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**Participation in a Health Promotion Programme and Healthcare Costs: Cross-sectional**

**Research of the *Discovery Vitality* Programme.**

**Deepak N Patel**

**A dissertation prepared by Deepak N Patel (Student Number PTLDEE002) in partial  
fulfillment of the requirements for the Master of Philosophy degree in Sports Medicine**

**(MPhil Sports Medicine) from the University of Cape Town**

**June 2010**

**DECLARATION**

I, Deepak N Patel, hereby declare that the work on which this dissertation is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university. This research report is based on inputs received from Discovery Health and Discovery Vitality, but the analyses and interpretations are my own and do not necessarily reflect the views of these companies.

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## List of Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
ANCOVA	Analysis of Variance
BMI	Body Mass Index
CPI	Consumer Price Index
CPR	Cardio-Pulmonary Resuscitation
CVD	Cardiovascular Diseases
DALY	Disability Adjusted Life Years
DM	Disease Management
HIV	Human Immunodeficiency Virus
HPP	Health Promotion Program
ROI	Return on Investment
SA	South Africa
USA	United States of America
WHP	Worksite Health Promotion

## **Abstract**

**Purpose:** To examine the association between 1) the levels of participation in an incentive-based health promotion program (study1), 2) the level of engagement with the fitness-related activities (Study2) and medical claims and hospital admission amongst adult members of a major health insurer.

**Methods:** A one year cross-sectional, correlation analyses of members of a private health insurer (n=948,974). Of these, 591134 (62.3%) were also members of the health promotion program. For study 1 the sample was grouped as follows: not registered (37.5%), registered but not engaged with any health promotion activity (21.9%), low engagement (30.9%) and high engagement (9.5%). High engagement was defined as the accumulation of more than 10500 points on the Vitality program. For study 2 the sample was grouped, *a priori*, based on documented participation in fitness-related activities, into inactive (equivalent to no gym visits/yr), low active (2-24 gym visits/yr), moderate active (24-48 gym visits/yr) and high active (>48 gym visits/yr) groups. Medical claims data were compared between groups after multivariate adjustment for age, gender, medical plan and chronic illness benefits.

**Results:** Study 1; highly-engaged members had lower costs per patient, shorter stays in hospital and fewer admissions compared to other groups (P<0.001). Low or non-engagement was not associated with lower hospital costs. Admission rates were also 7.4% lower for cardiovascular disease, 13.2% lower for cancers and 20.7% lower for endocrine and metabolic diseases in the highly-engaged group compared to other groups combined (P<0.01).

Study 2; there was a monotonic decrease in hospitalization costs per member from the inactive to the high active category ( $P < 0.001$ ). This same pattern was demonstrated for admissions rates ( $P < 0.001$ ). Further, there was good agreement between level of participation in fitness-related activities and in other wellness program offerings, with 90% of persons only nominally engaged in the wellness program also low active or inactive for fitness-related activities, whereas 84% of those in the high active group also had the highest overall participation in the wellness program.

**Conclusions:** Participation in the health promotion program (study1) and with fitness-related activities more specifically (study2) was associated with lower health care costs.

## Chapter 1 Introduction

There is an unprecedented increase in the prevalence of non-communicable chronic diseases globally(1) (2). These diseases, such as hypertension, diabetes, hypercholesterolemia and certain forms of cancers, in large part related to lifestyle behaviour such physical inactivity, unhealthy eating and smoking, have significant direct and indirect economic consequences for the individual and for society (1) (3) (4). In the main, people with unhealthy behaviour themselves bear the consequences of their behaviour by the lowering of their quality of life and increased financial costs in the form of out-of-pocket expenses and lost wages. However, these individuals also impose costs – referred to as external costs - on others. For instance, people who have healthy lifestyle habits indirectly subsidize those with unhealthy habits through collectively funded health insurance programmes (5) (6). Increasingly, it is recognised that controlling the wave of chronic disease and the attendant healthcare costs is dependent on modifying health behaviour linked to lifestyle.

This study examines the association between participation in *Vitality*– a comprehensive, incentivised health-promotion programme - and health care costs amongst members of the *Discovery Health Medical Scheme*.

There has, in recent years, been a resurgence of interest in incentivised health promotion programmes. This arises largely from the increasing prevalence of preventable lifestyle related chronic diseases. There is a recognition, particularly amongst employers and health plans, that the unrestrained increase in healthcare costs requires an approach that more fundamentally seeks to prevent diseases by changing health behaviour rather than simply managing costs (7).

The first chapter of this research report summarises data on the global and local (South African) trends in the prevalence and impact of lifestyle-related chronic diseases. It draws on evidence from the World Health Organisation and the SA Medical Research Council, to show that the global and local burden of non-communicable chronic diseases is increasing. This chapter also examines the economic impact of chronic diseases for health plans (medical schemes).

Chapter 2 begins with a conceptual framework for the prevention of chronic diseases. It then reviews the evidence for two preventive strategies that have been employed by health plans to contain healthcare costs related to chronic diseases: disease management programmes and health promotion programmes. The chapter wraps-up by reviewing the literature on use of financial incentives to induce changes in health behaviour.

Chapter 3 gives an outline of the *Vitality* health promotion programme. The chapter delineates the various types of incentives employed in the programme and reviews the evidence, from peer-reviewed research, for the effectiveness of several health interventions of the programme.

Chapter 4 describes the aims, design and statistical methods employed in analysing the association between engagement with *Vitality* and cost outcomes. The analysis, a 2006 cross-sectional correlation study of 948,974 members of the Discovery Health medical plan, examines two aspects of engagement and cost outcomes;

- 1) Engagement with *Vitality* in general and
- 2) Engagement with the fitness components of the programme

Chapter 5 presents results of the analyses. In essence, the studies report a significant association between greater engagement with the *Vitality* programme and hospital admission and cost outcomes.

Chapter 6 discusses the findings of the current research in relation to the available literature on incentive programmes and healthcare costs. While the current research adds to the growing body of evidence on incentive-based health promotion programme the limitation of the research design are also acknowledged. The study concludes that further longitudinal retrospective and prospective research of the *Vitality* data is needed to draw more definitive deduction about the effectiveness of the *Vitality* programme in changing health behaviour and reducing long-term healthcare costs related to chronic diseases.

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## **Chapter 2 The Rise of Non-Communicable Chronic Diseases of Lifestyle**

### **2.1 Global Trends in Non-Communicable Chronic Diseases**

It has long been recognized that trends in health and illness vary over time and across communities and continents (8). It was barely a hundred years ago that diseases such as pneumonia, tuberculosis, diarrheal diseases and diphtheria, many of which continue to exact such a huge toll in the developing world, were also leading causes of death in the West(9) (10). Today, these diseases have either receded or virtually disappeared as leading causes of morbidity and mortality in developed countries. According to the WHO World Report for 2003 (11), communicable diseases, maternal and perinatal conditions and under-nutrition contribute only 5% to the total burden of disease in developed countries.

The primary and overriding reason for the improvement in the health of people of developed countries is the improvement in the social and economic wellbeing of people of these countries. Access to education, better housing, sanitation, growing incomes, and public health measures such as immunization have contributed greatly to this transition in the last century (12).

Yet, this new era of relative prosperity and technological advancement, while improving overall health and reducing mortality, has also yielded its peculiar set of diseases. In developed Western countries diseases of poverty such as under-nutrition and infectious diseases exited the medical landscape to be replaced by non-communicable chronic diseases of lifestyle as the leading causes of morbidity and mortality. These diseases are a consequence of increased longevity and prolonged exposure to a common set of lifestyle factors, namely, unhealthy diets, smoking, lack of regular exercise and increased sedentary activity.



Middle- and low-income countries of the developing world are experiencing demographic and economic transitions similar to that undergone by developed countries. Many middle-income countries, predominantly in Asia and Latin America have also, in the last two decades, witnessed a reduction in diseases of poverty. These countries too have experienced a concurrent increase in non-communicable chronic diseases (13) (3).

The World Health Organisation reported in 2009 (12) that that across all income countries - high, middle and low, chronic diseases of lifestyle are the leading cause of mortality. They estimated that eight risk factors viz. alcohol use, tobacco use, high blood pressure, high body mass index, high cholesterol, high blood glucose, low fruit and vegetable intake, and physical inactivity account for 61% of cardiovascular deaths globally. The World Health Organisation estimates that by reducing the exposure to these eight risk factors global life expectancy would increase by almost 5 years.

## **2.2 The Burden of Non-communicable disease in South Africa**

Data on the burden of disease in South Africa is limited. South Africa is in a transitional stage of development and is encumbered by rapidly changing clusters of diseases (14). Large sections of the South African populace suffer from diseases of deprivation – malnutrition and infections. HIV and Aids has, in the last two decades, superseded many other diseases as the leading cause of morbidity and death. Injuries from intentional violence and accidents continue to pose a major problem and chronic diseases of lifestyle presents an ever increasing challenge as large sections of society undergo economic and lifestyle transition. Steyn (14) refers to this constellation of diseases peculiar to South Africa, as the ‘quadruple burden of disease’.

Rapid urbanization has been accompanied by major shifts in the health and disease patterns of South Africans. It is estimated that 56% of the population in South Africa now live in urban centres (15). The adoption of a western lifestyle, particularly in dietary habits, has led to a considerable increase in the prevalence of non-communicable diseases (14).

There are no longitudinal national surveys of chronic diseases incidence or prevalence in South Africa. A comparative cross-sectional study of disease burden for the year 2000, undertaken by the SA Medical Research Council (16), reported that sexually transmitted diseases, particularly HIV and AIDS were the leading cause of mortality (accounting for 26.3% of the estimated 521 000 deaths in South Africa in 2000). This was followed by high blood pressure (9.0%) and tobacco smoking (8.5%). Other lifestyle related risk factors were alcohol (7.1%), high body mass index (BMI) (7%), high cholesterol (4.6%), diabetes (4.3%), physical inactivity (3.3%) and low fruit and vegetable intake (3.2%) – all ranked within the top ten risk factors for mortality in South Africa- Figure1.

Many of these risk factors were responsible for morbidity and disability as well (Figure 2). Again, sexually transmitted diseases resulting from unsafe sex accounted for the highest burden (31.5% of the 16.2 million disability life years - DALYs in 2000). Interpersonal violence as a risk factor ranked second accounting for 8.4% of DALYs. Alcohol harm accounted for 7.0% and tobacco smoking for 4.0% of total DALYs. Other diet-related risk factors such as high BMI (17), high blood pressure (18) and cholesterol (19) each cause significant disability.

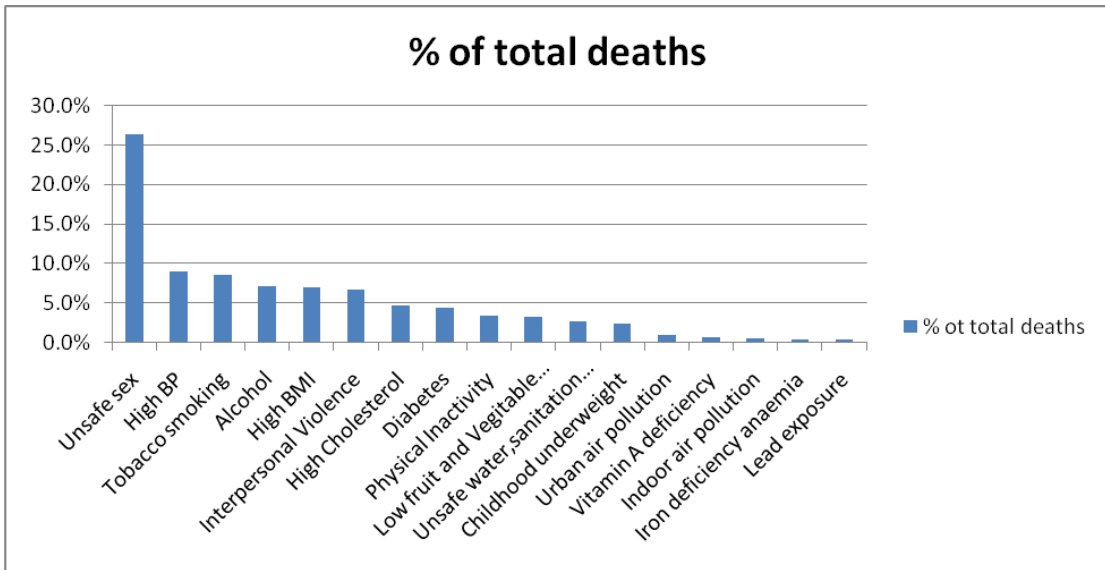


Figure 1. The commonest causes of mortality in SA

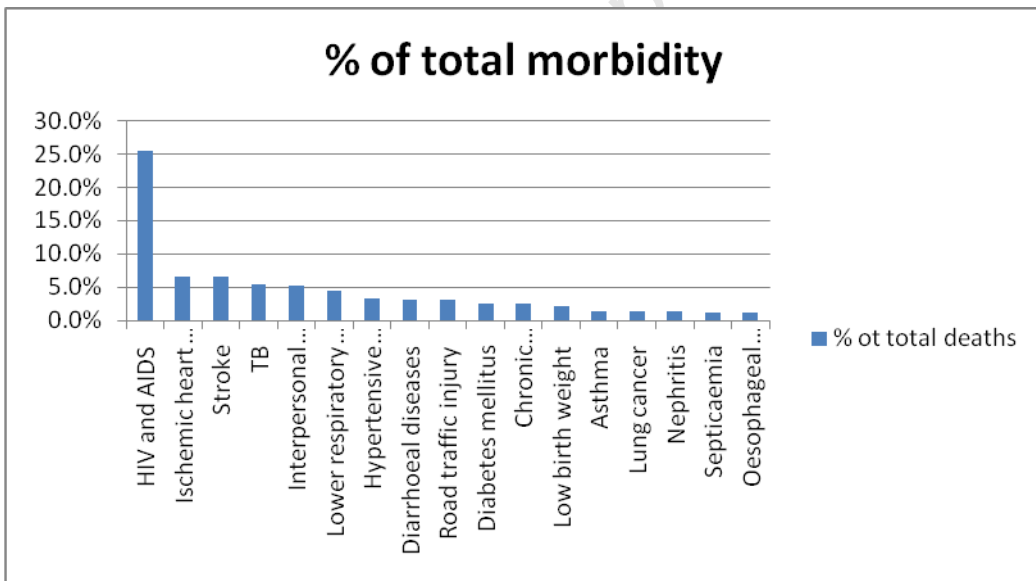
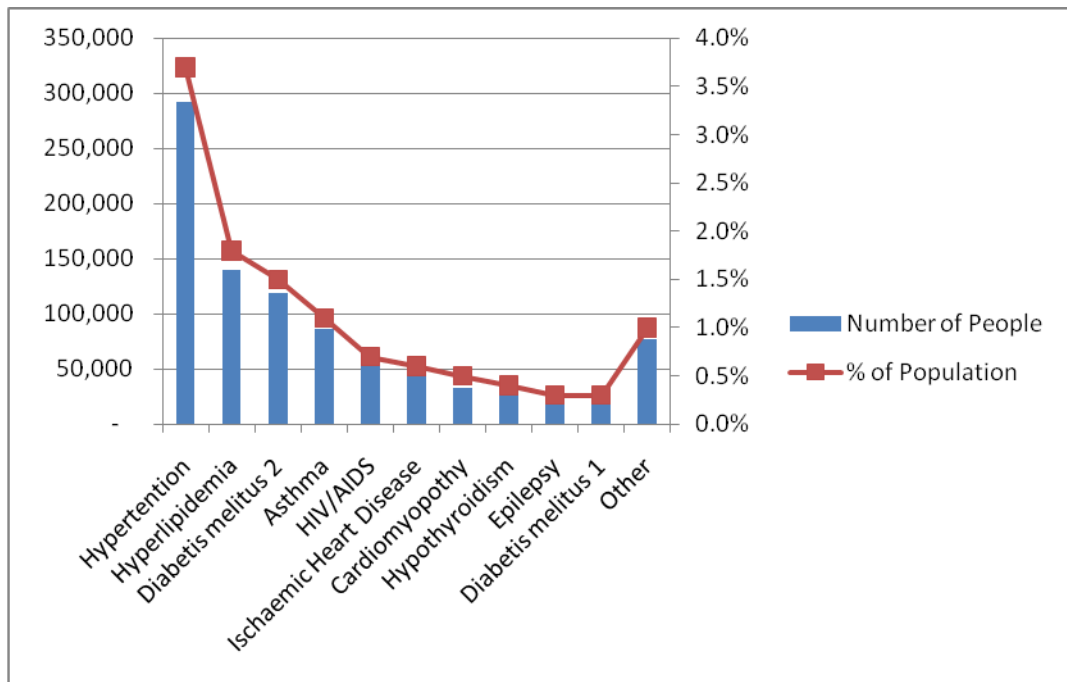


Figure 2. The commonest causes of morbidity (DALYs) in SA

Figure 3 below graphically shows the burden of lifestyle-related diseases amongst members of South African medical schemes in 2008 (20). The figure also displays the percentage prevalence of the 10 most common chronic conditions, indicating that 11.9% of the private health sector population had chronic diseases.



**Figure 3. Burden of lifestyle-related diseases amongst members of South African medical schemes in 2008**

It is evident from this that in the private healthcare sector chronic diseases of lifestyle exacts a significant toll.

### **2.3 The Economic Impact of Unhealthy Behaviour and Chronic Diseases**

Unhealthy behaviours and consequent chronic diseases impose a significant economic burden, not just on patients, but on households, communities, and the country (1) (3) . From an individual perspective chronic diseases diminish the quality of life and productive capacity. From a countries' perspective, chronic diseases reduce life expectancy and ultimately deplete the quality and quantity of countries' labour force. There is also growing research on the negative impact of lifestyle related chronic diseases on productivity and absenteeism (21) (22) (23).

It is estimated that almost half of all health care costs in the US in 1996 were related to five chronic conditions: heart disease, diabetes, hypertension, asthma and mood disorders (24). Only a quarter of healthcare costs were spent directly on treating the conditions. The remainder was spent on related illness and complications. Between 1987 and 2002, per capita private health insurance spending increased nearly 60% in the USA (25). More than half of the increase in health care spending in this period is attributable to the increase in the prevalence of treated conditions. For instance, the prevalence of treated diabetes increased by 64%, which accounted for an 80% rise in spending for this condition. Likewise, the prevalence of treated hyperlipidaemia increased fivefold, accounting for nearly 90% of the rise in spending for this condition (26). In a study on Medicare beneficiaries (27), Thorpe reported that the number of medical conditions treated per beneficiary rose sharply over fifteen years; in 1987, 31% of Medicare beneficiaries received treatment for five or more conditions, by 2002 more than half of all Medicare beneficiaries were treated for five or more conditions accounting for three quarters of all Medicare spending.

In South Africa there were approximately 8 million individuals (which constituted about 15 % of the population (28)) in private medical schemes in 2008 (29). The private healthcare sector has continued to increase on an annual basis since the 1980s. Total contributions to medical schemes have increased from R11.299 billion in 1994 (R21.869 billion in 2005 Rand terms) to R57.568 billion in 2006. The average amount contributed per beneficiary per month has increased from R343.67 in 1994 (2005 Rand terms) to R660.66 in 2005. This represents a 6.1% per annum increase above the Consumer Price Index (CPI). There is a growing realization, both within the private health sector as well as within government, that this situation is untenable and that measures to control costs have to be instituted.

In South Africa, chronic diseases of lifestyle impose a considerable cost burden. The 2008 Risk Equalisation Fund report (20) indicates that 11.9% of the medical scheme population suffers from a chronic disease. Hypertension (3.7%) is the most frequently occurring followed by hyperlipidaemia (1.8%) and type 2 diabetes mellitus (1.5%). In terms of cost burden, the top 3 chronic diseases above, together with ischaemic heart disease, account for 19% of total healthcare cost in the private sector.

Health plans (medical schemes), faced with the escalating costs of chronic diseases have, in the past, adopted numerous measures to contain spiralling costs. These have principally focused on demand side interventions such as managed care, differential benefit designs and cost sharing through consumer driven plans(30). Managed care is broadly defined as “any system of health payment or delivery arrangements where the plan attempts to control or coordinate the use of health services by its enrolled members in order to contain health expenditures, improve quality, or both. Arrangements often involve a defined delivery system of providers with some form of contractual arrangement with the plan.” (31).

While many managed care measures have been effective in restraining yearly cost increases, they have not always been acceptable to patients or providers and they fail to address the underlying problem of prevention (32).

Increasingly therefore, funders in South Africa and elsewhere are looking to improve the health of their members and to prevent or delay avoidable lifestyle-related diseases through health promotion programmes and not simply by containing risk and costs by re-designing medical scheme benefits.

In the next chapter we consider the role of disease management (DM) and health promotion programmes (HPP) in moderating health care cost. In particular, we examine the evidence for the effectiveness of financial incentives in changing health behaviour and reducing costs.

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### Chapter 3 Health Plans and Prevention Programmes for Chronic Diseases

In recent years health insurers have considered various strategies to improve the health of members and reduce long-term healthcare costs. Before we consider the evidence for and against these strategies, it is appropriate to outline a conceptual framework for the prevention of chronic diseases (33) (34).

#### 3.1 Conceptual Framework for the Prevention of Chronic Disease.

- a. **Primordial prevention** Primordial prevention is directed at the general population, irrespective of their health status. Strategies are intended to address societal factors and include legislative measures, changes in the built environment, school health programmes and wellness programmes. These strategies are intended to prevent the shift from healthy to 'at-risk'.
- b. **Primary prevention** Primary prevention is directed more specifically at people who are at risk for chronic diseases, for example the obese, smokers and those with a family history of disposition to chronic diseases. The aim of primary prevention is to diminish, halt or reverse the progression of health risks. The prevention strategies are largely directed at lifestyle intervention and behaviour modification. Screening tests such as routine BP measurement, random glucose and cholesterol tests to detect 'silent' diseases can be regarded as part of primary prevention.
- c. **Secondary prevention.** Secondary prevention is directed at people with established risk factors. These patients have already been diagnosed with chronic conditions such as hypertension, diabetes (types 1 and 2) and hypercholesterolaemia. The aims of secondary prevention are to reverse, where possible, these conditions in the incipient



stages or prevent progression to complications. Included in this stage of prevention are risk assessments for cardiovascular disease such as the Framingham Score.

- d. **Tertiary prevention** Tertiary prevention is directed at people who have developed complications such as coronary artery disease, heart failure, renal failure and stroke. Tertiary prevention is reliant on adequate and appropriate treatment and compliance with medication.

Based on this conceptual framework we will evaluate two strategies – Disease Management (DM) programmes and health promotion programmes (HPP) - employed by health plans to contain the costs of chronic diseases.

### **3.2 Disease Management Programmes**

Disease Management was initially used in the 1980 by pharmaceutical companies in the USA to promote medication adherence among patients with chronic conditions such as diabetes, asthma and coronary artery disease (35). From the mid-1990s, disease management strategies were adopted more widely by the healthcare industry in the United States because of their potential for cost savings in the treatment of chronic conditions (36).

Disease management programmes aim to manage costs incurred by individuals with established risk factors and diseases (secondary and tertiary prevention). DM programmes are largely directed at high-cost members of an insurance plan or to members that have the potential to incur high healthcare costs in the future. These programmes emphasize self-management, improved compliance and monitoring in high risk patients (37). DM is aimed at helping patients manage their chronic conditions between visits to the doctor and avoid exacerbations that may lead to hospitalization. DM programmes can be offered for a range of chronic conditions. Fitzner et al (38) reported that in the US, DM programmes for asthma

and diabetes were the most commonly offered programmes, but programmes for other high cost conditions such as chronic heart failure, coronary artery diseases and chronic lung disease were also offered.

Bott et al (37), reported that most DM programmes provided by Medicaid or Medicare have not shown widespread evidence of improvement in compliance with evidence-based care, satisfaction for providers or beneficiaries, or broad behavior change. Only a few programmes have produced financial savings after the costs of the programme are taken into account.

Similarly, a comprehensive report into DM programmes by the US Congressional Budget Office found that “there is insufficient evidence to conclude that disease management programmes can generally reduce overall health spending” (38) (39) (40).

These findings are consistent with several recent papers in the peer-reviewed literature which have raised the concern that secondary preventive measures such as population screening do not save money when compared to the cost of treating the disease (41) (42).

### **3.3 Health Promotion Programmes**

Health promotion programmes, in contrast to DM programmes, are primary (or primordial) prevention programmes that are directed to all employees or health plan members, immaterial of health status. Primary prevention programmes are intended to thwart the shift from low to high risk. It is argued that HPP are more cost-effective than disease management programmes that secondarily reducing risk in high-risk patients (43) (33).

Health promotion is defined by O’Donnell as “the science and art of helping people change their lifestyle. ...Lifestyle change can be facilitated through a combination of efforts to

enhance awareness, change behavior and create environments that support good health practices (44).”

Most HPPs, however, offer primary as well as some secondary preventive interventions. But, according to Goetzel (33), these secondary preventive interventions, such as biometric screening and monitoring are usually provided in a lower-cost setting such as the worksite or pharmacy which is staffed by nurses or health workers other than doctors.

**a. *Worksite Health Promotion (WHP) Programmes.***

Many health promotion programmes, particularly in the USA, are offered at the worksite and are primarily aimed at improving the health and well-being of workers (45). In the US, about 90% of worksites offer employees some form of health promotion to their employees (46). Few programmes, however, offer a comprehensive range of preventive services.

Worksite programmes are either administered in-house, by independent third party vendors or by the health insurer. Health insurance premiums in the USA are often based on health status and may also be based on engagement with the wellness activities of a health promotion programme. As most large employers in the US are responsible for part or full subsidy of employee’s insurance premiums, it is in the interest of employers that health claims amongst employees remain low. Thus, worksite programmes are offered by employers to reduce healthcare costs and also to reduce absenteeism and improve productivity.

According to Goetzel (45) “many employers associate poor health with reduced employee performance, safety, and morale. The organisational costs of workers in poor health, and those with behavioural risk factors, include high medical,

disability, and workers' compensation expenses; elevated absenteeism and employee turnover; and decreased productivity at work".

In February 2007, the Community Guide Task Force (47) released the findings of a comprehensive literature review of WHP programmes. The review, which focused on the health and economic impacts of WHP, found compelling evidence for the effectiveness of WHP in reducing tobacco use, high blood pressure, total serum cholesterol levels, absenteeism and improvements in worker productivity.

However, the evidence for changes in complex behaviour such as fruits and vegetables intake, physical activity and reducing overweight and obesity was less convincing.

In a recent review of economic outcomes, Chapman reported that participants in work site programmes have 25%–30% lower medical and absenteeism costs compared with nonparticipants, over an average study period of 3.6 years (48).

Aldana (49) in a 2001 review found an average return on investment (ROI) of \$3.48 for every dollar expended in seven of 32 studies which reported costs and benefits of WHPs.

Pelletier et al have conducted a series of reviews of all published research on comprehensive WHP since 1991 (50) (51) (52). The last review, for the period 2004 to 2008, was published in 2009. While acknowledging that much of research reported in peer reviewed is still of a poor quality, they conclude that there is growing evidence that comprehensive worksite programmes do improve clinical outcomes and reduce long-term health care costs.

Similarly, a recent systematic review by Groeneveld reported that there was strong evidence that workplace lifestyle interventions had a positive effect on body fat and in populations at risk for CVD, on body weight (53).

**b. *Health Promotion Programmes linked to Health Plans***

Health promotion programmes directly linked to health insurance plans are not well researched. As already stated, in the USA many health-plan linked health promotion programmes are offered at the worksite. There is, however, evidence that members of health insurance plans who engage in healthy practices incur less healthcare costs than those less attentive to their lifestyle (54-56).

Wolf et al (57) compared healthcare expenditure, over a one year period, between a lifestyle intervention group and a usual care group in Type 2 diabetic patients who were members of a health insurance plan. They reported that after taking into account the costs of a lifestyle intervention programme the total costs were \$3586 per person, per year, less among the intervention group compared to the usual care group.

Pronk et al (54) in a study of healthcare costs amongst members of a insurance plan found, that self-reported non-smokers, with a mean BMI of 25/kg/m<sup>2</sup> who participated in regular physical activity had mean annual healthcare charges that were approximately half that of physically inactive smokers with a BMI of 27.5kg/m<sup>2</sup>. They argue that funders seeking to minimize health care charges may wish to consider strategic investments in interventions that modify adverse health risks.

Most health promotion programmes address simple behaviours that require once-off or infrequent actions such as vaccinations or blood screening. Increasingly, however, incentive programmes are seeking to address complex behaviours, such as physical inactivity, unhealthy eating, overweight and smoking. Complex behaviours develop over a long time and require considerable and sustained effort to change.

### **3.4 Incentives to Change Behaviour**

The use of incentives to influence behaviours has a long tradition in psychology. The initial research, done by Skinner (58), examined the effect of rewards and punishment on learned behaviour in animals. This type of learning came to be known as operant conditioning which is defined as a “form of learning in which the responses come to be controlled by their consequences”. The findings from animal experiments have been increasingly applied to human behaviour. Today, incentives and rewards are used in many facets of life to motivate change in behaviour and promote effort and performance. For instance, parents promise reward for good grades; employers offer annual bonuses for performance from their employees. Incentives and rewards are now increasingly being considered in motivating change in health behaviour.

At one level it seems counterintuitive to pay individuals to be healthy; health, one would assume, would be something an individual would seek for its inherent benefits. However, a range of factors, not least of which are systematic, non-cognitive psychological factors, prevent individuals from implementing decisions that preserves their health. While the consequences of this “failure” in behaviour are most pronounced for the individual, they do result in costs and consequences - referred to as external costs – on others. For instance,

individuals who engage in unhealthy behaviour impose costs that are also carried by individuals who have healthier habits in collectively funded health plans.

Incentives, in various forms, have therefore been proposed as one strategy for motivating changes in health behaviour. The use of incentives to promote health is consistent with the strategy asymmetric paternalism. As stated by Loewenstein (59):

“interventions (that use incentives) can be seen as an even more extreme version of “light” paternalism in that, not only is participation voluntary, but also the introduction of financial incentives (assuming they are rewards and not punishments) actually puts individuals into financial positions that are better than their positions before the intervention. Financial incentives seem to help mainly by offering short term payoffs that bring the short-term incentives in line with long-term self interests”.

Thus if individuals value current consumption and discount future benefit then incentives and rewards are intended to diminish the value of current consumption and increase the value of future benefits - in the present.

The evidence for the effectiveness of incentives in changing health behaviour, while incomplete, is accumulating. Several reviews of incentive in changing health behaviour (60), (61) have been published in last few years.

Kane et al (60) undertook a detailed review of economics incentives in preventive care for the Agency for Healthcare Research and Quality in the USA. They sought to review the available published research to address four key questions: how have “preventive care” and “economic incentive” been defined in the literature; do incentives work? Is there evidence of a dose/response curve; what is the evidence for cost-effectiveness of economic incentive interventions?

They report that the definitions of economic incentives, the goals they seek to address and their possible impact on the individual are not clearly defined in the literature. Studies, in the main, fail to clearly outline whether incentives are intended as extrinsic reinforcement of behaviour until habituation or sufficient intrinsic motivation builds up or intended to expose individuals to preventive measure that are unknown to them. With regard to the effectiveness of incentives the review found that economic incentives are effective, in the short run, for simple preventive care and well-defined, distinct behavioural interventions. In this regard they reported a clear dose response. However, there is insufficient evidence to say that economic incentives are effective for long-term lifestyle changes required for health promotion. As few of the consumer studies undertook cost-effectiveness analysis the review could not report the predicted net financial benefit of incentives.

A more recent review of incentives in changing health behaviour was undertaken by Jochelson (61) in 2007. The review examined three issues: the kinds of financial incentives that exist; the evidence for incentives to change health behaviour; what makes financial incentive schemes successful?

The report describes two types of incentives from the literature - positive and negative. Positive incentives reward individuals directly for a desired behaviour while negative incentives are punitive and penalize individuals for failure to achieve a change in behaviour. While studies comparing positive and negative incentives directly are sparse, Jochelson believes that negative incentives may be less effective than positive incentives in effecting behaviour change and may even increase the sense of personal failure. They indicate that beside the type of incentive, the value of the incentive, the timing and continuity of incentives, social support and self-efficacy all play a part in determining the effectiveness of



incentives in changing health behaviour. This review, (as the Kane review previously) reported that there is compelling evidence for incentives in changing simple behaviours, such as once-off participation in screening tests and vaccinations, but the evidence for enduring change in complex, ingrained behaviour is less convincing. The review concludes that “further research is needed to understand when incentives are likely to be most effective in encouraging the adoption of healthier behaviours and whether long-term incentive schemes can enable people to maintain changes in behaviour”.

The use of incentives to change health behaviour is not without controversy. Many believe that incentive and rewards may improve performance in the short term but actually weaken performance and reduce intrinsic motivation in the long run (62), (63). Intrinsic motivation refers to motivation that is self generated. It is based on internal factors such as determination, consistency and effort. Extrinsic motivation is motivation that is influenced by external factors such as rewards and punishment. There is considerable evidence that intrinsic motivation is more likely to be successful and enduring than extrinsic motivation in changing behaviour (62). People who are motivated to change without the inducement of tangible rewards are more likely to sustain change than those who change only because of external inducement. They are also more likely to show greater interest and enjoyment in their undertaking. Psychologists believe that intrinsic motivation is more likely to produce greater effort, competency and proficiency. Extrinsic motivation may, on the other hand, elicit interest and involvement while the inducement or incentive is offered but motivation may disappear with the withdrawal of the reward (63).

Schmidt et al (64) and others (65) argue that incentive programmes may have greater success amongst higher socio-economic groups than amongst the poor. Penalty-based

programmes and negative incentives may discriminate against lower income individuals. These individuals are likely to be generally less healthy and in greater need of healthcare than their higher-paid counterparts. They conclude that “incentives for healthy behaviour may be part of an effective national response to risk factors for chronic disease. Wrongly implemented, however, they can introduce substantial inequity into the health insurance system. It is a problem if the people who are less likely to benefit from the programmes are those who may need them more” (64).

Redmond et al (65) from the Centre for Budget and Policy Priorities in the US reviewed the evidence for the use of incentives to change health behaviour. They conclude that there was little evidence that rewards increase preventive care when employed without education or outreach. They argue that rewards are especially unlikely to reduce the human and economic costs of complex behaviours, particularly smoking and obesity — the two areas where solutions are most needed.

Despite these misgivings there is evidence that appropriately targeted incentives do increase uptake in health-seeking behaviour and could reduce inequalities in health outcomes (66). Although health promotion programmes vary in the scope of activities and in the nature of incentives that are offered, many reviews have reported that programmes that employ incentives generally show improvements in lifestyle practices, health risks, health outcomes and associated reductions in healthcare costs (67) (48) (68) (52) (69) (70).

The use of incentives is one approach amongst many to effect change in health behaviour at a community or population level. The Guide to Community Preventive Services, for instance, identified community-wide health education campaigns, school-based PE, individually-adapted health behavior change and enhanced access to places for physical activity

combined with informational outreach activities settings as effective interventions to increase physical activity. Many of these approaches may be combined with the use of incentives to effect change (71).

Moreover, as stated by Volpp (72), when assessing the impact of incentives on health, comparative assessments with new or existing medical approaches to lifestyle diseases should be undertaken.

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#### **Chapter 4 A Description of the Vitality Programme**

*Vitality* is a comprehensive incentive-based health promotion and prevention programme that principally aims to limit the burden of chronic diseases amongst members of the *Discovery Health Medical Scheme*. The programme seeks to achieve this by changing simple as well as complex behaviours related to lifestyle diseases. Membership of *Vitality* is voluntary and offered separately from the health plan. The programme is offered to health-plan members for a nominal monthly fee of approximately R 100 per family. Members obtain immediate benefits on joining. These benefits are health as well as to non-health related. The health benefits include health assessments, free or reduced-cost gym and other fitness programme membership, reduced cost membership of a commercial weight-loss programme, reduced cost membership of smoking-cessation programmes and discounted visits with biokineticists and dieticians. The immediate non-health benefits of membership include discounts on store purchases, movie tickets, flights, car hire and hotel booking. The partnering stores, such as a supermarket chain and a bookseller chain have a national imprint and substantial market presence. Engagement with the numerous preventive and wellness programmes permit members to accumulate points which confer higher statuses - Bronze, Silver and Gold. These higher statuses, in-turn, allow members to claim greater discounts (rewards). While the incentive or rewards component of the programme may be perceived by some(73) as a traditional loyalty programme, *Vitality* has, over the last decade, been offering a steadily increasing number of health promotions interventions.

The various components of the programme have been adopted taking into consideration the following; the availability of cost-beneficial partners (gym chain, dietician networks etc); access and availability on a national level, the attractiveness of incentives and the scientific evidence for effectiveness of different interventions.

Interventions to effect behaviour change amongst members of *Vitality* can be principally assigned to two broad approaches:

#### **4.1 Providing health education and information to members.**

*Vitality* provides information on health and lifestyle to its members through variety of media -print (magazines, pamphlets), television and web-based communication. There is considerable evidence both in public-health discourse and more recently in the behavioural economics literature that acquiring information and knowledge about the ill-effects of certain practices alone does not always translate into the adoption of healthier practices. Despite this, there is evidence that health information does have a role in wider behaviour change strategies. Robertson (74) in a recent review of the use of information to promote healthy behaviours concludes: “information clearly has an important role to play in influencing behaviours such as smoking, alcohol consumption, drug use, diet, physical activity and sexual behaviour.... But we need to be clear about the limits of passive information provision. People need more than knowledge to be healthy, they need the skills to change; information campaigns must be coupled with other services and interventions if they are to bring about large changes in often complex and habitual lifestyle behaviours”.

#### **4.2 Using incentives to direct changes in health behaviour.**

Incentives used in the *Vitality* programme reward members for joining the programme and engaging with wellness activities. These incentives, which are generally positive, can be further categorized as:

- *Enabling Incentives.* These incentives are health perpetuating and are intended to encourage engagement with wellness activities by lowering the financial barriers to

participation and thereby widening access to wellness interventions. Incentives are offered as stimulus for joining rather than as rewards for engagement with health interventions.

- *Contingent Rewards*. These are incentives which have monetary value, and are allocated for engagement with wellness activities. In the case of *Vitality* they are allocated as *Vitality* points which can be redeemed as discounts on a range of purchases and services.

The activities of the *Vitality* programme are divided into four categories: “Fitness-related activity”, “Assessment and Screening”, “Healthy Choices”, and “Health Knowledge” (Table 1). Participating members can access components of the programme at various sites – online, at network of pharmacies, with partner dieticians and biokineticists.

**Table 1. Health promotion and wellness activities which comprise the *Vitality* health promotion programme.**

Fitness-related activities	Assessment and Screening	Healthy Choices	Health Knowledge
<ul style="list-style-type: none"> <li>• Gym membership</li> <li>• Walk/Run club</li> <li>• Pedometer programme</li> <li>• Golf network</li> <li>• SA Active <sup>TM</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Glucose</li> <li>• Blood pressure</li> <li>• Cholesterol</li> <li>• Glaucoma screening</li> <li>• Mammogram</li> <li>• Pap smear</li> <li>• Prostate screening</li> <li>• Voluntary HIV testing</li> </ul>	<ul style="list-style-type: none"> <li>• Smoking cessation programmes</li> <li>• Commercial weight-loss programmes</li> <li>• Dietician visit and nutritional advice</li> </ul>	<ul style="list-style-type: none"> <li>• Online health risk assessment and feedback</li> <li>• CPR course</li> </ul>

In summary, *Vitality* is an incentivised health promotion programme aimed at facilitating the adoption healthful behaviour and practices amongst members of the Discovery Health medical plan. The programme addresses simple as well as complex modifiable, health behaviour and offers multiple interventions principally to address chronic diseases of lifestyle.

In the next chapter we will compare the available health and claims data of *Vitality* members variably engaged with the programme.

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## **Chapter 5 Aims, Methods and Statistical Analysis**

We report on two cross-sectional studies that examined data on the associations between engagements in the Vitality health promotion programme and healthcare costs.

### **5.1 Aims of the studies;**

#### **Study 1**

The aim of the first study was to measure the relationship between the level of participation or engagement in the health promotion programme and inpatient medical claims experience of insured members. Specifically, we report on a comparison of hospital admissions and costs between members who are highly engaged with the programme against those members who are nominally engaged or not enrolled on the programme. This study examines a dose relationship between a comprehensive health promotion programme and healthcare costs in an especially large sample size. Further, it provides important baseline information on health care costs and level of uptake of health promotion activities, and has relevance for the future design of interventions for health promotions programmes, in the context of the private health insurance setting.

#### **Study 2**

The aim of the second study was to determine the association between engagement with the fitness-related components of the health promotion programme and medical claims and hospital admissions. Specifically, we report on a comparison of hospital admissions and costs between members with chronic conditions who are highly engaged with the fitness-related components of the programme and those members who are nominally engaged or not enrolled on the programme.



## 5.2 Methods

### *Design:*

We conducted a cross-sectional, correlation analysis of data obtained from the Discovery Health medical plan and the Discovery *Vitality* health-promotion programme for the year 2006.

### *Sample and data source:*

Adult members, whose health benefits had been effective for a full 12 month period of 2006 and who were eligible to register for the incentivised health promotion programme, were included in the study. Of those registered on *Vitality* only those members who had been registered for the full 12 month period of 2006 were included. These criteria resulted in a total sample of 948,974 members.

For study 1, it was reasoned that moving to the second tier status implied significant engagement with the programme. In 2006, 17% of members acquired sufficient points in all wellness categories to move to at least the second tier status. This cut-off, which translated to 10500 points, was used to differentiate high from low engagement with the health promotion programme. Based on these criteria the following dependent groups were defined *a priori*: not registered on *Vitality*; registered but no points earned in the four categories – not engaged; registered but less than 10500 points, defined as low engagement; and registered with above the threshold 10500 points defined as high engagement.

For study 2 members accumulating points specifically for fitness-related activities were included in the study. Members were able to accumulate points through gym visits (with

participating commercial fitness centre partners) and by participation in major sporting such as road running or cycle races (members register to participate through commercial partner organisation, SA Active). Fitness status was defined as follows: a) *Fitness engaged (High)*: points equivalent to more than 48 gym visits per annum, b) *Fitness medium active (Medium)*: points equivalent to between 24 to 48 gym visits per annum, c) *Fitness low active (Low)*: points equivalent to between 4 to 24 gym visits per annum, d) *Fitness inactive (Inactive)*: points equivalent to 3 or less gym visits per annum.

#### *Outcome Measures:*

The outcomes measured in this analysis relate to hospital admission experiences for 2006. More specifically we measured hospital claims, the length of stay and admission rate. These measures were calculated per event, per patient and per plan member. The next step was to conduct a comparison of medical costs by engagement with the health promotion programme in general (study 1) and with fitness-related components of the programme (study 2) for specific diagnostic subgroups. The selected subgroups included cancers, cardiovascular diseases, musculoskeletal conditions and endocrine and metabolic conditions such as diabetes. These conditions were selected because they are mutable by lifestyle interventions, such as physical activity or maintaining a healthy weight (75) (76). Because claims for acute ambulatory care are not covered from the insurance pool this data was incomplete and was, therefore, not analyzed.

#### *Statistical analysis:*

The first step in the analyses was the calculation of adjusted means by *Vitality* group (Study1) or fitness status (study 2), taking into account the impact of the weighted covariates. Factors which were likely to independently influence medical claims data,

irrespective of participation in the health promotion programme, were pre-selected as covariates for the analysis of covariance (ANCOVA) (77) For both studies the covariates selected included: age (in five year bands), gender, single or multiple chronic conditions and health plan options. For the current exercise, a tree analysis implemented in SAS<sup>®</sup> Enterprise Miner (SAS Institute Inc. Cary, North Carolina, USA) was used to assess the relative importance of these covariates in differentiating the experience under each claim cost category (78). All data were analyzed unlinked to any personal identifiers. The study protocol was approved by the Research Ethics Committee of the Faculty of Health Sciences, University of Cape Town.

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## Chapter 6 Results

### Study 1

#### *Member and plan characteristics:*

The distributions of members and demographic and plan characteristics between groups are presented in Table 2. Sixty two percent of the study sample had voluntarily joined the health promotion programme. However, roughly 35% of members of *Vitality* (21.9% of the sample) did not engage with any points earning activity on the programme. Based on the threshold for points, 15.3% of *Vitality* members (9.5% of the total sample) were considered to be highly engaged in 2006. Gender distribution was similar across groups. However, *Vitality* high-engaged members were younger than the other groups. In addition, a greater proportion of high-engaged and low-engaged members had comprehensive health insurance coverage compared to those not registered or who were not engaged with the programme. Further, 28.9% of members who were not on the *Vitality* programme were registered for chronic conditions compared to 14.3% of the high-engaged group.

**Table 2. Distribution and demographic and medical plan characteristics of members based on registration and engagement with the *Vitality* health promotion programme.**

	<b>Not Registered</b>	<b>Not Engaged</b>	<b>Low-Engaged</b>	<b>High-Engaged</b>	<b>Total</b>
Number of members (%)	357,840(37.7%)	207,728(21.9%)	293,208(30.9%)	90,198(9.5%)	948974(100%)
% male	45.5%	52.4%	45.9%	54.2%	48.0%
Mean Age, yrs	50.55	41.29	42.16	40.7	44.99
% Registered for at least one Chronic Condition	28.9%	8.9%	18.4%	14.3%	19.9%
% Registered for Multiple Chronic Conditions	14.2%	2.8%	7.4%	4.7%	8.7%
% On Comprehensive Plan	40.9%	38.2%	57.2%	52.9%	46.5%

*Level of participation and categories of preventive activities:*

Table 3 details the level of participation in the various preventive activity categories in which members accumulated points. By definition, members who were not registered and those who, although registered, had not acquired any points (non-engaged), were not represented in any of the categories for preventive activities. The high-engaged group had a greater proportion of members earning points in the fitness-related activity (93.8% vs 38.8%), healthy choices (47.7% vs 7.7%), and the health knowledge (56.4% vs. 16.8%) categories, compared to those in the low-engaged group. Only in the assessment and screening category did a similar proportion (73%) of low-engaged members participate when compared to the highly-engaged group (71%).

**Table 3. Number of members who earned any points in 2006 based on level of engagement with Vitality and health preventive activity**

Number of members	Not Registered	Not Engaged	Low- Engaged	High- Engaged
	357,840	207,728	293,208	90,198
'Fitness-related activity' points	0	0	113,886 (38.8%)	84,654 (93.8%)
'Healthy choices' points	0	0	22,578 (7.7%)	43,1144 (47.7%)
'Health Knowledge' points	0	0	49,480 (16.8%)	52,691 (56.4%)
'Assessment & Screening' points	0	0	214,302 (73%)	64,090 (71.1%)

**NB. Persons may have earned points in more than one category; therefore total summed % scores may exceed 100%.**

*Hospital admissions by group:*

Hospital experiences, by *Vitality* groups are presented in Table 4. The adjusted means take account of the differences in the covariates from the hierarchical analysis in each *Vitality* group. High - engaged members experienced lower costs per patient and per plan member compared to all the other groups. Cost per event was also lower but not significantly, between the high-engaged and those patients not registered. High-engaged members also had shorter stays in hospital per event and per patient and fewer admissions per patient compared to all other groups ( $P < 0.001$ ). The admission rates for those members who were highly engaged were significantly lower ( $P < 0.001$ ) than all other groups, with the exception of those registered but not engaged. The adjusted mean for the cost per member and admission rate was highest for the low-engaged members. Low engagement was not associated with reduced costs per patient, which were similar to those not-registered and those not engaged.

**Table 4 Hospital admission data adjusted for age, gender, chronic condition and plan type according to Vitality engaged status for 2006.**

	<b>Not Registered</b>	<b>Not Engaged</b>	<b>Low Engaged</b>	<b>High Engaged</b>
<b>Cost per event</b>	18494	19044***	19189***	18011
95% CI	18281-18707	18732-19356	18931- 19446	17596-18426
% Difference compared to High Engaged	2.7%	5.7%	6.5%	
<b>Cost per patient</b>	30420***	31332***	31078***	27538
95% CI	30018-30822	30743-31920	30592-31564	26754-28322
% Difference compared to High Engaged	10.5%	13.8%	12.9%	
<b>Cost per member</b>	8,654.30***	8,375.33***	9,436.30***	7,955.00
95% CI	8546.63-8743.97	8246.30-8504.40	9317.58-9555.01	7785.36-8124.65
% Difference compared to High Engaged	8.8%	5.3%	18.6%	
<b>Length of stay per event</b>	6.10***	6.12***	5.62***	4.77
95% CI	6.03-6.17	6.02-6.22	5.54-5.70	4.64-4.91
% Difference compared to High Engaged	27.9%	28.3%	17.8%	
<b>Length of stay per patient</b>	3.61***	3.60***	3.32***	2.97
95% CI	3.58-3.64	3.56-3.64	3.29-3.36	2.91-3.03
% Difference compared to High Engaged	21.5%	21.2%	11.8%	
<b>Admissions rate per patient</b>	1.56***	1.57***	1.56***	1.46
95% CI	1.556-1.573	1.439-1.473	1.551-1.572	1.553-1.578
% Difference compared to High Engaged	7.5%	7.5%	7.3%	
<b>Admissions rate per member</b>	0.42***	0.39	0.46***	0.39
95% CI	0.419-0.425	0.388-0.396	0.459-0.466	0.382-0.393
% Difference compared to High Engaged	7.7%	0.0%	17.9%	
Odds Ratio compared to High Engaged	1.1500	1.0200	1.3600	
95% CI	1.1-1.21	0.96-1.08	1.29-1.43	

**High-engaged compared to other groups; \*\*\* P < 0.001, \*\* P < 0.01, \* P < 0.05**

The sub-group analyses of specific disease-related groupings corroborate those of the overall analyses with *Vitality* high-engaged persons having significantly lower costs per patient for hospital claims and fewer hospital admissions (Table 5) compared to all other members. The difference in cost per member was 7.2% lower for CVD, 15.1% lower for cancers and 21.4% lower for endocrine and metabolic diseases in the high-engaged group compared to all other groups combined. The difference in admission rates was 7.4% lower for CVD, 13.2% lower for cancers and 20.7% lower for endocrine and metabolic diseases in those highly engaged members compared to all other groups.

**Table 5. Adjusted % difference in hospital costs and admission rates per member for persons engaged in Vitality compared to all other members.**

	%Difference in cost between high-engaged and other members (95%CI)	% Difference in Admission rates between high-engaged and other members (95%CI)
Cancers	-15.09%* (-0.75% - -29.43%)	-13.17%** (-3.57% - -22.63%)
Cardiovascular Diseases	-7.17%*** (-4.40% - -9.93%)	-7.37%*** (-5.49% - -9.25%)
Endocrine and metabolic disease	-21.38%** (-8.72% - -34.04%)	-20.66%*** (-14.83% - -26.53%)
Musculoskeletal Conditions	-17.44%*** (-10.42% - -24.47%)	-15.60%*** (-10.67% - -20.55%)

\*\*\* P < 0.001, \*\* P < 0.01, \* P < 0.05

***Data adjusted for age, gender, chronic condition and plan type***



## Study 2

### *Subject demographics by fitness-related groups:*

Table 6 describes the insured population in 2006, according to the fitness-related groups.

Nearly 40% were not registered for the incentivised wellness programme, and of those registered, 70.9% were considered Inactive, with nearly 12% in the High active category.

Men were over-represented in the High fitness-related activity group, compared to all other groups, and a greater proportion of those not registered for the incentivised wellness programme were registered for chronic illness benefits.

**Table 6. Demographic and medical plan characteristics of the members according to fitness-related activity categories.**

	<b>Not registered</b>	<b>Inactive</b>	<b>Low Active</b>	<b>Moderate Active</b>	<b>High Active</b>
<b>Members (N)</b>	357,840	419,187	52,713	49,633	69,601
<b>% Members in the various categories</b>	37.7	44.2	5.6	5.2	7.3
<b>% of Vitality members in each fitness-related category</b>	-	70.9	8.9	8.4	11.8
<b>Average age (yrs)</b>	50.5	42.5	37.5	39.3	41.1
<b>% Men in each category</b>	45.5	48.0	48.1	49.8	58.9
<b>% members in each category registered for chronic conditions</b>	28.9	15.4	10.4	12.5	13.1
<b>% members in each category on Comprehensive plan</b>	40.9	50.3	49.0	48.5	49.1

*Agreement between fitness-related activities and Vitality Engagement:*

A strong relationship between Fitness engaged and Vitality engaged status is demonstrated in Table 7 with 84% of the High Fitness group being similarly classified as High Engaged with the Vitality programme, In fact, over 27% of those in the Vitality HE group attended gym more than 96 times per year in 2006 (average of 1.85 times per week), and nearly 62% reported attending gym more than 48 times per year.

**Table 7. Agreement between Vitality engaged status and fitness-related activities.**

Vitality Engaged Status	Fitness-related activities Engaged Status				
	Inactive	Low Active	Moderate Active	High Active	Total
Not registered	47%	0%	0%	0%	38%
Registered but not engaged	27%	0%	0%	0%	22%
Low engagement	24%	90%	72%	16%	31%
High engagement	1%	9%	28%	84%	10%

*Fitness-related activities and hospitalisation:*

The adjusted means for only those members who underwent hospital admissions in 2006 are presented in Table 8, calculated for the groups according to fitness-related activities. Costs per patient, days per patient, number of admissions per patients, length of stay and cost per event were significantly lower in the High Active group, compared to all other groups ( $P < 0.001$ ). In addition, days per patient, and length of stay were significantly lower

in those patients with some level of engagement in fitness-related activities, compared to those not registered or who were Low Active (P< 0.001).

**Table 8. Adjusted means members for those undergoing hospitalisation by fitness-related activity category (per annum).**

	<b>Cost Per Patient ZAR</b>	<b>Days Per Patient</b>	<b>Admissions Per Patient</b>	<b>Cost Per Event ZAR</b>	<b>Length Of Stay Days</b>
<b>Not registered</b>	30455 <sup>a</sup> (30054 - 30856)	6.12 <sup>a</sup> (6.06 - 6.19)	1.57 <sup>a</sup> (1.56 - 1.57)	18497 <sup>a</sup> (18284 - 18709)	3.62 <sup>a</sup> (3.59 - 3.65)
<b>Inactive</b>	31373 <sup>a</sup> (30924 - 31822)	5.88 <sup>a</sup> (5.8 - 5.96)	1.57 <sup>a</sup> (1.56 - 1.58)	19164 <sup>a</sup> (18927 - 19402)	3.45 <sup>a</sup> (3.42 - 3.48)
<b>Low active</b>	30112 <sup>a</sup> (29168 - 31057)	5.38 <sup>a</sup> (5.22 - 5.54)	1.52 <sup>a</sup> (1.5 - 1.54)	18955 <sup>a</sup> (18455 - 19456)	3.24 <sup>a</sup> (3.17 - 3.31)
<b>Moderate active</b>	29958 <sup>a</sup> (28978 - 30937)	5.19 <sup>a</sup> (5.02 - 5.35)	1.49 <sup>a</sup> (1.47 - 1.52)	19159 <sup>a</sup> (18639 - 19678)	3.19 <sup>a</sup> (3.12 - 3.27)
<b>High Active</b>	26321 (25396 - 27247)	4.57 (4.41 - 4.73)	1.42 (1.4 - 1.44)	17478 (16988 - 17969)	2.88 (2.82 - 2.95)

<sup>a</sup> P<0.001 vs high active

In Table 9, the adjusted means (and 95% CI) were calculated across all members of the health plan (including those with no hospital admissions) according to fitness-related activities. Again, the cost per member, number of admissions and length of stay were all significantly lower in the High fitness activity group. As before, there was a monotonic decrease in hospitalisation costs per member, moving from the Inactive to High Active categories (P <0.001). This same pattern was demonstrated for admissions rate (P < 0.001).

**Table 9. Hospital admissions and claims experience of all members according to fitness-related activities (per annum).**

	<b>Cost Per member ZAR</b>	<b>Admissions Per Member</b>	<b>Days per member</b>
<b>Not registered</b>	8,644 <sup>a</sup> (8545 - 8743)	0.42 <sup>a</sup> (0.418 - 0.425)	1.72 <sup>a</sup> (1.7 – 1.73)
<b>Low Active</b>	8,770 <sup>a</sup> (8560 - 8980)	0.42 <sup>a</sup> (0.416 - 0.43)	1.6 <sup>a</sup> (1.57 – 1.64)
<b>Moderate Active</b>	8,642 <sup>a</sup> (8428 - 8856)	0.41 <sup>a</sup> (0.403 - 0.416)	1.54 <sup>a</sup> (1.51 – 1.58)
<b>High active</b>	7,540 (7354 - 7727)	0.36 (0.356 - 0.368)	1.36 (1.32 – 1.39)

<sup>a</sup> P<0.001 vs high active

*Diagnosis-related sub-group analysis:*

The admission rates per member for the High Fitness group were significantly lower when compared to all other groups for most of the diagnosis-related subgroups, including conditions such as cancer and mental illness (30% lower) and admissions associated with endocrine disorders, nervous conditions, and kidney and urinary tract disorders which were more than 20% lower (Table 10).

**Table 10. Difference (% lower) in admission rates for the high active group vs all other groups, by disease-related grouping.**

	<b>High active vs. all other groups</b>
Cardiovascular	-8.0% <sup>a</sup>
Digestive	-11.8% <sup>a</sup>
Nervous and Musculoskeletal System	-15.8% <sup>a</sup>
Cancer	-35.4% <sup>a</sup>
Kidney and Urinary Tract	-20.3% <sup>a</sup>
Respiratory	-18.7% <sup>a</sup>
Mental	-34.6% <sup>a</sup>
Endocrine, Nutritional and Metabolic (direct)	-20.0% <sup>a</sup>
Overall	-15.9% <sup>a</sup>

<sup>a</sup> P<0.001 vs high active

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## Chapter 7 Discussion and Conclusions

A key finding from the first study was that a higher level of participation in the various components of a health insurance-initiated health promotion programme was associated with overall lower healthcare costs compared to those who were not members of the Vitality programme or who had a little or no engagement with the programme. This association, of lower costs with higher engagement, was particularly evident for admissions related to diseases mutable by lifestyle, such as cardiovascular diseases, diabetes and cancers. This study examined a large database, in which levels of engagement with the health promotion programme were independently-recorded.

Compared to the low-engaged group, the high-engaged group was characterized by a greater percentage participation in all components of the programme, except preventive screening. Of interest is the greater proportion of high-engaged members earning points in fitness-related activity compared to low-engaged members (93.8% vs 38.8%).

Comparing participation rates between different programmes is often difficult, as programmes vary in design and incentives structure. For example, Serxner et al (56) reported participation rates for HRA and associated wellness activities of 49% in a worksite health promotion programme. Conversely, Ozminkowski et al. (55) found that only 5.9% of nearly 60,000 retirees engaged in more than two preventive activities in a Medicare health promotion programme. In the present study, about two thirds (62.3%) of the nearly one million health plan members voluntarily registered for the health promotion programme at a monthly cost of approximately R100. Roughly 65% of registered members engaged with points-earning wellness activities of the programme. The remainder, while registered with the programme, did not engage with any points earning health promotion activity. These non-engaged members were, presumably, attracted by the minimum level of rewards which were available to all members, irrespective of level of engagement. Only 15% of registered

members were highly-engaged, and likely to be receiving higher incentives and rewards. However, the extent to which incentives and rewards may have influenced participation is not known. Future longitudinal studies will need to address this question.

The second study found an unequivocal inverse relationship between participation in fitness-related activities of a health promotion programme and hospital claims amongst members of a health plan. The High Active group in the present study represents those individuals with the equivalent of 48 or more gym visits per year. The High Active members who were hospitalised in 2006 experienced a mean annual savings in associated medical claims of R5, 025 compared to Inactive members. Across all members, irrespective of whether or not they were hospitalised, this translated to a mean annual difference of R 1,535 between High and Inactive fitness-engaged groups.

Lower cost reported in the present study were similar in magnitude to those reported previously by Wang et al. (79) (80) and Nguyen et al (81). Wang et al found that average annual health care costs were approximately \$250 health lower in active vs inactive members, even considering those who exercised only one to two times per week. Similarly, a study of Medicare members receiving a health club membership as part of their health plan demonstrated fewer inpatient admissions (-2.3%, 95%CI: , -3.3% to -1.2%;  $P < .001$ ) and lower total health care costs (-\$500; 95%CI: -\$892 to -\$106;  $P = .01$ ) than matched controls not receiving the benefit (80) The overall costs-savings over the two years, for members averaging at least 2 health club visits per week was \$1252 (95CI:, -\$1937to -\$567;  $P < .001$ ) compared to those attending less than once per week. Nevertheless, the actual uptake of this benefit remained low, with less than 7% of the total plan membership participating.

Differences in savings between studies may be explained, in part, by the fact that in the present study only medical claims associated with hospitalisation were analysed, whereas the comparable studies typically report total health care expenditure. Furthermore, study populations differed in terms of age, and demographics. Martinson et al (82), for example, examined the impact of changes in physical activity status over 2 years in a small cohort of health plan members aged 50 years and older. In this study, changing physical activity status from inactive to active was associated with a more than \$2,000 savings in health care claims over 2 years, compared to remaining inactive over the same time period.

The strength of the current study is that gym visits and sports event participation were documented and not based on self-report. However, it may be argued that the definition of engagement in fitness-related activities, for example,  $\geq 48$  gym visits per year, lacked sufficient sensitivity to accurately reflect dose-response exposure to physical activity. Despite this, the presence of an apparent dose-response effect, seen in the monotonic decrease in claims and hospital visits suggests that the definitions may be sufficiently discriminating. Further, previous cohort studies, such as the Nurse's Health Study (83) (84) (85) and the Harvard Alumni study<sup>20</sup> have found that even 1-2 bouts of physical activity per week were adequate to show significant risk reduction for diabetes mellitus, and cardiovascular mortality, respectively.

Indeed, the fact that the activity participation was documented, and that most of the High fitness-engaged persons were also highly engaged in the wellness programme suggests that the potential health benefits that accrued were, in part, related to participation, even if there was potential selection bias. Furthermore, the significant association between participation in fitness-related activities and reduced medical claims or admissions was also



demonstrated in the disease-related sub-groups. This is in line with cohort studies, such as the Nurses' Health Study, in which relative risk for cardiovascular mortality, for example, in women diagnosed with diabetes decreased by 7% for as little as 1-2 hours of moderate physical activity per week ( $P < 0.001$  for the trend) (86). Similarly, Nguyen et al (81) demonstrated as much as a 40% savings in health care expenditure in a diabetic sub-group of members of a managed care cohort who attended a community-based fitness programme at least one time per week, compared to controls ( $P = 0.03$ ).

While the overall percentage of members using the gym 48 or more times per year was relatively low, it is similar in magnitude to other examples of health club benefits offered as part of managed care programmes. Nguyen et al. (81) found that in Medicare members, only 7% actually used the fitness centre benefit.

The challenge remains that while those members who are highly engaged experience significantly lower health care claims and hospitalisation, they are under-represented in the larger plan membership. Various health care providers have developed strategies to increase adoption of physically active lifestyles including full or partial subsidy of a health club or fitness centre memberships. In a small sample ( $n=132$ ) of managed care patients given an exercise referral from their general practitioners for full or partially-subsidised membership to a local exercise facility, the difference in level of subsidy was associated with a 12% higher attendance (21 visits per month, vs 16 visit per month,  $P < 0.05$ ). In addition, third-party monitoring of fitness centre visits was also associated with a 17% greater usage ( $P < 0.01$ ) (87). It is not clear the extent to which the incentives and rewards associated with the current wellness programme influenced participation in fitness-related activities.

In summary, participation in fitness-related activities within an incentive-based health insurance wellness programme was associated with lower health care costs. However, as in other studies, the involvement in fitness-related activities was generally low and further research is required to identify factors that may improve participation in such programmes.

The present studies have several limitations: The cross-sectional design did not permit us to draw a causal link between participation in the health promotion programme and healthcare costs. It is possible that healthier individuals selected the *Vitality* programme and participated in health promoting activities. We cannot comment or quantify on possible concomitant changes in health behaviors or engagement in health-related activities as these were not measured. Additionally, the *Vitality* programme, at the time of the study, allocated points for screening tests such as serum cholesterol, mammography and prostate specific antigen on detection of a health claim from a provider of these tests. In the current analysis, it is, therefore, not possible to differentiate members who engaged in screening tests as a preventative measure from those members who required these tests for diagnostic purposes. This 'coincidental' engagement may explain why the admission experience of low-engaged members, in whom screening and assessment activities predominate, were not lower than in the not-registered or non-engaged groups.

In conclusion, the present study analyzed the claims data of a health insurer who offers a multidimensional, primary prevention and health promotion programme to its members. This cross-sectional study provides an encouraging association between engagement with a health promotion programme and lower inpatient costs. These findings add to the growing literature on incentive-based health promotion programmes in addressing spiralling healthcare costs related to chronic diseases of lifestyle. Future research will further clarify

the potential causal relationships between engagement with the health promotion programme and health care costs.

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