



The Case for Incentivising Health

Using behavioural economics to improve health and wellness



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Foreword

Two in three Australians are currently overweight or obese and chronic disease is the leading cause of death and disability in the country. These preventive health challenges affect all sectors in Australia, including the life insurance industry.

At AIA Australia, we have seen this first hand, with increasing numbers of claims made because of chronic diseases that affect a person's ability to work, causing financial strain and impacting on their quality of life. Finding a way to halt this trend is critical for Australians to live better and happier lives with their families and for a more sustainable future for our national health system.

To help address this issue, AIA Australia is bringing the world's largest health and wellness program – Vitality – to Australia. Using the latest research in behavioural economics and health incentives, Vitality is designed by academics and health practitioners to encourage people to take the first steps towards healthy living and, more importantly, to make these lifestyle changes permanent.

AIA Vitality provides the knowledge and tools for people to achieve their health goals. Members of the program have the opportunity to complete full health and fitness assessments and earn points for undertaking healthy activities, such as buying healthy food and going to the gym. They are rewarded through discounts on shopping, entertainment and travel purchases, among other benefits. It will be sold initially through financial advisers to people who purchase an eligible life insurance policy with AIA Australia.

Over five million people across five countries – South Africa, UK, USA, China and Singapore – are being motivated every day to lead healthier lives through

Vitality, an incentive-based program. Evidence for the efficacy of the program – in terms of improved clinical outcomes, reduced healthcare costs, lower hospital admissions, increased productivity at work and improved mortality rates – has been profiled in leading academic journals such as the *American Journal of Health Promotion*.

We believe that Vitality can have a very significant impact on Australia's health, while at the same time revolutionising the life insurance industry.

Research into the benefits of employing behavioural economics, such as through incentives and 'nudges', as a part of the array of health promotion tools is still in its infancy in Australia. However, there is rapidly growing interest by governments and NGOs in learning how to incorporate these principles into program planning and policy making.

To help further this discussion, AIA Australia has commissioned this White Paper report titled *The Case for Incentivising Health*. Specifically, I'd like to thank Professor Kevin Volpp from the University of Pennsylvania for writing the introduction to the White Paper. Professor Volpp's considerable guidance in sourcing the latest research in the area of health incentives has been invaluable and I'm delighted with our collaboration on this project.

The White Paper aims to provide the latest research on how incentives and their associated principles can work to nudge people towards adopting and sustaining healthier behaviours. It is our hope that it can be used as an information and discussion resource by governments, NGOs and policy designers for when and how health incentives can work most effectively.

PETER CREWE, CEO, AIA Australia

Executive summary

- This is a White Paper prepared by AIA Australia to discuss a new approach of using insights from behavioural economics and health incentives to develop new interventions and solutions to change health behaviours in the hope of eventually reducing the burden of non-communicable disease (NCDs).
 - The burden of NCDs is one of the greatest health challenges of the 21st century and one of the most significant economic challenges to both developed and developing countries. NCDs are the leading causes of death in most countries and account for 63% of global mortality. In Australia 90% of deaths are caused by NCDs.
 - NCD incidence is not only increasing, but also increasing rapidly with, for instance, Australia experiencing a 47% increase in obesity between 1995 and 2012.
 - The overall cost to the health care system associated with the three most common contributors to NCDs – obesity, smoking and harmful drinking – is in the order of almost \$6 billion dollars per year.
 - Our health is affected by a range of factors: significantly where we are born, grow up, live, work and age; but also, our decisions to adopt certain behaviours both healthy and otherwise.
 - Public health and health promotion have addressed health problems with a range of policies in regard to, for example, sewerage and clean air as well as society-wide approaches to reducing disadvantage through education, job creation and individual support together with health promotion campaigns.
 - In recent decades, insights from developing research in behavioural economics and psychology are driving new approaches to how individuals make decisions.
 - While standard economics has focused on ‘rational’ decision-making in which individuals seek to maximise what economists call their utility, behavioural economics has demonstrated that decision-making is often ‘predictably irrational’.
- This irrationality stems from factors such as loss aversion (putting greater weight on losses than gains); status quo bias (taking the path of least resistance to continue what people are doing); the impact of framing (the way the frame of reference within which decisions are presented influence choices); present bias (focusing on immediate costs and benefit and undervaluing the future); and overweighting small probabilities (dreaming of winning the lottery without appreciating the real odds).
- These insights have been applied to ‘nudge’ approaches to health promotion and, increasingly, the use of financial incentives to change behaviour. Examples of incentives to moderate bad health choices include incentives to reduce smoking among employees or pregnant women. Equally, they have been applied to other health problems such as medication non-adherence. These incentive approaches are most effective with frequent feedback and when the incentives are small, frequently provided and given soon after the activity has been completed.
 - Other behavioural economics insights have also been applied to motivate health and other choices through default policies (opt in versus opt out) and contractual and commitment pledges. Altruism and the human desire for approval have been used in situations ranging from mentoring for diabetes control in the US to condom distribution in Zambia.
 - A significant case study encompassing the behavioural economics principles and evidence-based applications is the wellness program, Vitality, which is being implemented in South Africa, the US, UK, China, Singapore and, shortly, in Australia.
 - Behavioural economics is a rapidly-emerging discipline with wide-ranging ramifications for not only health policy and practice, but also other areas such as finance and consumer policy. Increasingly its lessons, often combined with new technologies, will have significant impacts on health, health spending and costs and community well-being.

Drawing from behavioural economics insights, this report summarises the main considerations those working in the preventive health space could think about when developing programs, policies or interventions to change behaviours:

- Provide small and frequent incentives close to the completion of a healthy activity to encourage adoption of healthy behaviours, while incorporating frequent feedback through the program (see page 14).
- Consider the use of a lottery-draw to distribute incentives (see page 16).
- Create an incentives structure that has attainable thresholds and with tiers of rewards so that a larger number of people are engaged (see page 20).
- Encourage high frequency of participation in the healthy behaviour during the period when incentives are provided, to improve the potential that the behaviour will be sustained when the incentives are removed (see page 15).
- Consider the importance of testing different types of messaging, as the same information conveyed in different ways can have extremely different effects (see page 13).
- Consider the use of 'contracts' and commitment devices to pledge to a certain behaviour or goal (see page 17).
- Make the healthier option the default or "path of least resistance" option, making it easier for the individual to choose, adopt and sustain that healthier behaviour rather than the unhealthy option (see page 17).
- Consider the use of modern technology such as mobile apps and social media to monitor health behaviour and outcomes outside of the GP clinic or hospital (see page 19).
- Leverage social altruism through programs such as offering people who have excelled in mastering a particular disease the opportunity to provide peer support to others who might benefit from such assistance (see page 18).
- Incorporate social recognition aspects into program design (see page 18).

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Introduction

By Kevin G. Volpp, MD, PhD Professor of Medicine, Perelman School of Medicine; Professor of Health Care Management, the Wharton School; Director, Center for Health Incentives and Behavioral Economics, Leonard Davis Institute, all of the University of Pennsylvania USA; Principal, ValHealth.

It has become increasingly clear that health behaviours contribute significantly to poor health outcomes and increased health costs. Harmful behaviours are observed as factors in contexts ranging from cardiovascular disease morbidity and mortality owing to poor medication adherence, to the widely acknowledged harms from smoking and obesity. While societal factors and structures, genes and the environment play a large role in contributing to these conditions, behaviour choices impact both the incidence and the trajectory of these conditions. This provides hope that the health harms from smoking, obesity, and low rates of engagement in areas such as medication non-adherence can be ameliorated or reversed.

In recent years, there have been dramatic advances in the science of behavioural economics. Behavioural economics utilises insights from psychology to enhance standard economic models of behaviour, which presume people are perfectly 'rational'. Extensive academic work has shown that people are often irrational, but that this follows patterns that are well enough understood to both make clear how such behavioural biases contribute to unhealthy behaviour and provide guidance on how interventions can be structured to improve health behaviour.

This White Paper describes some of the key areas in which behavioural economics has made contributions, such as: present-biased preferences (the tendency to focus on the immediate costs and benefits of an action); loss aversion (which makes people more motivated by a desire to avoid losses than to obtain gains); the default or status quo bias (which encourages the 'path of least resistance'); framing (in which people respond very differently to alternatives, depending on how they are described); and nonlinear probability weighting, specifically the overweighting of small probabilities near zero (the inaccurate assessment of lottery odds, for example). It then discusses some of the key studies that have begun to shape our collective understanding of how incentives that leverage some of the above behavioural economic principles have been used in practice to modify health behaviours in a variety of contexts and contrasts these with the standard economic approach.

Incentive programs to date have shown much progress in addressing these problems and are discussed in some detail, and through case studies, in this paper. Efforts are now ongoing to continue to improve the contributions of behavioural economics to health in areas such as improving

habit formation, better utilising pro-social motivation and using wireless technologies for chronic disease management. This will continue to be an exciting area for years to come as countries see increasing demand for achieving higher value and improvements in health, in return for growing spending in health across all industrialised countries. This need is being exacerbated by a climate in which both public and private sectors face budgetary pressures.

Healthcare financing has typically focused primarily on the treatment of diseases and in providing fee-for-service healthcare services within the four walls of a doctor's office. However, there is growing recognition in the US that paying for health services on a fee-for-service basis typically leads to a high rate of service provision, but not necessarily of keeping people healthy. While the Australian healthcare system is significantly different, some of the same issues apply in terms of use of GPs and the acute and sub-acute system. Significant new efforts are underway in a number of countries to shift healthcare financing to focus more on keeping people healthy as opposed to treating them once they get sick. This will drive demand for more effective and efficient solutions to chronic disease management and keeping populations of people healthy. A significant development in this area has been the use, and study of, the effectiveness of incentives to achieve these goals. For example, about 85% of large employers in the United States used incentives to motivate healthy behaviour this year in recognition of the role that unhealthy behaviour plays in contributing to high health costs and poor outcomes. In the UK, a pilot scheme is being conducted in the disadvantaged areas of South Yorkshire and Derbyshire to see

the impact of offering new mothers up to £200 in shopping vouchers to encourage them to breastfeed their babies. There is also recognition of the need to align individual incentives towards working to improve health.

In Australia, there is a community-wide incentive system to encourage participation in health insurance through the Lifetime Health Cover program, which encourages people to take out health insurance when young. If taking out health insurance is deferred to later ages, a loading calculated on the basis of that age is imposed on health insurance programs. This acts to moderate health insurance rates for all Australians by shifting the actuarial risk in the total health insurance pool. While this program does not appear to have been analysed within a behavioural economics framework, it was an early Australian example of using a mix of incentives and disincentives to address health costs.

Vitality has been a leader among commercial programs in using behavioural economic principles to influence health behaviour for about two decades within South Africa and, in more recent years, within the US, through a joint venture with Humana, and in the UK, through PruHealth. The AIA Vitality joint venture represents an innovative foray into this arena within Australia. It will provide further evidence-based solutions on the impact of incentives on health; how to improve services that complement healthcare delivery; and how insurance plan designs can contribute to the goals.

Non-communicable diseases

The burden of non-communicable diseases

It is evident that one of the greatest health challenges of the 21st century, and one of the greatest economic challenges to date, is that of non-communicable diseases (NCDs).

These largely preventable lifestyle-associated conditions, driven by unhealthy behaviours and other environmental and socioeconomic factors, are the leading causes of death in most countries and account for 63% of global mortality.¹

In Australia, 90% of deaths are caused by NCDs.²

According to the World Health Organization, the principal global risk factors for NCD mortality are unhealthy diet, insufficient physical activity, tobacco use and the harmful use of alcohol. These risk factors lead to key metabolic changes – obesity, raised blood pressure, raised cholesterol and impaired glucose metabolism – that underlie cardiovascular disease, several cancers, diabetes and certain chronic lung diseases.

Recent estimates indicate that over 60% of adult Australians and approximately 25% of Australian children are overweight or obese, with the population-wide prevalence of overweight and obesity steadily increasing.³ Recent data also show that two-thirds of the Australian population are sedentary or have low levels of physical activity and that 15.6% of Australians report being diagnosed with one of the following NCDs: heart disease, cancer, diabetes and hypertension.³

The development of the non-communicable diseases epidemic

There are several reasons for the global increase in the prevalence of NCDs. The last century has witnessed significant increases in life expectancy, from an average of 47 years in 1900 to around 79 years in 2011, which has had a major effect on the prevalence of NCDs.^{4,5} This is because the prevalence of NCDs varies across age groups. For example, hypertension is approximately ten-times more common in adults over the age of 60.⁶ Similarly, the risks of type 2 diabetes, hypercholesterolemia, cancers, arthritis and osteoporosis all increase with age.⁷⁻¹¹

Furthermore, the criteria used to diagnose most chronic conditions have been progressively revised over the years. The downward revision in normal values and threshold for diagnosis has occurred for hypertension, diabetes and dyslipidaemia. While revised guidelines have contributed to the increased prevalence, there are also indisputable changes in demographics and in the environment that account for much of the real increases.

However, the most important driver of the epidemic of chronic diseases is the dramatic change in unhealthy behaviours, which has resulted in a virtual conflagration of NCDs among individuals of all ages.^{1,3}

The contributing factors leading to the deterioration in health and nutritional status include urbanisation, economic development and market globalisation, leading to significant changes in diets and

lifestyle.^{12,13} Compared to 1995, the proportion of Australians that are obese in 2012 has increased by 47%.¹⁴ Shifts of this magnitude over a relatively short period of time cannot be explained by genetics or biology, but rather must be owing to social and behavioural factors. While the dramatic increase in obesity is sobering, recognition that this is likely owing to social and behavioural factors also suggests, to a significant degree, it could be reversible.

The cost of non-communicable diseases

The explosion in prevalence of NCDs has been accompanied by a burgeoning increase in the cost of and demand for healthcare. The costs are partly related to the increasing costs of newer drugs and technologies. However, the NCD epidemic itself is, without doubt, a significant factor associated with rising healthcare costs. In most countries of the developed world, the cost of treatment of NCDs is already straining national budgets.¹⁵ A significant economic burden is also imposed indirectly, owing to loss of productivity and absenteeism. Furthermore, intangible costs occur as a result of the psychological and social effects of NCDs on patients and their family members.

Over the next two decades, NCDs will cost in excess of US\$ 30 trillion globally,¹⁵ and a significant long-term economic impact is anticipated globally.

While Australia is one of the world's healthiest countries, it is estimated that, by 2050, the amount spent on healthcare will be approximately \$250 billion.¹⁶

A modelled case study prepared for the United Nations estimated that Australia's total health expenditure will increase in real terms by 127% over the period 2002–2032, and that health expenditure would increase as a percentage of GDP from 9.4% to 10.8%.¹⁷ Public health expenditure (which includes preventive health activities) is currently only 1.6% of overall health expenditure³ and Australian government spending on preventative health is being reduced for budgetary reasons. The National Preventative Health Task Force estimated that the cost to Australia of the impacts of obesity, smoking and harmful drinking total around \$13 billion.¹⁸ This raises important cost-benefit implications for the role of public health and health promotion and the significance of innovative approaches in the area. Given reduced government spending in the field, there are opportunities for employers, other organisations and private-sector health service providers to contribute significantly to approaches that reduce the cost to the community.

Public health and health promotion

The successes of public health and health promotion

Public health and health promotion have been the fundamental pillars underlying any attempt to improve the physical and mental health of individuals and societies. Traditional public health interventions and health promotion have contributed enormously to reducing disease burden globally. These strategies have been particularly successful in terms of reducing morbidity and mortality from road injuries and communicable (infectious) diseases. (Appendix A provides a brief history of public health and health promotion).

A significant reduction in malnutrition and communicable diseases, including respiratory infections and diarrhoeal diseases, has been observed through social and environmental interventions such as water sanitation, improved housing and enhancing food and financial security.^{19,20} Sexually transmitted infections have been reduced through education around safe sexual practice.²¹ Education and public health campaigns have increased childhood vaccination rates, also reducing the infectious disease burden, with the most notable example (and indeed one of the greatest triumphs of medicine and public health to date) being the eradication of smallpox.²²

In Australia, examples of the successes of health promotion and public health policy abound. Public health measures such as compulsory seatbelts, compulsory motorcycle helmets, road speed limits and penalties for being above the alcohol limit while driving have resulted in a reduction of road accident deaths from 8 per 10,000 vehicles in 1970 to 1.4 per 10,000 vehicles in 1999, and a substantial

decline in road accident trauma.²³ The reduction of infectious diseases through public health campaigns and national immunisation programs over the last few decades has resulted in a polio-free Australia; near-elimination of *Haemophilus influenzae* type b, measles and rubella; and nearly 80,000 estimated saved lives in 2001, with a net benefit of tens of billions of dollars.²³ At the same time, worrying falls in immunisation rates in Australia indicate the need to constantly renew and revise efforts to protect and enhance the gains made.

Public health and health promotion strategies have also achieved a reduction in the NCD burden in Australia. Increasing public awareness regarding risk factors such as high blood pressure, high blood cholesterol, high-fat and high-salt diets and tobacco use along with primary prevention strategies have resulted in reductions in NCD morbidity and mortality and countless dollars saved.²³ An example of this over the longer term (30 years): government investment of \$176 million in public health programs to reduce tobacco consumption returned an \$8.4 billion net benefit with 17,000 premature deaths averted.²⁴ However, these approaches have been insufficient in curbing the incidence and prevalence of NCDs, along with the substantial economic burden they impose.

Two core strategies have fundamentally underpinned the efforts of public health and health promotion: creating healthier environments through significant policies and programs such as installing sewerage and clean water, cleaning up their air, taxes and legislation on tobacco, addressing social and economic disadvantage; and, increasing health knowledge. Essentially, the latter efforts have often relied on the assumption that humans will behave

entirely rationally if they are presented with a favourable environment and the correct information in a form that they can understand. However, unlike other public health threats that can be addressed by one-time measures, such as vaccination, reduction of NCDs requires ongoing changes in lifestyle that affect individuals on a daily basis, with choices and habits that are subject to a number of physical, emotional, social and financial factors. In the context of NCDs and lifestyle choices, more often than not, people are aware of the dangers of their unhealthy behaviours and have access to healthy alternatives. If it were as simple as creating environments where individuals had good information on the health consequences of their actions and where they could easily obtain healthy foods and infrastructure to exercise, diseases of lifestyle would be much less prevalent than they are today. This paper, therefore, looks in more detail at the role of other approaches, such as incentives, in building on these fundamental efforts through a description of the Vitality case study.

Behavioural economics and health

For decades, traditional economic theories built on assumptions of rationality have been widely used to explain human behaviour. However, such models have limitations in describing self-harmful behaviour in that they largely presume that, if individuals have adequate information, observed behaviours are largely a function of preferences.

These standard economic models ignore limitations in human decision-making, termed decision errors, which help explain why individuals engage in behaviours that may appear not to be in their self-interest.

These decision errors are common and influence human behaviour in largely predictable ways.

Present bias and hyperbolic discounting

Potentially, the most challenging decision error in terms of implications for healthy behaviours is the tendency to focus on the immediate costs and benefits of a situation and undervalue the future implications.^{25,26}

This leads to a natural propensity to procrastinate in undertaking behaviour changes that have immediate costs (withdrawal from nicotine or not having a chocolate chip cookie), but significant benefits in the future (lower risk of heart disease or cancer or diabetes). Individuals, typically, also will be more willing to defer committing themselves to a course of action that has costs in the future (for example, go on a diet or quit smoking next week) because those future costs are not as salient in the present and are heavily discounted because they are in the future.

While present-biased preferences typically contribute to higher rates of unhealthy behaviour, effective incentive programs can offset this by providing immediate rewards and/or punishments related to the desired behaviours. People can also be encouraged to 'precommit' to programs in the future, such as an exercise or smoking-cessation program.

Overweighting of small probabilities

Lotteries are extremely popular because people tend to over-weigh small probabilities in making decisions.^{27,28} This is owing to a 'possibility effect' in which people put disproportionate weight on outcomes that have a small probability of occurring and tend not to recognise the magnitude of variations in probability near zero. Lottery-type rewards can be very cost efficient, since many people will, in essence, equate a 0.0001 and a 0.0000001 chance of winning a prize, even though the probabilities differ by orders of magnitude – people often focus on the magnitude of the rewards and not the expected value (probability multiplied by expected value). Recognising this can help lead to the design of more effective public health interventions.

Loss aversion

The principle of loss aversion is people put much greater weight on losses than gains. Studies have shown that a loss has roughly twice the disutility of an equivalent dollar gain.²⁹ Incentives can be framed as losses as a way to increase motivation; while there are a lot of philosophical debates about "carrots" versus "sticks" there is little comparative data. The sense is that the use of penalties (sticks) must be done selectively since, for instance, having employees or insurance plan members continuously

feeling they are being penalised is unlikely to engender happiness or loyalty among them.³⁰

Status quo bias

The *status-quo*, or default, bias refers to people's tendency to take "the path of least resistance" to continue doing what they have been doing or to select the preselected option from a group of options, even when other, probably better, alternatives exist.³¹⁻³⁴ Extensive work within the finance sector has shown employees tend to put aside no money in retirement funds, for example, when the default contribution rate is zero, even if that leaves employer matching of contributions unutilised.³⁵ In Australia and New Zealand, opt-in and opt-out policies for superannuation and financial planning have been pursued as well as default options for investment choices. In western European countries that have an opt-in policy for organ donation, donation rates tend to be close to just 10%. In contrast, in countries with an opt-out policy of automatic enrolment as organ donors, organ donation rates are typically 98%–99%.³¹ Well-chosen defaults can be used to help people engage in healthier behaviours at higher rate; for example, by changing the defaults on prescription refills from 30 days to 90 days (or longer) among people with indications for lifelong therapy to decrease the risk of medication noncompliance owing to running out of pills.³⁴

Framing

Another important concept is that individuals appraise options depending on how they are presented. For example, in choosing cancer

treatment, 82% of patients preferred surgery over radiotherapy when surgery was described as having a 90% survival rate. However, only 56% preferred surgery over radiotherapy when it was described as having a 10% mortality rate.³⁶ The literature on framing is extensive and highlights the importance of testing different types of messaging, as the same information conveyed different ways can have extremely different effects. In essence, however, it seems clear that setting the frame of reference of choices is a powerful influence on decision-making.

Examples of behavioural economics in improving health

In order to positively influence decision-making processes, behavioural economists propose interventions that: gently encourage individuals to make optimal decisions which are in their long-term interests; and avoid imposing restrictions on those individuals who make informed, deliberate decisions, even if these decisions may be injurious to their health in the long term. This approach is variably referred to as "soft paternalism", "asymmetric paternalism" or "liberal paternalism" and recognises the errors and biases inherent in human behaviour to help people make better choices.^{34,37} Altering choice architecture through "nudging" has been popularised through literature such as *Nudge: Improving decisions about health, wealth and happiness* by Thaler and Sunstein.³⁸

Recently, behavioural economics theories have been implemented in the healthcare sector to address the risk behaviours that contribute towards poor health and increased healthcare costs.

*Behavioural economics interventions used to enhance health, particularly in the context of NCDs, need to have long-term effects and create new sustainable habits that replace unhealthy choices with healthy ones.*³⁹

In the rapidly growing field of behavioural economics, there is an increasing body of literature that indicates that incentives are among the effective interventions that can be deployed and some examples of behavioural economics interventions used to enhance health are described below.

Providing material incentives

Incentives are being widely used to motivate changes in health behaviour. In the US, about 80% of large employers are using incentives to encourage healthy behaviour in 2014.⁴⁰ In succeeding pages, specific examples of these incentives, for example employer payments to employees to encourage smoking cessation, and their impacts are discussed. It is recognised that unhealthy behaviours play a significant role in driving both high health costs and poor health outcomes, and that incentives can increase employee focus on the relationships between health, health behaviours and health costs.

One of the key insights from behavioural economics has been that the type of incentive, its nature and its timing plays a great role in determining the success of interventions in influencing a given behaviour.⁴¹⁻⁴³ Standard economics would posit it is just the size of reward that matters. However, incentives can be more effective using the same amount of money, or achieve bigger effects for less money, if they

leverage some of the insights from behavioural economics by incorporating insights about decision errors into the program design. Material incentives have been used to create a wide range of incentives to improve lifestyle choices in the context of NCDs.⁴⁴ Essentially, these interventions use present bias by providing small, frequent and fairly immediate rewards to enhance healthy behaviours.

Incentives to discourage harmful habits

A first example illustrates the importance of mental accounting in which an incentive was offered separate from the standard selection of health insurance options offered under the largely employer-based US structure. While the Australian health and insurance systems are significantly different, the study findings still have relevance to how choices are made in the context of incentives. Volpp and colleagues tested the impact of a financial incentive of \$750 on smoking cessation rates among employees of a large multinational employer. In this program, study participants were randomised either to a control group, who received information about smoking cessation, or a group that received the same information plus incentives totalling \$750 over a year. Both groups were evaluated on the basis of meeting certain goals, such as completing a cessation program and having biochemical tests to confirm cessation over time. Quit rates were significantly higher in the incentive group compared to the control group, both in the short term (biochemically confirmed quit rates at six months of 20.9% versus 11.8%) and in the long term (with a near-tripling of quit rates lasting 15–18 months).⁴⁵ These incentives were provided separate from the health insurance premium structure. This was an important feature since tying the incentives

into premiums risks melding the incentive with a larger sum of money, as premiums are typically deducted from paychecks through automatic payroll withdrawal processes, to make adjustments relatively invisible.⁴¹ The effectiveness is illustrated by the relative savings available to both groups. Study participants smoked on average one pack a day on entry into the study and, in both the control and incentive groups, would save approximately \$1,500–2,500 a year by quitting smoking, based on the price of cigarettes in different states. However, the lump-sum payments and the opportunity to win money from an outside source clearly motivated the incentive group to a much higher degree than the inherent saving.

Other work has illustrated the importance of feedback frequency. In efforts to help people lose weight, Volpp *et al* randomly assigned individuals to one of three weight-loss plans: monthly weigh-ins, a lottery incentive program or a deposit contract. The deposit contract is a condition whereby the participant invested their own money, which was forfeited in the event of them not achieving their weight goals, but if they were successful the money was matched 1 to 1 (e.g. the participants' initial contributions were doubled). This plays on loss aversion as once individuals have made a deposit they will work hard not to lose the money. Both the lottery group and deposit contract group lost significantly more weight than the control group (13.1 pounds and 14.0 pounds versus 3.9 pounds, respectively).⁴⁶ However, in other work in which the feedback was only monthly, the same investigators found incentives of similar magnitude to be only modestly effective.⁴⁷

Frequent feedback has also been shown to be extremely effective in the context of financial

incentives for smoking cessation among pregnant women. Heil *et al* used a voucher-based reinforcement therapy to motivate abstinence from smoking. This provided feedback several times a week and found that incentives resulted in a significant increase in smoking cessation rates at the end of pregnancy (41% versus 10%). Impressively, evidence suggested that the behavioural change was sustainable, as the benefit was still evident 12 weeks postpartum.⁴⁸

Encouraging good habits

A key challenge is the question of how to use incentives to create good habits. Numerous investigators are testing approaches to this. Charness and Gneezy published one of the pioneering studies in the field showing that giving financial incentives to people when they go to the gym increases the likelihood that they will go.⁴⁹ However, a key to inducing ongoing gym use, even once the incentive is removed, is to have a high frequency of attendance during the intervention period. A key unknown is for how long and with what intensity different behaviours need to be instilled to have sustained effects post-intervention. In the example above of the employer-based smoking intervention, the ratio of quitting in the incentive and control group at 12 months was 2.9 (14.7% versus 5.0%). Six months later, following no incentives for six months, the quit rate ratio was 2.6 (9.4% versus 3.6%), indicating, though there were relapses in both groups, the incentive group maintained a similar ratio. This suggests that, in the context of smoking cessation, if an incentive program can help maintain cessation for 12 months there is a reasonable probability that individuals will continue on their own.

Apart from promoting healthy lifestyle behaviours to prevent disease, another significant challenge is medication non-adherence. Volpp *et al* tested the effectiveness of using financial incentives to improve warfarin adherence. Volunteers were used to investigate if a lottery-based daily financial incentive could be used to improve drug adherence. The results were favourable as in the first pilot the international normalised ratio (INR) decreased by 22.8%. Furthermore, the mean proportion of incorrect pills that were ingested during the intervention was 2.3%, compared to a historic mean of 22% incorrect pills.⁵⁰ Subsequent work illustrated the importance of targeting individuals with poor baseline adherence, as improvements in anticoagulation control from a daily lottery incentive were significantly greater among those with poor anticoagulation at baseline, but perhaps not surprisingly were not seen among those with good control at baseline.⁵¹

Non cash incentives

The use of cash incentives to promote good health and to deter bad habits does not indicate, of course, that behavioural economics is simply replicating aspects of standard economics. Rather it illustrates how both cash and non-cash incentives are perceived within a behavioural economics context.

Indeed, incentives do not have to involve cash to be effective. For example, in an attempt to increase childhood vaccination, Banerjee *et al* divided several rural villages in India into one of three groups. The first group received no intervention; the second had well-publicised immunisation clinics; and, the third had well-publicised immunisation clinics

with the additional incentive of a 1kg bag of lentils given to the caregiver when bringing the child in for vaccinations. At the end of the trial, the rate of immunisation was 6% in the control group, 17% in the group with the clinics only, and 38% in the group with the clinics and the lentil incentive.⁵²

In a head-to-head test of a standard economic versus a behavioural economic incentive, Volpp and colleagues engaged with an employer who was paying a \$25 incentive to employees for completion of a health-risk assessment. The employer had participation rates of around 40% and made the rational assumption that increasing the incentive to \$50 would increase participation. Volpp *et al* randomly assigned employer work sites into two groups: in the first group the incentive was increased to \$50; the second group was subdivided into small groups of 4–8 individuals who were entered into a “regret lottery” (also known as a Dutch lottery) in which once a week groups were randomly selected (over a 4-week period). Anyone who had completed the health risk assessment would receive \$100 if their group’s number was chosen. In addition, if over 80% of the group had completed the assessment, everyone who had done so would receive an extra \$25. After four weeks, the first group with the \$50 incentive witnessed increased participation from 40% to 44%. In the second group with the regret lottery, however, participation increased to 64%.⁵³ The impact of the regret lottery is likely attributable to a concept called anticipated regret, in which individuals can anticipate the disappointment they will feel if they don’t win something they could easily have won.⁵⁴ Importantly, both groups were actuarially designed to have the same cost to the employer, but the regret lottery was far more effective.

The use of contracts and commitment devices

Another approach is to use contracts that allow individuals to pledge to a certain behaviour or goal. One of the groups in the weight-loss trial conducted by Volpp *et al* (described above) was assigned to a deposit contract. As previously mentioned, this group and the lottery group lost significantly more weight than the group without incentives.⁴⁶ Gine *et al* designed a randomised controlled trial to assist people to quit smoking in the Philippines. Participants were offered a savings account into which they were able to deposit money that could not be withdrawn for six months. After six months, participants had their urine tested for cotinine, a metabolite of nicotine. If the test was negative, showing that they had successfully quit, they were able to withdraw the money. If the test was positive, the money was donated to charity. Participants in the commitment group were more likely to quit than those in the control group and more likely to still have a negative cotinine test six months later.⁵⁵

Contracts may also be used in the form of “Ulysses contracts” where individuals make decisions that bind themselves in the future and intentionally stop themselves from succumbing to some sort of temptation in the present (this is an allusion to the Greek myth of Ulysses binding himself to the mast and plugging the ears of his oarsmen so that he could hear the sound of the beautiful sirens without risk, since the sirens were known to lure people who listened to them into dangerous waters where their ships inevitably capsized). As Dan Ariely has noted, examples of potential Ulysses contracts abound in everyday life.⁵⁶ For example, one may intentionally avoid buying unhealthy foods, knowing that one’s

future self will overeat if such items are in the house. Similarly, smokers intentionally buy one pack of cigarettes rather than a carton, decreasing their own future cigarette consumption. Drivers who know they are going to consume alcohol at a party may give their car keys ahead of time to a friend, stopping their future selves from making the irresponsible decision to drive under the influence, or choose alternative transport options. There are a number of important questions to resolve to increase the impact of commitment contracts on health, many of which relate to increasing the initial and ongoing rate of participation.⁵⁷

Applying defaults

Defaults are, for a number of reasons, an effective way of influencing decision-making within a behavioural economics context. The status quo bias and inertia mean it is more effort to change from the default than to retain it: the presence of a default suggests that it is endorsed by people with relevant expertise; and the default itself establishes a reference point where moving from this requires effort.

The default effect has been observed in a well-known experiment conducted by Johnson and Goldstein. If organ donation was the default option on drivers’ licenses and not being an organ donor required individuals to opt out, 82% agreed to be donors. If the default was to not be an organ donor and becoming a donor required individuals to opt in, only 42% of people chose to do so.⁵⁸

In some settings, however, an opt-out default is not an option. In working with CVS Caremark, the largest pharmacy benefits manager in the US, with approximately 67 million members, Keller,

Loewenstein and Volpp developed an approach called “enhanced active choice”. A straightforward opt out wasn’t considered appealing as a member’s credit card would be charged every time a prescription was dispensed and members would reasonably be disgruntled if they hadn’t explicitly authorised the credit card charges. Active choice embedded the decision to sign up for an automatic refill program within the standard refill process. Some of the advantages and disadvantages in terms of convenience were highlighted as part of this: (“Press 1 if you prefer to refill your prescriptions each time. Press 2 if you would prefer us to do it for you automatically.”). This approach highlights the convenience of automatic refills, but also allows users to feel this was a program they had chosen. The enhanced active choice approach resulted in an increase in the rate at which members signed up for the automatic refill program of more than 100%.⁵⁹ A similar success was observed by Beshears and colleagues through the use of active choice regarding home delivery of chronic medications, which saved the employer over US \$1 million in one year.⁶⁰

Future directions

Ongoing work is underway to encourage pro-social motivations, which tap into both our desire for approval and our capacity for altruistic behaviour, to influence behaviour. These non-material incentives may prove to be even more powerful than material rewards in certain contexts.

An example of this is a peer mentoring program designed by a team led by University of Pennsylvania faculty member Judith Long to improve diabetes control. Patients with poor diabetes control were randomly assigned to one of three groups: usual care, a peer mentoring group and a financial incentives

group. The peer monitoring group was assigned a mentor who had previously had poorly controlled diabetes, but now had good control. Significantly, at six months, both the peer monitoring group and the financial incentives group reported better diabetes control than that of the control group. The mean change in HbA1c (the basic measure of diabetes control) relative to the control group was -1.07% in the peer mentoring group and -0.45% in the financial incentive group compared to 0.01% in the control group.⁶¹ Leveraging social altruism in such programs could, at low cost, both provide an opportunity for those who have excelled in mastering a particular disease to help others and peer support to those who might benefit from such assistance.

In another example, in an attempt to increase condom distribution, a study in Zambia randomly assigned hairdressers to one of four groups: a control group; a group incentivised with a low financial reward; a group incentivised with a high financial reward; and, finally, a group incentivised with social recognition. The group rewarded with social recognition sold twice as many condoms as any other group (an average of 14.4 condom packs sold over the study period in the social recognition group, compared to 6.9, 7.3 and 7.7 packs sold in the control, low financial incentive and high financial incentive groups, respectively).⁶²

Use of incentives has been found to be particularly effective at changing one-time behaviours (e.g. vaccination and screening tests) and programs targeting these behaviours can be enhanced by using insights from behavioural economics. Research is now focusing on how incentives can be used to achieve habit formation and to improve the effectiveness of programs in sustaining healthy behaviours and long-term sustained weight loss.

Based on this insight, David Asch, Kevin Volpp and Ralph Muller from the University of Pennsylvania health system developed a concept called automated hovering. Automated hovering combines the notion of monitoring with remote support for patients or plan members to help them achieve their health goals. This involves using technology during these 5,000 hours, alongside incentives, and feedback to either the patient, their carers or healthcare providers, to improve the individual's health.

Elements of programs, such as Vitality, have very similar goals, and to some degree provide this type of hovering as well.

Limitations of behavioural economics

Behavioural economics theories have now been widely adopted in academic and governmental institutions. Behavioural economists now form a key part of several academic and governmental organisations, advisory bodies, expert panels and public health groups.^{37,64,65} Behavioural economics undoubtedly has the potential to enhance health and wellness but, as with any concept or intervention, there are limitations. The tools presented by behavioural economists should represent part of the potential solution set and should not substitute for public policies that could be important to improving health, but politically more challenging.⁶⁶ Examples might include: societal changes that reduce disadvantage such as education, job creation and similar programs; further raising of tobacco excise taxes; or, in the US, reducing existing subsidies on corn production, which lower the price of food that contains high fructose corn syrup.

As described by Loewenstein and Ubel, behavioural economics should “complement, not substitute for, more substantive economic interventions. If traditional economics suggests that we should have a larger price difference between sugar-free and sugared drinks, behavioural economics could suggest whether consumers would respond better to a subsidy on unsweetened drinks or a tax on sugary drinks.”⁶⁷

All these are areas where further research is being undertaken and further insights and policy options are being developed for public and private organisations' consideration.

Wellness programs

The emergence of wellness programs and common pitfalls

While more research is needed in many areas, a recent review of new healthcare interventions by Loewenstein, Asch, and Volpp, points out that many health programs being implemented, despite good intentions, fail to recognise their potential because they “require information, expertise and self-control that few patients possess”.⁴³ The researchers argue that these programs would be more effective if insights from behavioural economics were incorporated.

The development of these programs is based on the global realisation that unhealthy choices are fuelling the NCD epidemic. In this context, a widely used strategy to improve patient engagement and health outcomes is the use of incentive-based wellness programs. For instance, in the US a survey of employers showed that 61% believe employees’ poor habits to be the top challenge in containing health care costs. The survey also showed that 87% of large US employers offer a wellness program, but participation rates are low, in the region of 5-10%.⁴⁰ While there are many reasons for low engagement, design features of programs will have a big impact in determining whether a given program is effective at increasing engagement. The Loewenstein *et al* article (see above) provides the example of an insurer giving a \$150 incentive for going to the gym 120 times in a year, but points out some basic problems with the structure of this incentive.⁴³ Firstly, the single threshold means that someone who goes to the gym 119 times or less will not be rewarded, although this would certainly be an achievement for many users. Secondly, the threshold is high, and therefore unlikely to motivate people who rarely go to the gym because it is seemingly unattainable. Unfortunately,

it is these individuals for whom the intervention has the most value. Thirdly, the incentive will only be received fairly far into the future, which means that the incentive may not succeed in motivating people to change their behaviour today – as opposed to planning to get off the couch and go to the gym next week. Therefore, simple changes to the design of this program, using behavioural economics principles, are likely to lead to significant improvements in engagement.⁴³

The following case study of a wellness incentive program illustrates some of these effects.

Vitality case study

The Vitality case study explores the application of behavioural economics research and understanding to a structured wellness program.

Vitality is a wellness program that aims to influence behaviour related to prevention of NCDs. The key interventions aim to: increase physical activity; improve nutrition and eating habits; encourage attendance at health assessments and preventive screenings; promote and assist with smoking cessation; and assess mental wellbeing. The interventions offered on the program are informed by evidence from a range of disciplines including medicine, exercise science, dietetics, epidemiology, public and community health, psychology and behavioural economics.

The program is currently available to more than 5 million members in several countries. Its principal base is in South Africa, where it is linked to Discovery Health, the largest private health insurer in the country. In the US, Vitality is available to members of Humana Inc (Humana Vitality) and is also offered as a stand-alone employee wellness program to individual corporate clients. In the UK, it is available as an embedded offering to members of the health insurer PruHealth and life insurer PruProtect. In China, Vitality has partnered with Ping An Health. AIA is now introducing the program to a number of other countries, including Australia.

Efforts to change health behaviour based on traditional public health initiatives have often largely relied on prescriptive approaches based on education and information alone and without the benefit of behavioural economics research. Vitality aims to enhance health and wellness through the judicious use of incentives and rewards anchored in

behavioural economics insights. Broadly speaking, the incentives offered on the Vitality program can be divided into two categories: “access or enabling” incentives, and contingent rewards. Access or enabling incentives lower the cost of participation in wellness activities and thereby widen access. Contingent rewards, in contrast, are rewards for participation in wellness activities.

Engagement with Vitality consists of three stages: know your health, improve your health and enjoy the rewards.

Know your health

Members are encouraged to know their health by participating in online health assessments and biometric and preventative screening activities performed by healthcare professionals. The principal online assessment provides clients with a complete assessment of their health risks using a tool called Vitality Age. Vitality Age is based on a clinically- and actuarially-derived algorithm that uses information gathered online to determine a risk-adjusted age. This allows members to appreciate the impact of their lifestyle choices and understand how their risks, both individually and in combination, affect their health. Using this information, members are able to compare their chronological age with their risk-adjusted age, which is intended to motivate them to improve health-related behaviours and engage in wellness activities. In addition, access incentives such as low-cost biometric screening tests and subsidised allied healthcare professional visits are used to further increase members’ health knowledge.

Improve your health

Once members have a better understanding of their personal risks, the program offers access to a variety of wellness solutions. Once again, access incentives are used to lower barriers and increase engagement. In addition to subsidised visits to wellness professionals and groups, such as dietitians, biokineticists and weight loss clubs; other access incentives include subsidised gym memberships, organised sports events, smoking cessation programs and discounts on purchases of healthy foods and exercise devices. These access incentives are particularly relevant in Australia, where approximately 70% of individuals state that a barrier to eating healthier food is that healthier food is generally more expensive⁶⁸ and 66.9% of citizens are classified as sedentary or having low levels of physical activity,⁶⁹ despite the fact that 57% of Australians admit that regular physical activity is an important driver of health.⁶⁸

Enjoy the rewards

The reward structure is based on points members earn by participating in wellness activities. Points allow members to climb statuses which, in turn, allow them to claim greater discounts on a range of goods and services. Examples include on-line and in-store purchases, local and international flights, car hire and hotel booking. These rewards (discounts) are obtained from an expanding group of partner businesses, which are high-value brands with a national presence and substantial market share. In addition, certain rewards are available as a fixed discount to all members, regardless of status. A status-based program is consistent with the behavioural economics recommendation on goal gradient where it is suggested that smaller goals are more achievable

than steeper and larger goals. Moreover, incentives in a status-based health promotion program encourage individuals to climb up the status ladder, but discourage a loss of status in keeping with the principle of loss aversion. Finally, Vitality aims to offer a seamless experience with minimal time between engagement and reward, taking advantage of present bias.

Vitality research

Research is of fundamental importance to the Vitality program in evaluating existing interventions; formulating and testing new ways of changing health behaviour; assessing how people interact with and respond to a range of new technologies that improve health; and contributing to the overall knowledge on how to address global health problems. The clinical rigour of the Vitality program is supported by a number of published research papers and learnings are shared with public health officials, researchers and practitioners.

Several analyses have been undertaken to assess the association between participation in the Vitality program and health behaviours and outcomes.⁷⁰⁻⁷² Patel *et al* investigated if engagement with the Vitality program was associated with increased participation in fitness-related activities and healthcare cost savings over a five year period.⁷² The findings suggested that by incentivising individuals to engage in physical activity with a points reward and by lowering the financial barriers to engage in physical activity, both cost savings would be realised as would an increase in physical activity. The study found that the proportion of individuals using the gym increased by 22% (from 27% to 33.1%) between 2004 and 2008. The proportion of individuals

initially classified as inactive decreased from 76% to 68% over the same time period and the odds of remaining inactive were 42% lower. Members who displayed a positive behavioural change and moved from the inactive to more active group were less likely to be admitted into hospital and had lower hospital claims those who were inactive and did not display a change in behaviour.

To analyse the use of access incentives in efforts to improve nutrition, Sturm *et al* investigated the effect that a price reduction would have on healthy food item purchases among members of the HealthyFood™ benefit being Discovery Vitality in South Africa.⁷³ The results were very favourable and indicated that rebates of between 10% and 25% had a favourable influence on healthy food purchases. A 10% rebate resulted in a 6.0% increase in the ratio of expenditure on healthy foods to total food expenditure; a 5.7% increase in the ratio of expenditure on fruits and vegetables to total food expenditure; and a 5.6% decrease in the ratio of expenditure on less-desirable foods. A 25% rebate resulted in a 9.3% increase in expenditure on healthy foods; an 8.5% increase in expenditure on fruits/vegetables, and a 7.2% decrease in expenditure on less-desirable items. Another analysis found that participation with the HealthyFood™ program was associated with healthier dietary behaviours including a higher consumption of fruit and vegetables and wholegrain foods and a lower consumption of processed, fried, high-sugar and high-salt foods.⁷⁴

Research has also been carried out to assess wellness interventions in the workplace setting, with promising results and the potential to result in long-term healthcare savings.⁷⁵⁻⁷⁹

Conclusion

This White Paper is designed as a contribution to the effort to combat the problems created by NCDs. As the prevalence of NCDs continues to rise, there is a growing commitment from a wide range of stakeholders to sustained and innovative ways to influence people's health behaviours; build and enhance the capacity of individuals, groups and the community; and pursue society-wide policy and other measures to reduce the huge cost to individuals and the community.

Technology, new academic research and best practice learnings will all contribute to achieving these goals.

Innovation will also play a crucial role as stakeholders — governments, health professionals, private-sector providers, health promotion organisations and academics — with the ability and means to influence people's behaviour, begin to explore and implement new solutions that can address the impact of diseases of lifestyle.

A growing body of evidence indicates that initiatives that employ the principles of behavioural economics will be an important part of that by providing powerful tools to achieve sustainable behaviour change that will be invaluable in alleviating the NCD burden and enhancing health and wellness of individuals and the community.

Bio of Professor Kevin Volpp, MD, PhD

Professor Volpp is the founding Director of the Center for Health Incentives and Behavioral Economics at the Leonard Davis Institute, a Professor of Medicine at the Perelman School of Medicine and Health Care Management at the Wharton School of the University of Pennsylvania and scientific advisory board member of VAL Health.

His research program focuses on the impact of financial and organisational incentives on health and he has published more than 100 articles in leading peer-review journals such as the *New England Journal of Medicine*, the *Journal of the American Medical Association* and *Health Affairs*. His work has also been covered by media outlets such as the *New York Times*, the *Wall Street Journal*, the *BBC*, *Time* and *Der Spiegel*.

Professor Volpp has been recognised by numerous awards, including the Presidential Early Career Award for Scientists and Engineers and the British Medical Journal Group Award for Translating Research into Practice. He is an elected member of the American Society of Clinical Investigation, Association of American Physicians and the Institute of Medicine, National Academy of Sciences.

Professor Volpp did his medical training at the University of Pennsylvania and Brigham and Women's Hospital and has a Ph.D. in Applied Economics and Managerial Science from the Wharton School. He is a board-certified general internist and practicing physician at the Philadelphia VA Medical Center.

Appendix A:

The history of public health and health promotion

Traditionally, efforts at improving health have largely focused on modifying the risk factors known to contribute to disease through public health policies and the dispersion of health-related information.

The concept of public health is virtually as old as human civilisation and the beginnings of religion when it was well established (albeit 'unscientifically') that unclean water, improper disposal of waste, diet and alcohol consumption could lead to ill-health.

One of the earliest definitions of health promotion was by Lalonde in 1974, who described it as a strategy: "aimed at informing, influencing and assisting both individuals and organisations so that they will accept more responsibility and be more active in matters affecting mental and physical health".⁸⁰ Public health has also been seen as: "the science and art of preventing disease, prolonging life and promoting health through the organised efforts and informed choices of society, organisations, public and private, communities and individuals".⁸¹ Health promotion has gained significant momentum since the Ottawa Charter from the first International Conference on Health Promotion in 1986, developed: "for action to achieve Health for All by the year 2000 and beyond".⁸² It stated that health promotion should have five key activities:

- 1 Building healthy public policy – putting health and on agenda of policy makers in all sectors and at all levels.
- 2 Creating supportive environments – systematic assessment of the health impact of a rapidly changing environment followed by action to ensure positive benefit to the health of the public.

- 3 Strengthening community actions – community action in setting priorities, making decisions, planning strategies and implementing them to achieve better health.

- 4 Developing personal skills – supporting personal and social development through providing information, education and skills for health.

- 5 Reorientation of health services – sharing the responsibility of health promotion among individuals, community groups, health professionals, health service institutions and governments.

More recently, the World Health Organization defined health promotion as "the process of enabling people to increase control over, and to improve, their health".⁸³

References

- 1 World Health Organization. Global status report on noncommunicable diseases. Geneva: WHO Press; 2010.
- 2 Commonwealth Health Online. Non-communicable diseases in Australia. Available from http://www.commonwealthhealth.org/pacific/australia/non_communicable_diseases_in_australia/. Accessed 17 January 2014.
- 3 Australian National Preventive Health Agency (ANPHA). State of Preventive Health 2013. Report to the Australian Government Minister for Health. Canberra; ANPHA, 2013.
- 4 Hoyert DL, Xu J. Deaths: preliminary data for 2011. *Natl Vital Stat Rep.* 2012 Oct 10; 61(6):1–52.
- 5 Arias E. United States Life Tables, 2008. *Natl Vital Stat Rep.* 2012 Sep 24; 61(3):1–64.
- 6 Yoon SS, Burt V, Louis T, Carroll MD. Hypertension among adults in the United States, 2009–2010. *NCHS Data Brief.* 2012 Oct; (107):1–8.
- 7 National Diabetes Information Clearinghouse. National Diabetes Statistics, 2011. Available from: <http://diabetes.niddk.nih.gov/dm/pubs/statistics/index.aspx>. Accessed 21 May 2013.
- 8 Centers for Disease Control and Prevention (CDC). Vital signs: prevalence, treatment, and control of high levels of low-density lipoprotein cholesterol—United States, 1999–2002 and 2005–2008. *MMWR Morb Mortal Wkly Rep.* 2011 Feb 4; 60(4):109–14.
- 9 Cancer Research UK. Cancer incidence by age. 2012. Available from: <http://www.cancerresearchuk.org/cancer-info/cancerstats/incidence/age/>. Accessed 21 May 2013.
- 10 Centers for Disease Control and Prevention (CDC). Arthritis-related statistics. 2011. Available from: http://www.cdc.gov/Arthritis/data_statistics/arthritis_related_stats.htm. Accessed 21 May 2013.
- 11 Looker AC, Borrud LG, Dawson-Hughes B, Shepherd JA, Wright NC. Osteoporosis or low bone mass at the femur neck or lumbar spine in older adults: United States, 2005–2008. *NCHS Data Brief.* 2012 Apr; (93):1–8.
- 12 Popkin BM. Agricultural policies, food and public health. *EMBO Rep.* 2011 Jan; 12(1):11–8.
- 13 Popkin BM. Global nutrition dynamics: the world is shifting rapidly toward a diet linked with noncommunicable diseases. *Am J Clin Nutr.* 2006 Aug; 84(2):289–98.
- 14 Heart Foundation Australia. Overweight and obesity statistics. 2012. Available from: <http://www.heartfoundation.org.au/S13iteCollectionDocuments/Factsheet-Overweight-and-obesity.pdf>. Accessed 31 January 2014.
- 15 Bloom DE, Cafiero ET, Jané-Llopis E, Abrahams-Gessel S, Bloom LR, Fathima S, et al. The global economic burden of non-communicable diseases. Geneva: World Economic Forum; 2011.
- 16 Medibank Private Media Release, October, 2008.
- 17 Vos T, Goss J, Begg S and Mann N. Projection of health care expenditure by disease: a case study from Australia (Revised version of report prepared for United Nations World Economic and Social Survey). Centre for Burden of Disease and Cost-effectiveness, School of Population Health, University of Queensland & Australian Institute of Health and Welfare, 2007. Available from: www.un.org/esa/policy/wess/wess2007files/backgroundpapers/australia.pdf. Accessed 07 February 2014.
- 18 Australia: the healthiest country by 2020. A discussion paper prepared by the National Preventative Health Taskforce. 2008. Available from: [http://www.health.gov.au/internet/preventativehealth/publishing.nsf/Content/A06C2FCF439ECDA1CA2574DD0081E40C/\\$File/discussion-28oct.pdf](http://www.health.gov.au/internet/preventativehealth/publishing.nsf/Content/A06C2FCF439ECDA1CA2574DD0081E40C/$File/discussion-28oct.pdf). Accessed 10 February 2014.
- 19 Centers for Disease Control and Prevention. Achievements in Public Health, 1900–1999: Control of Infectious Diseases. *MMWR Morb Mortal Wkly Rep.* 1999 July 30; 48(29):621–9.
- 20 Centers for Disease Control and Prevention. Achievements in Public Health, 1900–1999: Safer and healthier foods. *MMWR Morb Mortal Wkly Rep.* 1999 Oct 15; 48(40):905–13.
- 21 Centers for Disease Control and Prevention. Male latex condoms and sexually transmitted diseases. Updated 2013 Mar 25. Available from <http://www.cdc.gov/condomeffectiveness/latex.htm>. Accessed 17 January 2014.
- 22 Centers for Disease Control and Prevention. Achievements in Public Health, 1900–1999: Impact of vaccines universally recommended for children – United States, 1990–1998. *MMWR Morb Mortal Wkly Rep.* 1999 Apr 2; 48(12):243–8.
- 23 Gruszyn S, Hetzel D & Glover J. Advocacy and action in public health: lessons from Australia over the 20th century. Canberra: Australian National Preventive Health Agency; 2012.
- 24 Public Health Information Development Unit. Available from: <http://publichealth.gov.au/>. Accessed 3 February 2014.
- 25 O’Donoghue T, Rabin M. Doing it now or later. *Am Econ Rev.* 1999; 89(1):103–24.
- 26 Frederick S, Loewenstein G, O’Donoghue T. Time Discounting and Time Preference: A Critical Review. *J Econ Lit.* 2002;40(2):351–401.
- 27 Kahneman D, Tversky A. Prospect theory: an analysis of decision under risk. *Econometrica.* 1979; 47(2):263–91.
- 28 Prelec D. The Probability weighting function. *Econometrica.* 1998; 66(3):497–527.
- 29 Kahneman D, Knetsch JL, Thaler RH. Anomalies: the endowment effect, loss aversion, and status quo bias. *J Econ Perspect.* 1991; 5(1):193–206.
- 30 Volpp KG, Galvin R. How a carrot became a stick. *JAMA.* 2014 in press doi:10.1001/jama.2014.418.
- 31 Johnson EJ, Goldstein D. Do defaults save lives? *Sci Justice.* 2003; 302:1338–9.
- 32 Samuelson W, Zeckhauser R. Status quo bias in decision making. *J Risk Uncertainty.* 1988; 1:7–59.
- 33 Halpern SD, Ubel PA, Asch DA. Harnessing the power of default options to improve healthcare. *N Engl J Med.* 2007; 357(13):1340–4.
- 34 Loewenstein G, Brennan TA, Volpp KG. Asymmetric paternalism to improve health behaviours. *JAMA.* 2007; 298(20):2415–17.
- 35 Madrian BC, Shea DF. The Power of Suggestion: Inertia in 401(k) Participation and Savings Behaviour. *Q J Econ.* 2001; 116(4):1149–87.
- 36 McNeil BJ, Pauker SG, Sox HC Jr, Tversky A. On the elicitation of preferences for alternative therapies. *N Engl J Med.* 1982 May 27; 306(21):1259–62.
- 37 Camerer C, Issacharoff S, Loewenstein G, O’Donoghue T, Rabin M. Regulation for conservatives: behavioural economics and the case for “asymmetric paternalism”. *U Penn Law Rev.* 2003; 1151:1211–54.
- 38 Thaler RH, Sunstein CR. *Nudge: Improving Decisions About Health, Wealth, and Happiness.* Penguin Books. February 24, 2009.
- 39 Rice T. The behavioral economics of health and health care. *Annu Rev Public Health.* 2013; 34:431–47.
- 40 Towers Watson. Performance in an era of uncertainty: 2012, 17th annual Towers Watson/National Business Group on Health employer survey on purchasing value in health care. New York (NY): Towers Watson; 2012.
- 41 Volpp KG, Asch DA, Galvin R, Loewenstein G: Redesigning Employee Health Incentives – Lessons from Behavioural Economics. *N Engl J Med.* 2011; 365(5):388–90.
- 42 Volpp KG, Pauly MV, Loewenstein G, Bangsberg D. P4P4P: An Agenda for Research on Pay for Performance for Patients. *Health Aff.* 2009; 28(1): 206–14.
- 43 Loewenstein G, Asch DA, Volpp KG. Behavioral economics holds potential to deliver better results for patients, insurers, and employers. *Health Aff (Millwood).* 2013 Jul; 32(7):1244–50.

- 44 Jochelson K. *Paying the patient: improving health using financial incentives*. London: King's Fund; 2007.
- 45 Volpp KG, Troxel AB, Pauly MV, Glick HA, Puig A, Asch DA, et al. A randomized, controlled trial of financial incentives for smoking cessation. *N Engl J Med*. 2009 Feb 12; 360(7):699–709.
- 46 Volpp KG, John LK, Troxel AB, Norton L, Fassbender J, Loewenstein G. Financial incentive-based approaches for weight loss: a randomized trial. *JAMA*. 2008 Dec 10; 300(22):2631–7.
- 47 Kullgren JT, Troxel AB, Loewenstein G, Asch DA, Norton LA, Wesby L, Tao Y, Zhu J, Volpp KG. Individual- versus group-based financial incentives for weight loss: a randomized, controlled trial. *Ann Intern Med*. 2013 Apr 2; 158(7):505–14.
- 48 Heil SH, Higgins ST, Bernstein IM, Solomon LJ, Rogers RE, Thomas CS, et al. Effects of voucher-based incentives on abstinence from cigarette smoking and fetal growth among pregnant women. *Addiction*. 2008 Jun; 103(6):1009–18.
- 49 Charness G, Gneezy U. Incentives to Exercise. *Econometrica*. 2009; 77(3):909–31.
- 50 Volpp KG, Loewenstein G, Troxel AB, Doshi J, Price M, Laskin M, et al. A test of financial incentives to improve warfarin adherence. *BMC Health Serv Res*. 2008 Dec 23; 8:272.
- 51 Kimmel SE, Troxel AB, Loewenstein G, Brensinger C, Jaskowiak J, Doshi JA, Laskin M, Volpp K. Randomized trial of lottery-based incentives to improve warfarin adherence. *Am Heart J*. 2012; 164(2):268–74.
- 52 Banerjee AV, Duflo E, Glennerster R, Kothari D. Improving immunisation coverage in rural India: clustered randomised controlled evaluation of immunisation campaigns with and without incentives. *BMJ*. 2010 May 17; 340:c2220.
- 53 Haisley E, Volpp KG, Pellathy T, Loewenstein G. Promoting Completion of Health Risk Assessments with Lottery Incentives. *Am J Health Promot*. 2012; 26(3):184–8.
- 54 Zeelenberg M. Anticipated regret, expected feedback and behavioural decision making. *J. Behav. Decis. Making*. 1999; 12(2):93–106.
- 55 Giné X, Karlan D, Zinman J. Put your money where your butt is: a commitment contract for smoking cessation. *A EJ: Applied Economics*. 2010; 2(4):213–35.
- 56 www.danariely.com. Accessed 31 January 2014.
- 57 Halpern SD, Asch DA, Volpp KG. Commitment contracts as a way to health. *BMJ* 2012; 344:e522.
- 58 Johnson EJ, Goldstein DG. Defaults and donation decisions. *Transplantation*. 2004 Dec 27; 78(12):1713–6.
- 59 Keller PA, Harlam B, Loewenstein G, Volpp KG. Enhanced active choice: a new method to motivate behaviour change. *J Consum Psychol*. 2011; 21(4):376–83.
- 60 Beshears J, Choi JJ, Laibson D, Madrian BC (forthcoming). Active choice and health outcomes: Evidence from prescription drug home delivery. NBER Working Paper, 2013.
- 61 Long JA, Jahnle EC, Richardson DM, Loewenstein G, Volpp KG. Peer mentoring and financial incentive to improve glucose control in African American veterans: a randomized trial. *Ann Intern Med*. 2012 Mar 20; 156(6):416–24.
- 62 Ashraf N, Bandiera O, Jack K. No margin, no mission? A field experiment on incentives for pro-social task. Working Paper, 2013.
- 63 Asch DA, Muller RW, Volpp KG. Automated hovering in health care: watching over the 5,000 hours. *N Engl J Med*. 2012 Jul 5; 367(1):1–3.
- 64 National Institute on Ageing, National Institutes of Health. Psychological science and behavioural economics in the service of public policy. Meeting summary; 2013 May 22; Washington DC.
- 65 Thaler RH, Sunstein CR. Libertarian paternalism. *Am Econ Rev*. 2003; 93:175–9.
- 66 Loewenstein G, Asch DA, Friedman JY, Melichar LA, Volpp KG. Can behavioural economics make us healthier? *BMJ*. 2012 May 23; 344:e3482.
- 67 Loewenstein G, Ubel PA. *Economics Behaving Badly*. New York Times. July 14, 2010.
- 68 2012 AIA Australia Healthy Living Index.
- 69 Australian Health Survey: First Results, 2011–12.
- 70 Lambert EV, da Silva R, Fatti L, Patel D, Kolbe-Alexander T, Derman W, et al. Fitness-related activities and medical claims related to hospital admissions – South Africa, 2006. *Prev Chronic Dis*. 2009 Oct; 6(4):A120.
- 71 Patel DN, Lambert EV, da Silva R, Greyling M, Nossel C, Noach A, et al. The association between medical costs and participation in the vitality health promotion program among 948,974 members of a South African health insurance company. *Am J Health Promot*. 2010 Jan–Feb; 24(3):199–204.
- 72 Patel D, Lambert EV, da Silva R, Greyling M, Kolbe-Alexander T, Noach A, et al. Participation in fitness-related activities of an incentive-based health promotion program and hospital costs: a retrospective longitudinal study. *Am J Health Promot*. 2011 May–Jun; 25(5):341–8.
- 73 Sturm R, An R, Segal D, Patel D. A cash-back rebate program for healthy food purchases in South Africa: results from scanner data. *Am J Prev Med*. 2013 Jun; 44(6):567–72.
- 74 An R, Patel D, Segal D, Sturm R. Eating better for less: a national discount program for healthy food purchases in South Africa. *Am J Health Behav*. 2013 Jan; 37(1):56–61.
- 75 Anderko L, Roffenbender JS, Goetzl RZ, Howard J, Millard F, Wildenhaus K, et al. Promoting prevention through the affordable care act: workplace wellness. *Prev Chronic Dis*. 2012 Dec; 9:E175.
- 76 Bolnick H, Millard F, Dugas JP. Medical care savings from workplace wellness programs: what is a realistic savings potential? *J Occup Environ Med*. 2013 Jan; 55(1):4–9.
- 77 Kolbe-Alexander TL, Proper KI, Lambert EV, van Wier MF, Pillay JD, Nossel C, Adonis Let al. Working on wellness (WOW): a worksite health promotion intervention programme. *BMC Public Health*. 2012 May 24; 12:372.
- 78 Milner K, Greyling M, Goetzl R, da Silva R, Kolbe-Alexander T, Patel D, Nossel C, Beckowski M. The relationship between leadership support, workplace health promotion and employee wellbeing in South Africa. *Health Promot Int*. 2013 Oct 18. [Epub ahead of print].
- 79 Patel D, Goetzl RZ, Beckowski M, Milner K, Greyling M, da Silva R, et al. The Healthiest Company Index: a campaign to promote worksite wellness in South Africa. *J Occup Environ Med*. 2013 Feb; 55(2):172–8.
- 80 Lalonde M. *A new perspective on the health of Canadians. A working document*. Ottawa: Government of Canada; 1974.
- 81 Winslow CE. The untilled fields of public health. *Science*. 1920 Jan 9; 51(1306):23–33.
- 82 Participants of the 1st International Conference on Health Promotion. *The Ottawa Charter for Health Promotion. The 1st International Conference on Health Promotion; 1986 November 21; Ottawa*.
- 83 Participants at the 6th Global Conference on Health Promotion. *The Bangkok Charter for health promotion in a globalized world. The 6th Global Conference on Health Promotion; 2005 Aug 11; Geneva*.

