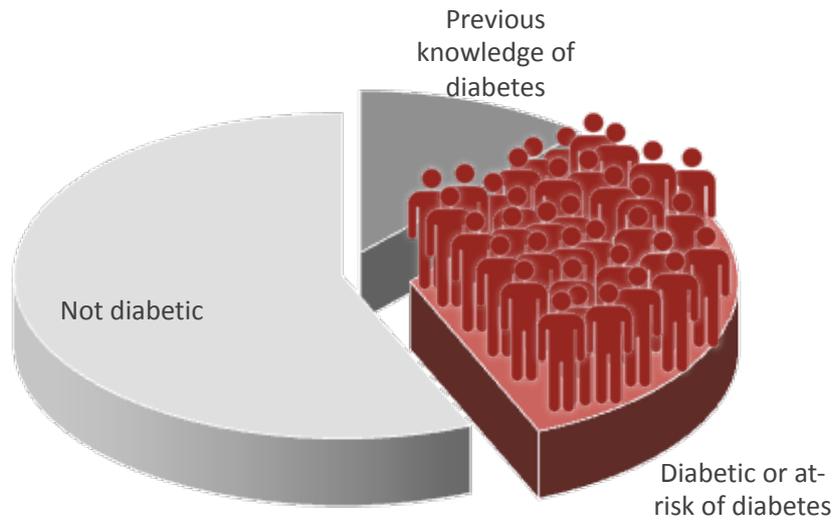
People with diabetes may not have any symptoms, therefore, screening tests are essential. The earlier the diagnosis, the lower the risk of developing diabetes complications and the better the chance of treating the disease appropriately and keeping the patient healthy. In fact, the American Diabetes Association (ADA) recommends universal screening of adults age 45 and older every three years or more frequently if the individual is overweight and has one or more of the risk factors such as family history of diabetes for example.

***In 2009, it was estimated that one third of people with diabetes are unaware of their condition.<sup>35</sup>***

According to a national representative survey in the United States, only 46.2% of approximately 136 million adults meeting ADA criteria reported attending a screening.<sup>36</sup> This behaviour could be explained by a lack of awareness – not knowing that one meets ADA criteria for diabetes screening, or if individuals are aware of the need for screening, they might be procrastinating by postponing the action to go for screening. Individuals might also consider the screening process as a hassle, for instance the capillary blood glucose testing requires participants to fast for some time before taking the test.

In 2014, to tackle this issue, Action on Diabetes in partnership with Hamad Medical Corporation (Qatar's premier not-for-profit health care provider) used the opportunity during Ramadan Friday prayers to organise diabetes screening in front of the Grand Mosque in Doha. During Ramadan Friday prayers, worshippers had already been fasting for more than nine hours and as such were eligible to take a capillary blood glucose test. In addition, Imams, the leaders of the religious community, were involved in encouraging worshippers to take the opportunity for testing. A total of 20 screening booths, staffed by trained diabetes nurses and educators, were set up to allow worshippers to get screened and receive a personalised analysis of results. They also received advice and recommendations from trained diabetes educators on how to fast safely during Ramadan and reduce the risk of developing diabetes in the future.<sup>37</sup> The timeliness of the intervention – during Ramadan, in addition to the ease of access to screening stations, and the effect of the messenger – the Imam, were effective tools to encourage screening. This initiative found that almost one third of more than 2000 screened were unaware that they had diabetes or were likely to develop the disease (see [Figure 4](#)).<sup>38</sup>

**Figure 4: Proportion of People Diagnosed with Diabetes or at Risk of Diabetes**



Source: Thousands screened for diabetes during Ramadan. (2015)<sup>37</sup>

Health systems need to continue screening and monitoring patients after diagnosis because effectively controlling diabetes requires regular clinical visits and laboratory tests. However, patients might forget to attend or be put off by the aversive experience when giving blood tests.

The following case study describes how behavioural insights can solve such barriers.

#### **Diabetes Case Study 2 - The Effect of Patient Reminders and Gas Station Gift Cards on Patient Adherence to Testing Guidelines for Diabetes<sup>39</sup>**

##### **Executive Summary: Test Taking**

A 3-month pilot program improved rates of receiving HbA1c and LDL-C tests in patients with diabetes by using a letter signed by patients' physicians which informed them of the missing tests and offered each patient a gift card worth \$6 at a local gas station (a "gas card") if they received the tests. During the 2 years following the pilot program, on average, the target patient population received about two thirds more screenings than the matched comparison group, which provides evidence that a small financial incentive coupled with a written reminder can increase test taking (especially the HbA1c screening). The program also found greater control of HbA1c levels among patients who had previously missed screenings.

## **Problem**

Effectively controlling diabetes requires a combination of lifestyle changes and regular clinical visits and laboratory tests. Two important laboratory tests for diabetes control are glycosylated hemoglobin (HbA1c), which measures blood glucose control over time, and low-density lipoprotein cholesterol (LDLC), an indicator of cardiovascular health. Higher patients' adherence to testing helps health professionals to assess the severity of a person's diabetes and allows them to adjust care accordingly.

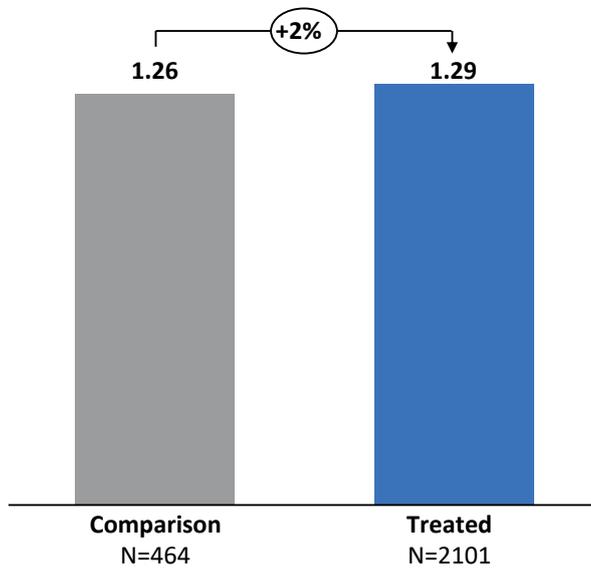
## **Solution**

A 3-month pilot program to improve rates of receiving HbA1c and LDL-C tests by providing screening reminder letters and offering a small financial incentive was conducted. The study uses a quasi-experimental design and compared 464 diabetic patients who received a letter reminding them of screenings and a financial incentive for undergoing screening; there were 693 control patients who received neither a letter nor a financial incentive. The letter was signed by patients' physician, informing them of the missing tests, and offering each patient a gift card worth \$6 at a local gas station (a "gas card") if they received the tests. Such small incentives create a sense of immediate reward (also known as 'present bias' - we prefer more immediate payoffs) which aims to overcome the psychological costs (e.g. discomfort, time hassle, etc) associated with the target behaviour (test-taking). The recipient then could talk with the lab staff and redeem a coupon included with the letter. Upon receiving the tests, patients also received an educational packet outlining the importance of the HbA1c and LDL-C tests.

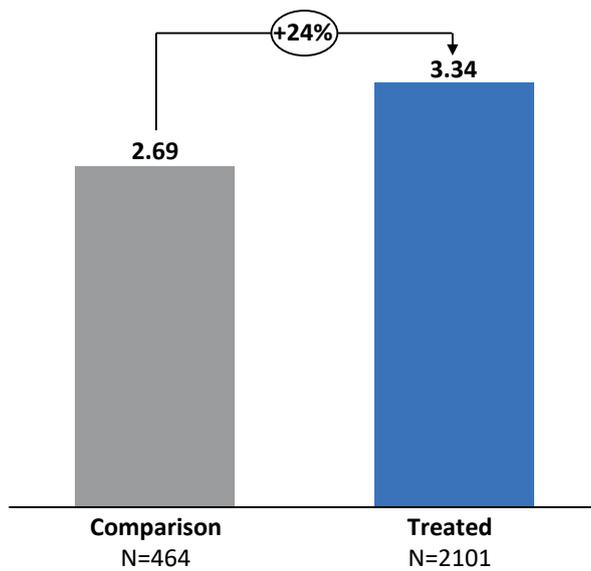
## **Impact**

The pilot program had generally positive effects on the HbA1c test-taking behaviour of the targeted patients. During the 2 years following the pilot program, on average the target patient population received about two thirds more screenings than the matched comparison group, and a smaller proportion of the targeted group had no screenings at all during the period. The improvement appears to persist for a relatively long time period, given the nature of the initiative. The pilot program had a limited effect during the pilot period itself, with each targeted patient receiving 0.21 more LDL-C screenings on average during those 3 months. However, during the following 2 years, the targeted patients were more likely than the comparison patients to receive an LDL-C screening. The results provide evidence that a small financial incentive coupled with a written reminder work to increase test taking (especially the HbA1c screening) and suggest greater control of HbA1c levels among persons who had previously missed screenings.

**Screenings of Patients LDL-C**  
(on average 2 years following the pilot program)



**Screenings of Patients HBA1c**  
(on average 2 years following the pilot program)



## TREATMENT AND ADHERENCE

***Once diagnosed, for people living with diabetes the most important self-care behaviours are medication adherence, healthy eating, being active, and metabolic monitoring.<sup>40</sup>***

Patients' behaviour contributes to the success of their treatment and doctors rely on patients to take their prescribed medication, and change their diet and lifestyle. However, many patients fail to adhere to take their prescribed treatment enough to receive its full benefits. In fact, patients diagnosed with Type 2 diabetes have problems adhering to their treatments: medications, lifestyle change, diet change, etc.<sup>41,42</sup> Non-adherent diabetes patients often experience costly comorbidities, like hypertension, cardiovascular disease, foot amputations, and loss of eyesight. Conversely, in the short term, patients who adhere better may experience improved glucose control, higher energy, changes in treatment, and minimised adverse diabetes symptoms.<sup>43,44</sup> In the long term, better adherence may promote patients' control of risk-factors and improve their quality of life.<sup>45</sup> For the healthcare system, reduction in the number of complications can be associated with significant savings.<sup>i</sup>

Patients may fail to adhere to their treatment for intentional and unintentional reasons.<sup>46</sup> Intentional non-adherence is the result of a conscious decision while unintentional non-adherence is the result of subconscious and automatic factors (patients are generally unaware of such influences). For example, simply forgetting to take the medication is the most common reported unintentional reason of non-adherence.<sup>42,46,47</sup> Educational interventions typically attempt to modify patients' intentional reasons; unfortunately, the benefits of educational interventions are often short-lived.<sup>48-52</sup> The main reason educational interventions tend not to deliver sustained effects is that such interventions are not designed to influence the unintentional reasons patients fail to adhere to their treatment plan. In order to address unintentional factors, recent trials have demonstrated the benefits of telephone interventions to remind patients to pick-up new prescriptions and talk about adherence.<sup>53-56</sup> Text-message reminders are a less expensive way forward.<sup>57-61</sup> Another intervention included real-time monitoring of patients' medication dispenser and sending SMS reminders if the dispenser was not opened during the time period agreed with the pharmacist.<sup>62</sup> The following two case studies show how medication adherence might be enhanced by using insights from behavioural science which target all kinds of reasons for non-adherence.

<sup>i</sup> For example, the NHS spends approximately 10% of its budget on treating diabetes, 60% of which is for treating complications.

## **Diabetes Case Study 3 - Using behavioural science to change behaviour in Type 2 diabetes patients<sup>63</sup>**

### **Executive Summary: Physical activity and diet**

To increase adherence to medication and improve lifestyle choices, a sample of patients diagnosed with Type 2 diabetes were given a poster with several behavioural levers to increase their commitment and adherence to their prescribed treatment. Adherence to medication, diet, and exercise advice were measured via a mobile application, two weeks before and after the intervention. The results revealed that the majority of patients showed improvement in medication adherence and they were also more likely to have a healthy diet and engage in healthy activity levels.

### **Problem**

Many patients diagnosed with Type 2 diabetes have good intentions to adopt healthy lifestyle, but often fail to comply with their medication requirements, dietary and lifestyle advice, especially when these patients are being asked to adhere to a strict schedule of medication, and dramatically change their diet and physical activity levels.

### **Solution**

A sample of 26 patients diagnosed with Type 2 diabetes and struggling to adhere to the necessary lifestyle changes were given a behaviourally informed leaflet consisting of: a) a photo of a loved one to motivate patients (known as messenger effect); b) an image of watching eyes to give subjects the sensation that their behaviour is being monitored (known as priming effect: our acts are often influenced by sub-conscious cues), c) a self-report calendar to help patients keep track of their adherence levels (increasing salience of the progress), d) a promise contract to strengthen the patient's commitment to the programme (known as commitment device because we seek to be consistent with our public promises)

Adherence to medication, diet and exercise advice was measured via a mobile application, two weeks before and after the intervention.

### **Impact**

According to the results 7 out of 10 patients showed improvement in medical adherence. In addition, patients were 45% and 51% more likely to have a "healthy" diet and engage in "healthy" activity levels compared to the baseline. This study shows how a combination of different behavioural insights is often required to achieve a powerful effect on behaviour.

## Diabetes Case Study 4 - Are You Getting the Medication You Need?<sup>64</sup>

### Executive Summary: Taking statins

In order to reduce the risk of heart attack and stroke, diabetic patients enrolled in Oklahoma's Sooner Care programme randomly received one of four letters prompting them to make an appointment with their health care provider and to discuss the use of statins, a class of drugs designed to reduce blood cholesterol levels. Patients receiving the behaviourally informed letter were more likely to fill a statin prescription 60 days following the intervention. These differences disappeared one year following the intervention.

### Problem

A cost-effective way to protect diabetic patients against cardiovascular disease is to use statins – a class of drugs designed to help lower cholesterol levels in the blood, which in turn reduces the risk of heart attack and stroke. Despite the low risk, low cost, and potentially high benefits of statins, many patients do not use them.

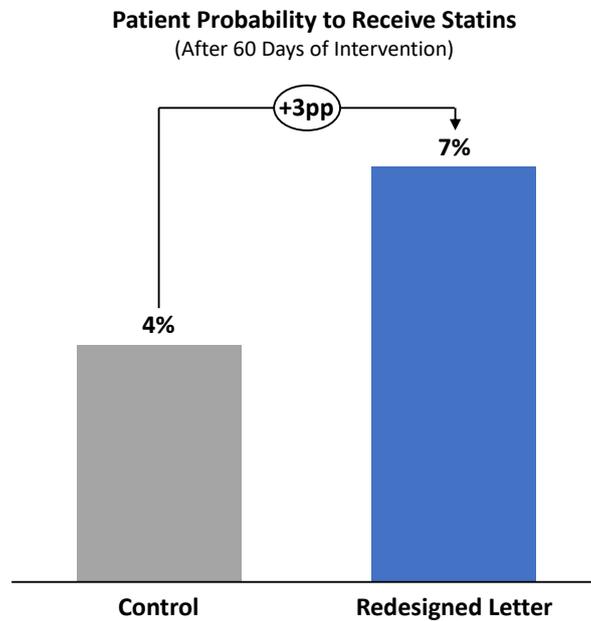
### Solution

A sample of 2,324 diabetic patients were randomly assigned to four groups, each receiving a different type of letter:

- Control group – received a letter asking them to schedule an appointment with their healthcare provider for a cholesterol check and to discuss the use of statins
- Behavioural intervention group - received a letter that included an explanation of the health risks patients were facing, as well as magnetic notepads with personalized reminders, including their doctor's phone numbers
- Financial incentive group – received a letter with a \$5 gift card that can only be activated after seeing a physician
- Behavioural intervention plus financial incentive group - received a behaviourally informed letter with the \$5 gift card

## Impact

The likelihood of patients filling out statin prescriptions was measured 60 days following the intervention. According to the results, patients who received the behaviourally informed letter were three percentage points more likely to receive statins compared to patients in the control group (7% vs. 4%). In contrast, the \$5 gift card financial incentive did not have any impact on patients' procurement of statins. However, an additional analysis testing for long-term effects one year following the intervention, revealed that patients who received the control letter were as likely to fill their statin prescriptions as the behavioural intervention group, suggesting that the intervention did not increase the long-term uptake of statins, but rather prompted patients to act more quickly. A follow-up intervention to maintain the initial behaviour change may be needed in order to achieve a long-term impact.



Weight loss is another health outcome that is very desirable for diabetic patients, but regardless of what interventions people use to lose weight, pharmacological<sup>65</sup> or behavioural (usually a combination of diet change and increased physical activity),<sup>66</sup> the weight is commonly regained.<sup>ii</sup> <sup>67</sup> Therefore, in addition to medication adherence, finding effective interventions for healthy lifestyle and weight loss maintenance is crucial for the long-term success of diabetes interventions.<sup>68</sup> The following case study shows how this objective might be achieved by using behavioural insights to enrol individuals with diabetes in a healthy food programme.

- ii Typically half the weight lost is regained in the first year. Weight regain then continues so that 3-5 years post-treatment about 80% of people return to or exceed their pre-intervention weight. Even patients undergoing weight-loss (bariatric) surgery need to change their pre-surgery diet in order to lose 5-10% of their weight, which is challenging – as many as 50% fail to reach this target.

### **Diabetes Case Study 5 - Randomised controlled trial to test alternative messages to increase enrolment in a healthy food programme among individuals with diabetes<sup>69</sup>**

#### **Executive Summary: Enrolling in a healthy food programme**

To increase the enrolment of diabetic patients in a food programme designed to maintain a healthy diet, patients were randomly sent one of four different messages. All four messages revealed significantly higher programme enrolment rates compared to a no message control group, with the behaviourally enhanced active choice message achieving the best results.

#### **Problem**

Adults with Type 2 diabetes who maintain a healthy diet can reduce their risk of experiencing cardiovascular complications.<sup>70-73</sup> However, maintaining a healthy diet is often challenging, especially considering the increased cost of healthier food options. Enrolment rates to the HealthFood (HF) programme were low, with less than half of eligible members with Type 2 diabetes taking part in the HF programme.

#### **Solution**

A sample of 3906 adults with Type 2 diabetes were randomly assigned to one of five groups in order to test the effect of diabetes-focused messaging on enrolment in the HF program:

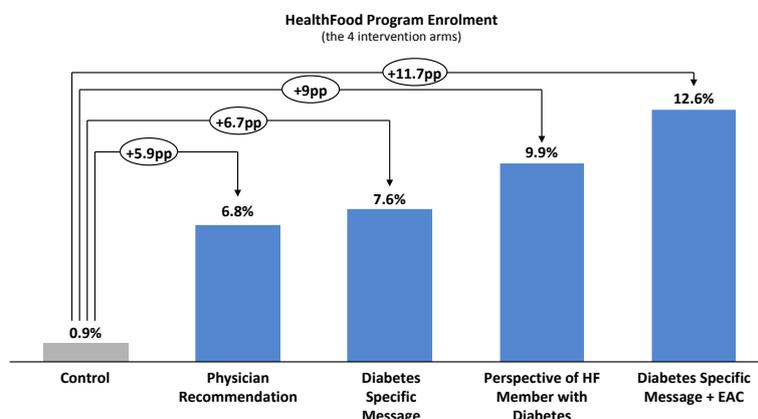
- Control group (N=791), received no message

- Treatment group 1 (N=793), received a diabetes-specific email that mentioned two potential health benefits for individuals with diabetes (better sugar control and weight management)
- Treatment group 2 (N=812), received a diabetes-specific email which included a recommendation from an HF member with diabetes to join the HF programme. This is known as the messenger effect: we are heavily influenced by who communicates information, especially when there are demographic and behavioural similarities between the messenger and the recipient
- Treatment group 3 (N=752), received a diabetes-specific email with a physician's recommendation to join HF; which is another variety of messenger effect: we are affected by the perceived authority of the messenger (whether formal or informal)
- Treatment group 4 (N=758), received a diabetes-specific email + an "enhanced active choice" (EAC). Patients receiving the message were asked to make an immediate choice between two options: "Yes! I want to activate the HealthyFood benefit and get up to 25% cash back on the healthy food I buy" or "No, I'd prefer not to activate and continue paying full price for my healthy food purchases." This intervention utilised behavioural insights related to incentives: our responses to incentives are shaped by predictable mental shortcuts such as strongly avoiding losses (we dislike losses more than we like gains)

All treatment messages contained common elements: a personalized subject line, a description of the benefits of the HF programme and a mention of two potential health benefits for individuals with diabetes (better sugar control and weight management).

## Impact

Enrolment to the HF programme was measured one month after the first email. All four experimental groups had significantly higher HF enrolment rates compared to the control group ( $p < 0.0001$  for all comparisons). Moreover, a pairwise comparison of the experimental groups revealed a difference between the diabetes-specific message group (7.6%), and the diabetes-specific message with the EAC group (12.6%,  $p = 0.0016$ ).



As part of their treatment and metabolic monitoring, patients are usually asked to generate health data such as glucose level, symptoms experienced, lifestyle choices and other biometric health data. Data collected needs to be analysed for patterns and trends in relation to the individual participant, and this data need to be interpreted and shared with the patient in a meaningful way to change the plan of care if needed. It is already known that education and self-monitoring by diabetic patients can help them achieve satisfactory metabolic control, enabling improved management and reduced morbidity and mortality. A recent study systematically reviewed interventions on self-management of Type 2 diabetes in GCC countries and revealed that self-management interventions may have a positive impact on haemoglobin (HbA1) levels. Additionally, the study concluded that a greater emphasis on culturally appropriate self-management programmes may improve the effectiveness of such interventions for adults with Type 2 diabetes in the GCC. The following two case studies describe how such self-management behaviours are encouraged by behaviourally designed incentives.

#### **Diabetes Case Study 6 - Financial incentives for home-based health monitoring: A Randomised Controlled Trial<sup>74</sup>**

##### **Executive Summary: Self-monitoring of health measures**

In order to encourage adherence with remote-monitoring regimens, patients with poorly controlled diabetes were offered the opportunity to participate in a daily lottery with an expected daily reward worth \$1.40 (low incentive group) or \$2.80 (high incentive group) when they used their home-based health monitoring devices. During the three-month intervention period, patients assigned to the low and high incentive groups were more likely to use their devices than the no incentive control group. Interestingly, patients in the low incentive group had higher adherence rates compared to the patients in the high incentive group and to the patients in the control group 12 weeks after the incentives were removed.

##### **Problem**

Ongoing home-based monitoring of health using wireless devices is a promising approach to health management, but its potential use as a tool to improve population health is likely to be limited by low patient adherence.

##### **Solution**

In order to assess the efficacy of a lottery-based incentives in promoting self-monitoring of blood glucose, blood pressure and weight among patients with uncontrolled diabetes, 75 patients with a haemoglobin greater than or equal to 7.5% were recruited. All participants were given three biometric devices to monitor their blood glucose level, blood pressure and weight daily.

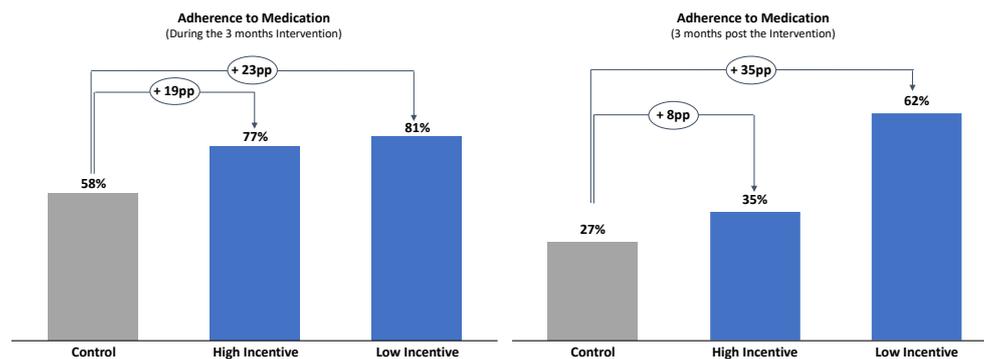
The devices transmitted daily readings to the study website during the 12-week intervention period, and the 12-week follow-up period. The participants were randomised to one of three groups:

- Control group (n=28);
- High lottery incentive group (n=26), in which participants entered a lottery with a chance to win \$100 or \$10 (expected daily value of \$2.8) if they used their three monitoring devices on a given day;
- Low lottery incentive group (n = 21), in which participants entered a lottery with a chance to win \$50 and \$5 (expected daily value of \$1.40), if they used their three monitoring devices on a given day.

Non-adherent participants with a match in the lottery received messages notifying them that they could have won had they used their devices the previous day.

### Impact

The daily use of the three monitoring devices was measured during the 12-week intervention period, and 12-week follow-up period. During the intervention period, patients assigned to the high and low incentive groups were 19% and 23% more likely to report their daily readings, compared to the control group. In addition, patients in the low incentive group were 35% and 27% more likely to report their daily readings than the control and high incentive group in the 12-weeks following the intervention. It seems the most important driver of behaviour change is receiving some incentive but not the size of the incentive (which has been shown in other studies).



## **Diabetes Case Study 7 - Peer mentoring and financial incentives to improve glucose control in diabetic African-American veterans: A Randomised Controlled Trial<sup>75</sup>**

### **Executive Summary: Glucose control**

To help control their glucose levels, a cohort of African American veterans with diabetes were assigned to one of three groups: a control group, a financial incentive group, and a peer mentor group. Those assigned to the peer mentor group were more likely to show improvement in their glucose levels compared to both the control group and the financial incentive group.

### **Problem**

Many patients struggle to follow the treatments recommended by their doctors, especially when these patients lack the support they need from friends and family. As a result, these patients find it difficult to manage and control their sugar blood levels.

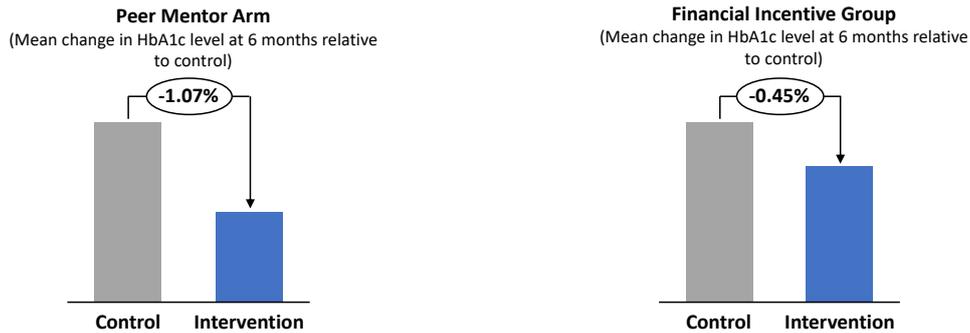
### **Solution**

To help lower their blood sugar levels, African American veterans with poor diabetes control were randomly assigned to one of three groups:

- Control group, in which patients were treated as usual
- Financial incentive group, in which patients were offered the equivalent of \$100 for reducing their blood sugar levels by one point, and \$200 for reducing their blood sugar levels by two points over a six-month period
- Peer mentor group, in which patients were paired with African American mentors who previously struggled with poor glucose control. Mentors were asked to talk to the participant at least once a week. This is known as the messenger effect: we are heavily influenced by who communicates information, especially by the perceived authority of the messenger (whether formal or informal), the demographic and behavioural similarities between the messenger and the recipient, and the feelings we have for the messenger

## Impact

Change in glucose levels were measured 6 months following the intervention. On average, patients assigned to the peer mentor group reduced their glucose levels by 1.1 percentage points compared to the control group (MD= 1.07, CI =-1.84 to -0.31). They also revealed greater improvement in glucose control compared to the patients assigned to the financial incentive group. In addition, the difference between the financial incentive group and the control group was not statistically significant.



***Across the world, since the introduction of mobile phones, technology has been increasingly used to enable diabetes self-management education and support.*** <sup>iii</sup>

Behaviour change technology should include a complete feedback loop which incorporates monitoring, interpretation of data, adjustment of treatment, and communication of tailored advice and repetition of the cycle.<sup>76</sup> The following lessons were learned from systematic reviews of the literature reporting how technology can enable diabetes self-management.

<sup>iii</sup> The American Association of Diabetes Educators offers a robust online software package for diabetes educators (AADE7TM), which supports self-care behaviours and provides a framework to identify essential behaviours for managing diabetes including healthy eating (diet or nutrition), being active (exercise or physical activity), monitoring (remote patient monitoring or self-monitoring of blood glucose), taking medications, risk reduction (avoiding complications), problem solving (shared decision-making and communication between health care providers and participants for the purpose of changing medications), and healthy coping (peer support by others living with diabetes and stress management). It is important to note that such diabetes self-management education and support is implemented by the healthcare team (diabetes educators, nurses, dietitians, health care providers, coaches, community health workers, and others).

### **Review Study - Efficacy of mobile apps to support the care of patients with diabetes<sup>77</sup>**

#### **Problem**

Complications of diabetes including cardiovascular diseases are the leading causes of death globally and are responsible for 50-80% of diabetes deaths. Substantial resources are required to effectively support people to manage their diabetes and prevent death.

#### **Lessons Learned**

##### Education

- Morbidity and mortality rates in patients with diabetes can be reduced by education and self-monitoring for which mobile phones can be used.

##### Self-Monitoring

- Using mobile apps could be helpful in improving control of glucose and in strengthening the perception of self-care by providing better and wider information and health education to the diabetes patients.

**Review Study - A systematic review of reviews evaluating technology-enabled diabetes self-management education and support<sup>40</sup>**

**Problem**

Since the introduction of mobile phones, technology has been increasingly used to support patients with diabetes. There is a need to assess how helpful technology is in diabetes self-management education and support.

**Lesson Learned**

- Technology-enabled diabetes self-management solutions significantly improve glucose levels
- The most effective interventions incorporated all the components of a technology-enabled self-management feedback loop that connected people with diabetes and their health care team using 2-way communication, analysing patient-generated health data, tailoring education, and giving individualized feedback.

## SECTION 3: FOCUS ON BEHAVIOURAL INSIGHTS AND CARDIOVASCULAR DISEASES

The World Health Organization (WHO) defines cardiovascular diseases (CVDs) as disorders of the heart and blood vessels which include coronary heart disease, cerebrovascular disease, rheumatic heart disease and other conditions.

***In 2016, cardiovascular diseases (CVDs) were responsible for 17.9 million deaths globally which makes it the number one cause of death.***

Of these deaths, 85% or 4 out of 5 CVDs deaths are attributable to heart attack and stroke (WHO).

### LIFESTYLE AND PREVENTION

Despite the ominous statistics, 80% of premature heart attacks and strokes are preventable if one abides by healthy lifestyle guidelines such as maintaining a healthy diet (plenty of fruit and vegetables, whole grains, lean meat, fish and pulses, and restricted salt, sugar and fat intake), engaging in regular physical activity (at least 30 minutes of regular physical activity every day helps to maintain cardiovascular fitness) and avoiding tobacco use. Even though these guidelines are widely known, people do not abide by them and are slow in adopting healthy lifestyle behaviours, which results in a high rate of CVDs prevalence and a high number of preventable deaths.

***Behavioural determinants of cardiovascular diseases include knowledge and beliefs such as perceived severity, perceived susceptibility, perceived benefits, and perceived barriers.<sup>78</sup>***

It has been shown that patients with a good understanding and high level of health literacy are more likely to perceive the importance of a healthy diet and physical activity in controlling their disease and are motivated to adopt such behaviours.<sup>79,80</sup>

In terms of specific beliefs, studies have shown that patients whose 'perceived threat' is high were more likely to follow the advice they were given about health-related behaviours.<sup>81</sup> The concept of perceived threat combines two types of beliefs: 'perceived severity' – defined as the beliefs concerning the significance of contracting an illness and the subsequent medical consequences (such as pain, disability, death, and social costs such as the effect on work, family, and relationships); and 'perceived susceptibility' – one's own opinion of the probability of developing a condition.

Another type of belief is the 'perceived benefits' of health-related behaviour, which is a strong predictor of health behaviour change, especially in the CVDs-related areas of stress management, diet and physical activity. Perceived benefits is defined as one's belief that undertaking a recommended action could decrease severity of possible illness. For example, perceived benefits of adhering to healthy diet include controlling hyperlipidaemia and hyperglycaemias, losing or maintaining weight, preventing complications, feeling healthier and living longer.<sup>82</sup>

'Perceived barriers', or one's beliefs about the personal costs of the required action, are also a strong predictor of the likelihood that people will make changes in health behaviour. Perceived barriers related to regular physical activity include difficulties in finding time to exercise due to work or home duties, laziness, tiredness, lack of will, and not having an exercise partner.<sup>83</sup> The most important perceived barriers for following a healthy diet are the cost of healthy food, other family members not accepting patient's diet, and being tired of the taste of healthy food.<sup>84</sup>

However, knowledge and attitude do not always change behaviours that lead to CVDs risk reduction.<sup>85</sup> Therefore, in addition to changing beliefs, behavioural interventions should also address patients' values, motivations and goals.

The following review and case study show that addressing the behavioural determinants of cardiovascular diseases has an impact on people's healthy lifestyle decisions.

#### **Review Study - Efficacy of diet and physical activity behavioural interventions on cardiovascular risk<sup>86</sup>**

##### **Problem**

Unhealthy dietary habits, low levels of physical activity, and high sedentary time increase the risk of cardiovascular diseases, which is a major cause of death and disability

##### **Lessons Learned**

- Behavioural interventions that seek to improve diets and promote physical activity result in modest but consistent benefits across a variety of important intermediate health outcomes including blood pressure, low-density lipoprotein and total cholesterol levels, and obesity
- Increasing intervention intensity (total contact in minutes) exhibits a dose-response relationship whereby higher intervention intensity is associated with larger improvements in intermediate outcomes
- There is very limited evidence on the intermediate and long-term health outcomes of the mentioned interventions

## **CVDs Case Study 1 - Diet and Exercise Are Equally Effective in Reducing Risk for Cardiovascular Disease<sup>87</sup>**

### **Executive Summary: Diet and Exercise**

In order to promote healthy diet habits and physical activity, an RCT was conducted on a community of healthy middle-aged men who had moderately elevated risk factors for CVDs. The intervention consisted of three treatment arms testing the efficacy of diet, exercise, and a combination thereof on cardiovascular risk factors. The results were positive for all treatment arms showing a significant reduction in the CVDs risk (expressed as 10-year risk).

### **Problem**

Studies show that a sedentary lifestyle and lack of physical activity along with unhealthy dietary patterns of high calories, fat and sugar and low in fiber content are associated with an increased risk of cardiovascular diseases (CVDs). However, despite the evidence, peoples' behaviours do not align with best-practices required to prevent poor cardiovascular outcomes. Self-control problems in diet occur because choices and their related consequences are separated in time.

### **Solution**

For this reason, to test the impact of diet and exercise and the combination of the two on cardiovascular risk factors, a six month RCT was conducted with 157 healthy men aged 35-60 years with moderately raised cardiovascular risk factors randomised to four groups: Control (n=39), Exercise (n = 39), Diet (n = 40), and Exercise + Diet (n = 39). Participants in the mentioned groups received individual information about exercise, diet, and exercise plus diet, respectively, by a physician. Participants in the control group were told to continue their lifestyle as before.

### **Impact**

The Exercise, Diet, and Exercise + Diet treatment arms significantly reduced the estimated 10-year risk of CVDs by 12%, 13%, and 14%, respectively. In addition, the intervention had variable positive impact on improving secondary cardiovascular risk factors such as BMI, waist circumference, blood pressure, systolic BP, diastolic BP, Serum cholesterol, VLDL-cholesterol, and LDL-cholesterol. In contrast, neither HDL-cholesterol nor serum triglycerides were influenced by the intervention. This intervention shows that receiving individual education about exercise and diet is an effective way to change behaviour and improve cardiovascular health.

## DETECTION AND MONITORING

***In addition to leading a healthy lifestyle, regular checks and controls on the cardiovascular risks such as blood pressure, blood lipids and blood sugar, are among the WHO recommendations on how to avoid a heart attack or a stroke***

Due to the financial and economic consequences which CVDs have at a national level, some countries have started health check programmes in order to reduce the incidence of major vascular disease events. For example, the National Health Service (NHS) Health Check programme, which explores risk factors including family history, hypertension, high cholesterol, blood markers for abnormal glucose levels, obesity, smoking, physical inactivity, and alcohol intake, was rolled out across England in 2011.<sup>88</sup> The NHS Health Check is offered to patients aged between 40 and 74 years with no pre-existing cardiovascular condition, once every five years. With a 75% rate of uptake, it is estimated that 650 deaths and 9,500 non-fatal myocardial infarctions and strokes could be prevented each year.<sup>89</sup> However, uptake has been lower than this - the national average uptake for April 2013 to March 2017 remains at 48.6%.<sup>90</sup> Population-based programmes may reduce CVDs risk and premature mortality but their uptake needs to be increased for them to be effective and sustainable.<sup>91</sup>

There are several studies discussing the barriers to uptake. In addition to physical barriers to access, such as opening hours and location, barriers to uptake include a perception of no personal need ('I'm fit and active, you should go when you're poorly'), which may also include the attitude that it is irresponsible to take up NHS resources if one is not ill.<sup>92</sup> Demographic factors also play a role, with women, older people, and those from less deprived areas being more likely to attend NHS Health Checks.<sup>93</sup> In order to address such barriers, an RCT testing a behaviourally informed letter which included simplification, behavioural instruction (action focused language), personal salience ("your appointment is due") and addressed implementation intentions (adding a planning prompt in the form of a tear off slip to record date, time and location of appointment) increased NHS Health Check uptake by 4.2 per cent.<sup>94</sup> A further RCT building on these findings found an increased uptake when invitations contained personalised tear-off slips (prepopulated with the patients' name, GP practice and practice address) where patients could write the time and date of their appointment, and when patients were sent SMS pre-notification and/or reminder messages.<sup>95</sup> The following case studies describe these behaviour change interventions in more detail.

## **CVDs Case Study 2 - The effectiveness of enhanced invitation letters and Short Message Service (SMS) pre-notifications and reminders on uptake of National Health Service (NHS) Health Checks in primary care: A factorial randomised controlled trial<sup>96</sup>**

### **Executive Summary: NHS Health Checks uptake**

In order to encourage uptake of NHS health checks, subjects were randomly assigned to receive a prenotification SMS (yes or no), one of four different types of invitation letters (control, open, closed, and social norms) and a reminder SMS (yes or no). The percentage of patients who were invited and attended NHS Health Check (uptake) was highest in the group who received the closed letter and both the pre-notification and reminder SMS.

### **Problem**

Uptake of the NHS Health Check programme seeks to decrease the prevalence of the CVDs in the UK, remains lower than expected.

### **Solution**

To test the effectiveness of enhanced invitation letters and SMS pre-notifications and reminders on the uptake of health checks, a factorial randomised controlled trial was conducted. Patients in the London borough of Southwark who were due to be invited to an NHS Health Check were randomly allocated to receive an SMS prenotification (yes or no), one of four different invitation letters, and a SMS reminder (yes or no). There were 2 x 4 x 2 (i.e. 16) combinations. The different invitation letters were: control letter, i.e. usual letter sent (N=3,285), open letter (N=2,908), closed letter (N=2,996), and a social norms letter (N=3,055). All intervention letters were simplified and had a behavioural instruction informing patients of the next steps they should take ("Call to book an appointment"), and were sent from the patient's General Practitioner (the messenger). The open letter had an open invitation to attend while the closed letter offered a time-limited slot for the appointment (thus prompting a sense of scarcity and loss-aversion). Both had a tear-off slip to serve as a planning prompt (a commitment device). The social norms letter included a descriptive social norms message about thousands of people in Southwark attending their health check and testimonials from local residents. The prenotification SMS was sent to patients one week before their invitation letter, informing them that they were about to receive an invitation. The reminder SMS was sent to patients one week after their letter, reminding them of the invitation and giving them a number to call to book an appointment.

### **Impact**

The percentage of patients who were invited and attended NHS Health Check (uptake) varied from 18.2% for those who received the control letter but no pre-notification or reminder SMS to 30.0% for those who received the closed letter and both the pre-notification and reminder SMS. All but three conditions significantly increased the likelihood of attending the health check.

<sup>iv</sup> The positive impact of these invitations, compared to the control, was due to the content of

the invitation letter, its simplification, the behavioural instruction, and the tear-off slip used as a planning prompt. Moreover, the SMS reminders had positive effect on the uptake of Health Check while the effect of the SMS pre-notifications was only marginal.

### **CVDs Case Study 3 - Increasing uptake of National Health Service (NHS) Health Checks in Primary Care: A pragmatic randomised controlled trial of enhanced invitation letters in Northamptonshire, England<sup>97</sup>**

#### **Executive Summary: NHS Health Checks uptake**

To increase uptake of the NHS Health Check, patients aged 40-74 who had not previously been diagnosed with CVDs were randomly assigned to receive either a control letter, a 'cost' letter mentioning the scarce NHS resources, or a 'counterargument' letter including arguments against common barriers to NHS Health Check attendance. Both the cost and counterargument intervention letters significantly increased uptake of the NHS Health Check compared to the control letter.

#### **Problem**

The NHS Health Check is a cardiovascular risk assessment designed to reduce the prevalence of cardiovascular disease in the United Kingdom. Still, uptake is lower than the 75% that was anticipated and aspired.

#### **Solution**

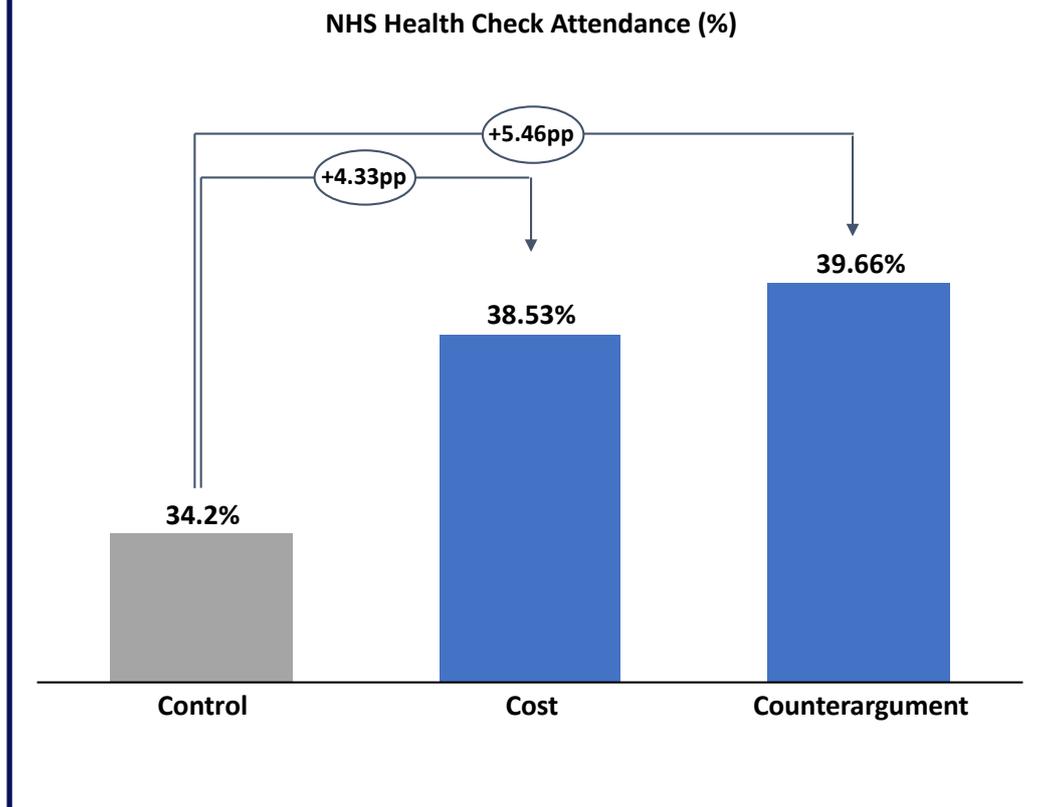
To increase uptake of the NHS Health Check, a total of 6313 patients aged 40-74 who had not previously been diagnosed with CVDs were invited to an NHS Health Check appointment. Two behaviourally informed letters were tested against the usual invitation letter i.e. the control letter. The 'cost' letter was designed to encourage patients to make the most of the scarce NHS resources, saying that the General Practitioner (GP) has already set aside funding for the health check (N=2105). The 'counterargument' letter included arguments against common barriers to NHS Health Check attendance e.g. not wanting to attend as the person feels well (N=2085). Both interventions were sent by a GP (which is a behavioural insight known as the 'messenger' effect: we are heavily influenced by who communicates information, especially the perceived authority of the messenger, whether formal or informal).

#### **Impact**

Compared to the control letter, the 'cost' intervention letter increased the uptake by 4.33pp and the 'counterargument' intervention letter increased attendance by 5.46pp. This study reveals the impact of altering

iv Closed letter with neither pre-notification nor reminder SMS, the social norms letter with neither pre-notification nor reminder SMS, and the control letter with just the pre-notification SMS did not significantly increase the likelihood of attending the health check

the content of a behaviourally optimized letter delivered by an influential messenger – the GP. Therefore, it is possible to optimize content and alter the messenger to increase uptake. These behavioural insights are potentially transferable to other screening programmes, because the tested two messages have broad applicability. Another important implication is the potential of using messages that are tailored for different target audiences.



Cardiovascular health checks are usually based upon set appointments in General Practitioner (GP) surgeries and local pharmacies, but may also be offered at other locations such as leisure centres and by mobile units. This can address barriers such as the lack of awareness of the programme, the lack of time when appointments allocated during normal working hours, the inconvenience of appointment locations and the lack of motivation to have a health check in the absence of symptoms. There is also evidence suggesting that health checks offered outside traditional clinical settings, for example the GP surgery, may be beneficial in achieving greater levels of uptake.<sup>98</sup> In this respect, recent evidence demonstrates the potential for sports stadia to be used in the promotion of healthy lifestyle, highlighting the power of a club's brand and the iconic status of sports venues to engage fans and members of the local community, with a view to encouraging changes in lifestyle behaviours.<sup>99</sup> Such initiatives provide users with both capability and opportunity, since there is the option

for a free health check at a venue that they have already chosen to attend. It is also possible that behaviour change of the users is motivated by the positive association of sports and health and this may encourage users to have a health check. The following case study describes how NHS style health checks can be conducted at sport events.

#### **CVDs Case Study 4 - Behaviourally Enhanced Text Message Reminders to Increase Medical Attention to High Blood Pressure<sup>100</sup>**

##### **Executive Summary: Screening and Seeking Medical Attention**

In order to assess the prevalence of high blood pressure (BP) amongst marathon runners and visitors, an experiment was conducted during the 2018 Beirut Marathon. A total of 1227 people had their BP tested. Results showed that more than 25% of the people screened had elevated BP. Interestingly, out of those individuals, 76% were not aware of their condition. Subsequently, a reminder text message was sent to the treatment group, leading to 17.5 percentage point higher probability of seeking medical attention compared to the control group who did not receive such message.

##### **Problem**

High blood pressure or hypertension (HTN) is one of the leading risk factors contributing to cardiovascular diseases. In Lebanon, the prevalence of HTN increased by threefold in the past decade. Evidence from a recent study conducted in the greater Beirut area suggests that 36.4% of the study participants were hypertensive. Similar figures were also observed among runners participating in Beirut International Marathon in 2014. The study which screened 30 runners participating in the 42 km race, and 295 runners participating in the 10 km race revealed an incidence rate of 46.7% and 31.2% respectively. If left uncontrolled, hypertension may lead to strokes, vision loss, heart failures and fatal heart attacks which highlights the importance of regular screening and seeking of medical attention.

##### **Solution**

To assess the prevalence of hypertension among marathon runners and visitors, and to nudge those who are hypertensive to seek medical care, Nudge Lebanon in collaboration with B4development (formerly known as QBIU) and SmartScience conducted a behavioural intervention during Marathon-Beirut 2018. The intervention was implemented in two phases. In Phase 1, trained volunteers measured the blood pressure of marathon participants and visitors while collecting data regarding their age, gender, smoking and drinking habits, health conditions, family history of hypertension, and their awareness of the condition.

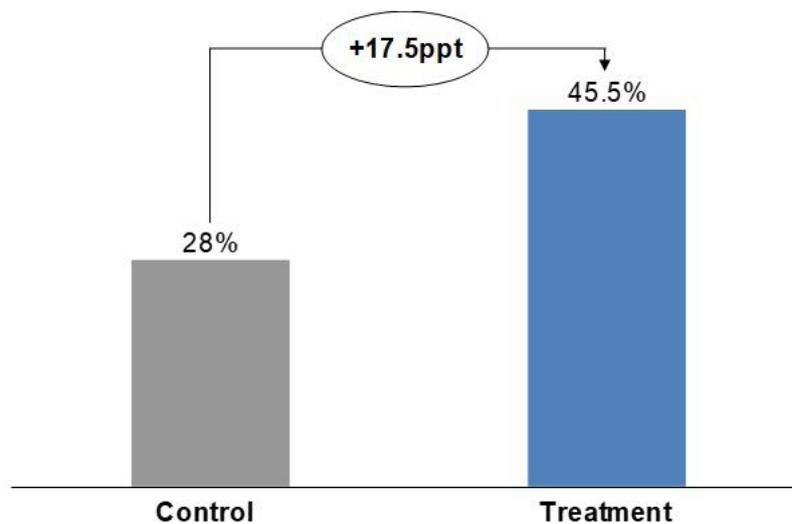
Participants diagnosed with hypertension (as defined by the American Heart Association ) were asked for a verbal consent to receive further communication from the Team.

In Phase 2, consenting hypertensive participants with a valid mobile number were randomly assigned to either control or treatment group. In the treatment group, participants received a personalized message via WhatsApp messenger, 25 days following the Marathon day. The behaviourally-informed message, which was communicated in Arabic, included the participant's first name, their measured BP, and a statement urging them to seek medical attention. Participants in the control group did not receive any WhatsApp communication. Both groups received a phone call one month following the dissemination of the WhatsApp message, to enquire whether they sought further medical attention.

### Impact

Results of the intervention showed that out of the 1,227 participants screened, more than 25% were diagnosed with hypertension. Of those, 76% were not aware of their condition. Phase 2 results showed that 45.5% of individuals who received behaviourally enhanced reminder message sought medical attention compared to only 28% in the control group. According to the results, individuals who received the behaviourally-informed WhatsApp message, and answered the follow up call, had a 17.5 percentage point higher probability of seeking medical attention compared to the control group. The current study reveals that high BP can be widely prevalent even across a health-conscious population such as the one participating in the Beirut Marathon. The intervention proves to be significant in raising awareness among people suffering from hypertension, thereby generating an intention to seek medical attention. Implementing a simple nudge in the form of a personalised WhatsApp reminder can prompt hypertensive individuals to seek medical attention, and thereby reduce their risk experiencing cardiovascular diseases.

**Proportion of hypertensive participants who claimed to have sought medical attention**



## TREATMENT AND ADHERENCE

***Once a person is identified as at-risk of CVDs or is diagnosed with the disease, lack of adherence to medication and health recommendations is a key behaviour to tackle.***

If we take hypertension as an example, a survey of the British Hypertension Society (BHS) members found that 80% of clinicians believe their patients have problems adhering to medications, but most organisations (73%) do not have an agreed practice to improve adherence. Many members (54%) expressed that there are few evidence-based adherence treatments, and most (86%) expressed a need for a study.<sup>101</sup>

In England approximately 15% of adults are prescribed medications to treat hypertension, but 30-50% of these patients fail to sufficiently adhere.<sup>102-105</sup> Patients diagnosed with hypertension who do not adhere to their medication regime often experience costly comorbidities like cardiovascular disease, stroke, and myocardial infarctions.<sup>106,107</sup> Estimates suggest that hypertension contributes to 62% of strokes, 49% of heart disease, and 13% of all deaths annually.<sup>108,109</sup> Thus, there is an opportunity for behavioural interventions to have a large impact.

Patients do not adhere to prescribed medications due to intentional reasons (missing/altering doses to suit one's needs) and unintentional reasons (forgetting to take medication).<sup>46,110</sup> A recent trial attempted to address this by targeting both reasons for non-adherence.<sup>111</sup> This trial was conducted with self-sufficient elderly patients who were prescribed medication to treat hypertension. The intervention involved a nurse visiting participants' homes each week for four weeks. During the first visit participants developed 'implementation intentions,' which is a plan to take their medication at a designated time, place, and manner. For example, a participant could plan to take their medications at breakfast, at their coffee table, while drinking orange juice. Helping people develop implementation intentions is a theoretically and empirically supported behaviour change technique.<sup>112</sup> Participants who received the intervention were more adherent.

Such interventions can be useful in the short-term by helping patients to better control their blood pressure but also in the long term, by helping them to avoid costly comorbidities like cardiovascular disease and stroke. For the healthcare system, reduction in the number of such complications can be associated with significant savings.<sup>113,114</sup> For example, in the UK, health economic models that consider event rates and cost of treatment suggest that the annual

cost per non-adherent hypertensive patient is £912, and therefore that helping 80% of patients to adhere would save the National Health Service (NHS) £100 million per year.<sup>113</sup>

Often medication adherence requires changing the behaviours of both patient and healthcare providers. For example, in order to keep patients' cholesterol at healthy levels, and thus avoid costly comorbidities, higher prescription and adherence rate are needed. The following case study describes a behaviour change intervention that achieved this aim.

### **CVDs Case Study 5 - Effect of financial incentives to physicians, patients, or both on lipid levels: A Randomised Controlled Trial<sup>115</sup>**

#### **Executive Summary: Adherence to prescribed medication**

In order to reduce levels of low-density lipoprotein cholesterol (LDL-C) among patients with high cardiovascular risk, an RCT was conducted using a variation of financial incentives targeting physicians and patients. Incentives given to both physicians and patients significantly improved adherence to prescribed medication that aimed to reduce the cholesterol levels compared to control as well as other financial incentives targeting only physicians or patients.

#### **Problem**

Even though statins are rather low-cost medication which helps patients reduce their risk of cardiovascular diseases by reducing low-density lipoprotein (LDL-C) levels, physicians are under-prescribing them and patients are non-adherent to the prescribed medication. In order to keep patients' cholesterol at healthy levels, higher prescription and adherence rates are needed.

#### **Solution**

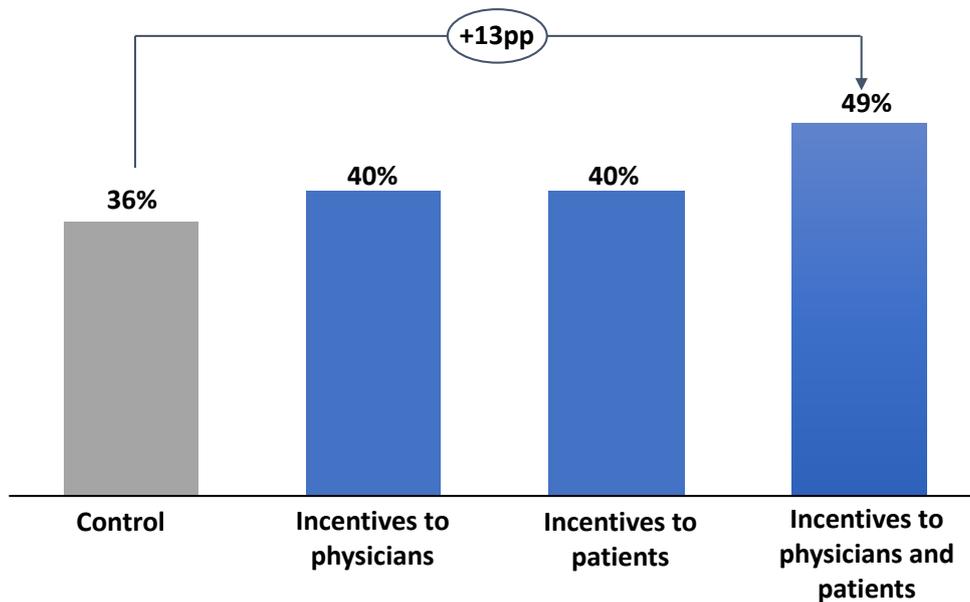
Physicians were randomly assigned to either a control whereby physicians and patients did not receive any incentive, and three treatments: a) physician incentives, whereby physicians were eligible to receiving up to \$1024 per enrolled patient meeting LDL-C goals, b) patient incentives, whereby patients were eligible for the same amount, distributed through daily lotteries tied to medication adherence, or c) shared physician-patient incentives whereby physicians and patients shared these incentives. The interventions continued for 12 months, and patients were followed up for an additional three months.

#### **Impact**

The results of the study showed that the shared incentives that targeted both physicians and patients significantly reduced the levels of cholesterol compared to the control. Cholesterol levels of the aforementioned group were significantly reduced by an average of 8.5 mg/dL, from 33.6 mg/dL to 25.1 mg/dL. At 12 months, 49% of

patients in the shared physician-patient incentives group had achieved their LDL-C goal compared with 40% in the physician incentives, 40% in the patient incentives, and 36% in the control (P = .03 for comparison of all 4 groups). At 15 months, three months after stopping all incentives, LDL-C values remained stable implying that the intervention, up until three months, had a long-term impact. The superiority of a shared approach suggests that treatment success is driven by both, provision of medication by clinicians and patient adherence to that medication. The incentives are likely to reinforce both provision of medication and adherence to medication when tied to those activities. Indeed, making rewards action-specific is a fundamental behaviour change principle.

**Patients who achieved their LDL-C goal at 12 Months (%)**

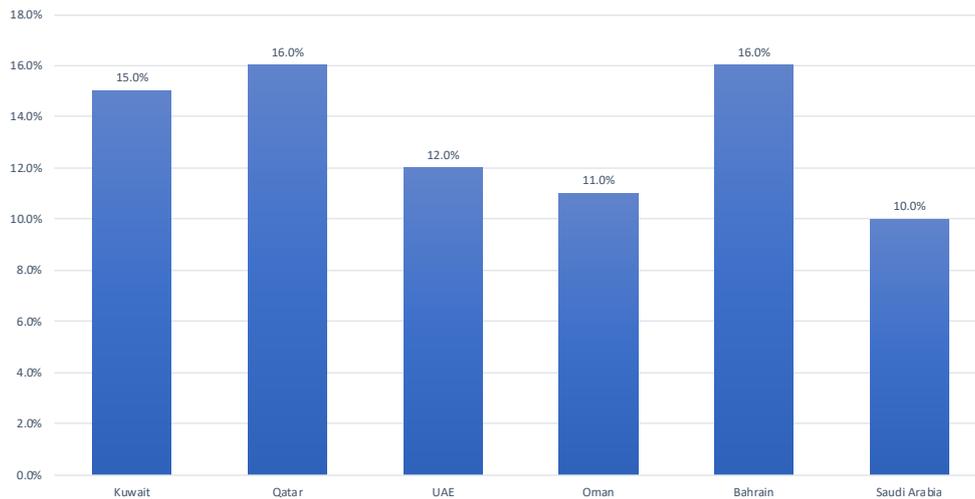


## SECTION 4: FOCUS ON BEHAVIOURAL INSIGHTS AND CANCER

Cancer is the uncontrolled growth and spread of cells: abnormal cells divide without control and can invade nearby tissues. Cancer cells can also spread to other parts of the body through the blood and lymph systems. It can affect almost any part of the body. There are several main types of cancer. Carcinoma is a cancer that begins in the skin or in tissues that line or cover internal organs. Sarcoma is a cancer that begins in bone, cartilage, fat, muscle, blood vessels, or other connective or supportive tissue. Leukemia is a cancer that starts in blood-forming tissue, such as the bone marrow, and causes large numbers of abnormal blood cells to be produced and enter the blood. Lymphoma and multiple myeloma are cancers that begin in the cells of the immune system. Central nervous system cancers are cancers that begin in the tissues of the brain and spinal cord.

Cancer is the second leading cause of death globally, and is responsible for an estimated 9.6 million deaths so far in 2018. About one in six deaths are due to cancer and approximately 70% of deaths from cancer occur in low- and middle-income countries.

**Figure 5: Cancer Proportional Mortality in GCC Countries (% of Total Deaths, All Ages)**



Source: Noncommunicable diseases country profiles 2018. WHO (2018)<sup>16</sup>

A significant proportion of cancers can be cured by surgery, radiotherapy or chemotherapy, especially if they are detected early. However, late-stage presentation and diagnosis and treatment are common. In 2017, only 26% of low-income countries reported having pathology services generally available in the public sector while more than 90% of high-income countries reported that treatment services were available.

In addition, the economic impact of cancer is significant and is increasing. The total annual economic cost of cancer in 2010 was estimated at approximately US\$1.16 trillion. Only one in five low- and middle-income countries have the necessary data to drive cancer policy.

Around one third of deaths from cancer are due to the five leading behavioural and dietary risks: high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco use, and alcohol use. Many cancers can be prevented by avoiding exposure to common risk factors, such as tobacco smoke, unhealthy eating and physical inactivity.

## LIFESTYLE AND PREVENTION

Research has shown that cancer incidence and mortality is decreased when people follow health promotion guidelines for diet and physical activity. Conversely, behaviours such as poor dietary choices, physical inactivity, excess alcohol consumption and unhealthy body weight could account for more than 20% of cancer cases and therefore be prevented with lifestyle modifications.<sup>117</sup> Research has also shown that, in addition to smoking, poor diet and being inactive are key factors that increase a person's cancer risk. A recent systematic review has revealed the associations between adherence to established cancer prevention guidelines for diet and physical activity and overall cancer incidence and mortality.<sup>118</sup> Adherence to nutrition and physical activity cancer prevention guidelines is associated with up to 60% decreases in colorectal cancer incidence, breast cancer incidence, and endometrial cancer incidence (no significant relationships were found between adherence and lung, ovarian or prostate cancers). In summary, healthy lifestyle in terms of diet and physical activity is consistently associated with lower risks of cancer, including for some site-specific cancers. The good news is that people can do something about this risk: have and maintain a healthy weight throughout life, be physically active on a regular basis, make healthy food choices. How some of those behaviour change challenges are addressed is described in the following case study.

## **Cancer Case Study 1 - Feasibility study to assess the impact of a lifestyle intervention programme ('LivingWELL') for people having a family history of breast cancer and colorectal cancer<sup>19</sup>**

### **Executive Summary: Encouraging healthy lifestyle habits**

In order to evaluate the feasibility of providing and assessing a weight management programme "LivingWell" in Scotland for overweight patients with a family history of breast cancer or colorectal cancer; participants were randomised to a control (lifestyle booklet) or 12-week intervention arm where they were given one face-to-face counselling session, four telephone consultations and web-based support. Results show that the intervention group were more likely to achieve the target weight loss.

### **Problem**

Cancer arises from both genetic and environmental factors. Hence, people with a family history of breast cancer and colorectal cancer are at greater risk of cancer and should follow recommendations for cancer surveillance and lifestyle. In Scotland, the National Health Service (NHS) genetics center provides early detection and counselling for people with a family history, but offers little lifestyle advice.

### **Solution**

Of 480 patients approached, 196 (41%) expressed interest in the study, and of those, 78 (40%) patients were randomised. A two-arm randomised controlled trial was conducted where participants were randomly assigned to a control group (lifestyle booklet) or 12-week intervention arm where the treatment group were given one face-to-face counselling session, four telephone consultations and web-based support. A goal of 5% decrease in body weight was set. In addition, a tailored diet and physical activity programme were provided. The face-to-face session was designed to be interactive and included a 10min 'walk and talk' session during which pedometer use as well as walking goals, self-identification of BMI category and a portion-weight estimate task were discussed. Participants received a personalised energy deficit diet, a personalised graduated-walking plan, guidance on setting personal goals, and guidance on how to make changes habitual and prevent relapses. Motivational interviewing techniques were used to explore self-assessed confidence to change and self-perceived benefits.

### **Impact**

Overall, 36% of the intervention group (vs 0% in control) achieved 5% weight loss. Satisfactory increases in physical activity and reduction in dietary fat were also reported. The results suggest that techniques such as personalised education and training, as well as goal-setting and feedback, effectively change lifestyle behaviours.

Given the importance of healthy diet, we can also learn from behavioural interventions designed for people who are not at greater risk of cancer. A recent intervention combined specific behaviour change techniques (known to improve self-regulation) in order to promote eating fruits and vegetables over two years.<sup>120</sup> Specifically, the participants were asked to write down:

(i) Their most important goal regarding their diet that is both challenging and feasible (such as “eating more fruits and vegetables”).

(ii) The most positive outcome of realizing this goal (such as “greater well-being”) and events and experiences they associated with this positive outcome.

(iii) The most critical obstacle (such as “no fruits at work”) together with events and experiences they associated with this obstacle.

(iv) Three ‘if-then plans’ (also known as ‘implementation intentions’) with the following questions:

“When and where does the obstacle occur, and what can I do to overcome or circumvent the obstacle?” (such as “If I have no fruits at work then I will buy an apple in the canteen at lunch!”).

“When and where is an opportunity to prevent the obstacle from occurring, and what can I do to prevent it from occurring?” (such as “If I pass the green-grocer on my way to work then I buy apples!”).

“When and where is a good opportunity for me to act in a goal-directed way, and what would the goal-directed action be?” (such as “If I am eating out for lunch then I order a salad!”).

In order to learn those self-regulation techniques, participants applied the techniques four times (twice to a long-term wish for the coming weeks and twice to a short-term wish for the next 24 hours), which took place under the interventionist’s supervision during the instruction session.

## DETECTION AND MONITORING

### ***Cancer screening can lead to more timely diagnosis and effective treatment***

Particularly important when dealing with cancer is the diagnosis stage, as delays in the diagnosis of cancer can lead to disease being more advanced at the point of detection and to avoidable deaths. For example, screening is part of the UK strategy of providing a responsive health service that helps people stay healthy, which includes several established cancer screening programmes – breast, colorectal and cervical.<sup>121</sup> Uptake (the proportion of those invited to screening that actually attend) is one of the most important factors in determining the success of a screening programme.<sup>122</sup> Cancer screening can detect cancers at an early stage and, in some cases, even prevent cancers from developing in the first place. Therefore, behavioural insights focused on motivating people to take up cancer screening offer a large potential to influence cancer outcomes. A recent review of evaluations of interventions to improve participation in cancer screening services reveals that, across different countries and health systems, a number of interventions were found more consistently to improve participation in cancer screening, including in underserved populations: pre-screening reminders, general practitioner endorsement, more personalized reminders for non-participants, and more acceptable screening tests in bowel and cervical screening.<sup>123</sup>

A challenge for National Screening Programmes is to find effective, simple and inexpensive population wide strategies to recruit hard to reach individuals. According to Cancer Research UK, in the UK, breast cancer and cervical cancer account for 31% and 2% respectively of all female cancer incidence in 2013 and 18% and 1% respectively of female cancer deaths in 2014; also, 27% of breast and 100% of cervical cancer can be prevented, with breast cancer as the most common cause of female cancer deaths in the UK and Cervical cancer as the most common cancer in women under the age of 35.<sup>124</sup> As a result, screening programmes have been offered as they have been shown to be highly effective at reducing morbidity and saving lives. It is estimated that UK screening programmes prevent approximately 1,300 deaths per year from breast cancer and 4,500 from cervical cancer.<sup>125</sup> And, whilst these figures provide some optimism, there is a significant amount of societal benefit being lost, particularly in some areas where there is lower uptake of screening, resulting in significant costs of late-stage treatment.

The following case studies show how behavioural insights have helped to increase the uptake of breast and cervical cancer screening, respectively.

## **Cancer Case Study 2 - Improving cancer screening rates – Increasing the number of appointments among women to detect breast cancer<sup>126</sup>**

### **Executive Summary: Increasing breast cancer screening appointments**

In order to increase the number of breast cancer screening appointments made by women, behaviourally designed letters were used, which included a planning prompt and committing to an appointment. The results showed that this intervention increased the number of breast cancer screening appointments made by women compared to control.

### **Problem**

Early detection of breast cancer can save lives by maximising the chances of successful treatment. Regular attendance at breast cancer screenings helps in early discovery. The major challenge is to motivate women to adhere to recommendations for routine screenings.

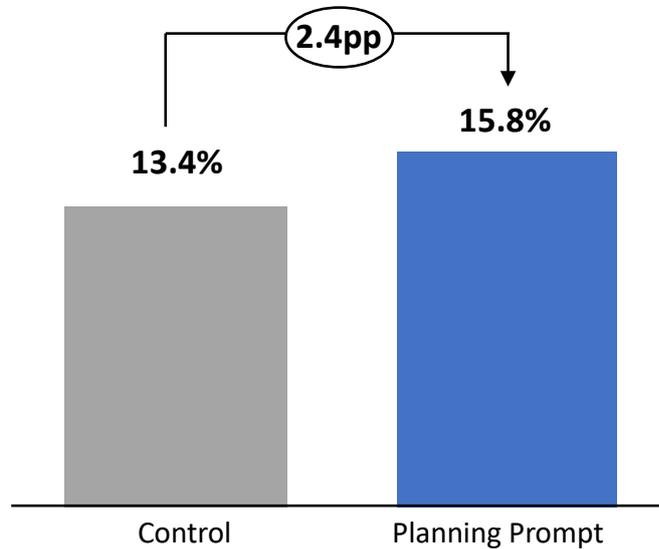
### **Solution**

To test the efficacy of a classic behavioural intervention—encouraging people to plan ahead—a randomised controlled trial was conducted by BIT Australia, in collaboration with BreastScreen Victoria. Around 7,700 women received a letter informing them about the risks of breast cancer and about the free breast screening service offered by BreastScreen Victoria. In the treatment group, a simple planning prompt was added: at the bottom of the letter, recipients were encouraged to write down the time and date of their breast screening appointment (a behaviour change technique known as commitment device). The intention behind the prompt was to get women to think about when they might be able to attend, the practicalities involved in getting there, the obstacles they might encounter and once the appointment is booked to remember to attend. This prompt also aimed to create a sense of personal commitment.

### **Impact**

The results showed that letters which included the planning prompt significantly increased the number of women who booked the breast screening appointment by 2.4pp compared to the control group (from 13.4% to 15.8%). These behavioural insights causing this effect are transferable to other screening programmes.

### Number of women who booked the appointment for breast screening (%)



#### Cancer Case Study 3 - Behavioural text message reminders to improve participation in cervical screening: a randomised controlled trial<sup>127</sup>

##### Executive Summary: Increasing Participation in Cervical Screening

In order to increase participation in cervical screening, different behavioural text message reminders were sent to women aged 25 to 64. Researchers found that women aged 30 to 64 years who received General Practice endorsed SMS reminders were more likely to participate in cervical screening. Additionally, women who received a simple reminder were also more likely to participate. As for women aged 25 to 29 years, participation was more likely for women in the GP endorsement group.

##### Problem

Cervical screenings can save lives. If all eligible women attended screenings regularly, 83% of cervical cancer deaths could be avoided. Recent numbers showed a decrease in cervical screenings. Text message reminders (SMS-R) have been proven to be efficient at increasing the participation in breast and bowel cancer screenings.

## Solution

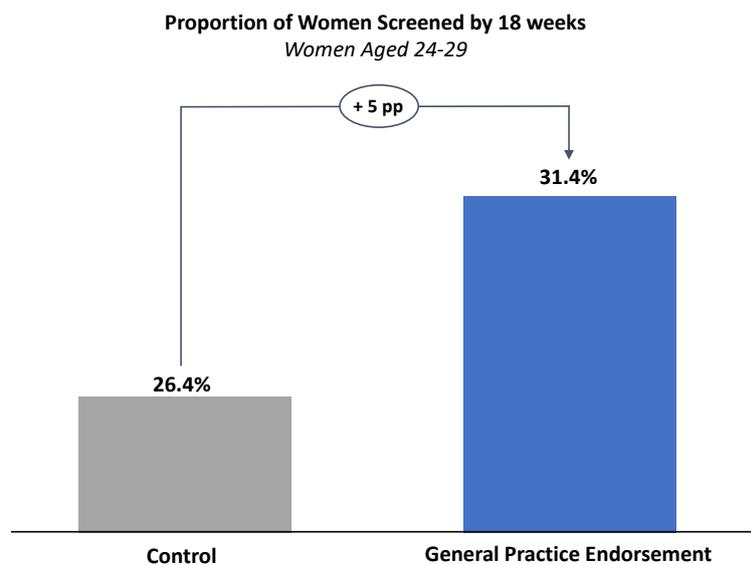
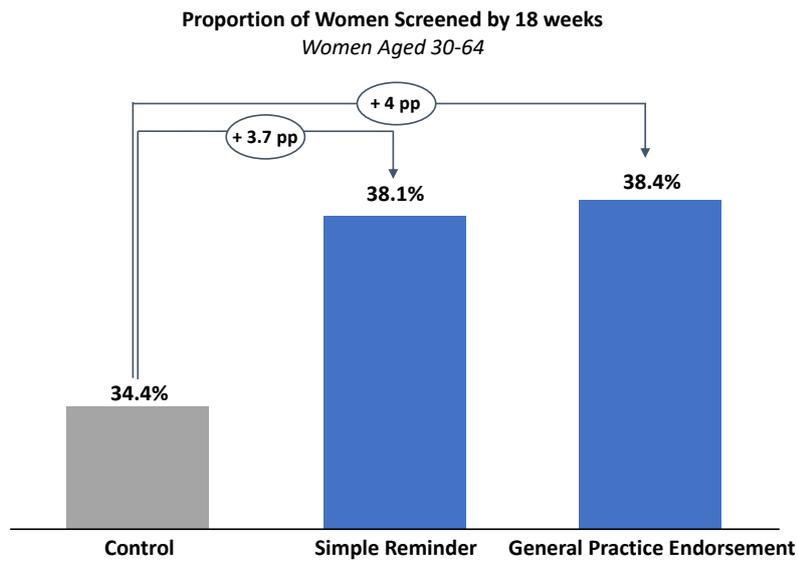
To test the efficacy of behavioural text message reminders at increasing uptake of cervical screening, women aged 25 to 29 years were randomly assigned to either a no text message reminder group (“no SMS-R” group) or an “SMS-R group with General practice (GP) endorsement”, while women aged 30 to 64 years were randomly assigned to seven different groups:

1. No SMS-R (control group, n=1568)
2. A simple reminder to attract attention and enhance the salience of screening (n=1522)
3. GP endorsement (the messenger effect: we are heavily influenced by who communicates information, especially the perceived authority of the messenger, whether formal or informal, n=1493)
4. Total social norms messages (informing how many have participated, n=1514)
5. Proportional social norms messages (informing what proportion has participated, n=1488)
6. Gain-framed messages focusing on the benefits of screening (n=1560)
7. Loss-framed messages focusing on the costs of not screening (n=1507)

## Impact

The primary outcome measured was the proportion of women screened in each of the groups after 18 weeks. Among women aged 30 to 64, compared to the control group (34.4%, n=540), women in the GP endorsement group (38.4%, n=575) were 1.19 times more likely to participate in the screening, while women in the simple reminder group (38.1%, 580) were 1.18 time more likely to participate. No other significant differences between control and other groups were detected. Among women aged 25 to 29 years, participation was 1.29 more likely for women in the GP endorsement group (31.4%, n=466) compared to women in the control (no SMS-R) group (26.4%, n=384).

Studies of cancer prevention show that the natural course of the disease can be altered if pre-cancerous changes or cancer is detected early. However, uptake of cancer screening programmes falls well below their national targets. This may be partly due to behavioural



processes causing the population to discount the advantages that would be received in later life.<sup>128</sup> The efficacy of the process is thus lost with sub-par attendance and many non-participants (defined as those who receive yet do not engage with any material). The following case study illustrates how the psychological bias towards immediate rewards can be utilized in an intervention that provided incentives to increase the booking rate of particularly non-responsive women for breast cancer screening.

## **Cancer Case Study 4 - Improving cancer screening rates - Increasing the appointment booking rates for breast cancer screening among previously non-responsive women<sup>126</sup>**

### **Executive Summary: Increasing participation in breast cancer screening**

In order to increase appointment booking rates for breast cancer screening among the population of women who previously did not respond to breast screening invitation letters, an intervention was conducted whereby three different types of invitation letters were tested (behaviourally informed letter, prize draw letter and giving prize letter), compared to a standard letter (the control). Results showed that all interventions had a significantly higher impact on booking rate, compared with the control, with “the giving prize letter” recording the highest increase.

### **Problem**

Early detection of breast cancer can save lives by maximising the chances of successful treatment. Regular attendance at breast cancer screenings helps in early discovery but the major challenge is to motivate women to adhere to recommendations for routine screenings.

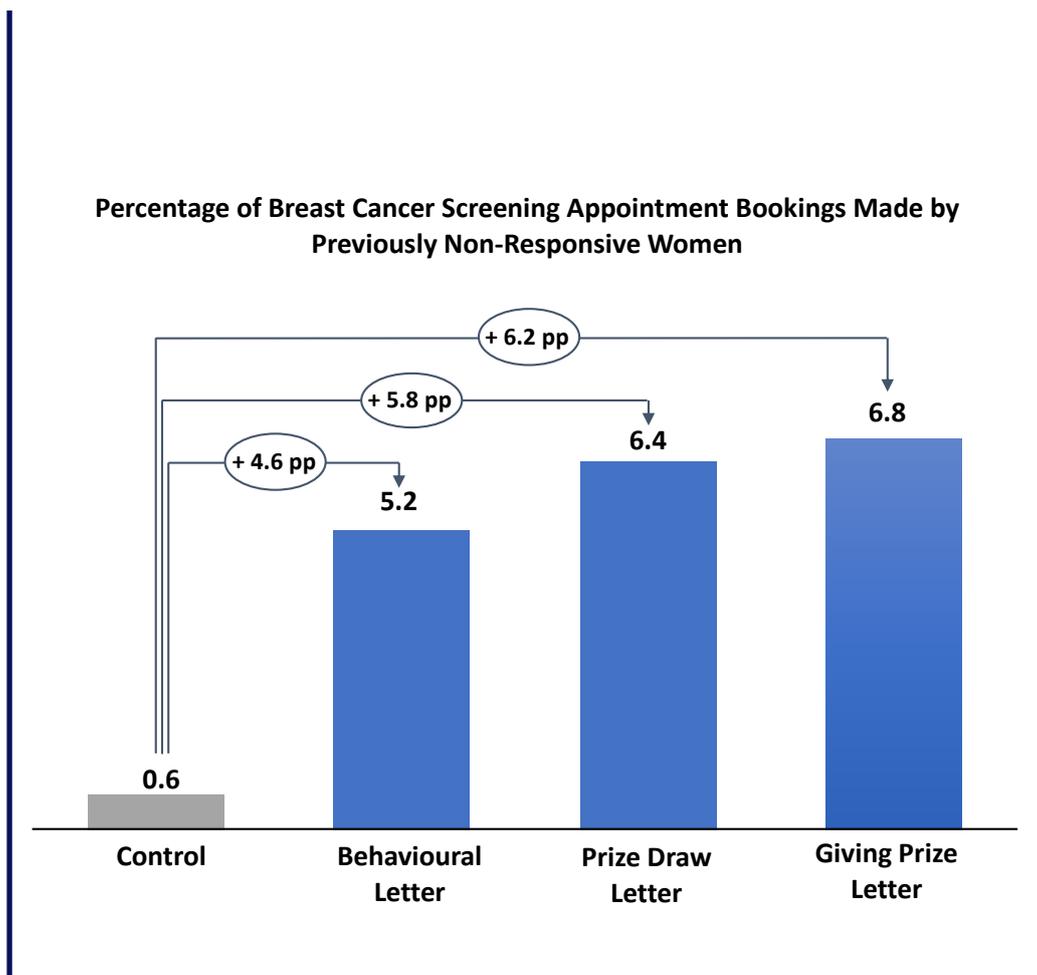
### **Solution**

BIT Australia, in collaboration with BreastScreen Victoria, conducted a randomised controlled trial to evaluate the efficacy of three different letters sent to women who had not previously responded to two postal invitations for breast cancer screening. A total of 38,000 women were randomly assigned to one of the four groups: 1) control group (received no invitation), 2) behaviourally informed letter group, 3) a prize draw letter with the possibility of winning an iPad, and 4) a pro-social twist group in which women were told that they could give the prize to a valued person.

### **Impact**

The main outcome was the number of bookings for breast screening made by previously non-responsive women. The results showed that the behaviourally informed letter led to eight times more bookings, the prize draw letter led to 10 times more bookings, while pro-social twist letter led to 11 times more bookings compared to the control group. The highest rate of bookings was for the giving prize draw, but there was no statistically significant difference between this and the standard prize draw. Indeed, our responses to incentives are shaped by predictable mental biases such as reference points (the value of something depends on where we see it from) and overweighting small probabilities (hence why lotteries may act as a powerful motivation).

In the case of several studies on various types of cancer and screening methods, there is strong evidence suggesting that increased participation levels can be achieved through different types of interventions targeted at changing perceptions as well as behaviour. As with most interventions, health policy makers agree that “interventions to promote cancer screening should be non-coercive and should respect the principle of informed



choice".<sup>129</sup> By implementing small interventions informed by behavioural risk factors we can improve participation rates, reach previous non-participants and thus mitigate the opportunity costs of later treatment.

***Falling victim to the perception that cancer screening is an added benefit rather than a necessity***

Unlike the case of CVDs screening, cancer screening is diagnostic rather than preventative; however, both share the challenge of reaching the 'at risk' but asymptomatic population. Due to the perceived threat being latent, people may see a screening appointment as a low priority compared to other tasks, falling victim to the perception that cancer screening is an added benefit rather than a necessity.

We must also consider conscious factors such as the effect of perceived inconvenience, discomfort, and time and opportunity costs for those who do not believe they are at risk. This explains why interventions to improve uptake have often also focused on changing rational decision-making. In addition, psychological processes such as emotions and forgetfulness play

a part too, because people often are more prone to making automatic, habitual, 'gut-feeling' decisions. Therefore, behaviour change interventions should consider targeting both the rational and non-rational decision-making processes. The next case study illustrates how such a multifactorial, theory-based approach improved the uptake of colorectal cancer screening among non-respondents (those who previously did not book their appointment or who previously booked their appointment but did not attend).

**Cancer Case Study 5 - Improving uptake of flexible sigmoidoscopy screening: a randomised trial of nonparticipant reminders in the English Screening Programme<sup>130</sup>**

**Executive Summary: Increasing uptake of cancer screening programme**

In order to increase uptake of flexible sigmoidoscopy screening, an RCT was conducted whereby 1,383 men and women were randomly assigned to either a control group that received no reminder, a treatment group that received a reminder and a standard information booklet, or another treatment group that received a reminder and a theory-based leaflet designed to address barriers to screening. Results showed that both treatment groups were significantly more likely to attend screening. Participants who received the theory-based leaflet were also significantly more likely to attend screening than individuals who received the standard information booklet. Across all groups, former non-attendants were more likely to participate in screening than former non-respondents.

**Problem**

According to a large UK RCT, a one-off screen between the ages of 55 and 64 years significantly reduces the incidence and mortality of colorectal cancer (CRC) among screened adults. Data from 2016 research shows that uptake of the test in England is very low - only 43% of invitees attend an appointment - and the most common reasons for not attending found by surveys are a lack of current health problems, inconvenient appointment time/day, concerns about pain, discomfort, or injury associated with the examination, and not wanting to know about any health issue.<sup>131-133</sup>

**Solution**

An RCT was performed in order to test the impact of a nonparticipant reminder and theory-based leaflet on uptake among former non-respondents, people who previously did not book their appointment, and non-attendants who previously booked their appointment but did not attend. The participants were eligible adults, both men and women in London who had not attended a colorectal cancer screening appointment within 12 months of their invitation (n=1383).

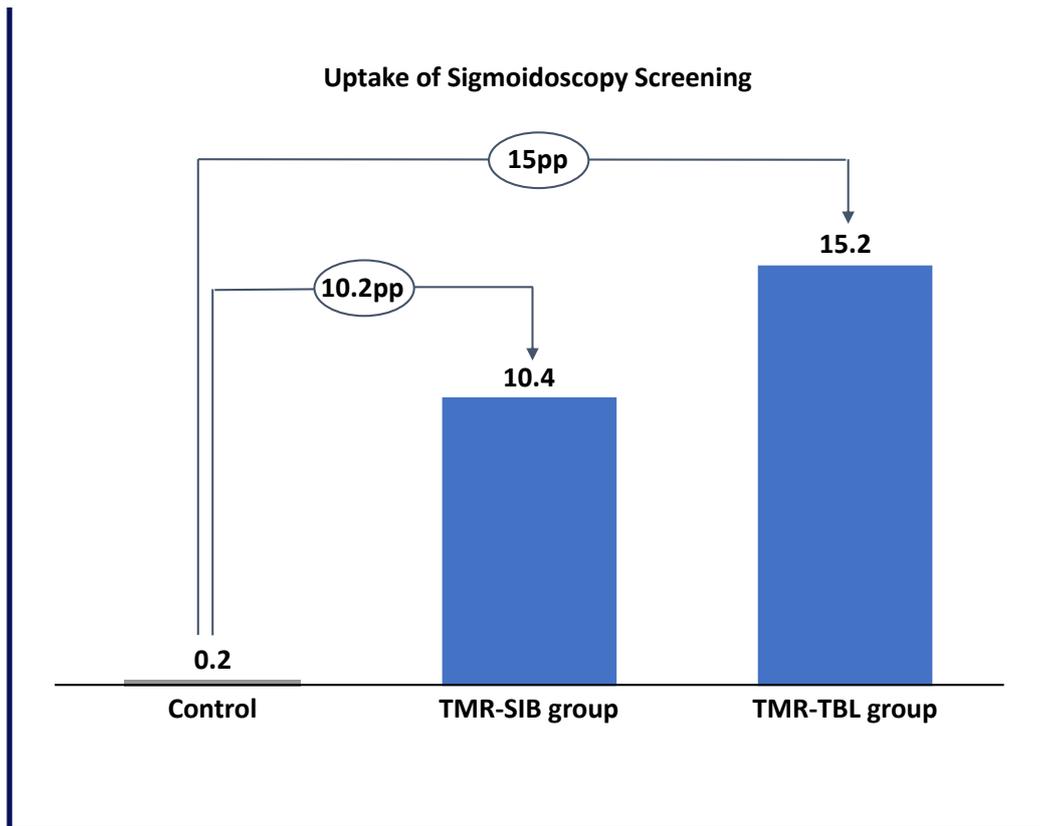
Participants were randomised into three groups:

- Control group, which received no reminder
- TMR-SIB group, which received a 12-month reminder plus standard information booklet
- TMR-TBL group, which received a 12-month reminder plus bespoke theory-based leaflet designed to address barriers to screening.

The 12-month reminder was a personally addressed letter from the hospital that invited recipients to make a new appointment by returning an appointment-request slip or by calling the telephone number for the screening center. The reminder also gave recipients the option to express a preference for the day and time of the appointment, as well as the sex of the practitioner performing the test. Individuals not responding to the reminder within four weeks were sent a follow-up reminder, which also included an appointment-request slip, the allocated information leaflet, and a freepost return envelope.

### **Impact**

The results show that uptake in the control group was 0.2% (n=1), in the TMR-SIB group 10.4% (n = 48) and in the TMR-TBL group 15.2% (n = 70). Individuals in the TMR-SIB and TMR-TBL groups were significantly more likely to attend screening than individuals in the control group (adjusted odds ratio OR 53.7, 95% CI 7.4 – 391.4,  $P < 0.001$  and OR 89.0, 95 %CI 12.3 – 645.4,  $P < 0.01$ ). Individuals who received a 12-month reminder plus a customised theory-based leaflet were also significantly more likely to attend screening than individuals who received a 12-month reminder plus standard information (OR 1.7, 95%CI 1.1 – 2.5,  $P = 0.01$ ). Former non-attendants were more likely to participate in screening than former non-respondents (uptake was 14.2% and 8.0%, respectively; OR 2.5, 95%CI 1.4 – 4.4,  $P < 0.01$ ) across all groups. It seems that the positive result is driven by behavioural insights such as reminders attracting attention to the importance of screening (our attention is drawn to what is novel and seems relevant to us) and also by removing emotional barriers related to convenience and shame by allowing people to express a preference for the day and time of the appointment, as well as the sex of the practitioner performing the test.



If we consider the dual-process model of human cognition,<sup>20</sup> then previous methods have perhaps focused too much on the deliberate and rational aspects of decision making. In the case of the majority of individuals who consider themselves healthy and consider cancer to be an afterthought it is perhaps unwise to believe that they will engage with the full scope of the resources available and commit themselves to rationally weighing up the full benefits and costs. Instead, mounting evidence suggests that individuals are much more likely to use mental shortcuts or heuristics (that operate largely through the automatic psychological processes) and often take the easy option when it comes to decisions that have little short-term benefit. Thus any interventions should be targeted at automatic psychological processes which may not necessarily be rational or considered but may still have positive effect on screening attendance.

The following case study demonstrates how triggering such automatic psychological processes increased the probability of mammography screening.

## Cancer Case Study 6 - Increasing cervical screening rates through Commitment Device<sup>134</sup>

### Executive Summary: Increasing cervical screening

In order to examine whether variations to the framing of the cervical screening reminder letters could lead to an increase in the number of Papanicolaou (Pap) tests over and above the usual response; an RCT was conducted to test four variations of the reminder letter against the standard reminder letter (control). The four letters were more effective than the control letter at encouraging women to have a Pap test. The letter which included a commitment device had the largest response rate. The commitment device letter could lead to an additional 7,500 women attending their Pap test appointment within three months of receiving their reminder letter.

### Problem

The risk of being diagnosed with cervical cancer can be reduced by regular Pap tests. Even though the Cancer Institute of New South Wales, Australia sends letters to women to remind them that they should make an appointment, fewer than 30 per cent of women made an appointment after receiving their letter.

### Solution

Different framings of the cervical screening reminder letters were tested in a randomised controlled trial in order to evaluate their impact on the number of Pap tests taken. Over a three-month period, a total of 75,000 women received either the control letter or one of the four treatment letters inviting them to book a Pap test appointment. All four treatment letters included 'gain framed' messages in relation to the benefits of screening (that "regular Pap tests reduce cervical cancer risks by 96%") and presented information in a clear and simple way, also known as the 'salience' effect - our attention is automatically drawn to what is novel, understandable, and seems relevant to us. All treatment letters also stated the 'social norm' message that "Join the 50,000 women in Northern NSW who had their Pap test in the past two years." which utilised our automatic tendency to be strongly influenced by what others do. In addition to the control reminder letter, four letters also included one of the below:

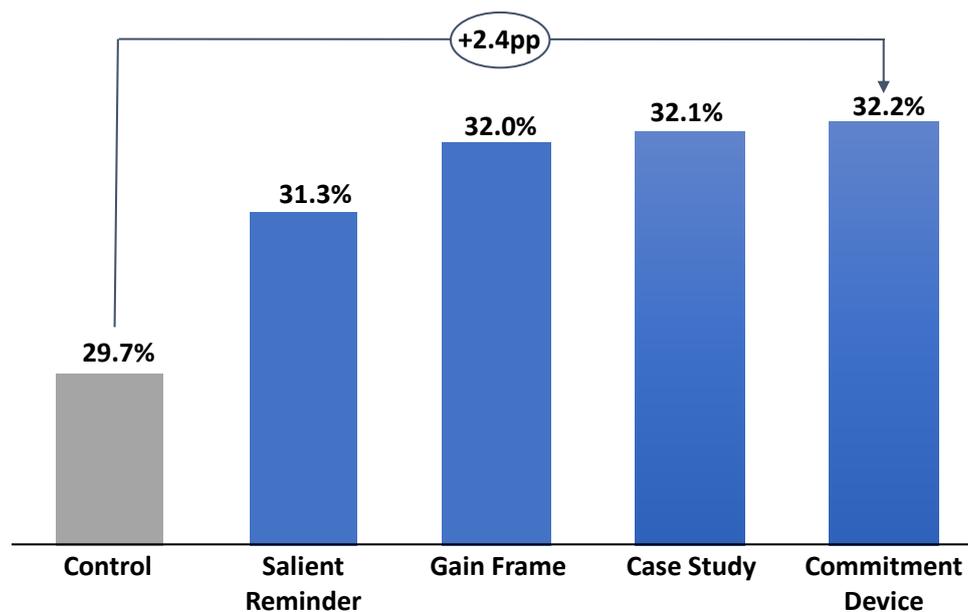
- Social norm and Gain frame
- Social norm and Gain frame plus making salient (by including in a red frame) the key message that regular Pap tests reduce cervical cancer risks by 96% and that it only takes 15 minutes to get tested
- Social norm and Gain frame plus a personal case study of a woman stating how having regular Pap test saved her life through early detection (thus signalling the demographic and behavioural similarity which is known as the 'messenger' effect – we tend to be influenced by people like us)

- Social norm and Gain frame plus a commitment device in the form of a section at the bottom of the letter where women could write down the details of their appointment and keep it in a salient place to remind them (thus tapping into our automatic desire to be consistent with our public promises)

### Impact

The percentage of women having a Pap test within three months was collected. The results reveal that all treatment letters were more effective than the control letter. The most effective letter was the one that included the commitment device, which significantly improved the response rate by 2.4pp (from 29.7% control to 32.2%). The other treatment letters had similar but slightly lower response rates (see the figure below). The results show the effectiveness of simple behavioural insights such as norms, salience, messenger and commitments (we seek to be consistent with our promises and plans). Those insights are easily transferable to other screening programmes.

Response rate for 27 day Pap test reminder letter



***Small changes to the infrastructure and delivery of the intervention can be more effective than efforts to change conscious behavioural decisions***

A large portion of nonattendance can also be attributed to perceived or objective barriers of various forms. Thus, at one level, interventions can target perception and the subsequent reactionary and irrational behaviour; however, there are also organizational changes, such as the mechanisms for scheduling appointments, self-referral, and patient

outreach. Therefore, on an organisational level, the changes made to the infrastructure and the delivery of interventions should also prove effective. Such changes should result in increased participation rates for as long as the intervention mechanism remains in place, or until individuals begin to adapt and acclimate to these mechanisms, thus making behaviour changes not only more cost effective to maintain, but also more effective in the long run. Conversely, any perceived inconveniences or unpleasant parts of the process will have a relatively greater effect as a deterrent and reduce participation. In the study on flexible sigmoidoscopy screening for bowel cancer, they found that a “lack of current health problems, practical barriers (i.e. inconvenient appointment time/day), concern about pain, discomfort, or injury associated with the examination were the most prevalent reasons for non-participation and non-attendance.”<sup>130</sup> These findings were validated by the fact that post-intervention data revealed that former non-attendants were now more likely to show up to appointments than former non-respondents (14.2% vs. 8.0%). This would imply that those who had already undergone much of the process are similar to screened adults and therefore might perceive fewer barriers and more benefits to screening than non-respondents. Therefore, we must be careful as people may have different levels of exposure to screening, which can have an effect on their propensity to participate. This conclusion resonates with evidence that participation in colorectal cancer screening is a process comprising distinct behavioural stages through which individuals move based on their readiness to be screened.<sup>135</sup> Each stage is strongly associated with a specific set of attitudes and beliefs toward the test.

Finally, there is also a socioeconomic gradient of screening uptake, with patients in less deprived areas being more likely to attend a screening appointment than patients in less deprived areas.<sup>136</sup> While the attempts to change perceptions that were explored in several of the aforementioned studies (including improved education, information booklets and bespoke guidance from GPs) resulted in increased overall uptake, there was a distinct correlation between increase in participation and areas which had previously had the lowest rates – this effect was stronger in the most deprived quintile than in the least deprived.<sup>137</sup>

## TREATMENT AND ADHERENCE

Oral therapies for the treatment of cancer, which require better patient adherence, are of increasing importance.<sup>138</sup> For cancer, prolonged oral therapy is the gold standard of care, but when patients need to administer cancer medications at home, the rates of adherence range from 15% to 97%.<sup>139</sup> In addition to numerous oral medications prescribed for first-line treatment of cancer and for relapsed and stubborn cancers, there are also self-administered subcutaneous therapies.<sup>140</sup> The evidence also reveals that patients who adhere to medications for cancer have a significantly higher 10-year survival rate.<sup>141</sup> Conversely, non-adherence causes significant negative impact on clinical outcomes.<sup>142</sup> Therefore, health systems must try to maximize medication adherence in order to improve clinical outcomes.

There are some known behavioural or psychological barriers associated with poor adherence to such treatments: adverse events; forgetfulness; missed appointments; competing priorities (medical and/or social); lack of information; higher out-of-pocket costs; longer duration of treatment; poor relationship with healthcare providers; higher levels of comorbidity; regimens with high dosing frequency; history of low out-of-pocket pharmacy costs in the year prior to cancer diagnosis; belief that the patient has little influence over his or her own health; belief that no benefit is to be gained from medication; and lack of social support.<sup>138</sup> Those barriers should be addressed in interventions inspired by behavioural insights.

It is known that maximizing adherence begins with the therapeutic relationship between the healthcare provider and patient, which requires communication skills. Such a relationship requires warm interaction with a competent physician who gives adequate information and can learn about the patient's beliefs, attitudes, cultural context, psychosocial implications, and emotional challenges.<sup>143</sup>

Many of those behavioural risk factors have also been associated with non-adherence in teenage and young adult patients with cancer – factors such as patient emotional functioning (depression and self-esteem), patient health beliefs (perceived illness severity and vulnerability), and family environment (parental support and parent-child concordance).<sup>144</sup> Therefore strategies that foster greater patient adherence should be multifactorial, targeting the patient, the health professional, family, and treatment regimen. The lack of intervention studies addressing treatment adherence in such vulnerable cancer patients is alarming. In fact, this review identified only one such intervention – a video game focusing on behavioural issues related to cancer treatment and care, which is described in the following case study.

## **Cancer Case Study 7 - A video game improves behavioural outcomes in adolescents and young adults with cancer: a randomised trial<sup>145</sup>**

### **Executive Summary**

In order to increase adherence of prescribed treatment regimen among adolescents and young adults with cancer, participants played a behaviourally informed video game where they control a nanobot to ensure that virtual patients engage in positive self-care behaviours, such as taking oral chemotherapy to fight cancer cells and taking antibiotics to fight infection. This gamified intervention led to an increase in adherence rate compared to the control group.

### **Problem**

Patient non-adherence to treatment regimens is a common problem. Adolescents and young adults (AYA) with cancer often fail to adhere to prescribed treatment regimens, especially self-administered treatments such as oral chemotherapy. This poses a significant problem because cancer incidence is the leading cause of non-accidental death among AYA.

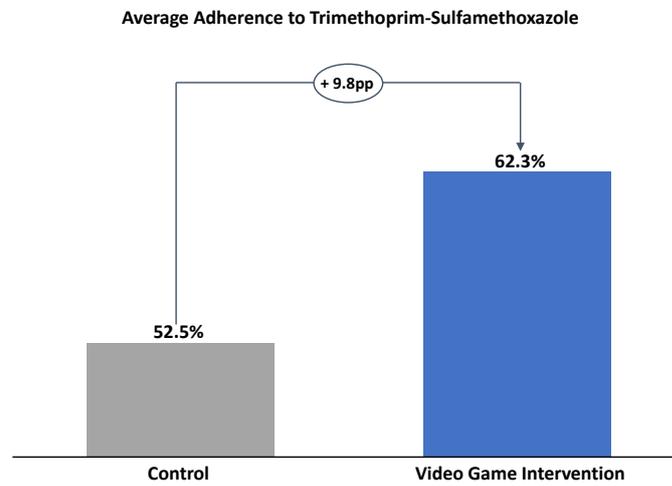
### **Solution**

To tackle the adherence challenge, a randomised controlled trial testing the impact of a behaviourally informed video game was conducted. Following a baseline assessment, a total of 375 male and female patients from 34 medical centers in the United States, Canada, and Australia, with the following criteria were randomly assigned to the intervention or control group: between 13 and 29 years old, had an initial or relapse diagnosis of a malignancy and were currently undergoing treatment and expected to continue treatment for at least four months from baseline assessment. The intervention was a video game that translated behavioural objectives around cancer treatment and care into game structure. The game included destroying cancer cells and managing common treatment-related adverse effects such as bacterial infections, nausea, and constipation by using chemotherapy, antibiotics, antiemetics, and a stool softener as ammunition. To win, players control a nanobot to ensure that virtual patients engage in positive self-care behaviours, such as taking oral chemotherapy to fight cancer cells and taking antibiotics to fight infection.

### **Impact**

Assessment was conducted one month and three months after the start of the intervention. Outcome measures included adherence, self-efficacy, knowledge, control, stress, and quality of life. For patients who were prescribed prophylactic antibiotics, adherence to trimethoprim-sulfamethoxazole was tracked by electronic pill-monitoring devices (n = 200). The video game intervention increased adherence rate by 9.8pp compared to the control group. Changes in cancer-specific self-efficacy and knowledge about cancer through the video game contributed to increase in adherence. Similar gamification approach could be directed towards a variety of chronic diseases where the role of behavioural factors is central to management of the disease.

Gamification works because it implements behavioural insights such as affect (emotional responses can be very rapid and automatic and our emotional associations created by the game can powerfully shape our learning and actions).



## SECTION 5: ROAD AHEAD FOR APPLYING BEHAVIOURAL INSIGHTS TO HEALTH

The recent growth in the use of behavioural insights as a complementary tool in health policy has been phenomenal. Evidence from a large number of behavioural interventions is proving that the use of behavioural sciences to tackle NCDs such as diabetes, cardiovascular diseases and cancer, can be valuable and cost-effective, and can enhance traditional approaches.

Based on the findings from the literature summarised in this report, we identify specific actions and practical steps that health policymakers and leaders can take to reduce the burden of NCDs. Table 1 describes the actions required to implement the behaviour change pathway to preventing NCDs for each stage of the three diseases reviewed in the report.

**Table 1: Recommended actions to implement the behaviour change pathway to preventing NCDs**

	LIFESTYLE & PREVENTION	DETECTION & MONITORING	TREATMENT & ADHERENCE
D I A B E T E S	<p>For people at risk offer to enrol into a programme that includes comprehensive diet and lifestyle intervention aimed to change participants' daily habits by sessions teaching nutrition and behavioural strategies for weight loss and physical activity, lifestyle coaches with frequent contact with participants, and supervised physical activity sessions.</p> <p>In order to increase adherence to a diabetes prevention program, offer financial incentives and also a deposit scheme in which participants deposit money matched by the provider and returned to them if the goal is attained.</p>	<p>Use religious events that require fasting, such as Ramadan for example, to organise diabetes screening.</p> <p>Improve the ease of access to screening stations.</p> <p>Involve the leaders of the religious community in encouraging worshippers to take the opportunity for testing.</p> <p>Send screening reminder letters signed by the patient's physician, which offers a small incentive (such as a gift card for example) if the required tests are done on time.</p>	<p>Call patients to remind them to pick-up new prescriptions and talk about adherence.</p> <p>SMS medication reminders.</p> <p>Set up a real-time monitoring of patients' medication dispenser and send SMS reminders if the dispenser was not opened during agreed time period.</p> <p>Send a letter about health risks if not adhering, and magnetic notepads with personalized reminders.</p> <p>Give patients a self-report calendar to keep track of their adherence levels.</p> <p>Ask patients to sign a promise contract.</p> <p>Offer daily lottery when patients use home-based health monitoring devices.</p> <p>Pair patients with mentors who previously struggled with poor glucose control.</p> <p>Provide mobile apps which connect patients with their health care team, analyse patient-generated health data, tailor education, and give individualized feedback.</p> <p>Offer a healthy food programme (include a message from a health professional, inform about health benefits for diabetes, and offer price discount).</p>

	LIFESTYLE & PREVENTION	DETECTION & MONITORING	TREATMENT & ADHERENCE
CARDIO-VASCULAR DISEASES	<p>Educate to change the cognitive determinants of lifestyle, which include knowledge and beliefs such as perceived severity (the significance of contracting an illness and the subsequent medical consequences), perceived susceptibility (the probability of developing a condition), perceived benefits (beliefs that recommended actions could decrease severity of possible illness), and perceived barriers (the personal costs of the required action).</p> <p>Provide individualised education about exercise and diet, which also addresses patients' values, motivations and goals.</p>	<p>The cardiovascular health check invitation letter should include simple information, action focused language ("call to book an appointment"), personal salience ("your appointment is due"), arguments against common barriers to screening attendance (e.g. the person feels well), and a planning prompt in the form of a tear off slip (prepopulated with the patients' name and doctor's address) where patients could write the time and date of their appointment.</p> <p>Send SMS reminders about the screening invitation and give a number to book an appointment.</p> <p>Offer different opportunities for cardiovascular health checks – primary care surgeries, local pharmacies, leisure centres, mobile units, and sport events.</p>	<p>Ask patients to develop 'implementation intentions' which is a plan to take their medication at a designated time, place, and manner. For example, a participant could plan to take their medications at breakfast, at their coffee table, while drinking orange juice.</p> <p>Use a variation of financial incentives targeting physicians and patients, whereby physicians are eligible to receiving up to a given amount per enrolled patient meeting LDL-C goals, and whereby patients are eligible for the same amount, distributed through daily lotteries tied to medication adherence.</p>

	LIFESTYLE & PREVENTION	DETECTION & MONITORING	TREATMENT & ADHERENCE
CANCER	<p>Offer a lifestyle intervention programme for people having a family history of cancer, which includes personalised education, training, goal-setting and feedback.</p> <p>Use techniques known to improve self-regulation, which include asking the participants to write down: (i) the most important goal regarding their lifestyle that is both challenging and feasible; (ii) the most positive outcome of realizing this goal and events and experiences associated with this outcome; (iii) the most critical obstacle together with events and experiences associated with this obstacle; (iv) three 'if-then plans' specifying when and where the obstacle occurs and how to overcome it, when and where and how prevent the obstacle, and when and where and how to act in a goal-directed way. The techniques are applied four times (twice to a long-term wish for the coming weeks and twice to a short-term wish for the next 24 hours).</p>	<p>Improve participation in cancer screening by using pre-screening reminders, clinician endorsement, salient information about the benefits of screening, information about the number of screening patients in the region, more personalized reminders for non-participants.</p> <p>Add a simple planning prompt at the bottom of the cancer screening invitation letter, which encourages recipients to write down the time and date of their screening appointment (and keep it in a salient place to remind them).</p> <p>Give recipients the option to express a preference for the day and time of the appointment, as well as the sex of the practitioner performing the test.</p> <p>In order to increase appointment booking rates among the population who previously did not respond to screening invitation letters, offer a prize draw with the possibility of winning a valuable good (such as an iPad) which can also be given to a valued person.</p>	<p>Promote the therapeutic relationship between the healthcare provider and patient, which requires improving clinicians' communication skills (such as ability to give adequate information and learn about the patient's beliefs, attitudes, cultural context, psychosocial implications, and emotional challenges).</p> <p>Consider the family environment in order to elicit social support.</p> <p>Consider prescribing technological solutions, such as apps and even video games focusing on behavioural issues related to cancer treatment and care (games translate behavioural objectives into game structure such as controlling a nanobot to ensure that virtual patients take oral chemotherapy to fight cancer cells and take antibiotics to fight infection).</p>

This said, there should be additional focus going forward on newly prioritised areas in healthcare, in particular, better managed and more egalitarian access to health services, innovative tools that bring artificial intelligence, data analytics and big data to decision making in health, and finally, new governance and institutional aspects of behavioural insights initiatives in health.

Future work should also aim to bring together, leading international behavioural scientists with expertise in and beyond psychology, sociology and behavioural economics, world-class methodologists, leading experts in health service, and local government and communities to deliver high quality research and implement innovative solutions at scale with robust evaluations. This breadth of knowledge and experience uniquely positions Behavioural Insights Units to mobilise expertise to answer requests around behavioural patterns and practices of healthcare professionals, managers, commissioners, decision-makers in various settings (e.g. primary and secondary care, local authorities, educational/justice settings, communities), and to conduct behavioural interventions of the highest ethical and governance standards.

#### **APPLICATIONS TO NEW AREAS OF NCDs AND HEALTH POLICY**

While this report has focused on three non-communicable diseases, applications of behavioural insights for the prevention of other NCDs are being widely used. For example, in chronic obstructive pulmonary disease (COPD), the use of behavioural insights have been focused on self-management programmes that provide social support and require setting motivational goals.<sup>146-148</sup> These programmes seek to address behavioural barriers and facilitators to effective self-management and have been targeting the reduction in hospital attendance and improvement in health-related quality of life in COPD patients.<sup>149</sup>

Asthma is another chronic respiratory disease where behavioural interventions are of utmost importance, namely in ensuring patient adherence to treatment regimens. In fact, adherence to asthma treatment has been empirically estimated at around 50% despite some recent advances in behavioural approaches.<sup>150</sup> Therefore, helping patients develop systematic behavioural patterns (habits) to increase their adherence to respiratory treatment is an important goal.<sup>151</sup>

Applying behavioural insights to the various stages of the mental health problem – for example, to the prevention of risk factors associated with mental disorders – also creates real opportunities for change. Many of these risk factors, which all augment the risk of dying from NCDs are associated with a number of behavioural biases, and therefore interventions designed using behavioural science promise improved cost-effectiveness and impact.<sup>152,153</sup> For example, it has been shown that behavioural insights such as social norms (following the herd), deciding on the basis of salience (what attracts attention), and defaults

(attachment to current status quo), can enhance other preventative approaches and mitigate the risk factors associated with Major Depressive Disorder (MDD) in a cost-effective manner.<sup>154</sup>

Furthermore, a number of behavioural interventions have also been conducted in order to improve mental health screening, increase adherence to prescribed medications and reduce missed psychiatric appointments.<sup>155–157</sup> Nudge Lebanon in collaboration with B4development is conducting a behavioural intervention with the twin objectives of increasing attendance of patients diagnosed with depression to their follow-up appointments and improving the quality of medical history reported by patients. This is being achieved by giving patients self-report cards that help them record their daily mood leading up to their follow-up appointments. The aim is thus not only to serve as a token of commitment and remind patients to come back to their follow-up appointments, but also to increase their self-awareness of their mood changes as well as to provide practitioners with more accurate history of their patient's mental state.

However, stigma surrounding mental health greatly limits access to care and decreases quality of life for individuals affected by mental health disorders. The lack of community awareness and stigma around mental health disorders can negatively affect demand for care and treatment. Behavioural insights can also examine components of previous or existing anti-stigma campaigns. Behavioural approaches can also help tackle the impact of stigma on mental health outcomes and discover how the mental health care system could be designed with concerns about stigma in mind.

Finally, there is a need for increasing the number of trained health care providers to deliver evidence-based treatment in both the hospital and community settings. In fact, healthcare systems in low- and middle-income countries face a double burden of workforce challenges: low availability of healthcare workers and poor performance of many in service. Behavioural insights and knowledge of what motivates healthcare workers in their work may help address both challenges.<sup>158</sup>

## **IMPROVING ACCESS AND REDUCING HEALTH INEQUALITIES**

The prevalence of major NCDs and mental health problems are not uniform across socio-economic classes contributing to significant life expectancy gaps between the most and least deprived communities. This can result from inequalities in affordability (such as direct costs of healthcare), service provision (such as more clinics located in urban and affluent areas), cultural barriers (such as social norms or social exclusion), behavioural variance (such as greater prevalence of smoking and poor diet), or health literacy (due to older people, migrant status and language, or educational attainment). There

is also evidence that the quality of care received within a health system varies by sociodemographic group. For example, people from less educated backgrounds are less likely to receive high-quality care and less likely to exercise choice over service provider.<sup>159</sup>

Reducing inequalities in health is often a central part of many governments, health policies, especially from a cost-effectiveness perspective – money spent on more deprived people is likely to deliver greater health, economic and societal benefits. It is important for health systems to establish how health policies and interventions can promote health equity and, that due regard is given to socio-economic, demographic and spatial inequalities in health and healthcare. For example, there have been continuing concerns that those at greatest risk of cancer were not being tested and there has been renewed interest in adequate population-wide coverage. The studies discussed in the section on cancer in this report reveal that variations exist in the uptake of screening amongst different socioeconomic groups (e.g. women from ethnic minorities and deprived sub-groups have been found to be less likely to enter cervical and breast cancer screening in countries worldwide). There are already a number of behaviour change interventions, which look at effects across socioeconomic groups. Some of the case studies presented in this report have shown how changes to the framing of text messages and other forms of communication may positively impact behaviour across groups.

The behavioural concept of ‘scarcity’ is important to understand the factors behind inequality and how it can be reduced. People have limited ‘mental bandwidth’ or brainpower, which refers broadly to our attention, cognition, and self-control.<sup>160</sup> Our mental resources often become depleted, which is particularly pronounced for people living in poverty, because their immediate needs such as finding food, shelter, or paying the bills occupy most of their cognitive capacity. Such cognitive scarcity inhibits human ability to learn, reason, solve problems, plan and control impulsiveness; which obstructs individuals’ attempts to improve their condition. It is therefore likely that individuals in such situations will gain least benefit from (rational) educational behaviour change campaigns – and hence why such interventions are likely to increase inequalities.

An important methodological implication for evaluating policy interventions is the need to better capture who gains the benefits and who bears the costs (informing judgments on inequalities as well as efficiency). Such evaluation should use the principles of health economic analysis for identifying relevant costs and benefits. Future programmes should also aim to use behavioural and social science methods (including health economics and sociology) to identify

effective and cost-effective interventions, including for whom interventions are effective in terms of key diversity and equality issues. Interventionists must also keep a focus on inclusion and widening participation – working closely with patient and community groups to ensure any approaches are sensitively developed for the specific social and cultural contexts. A major opportunity is to test the potential for co-creation of interventions with communities to increase both their acceptability, engagement, uptake and affordability.

#### **ADAPTING NEW TECHNOLOGY TO PROMOTE HEALTHIER BEHAVIOUR CHANGE**

Leveraging both data analytics and behavioural insights in order to better understand particular populations and identify behavioural patterns is becoming increasingly popular. In the age of big data and artificial intelligence, behavioural scientists are starting to use historical data to develop more targeted, and subsequently, more impactful interventions. These tailored interventions are especially helpful in targeting subgroups in large populations in more efficient and cost-effective ways, which is only made possible by using data analytic algorithms necessary for identifying behavioural patterns in large data sets. Additionally, they can be used to understand how individuals respond to different strategies and identify different impacts of an intervention across observable characteristics.<sup>161</sup> Another key advance here is the ability to infer causality through big data rather than through experimentation and potentially to intervene or support with real-time responses.

Furthermore, big data and other technologies are being used to enhance existing behavioural interventions in order to develop ‘smarter’ nudges. For example, an electronic soap dispenser equipped with a computer chip, known as the DebMed Group Monitoring System, can record how often members of different hospital wards wash their hands. It can determine whether or not healthcare workers are cleaning their hands as frequently as they should do, according to World Health Organization guidelines. In this way, the technology provides frequent and timely feedback which is an effective behaviour change technique. Such technology also allows measurement and evaluation.

Another example of using technology in health care, which has been widely studied is the use of eHealth for tackling obesity and other chronic conditions, or the use of Web 2.0 (aka social media) technologies, mobile technology and more recently wearable devices to track and improve sleep and physical activity. At the forefront of this wave of innovation, are mobile phone apps that use self-reported answers to questions combined with integral phone data, such as accelerometer data and geolocation, in an algorithm to provide personalized support tailored by time and space that is designed

with behavioural science.<sup>162</sup> Most of those studies have been performed in Europe and North America, highlighting the need for more research in other regions where other cultural factors might play a role in the design of eHealth interventions.

There is a huge potential for advancing the state of the art on digital health for NCDs due to the high penetration of new technologies and also the scale of the problem. However, one has to be careful because evidence-based science is still growing. While there is huge potential for public health improvement, many technical deployments in digital health do fail to meet expectations at the implementation or scale-up phase. This is largely due to either the lack of use of behavioural science in the design of the intervention, or the lack of adaptation to human factors, which can vary across organizations and countries<sup>163</sup>. Further, culture and social norms play a major role in the technological acceptance of lifestyle interventions. As for mobile health, studies among women from Saudi Arabia highlighted the need of culture-sensitive applications for weight loss.<sup>164</sup> Experiences on the use of eHealth in Qatar include the adaptation of educational text messages for mobiles and the use of 'quantified-self' technology that combines mobile, social media and wearables.<sup>165,166</sup>

#### **CREATING FOCUSED GOVERNANCE STRUCTURES FOR APPLYING BEHAVIOURAL INSIGHTS IN HEALTH CONTEXTS**

The set-up of teams and units for behavioural insights and nudge has been spreading fast. The early wave of these units saw their establishment at senior governance levels in national government. Now, a new trend is emerging of focused units being established in ministries and public agencies around specific policy areas, e.g. treasury and revenue, environment, economy, labour, as well as health.<sup>167</sup>

Many public health ministries and agencies are setting up behavioural insights units and teams to focus on behaviour change and experimentation. In the Middle East, this is starting to happen with many health-related entities involved in behavioural insights and nudge experiments even outside dedicated institutional set-ups, e.g. Ministry of Public Health in Lebanon on immunization and Hamad Medical Corporation in Qatar on diabetes screening.

Furthermore, the collaborative and innovative application of behavioural insights is spilling over into the private sector giving rise to new behavioural science vacancies in private sector institutions. Behavioural science is increasingly being used by the private sector to enhance companies' business operations, spur innovative design and thinking, develop the ability to understand and influence customer behaviour, and increase employee engagement. Positions such as Behavioural Finance Analyst and Chief Behavioural Officer (see **Figure 6**) are being created to develop more evidence-based business models surrounding the financial and corporate sectors, respectively.

Private sector stakeholders working in the field of health are also following the same trend. For example, health insurance and private health care providers are setting up behavioural insight units and teams within their organizations to focus on health behaviour change.

**Figure 6: Illustration of Emerging Behavioural Science Positions**



Source: B4d

Even though behavioural scientists have been focused on nudging for better health outcomes even before the publishing of “Nudge” in 2008, it wasn’t until 2012/13 that the UK Department of Health and Public Health England established complementary health-focused behavioural insights teams to analyse issues from a behavioural perspective, design and evaluate innovative interventions, advise on national policy, and build behavioural science capability in the health system.<sup>168</sup> A key strength to these teams has been their multidisciplinary nature, drawing primarily on behavioural science, health psychology, health, policy, research design, and data analytics. They have run a wide range of behavioural trials and other studies to support the screening and vaccination behaviours of both patients and clinicians, the drug prescribing behaviours of clinicians, environmental change to help people make healthier dietary choices, and more. To engage the wider system and spread the behavioural and social science approach, PHE Behavioural Insights (PHEBI) recently co-created and launched the first national strategy in this field.<sup>169</sup> This will build on and expand support for local behavioural insights professionals embedded in local public health teams in regional/county government through training, consulting and advisory support. Local expertise varies from well-established, doctorate-level teams of one to three people to individual government officers with an interest

in nudge, to zero in-house professional support but use of external consultants on a commissioned basis. Impact is often greatest when these teams are embedded in organizational executive or strategy teams.

In 2016, the first local behavioural design team within a clinical health care system was launched at Penn Medicine, University of Pennsylvania. Its primary focus is on development and testing interventions based on insights from behavioural science to improve health care delivery and their ideas for nudges are collected from the health care practitioners; health care managers, clinicians, nurses and other members of hospital units.<sup>170</sup>

Behavioural insights have demonstrated their cost-effectiveness in health care through optimizing referrals, reducing missed appointments, improving diagnosis procedures and much more. Therefore, more and more health care managers and top-level executives are becoming interested in creating health nudge units. This interest has been recently confirmed at the “Nudge Units in Health Care Symposium” recently organized by Penn Medicine. A recent survey conducted among the health care top level executives reveals that many health system representatives are looking for advice and guidelines on how to create a nudge unit.<sup>171</sup> Outside institutional set-ups, there is need to incorporate behavioural science solutions in health care management at various stages as a complementary tool.

With a change in mindset around the importance of behavioural insights as a complementary tool in health care management comes a change in skillset and capacity building for the health care profession, namely in behavioural sciences and policy experimentation.

We hope this report provides policymakers and health practitioners with ideas for potential applications of this important field of behavioural insights to tackle these three NCDs, and other health policy challenges with strong behavioural roots.

## APPENDIX 1: LIST OF PSYCHOLOGICAL BIASES IN MEDICAL DECISION MAKING

The role of cognitive biases and heuristics in medical decision making and health behaviours is of growing interest to clinical and behavioural communities. A recent systematic review summarized the empirical studies on cognitive biases and heuristics in medical decision making.<sup>172</sup> The studies included in the review were based on actual or hypothetical decisions and some were conducted with populations that are representative of those who typically make clinical or health-related decisions. Those biases, defined below, are also the same biases discovered by behavioural scientists to influence decisions in every aspect of our life.

**Affect heuristic:** Representations of objects and events in people's minds are tagged to varying degrees with affect. People consult or refer to an 'affective pool' (containing all the positive and negative tags associated with the representations consciously or unconsciously) in the process of making judgments

**Ambiguity aversion:** The display of preferences for known or certain probabilities over uncertain probabilities regardless of actual benefits

**Anchoring bias:** The response is strongly biased toward any value, even if it is arbitrary, that the respondent is induced to consider as a candidate answer

**Availability bias:** People assess the probability of an event by the ease with which instance or occurrences can be brought to mind

**Bandwagon effect:** An accelerating diffusion through a group or population of a pattern of behaviour, the probability of any individual adopting it increasing with the proportion who have already done so

**Commission bias:** Tendency toward action rather than inaction

**Confirmation bias:** The tendency to perceive more support for [one's] beliefs than actually exists in the evidence at hand

**Decoy effect:** The addition of a dominated choice alternative increases the preference for the item that dominates it

**Default bias / status quo bias:** Individuals have a strong tendency to remain at the status quo, because the disadvantages of leaving it loom larger than advantages

**Frequency/percentage framing effect:** Frequency scales generally lead to higher perceived risk

**Impact bias:** Failure to anticipate our remarkable ability to adapt to new states. People tend to overestimate the long-term impact of both positive events and negative events

**Loss vs. gain framing bias (loss aversion bias):** Losses loom larger than corresponding gains

**Omission effect:** The tendency to judge harmful actions as worse, or less moral than equally harmful omissions (inactions) because actions are more obvious than inactions

**Optimism bias / optimistic overconfidence:** Tendency to undervalue those aspects of the situation of which the person is relatively ignorant and have favourable expectations for an activity and for his/her own prospects in particular

**Order effects / primacy and recency effect:** Information presented at the beginning or end of a series is remembered and chosen more often than information presented in the middle of the series

**Outcome bias:** Allowing a prior event or decision outcome to influence subsequent independent decisions

**Relative risk bias:** A stronger inclination to choose treatment when presented with the relative risk than when presented with the same information described in terms of the absolute risk

**Representativeness heuristic:** Probabilities are evaluated by the degree to which event A is representative of event B, that is, by the degree to which A resembles B and not influenced by factors that should affect judgments, such as prior probability outcomes, sample size, chance, predictability and validity

**Sunk-cost effect:** The tendency to continue an endeavour once an investment in money, effort, or time has been made

## APPENDIX 2: BEHAVIOURAL INSIGHTS FRAMEWORKS – MINDSPACE AND SHAPE DIFFERENCE

The prominent MINDSPACE framework is an acronym that brings together the most robust behavioural effects (e.g. the concepts Messenger, Incentives, Norms, etc.) that operate largely through the automatic and often subconscious psychological processes (such as cognitive heuristics and biases).<sup>17,172–174</sup> MINDSPACE (see [www.instituteforgovernment.org.uk/publications/mindspace](http://www.instituteforgovernment.org.uk/publications/mindspace)) provides a framework for designing effective policies or interventions utilizing insights from behavioural sciences. The framework is used across both local and central government and in the commercial sector.

**Messenger:** We are heavily influenced by who communicates information. We are affected by the perceived authority of the messenger (whether formal or informal). Demographic and behavioural similarities between the expert and the recipient can improve the effectiveness of the intervention. We are also affected by the feelings we have for the messenger. We also use more rational and cognitive means to assess how convincing a messenger is.

**Incentives:** Our responses to incentives are shaped by predictable mental shortcuts such as strongly avoiding losses (we dislike losses more than we like gains), referencing points (the value of something depends on where we see it from), overweighting small probabilities (hence why lotteries may act as a powerful motivation), mental budgets (allocating money to discrete bundles), present bias (we prefer more immediate payoffs).

**Norms:** We are strongly influenced by what others do. Social and cultural norms are the behavioural expectations, or rules, within a society or group. Norms can be explicitly stated or implicit in observed behaviour. People often take their understanding of social norms from the behaviour of others. Relate the norm to your target audience as much as possible and consider social networks.

**Defaults:** We “go with the flow” of pre-set options. Many decisions we take every day have a default option, whether we recognise it or not. Defaults are the options that are pre-selected if an individual does not make an active choice. Defaults exert influence as individuals regularly accept whatever the default setting is, even if it has significant consequences.

**Salience:** Our attention is drawn to what is novel and seems relevant to us. Our behaviour is greatly influenced by what our attention is drawn to. People are more likely to register stimuli that are novel (messages in flashing lights), accessible (items on sale next to checkouts), simple (a snappy slogan), and relevant (easier to grab attention at moments when people enter a new situation or life-stage such as moving house, going to university, pregnancy etc.). We also look for a prominent anchor (such as unusual or extreme experiences, price, and advice) on which to base our decisions.

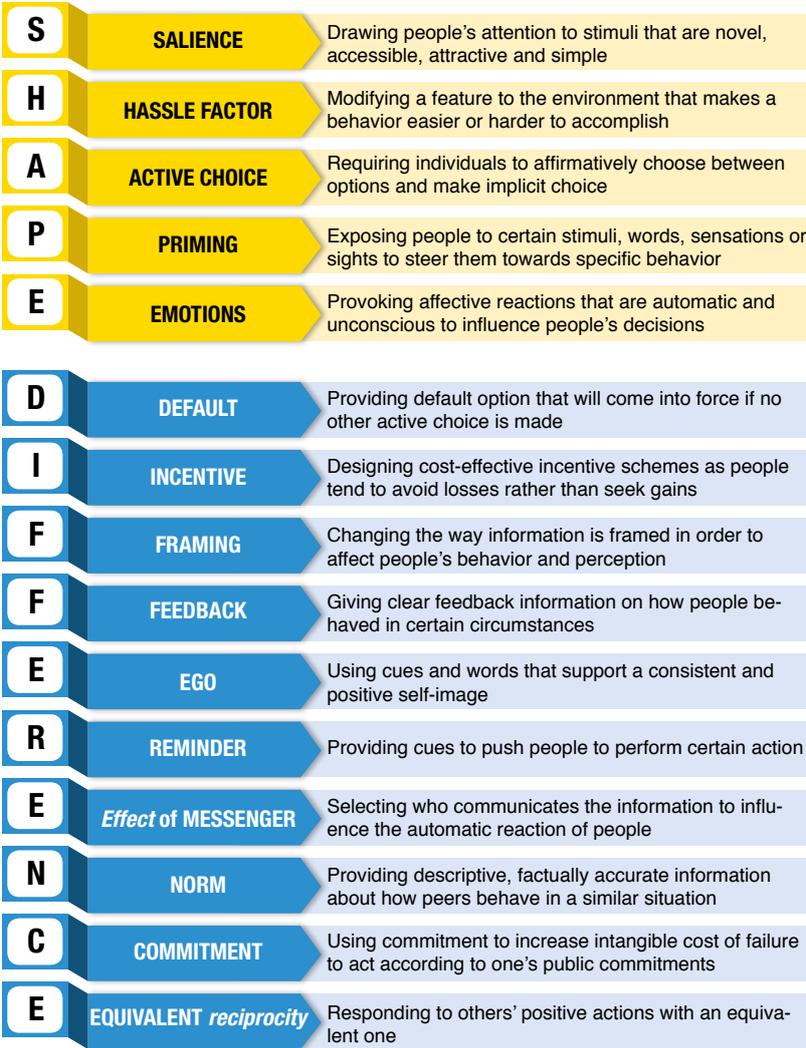
**Priming:** Our acts are often subconsciously influenced by cues in the environment. People’s subsequent behaviour may be altered if they are first exposed to certain sights, words or sensations, which activate associated concepts in memory. In other words, people behave differently if they have been ‘primed’ by certain cues beforehand.

**Affect:** Our emotional associations can powerfully shape our actions. Emotional responses to words, images, and events can be very rapid and automatic. Moods, rather than deliberate decisions, can therefore influence judgments. People in good moods make unrealistically optimistic judgements, whilst those in bad moods make unrealistically pessimistic judgements.

**Commitments:** We seek to be consistent with our public promises and reciprocate acts. We use commitment devices to achieve long-term goals. It has been shown that commitments usually become more effective as the costs for failure increase. One common method for increasing such costs is to make commitments public, since breaking the commitment will lead to significant reputational damage. Even the very act of writing a commitment can increase the likelihood of it being fulfilled. A final aspect of commitment is our strong instinct for reciprocity, which is linked to a desire for fairness.

**Ego:** We act in ways that make us feel better about ourselves. We tend to behave in a way that supports the impression of a positive and consistent self-image. We think the same way for groups that we identify with. We also like to think of ourselves as self-consistent. So what happens when our behaviour and our self-beliefs are in conflict? Interestingly, often it is our beliefs that get adjusted, rather than our behaviour.

In the Arab region, B4development and Nudge Lebanon have developed a similar framework dubbed **SHAPE DIFFERENCE**.



Source: B4d & Nudge Lebanon

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