

Health and productivity management in New Zealand: an exploratory study

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Appendix E Participant information sheet for HRA study

Appendix E Participant information sheet for focus group study

List of abbreviations

Abbreviation	Definition
BMI	Body mass index
CHD	Coronary heart disease
CHO	Carbohydrate
CVD	Cardiovascular disease
DoL	Department of Labour
HRA	Health risk assessment
FV	Fruit and vegetable consumption
HW	Healthy weight
K6	Kessler-6 questionnaire
PA	Physical activity
LHCA	Lifegain Healthy Culture Audit
MoH	Ministry of Health
NZPAQ-SF	New Zealand Physical Activity Questionnaire Short Form
RR	Relative risk
ROI	Return on investment
SPARC	Sport and Recreation New Zealand
UK	United Kingdom
US	United States of America
WHO	World Health Organization
WHO-HPQ	World Health Organization Health and Productivity Questionnaire
WHP	Workplace health promotion

List of publications arising from Doctoral Thesis

Peer-reviewed Journal Publications

Papers in submission

1. Williden, M., Duncan, S. & Schofield, G.M. (in press). Do health behaviours cluster in a working population in New Zealand? *Health Promotion Journal of Australia*
2. Williden, M., Duncan, S., & Schofield, G. M. (in press). Establishing links between health risk factors and productivity in the New Zealand workforce. *Journal of Occupational and Environmental Medicine*.

Papers to be submitted

3. Williden, M., Badland, H.M., Schofield, L., Schofield, G.M. & Duncan, S. The development and implementation of a worksite environment tool.
4. Williden, M., Duncan, S. & Schofield, G.M. (in submission) Associations between employee health and the health culture at work. *Scandinavian Journal of Environment and Work*.

Peer-reviewed Conference Presentations and Associated Publications

5. Williden, M., Soper, C. & Schofield, G.M. (2008). Assessing the health risk profile of the health care sector. Poster presented at Asics Conference of Science and Medicine in Sport, Hamilton Island, Australia, 12-15 October 2008.
6. Williden, M., Schofield, G.M., Soper, C. & Badland, H.M. (2009). Health and productivity management in the New Zealand workforce. Poster presented at the Asics Conference of Science and Medicine in Sport, Brisbane, Australia, 14-17 October, 2009.

7. Williden, M., Schofield, G.M. & Badland, H.M. (2010). The relationship between health risk factors and productivity in the New Zealand workforce. Poster presented at the 3rd International Congress of Physical Activity and Public Health, Toronto, Canada, 5-8 May 2010.

Papers accepted for Presentation 2011

8. Williden, M., Badland, H.M., Schofield, L., Schofield, G.M., & Duncan, S. (2011) *The development and implementation of a worksite environmental audit tool*. Paper presented at the 3rd Health and Productivity Management Congress. Sydney, 9-11 August, 2011.
9. Williden, M., Duncan, S., & Schofield, G. M. (2011). Establishing links between productivity and health risk in the New Zealand workforce. Poster to be presented at the International Society of Behavioural Nutrition and Physical Activity. Melbourne, Australia, 15-18 June, 2011
10. Williden, M., Duncan, S., & Schofield, G. M. (2011). The relationship between modifiable risk factors and health conditions in a working population in New Zealand. Paper to be presented at the International Society of Behavioural Nutrition and Physical activity Satellite Conference. Queenstown, New Zealand, 20-21 June, 2011.
11. Williden, M., Duncan, S., and Schofield, G.M. (2011). Is employee health behaviour associated with workplace health culture? Paper to be presented at the 139th American Public Health Association Meeting and Exposition, Washington DC, USA, 29-2 November, 2011.

Attestation of authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Chapters four to seven have been submitted (or are in the process of being prepared for submission) for consideration as separate papers for publication in national and international peer-reviewed journals. Each of these papers was conceived by the candidate, who was also the main contributor and author. All co-authors have approved the inclusion of the papers they were involved in as chapters for this thesis. Individual contributions for these chapters are outlined in the introduction.

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Thesis abstract

Health and productivity management (HPM) is a business strategy employed by organisations to manage employee health risk and improve productivity. The major determinants of health are chronic disease and the associated risk factors and, as adults spend more of their waking time at work, the workplace is gaining ground as a setting for health promotion. However, HPM is in its infancy in New Zealand; thus the aim of this thesis was to examine the individual and environmental determinants of health and their relationship to productivity in this novel contribution to the HPM field. This study explores associations between employee health, environmental and policy attributes of the organisation (workplace), and workplace productivity. Three separate but related studies were conducted using two New Zealand-specific workplace tools, developed to measure the health risk profile of employees and the physical workplace environment. The studies described in this thesis represent the first investigations of these relationships in New Zealand.

The initial step was to develop a New Zealand-specific online health risk assessment (HRA) tool to collect employee health risk data, workplace productivity information, and to compare to known population health data. This enabled three sub-studies to be conducted in Study 1 of this thesis. First, three health behaviours of working adults (meeting fruit and vegetable recommendations, being sufficiently active and maintaining a healthy weight) and their relationships with health conditions known to affect employee work factors were examined. Second, the relationship between employee health and organisational health culture was explored using the LifeGain Health Culture Audit (LHCA) tool. Third, associations between health risk factors and productivity in the workplace were characterised. Study 2 tested the first New Zealand-specific environmental audit tool designed to measure physical environmental factors that facilitate or inhibit health behaviour in the workplace. A case study analysis of one organisation with 23 worksites across New Zealand was conducted. Finally, Study 3 consisted of focus groups that were conducted with employees and managers to understand the factors influencing their health and work performance.

The novel finding of Study 1 was that few participants adhered to all three selected health behaviours: only 3.8% of participants ate five or more servings of fruit and vegetables, were sufficiently active, and maintained a healthy weight. In addition, employees with two sub-optimal health behaviours reported a significantly greater number of health conditions (odds ratio range: 1.40 - 1.55) when compared to employees meeting the recommendations. The second key finding found support for healthy behaviour in the workplace was negatively (although weakly) associated with psychological distress (range of $r = -0.17$ to -0.30), and positively associated with the sum of health behaviours ($r = 0.13$) and being a non-smoker ($r = 0.12$). The third important finding was that, compared to people reporting high psychological distress scores people with low to moderate psychological distress scores reported a work performances 6.5% and 3.5% higher respectively ($p < 0.001$). Similarly, physically active people reported a work performance 3.5% greater than those not active ($p < 0.001$). In addition, high psychological distress levels and smoking accounted for 16.8 and 11.6 (respectively) additional absentee hours over the previous four weeks. These novel findings suggest that poor employee health may be costly to the employer; the HRA tool is the first to enable associations between work performance and employee health risk factors these associations to be measured and quantified.

Study 2 illustrated that the New Zealand-specific workplace audit tool, developed to be freely available to New Zealand businesses, could be used for identifying priority areas of the workplace environment to be targeted for improvement. A number of low cost initiatives around physical activity and nutrition that were not currently utilised by the organisation were recommended based on best-practice guidelines. Though the utility of the tool to examine associations between environmental attributes of the worksite and employee health behaviour revealed trivial associations, the homogeneity of the workplace sample may not have allowed the true effect of the worksite environment to be observed. The environmental audit tool is an important advancement in the field of health and productivity management in New Zealand to provide structure to the development and evaluation of workplace wellness programmes within New Zealand businesses.

Physical activity was the most frequently cited behaviour identified for maintaining and improving health in the final qualitative component of this thesis (Study 3). The accessibility of a fitness facility and exercise classes onsite and the inclusion of physical activity into the work day helped some participants manage work-life balance. The opposite was true for others, however, who preferred clearer divisions between work and leisure time. While perceived work stress and high job demands affected their ability to maintain healthy behaviour, employees valued the support they received from their team leader to help them manage work commitments. The team leaders perceived they were not offered the same support from management structures above them. While this organisation had components of a workplace health programme in place, both employees and team leaders felt that inconsistent messages prevailed throughout the organisation regarding the support for health behaviour, which served to undermine the health promotion efforts of the company. These significant findings highlight that wellness programmes need to be supported by health policy and practices that are embedded within all levels of the workplace structures if they are to be effective.

Taken together, the novel findings of this research illustrate that poor employee health is associated with business-related outcomes and provides evidence of a business case for HPM in the local context. This novel research significantly contributes to the HPM field with the development and the testing of a HRA and environmental audit tool specifically designed for the New Zealand workplace. Future research could build on these findings by utilising the HRA tool in a variety of worksite settings. Demonstration that employee health and subsequent productivity can be improved through HPM is necessary to advance HPM as a business strategy for New Zealand employers.

Chapter 1. Introduction

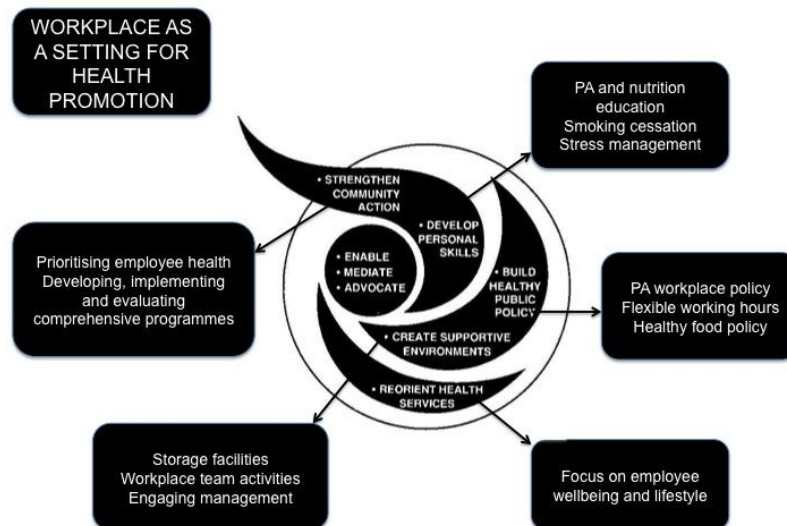
1.1 Background

It is universally acknowledged that the health problems burdening society today are largely borne from lifestyle factors that are modifiable. The rapid increase in obesity, cardiovascular disease, type 2 diabetes and some cancers cannot be explained by changes in genetic factors. While an individual's genes can certainly predispose them to being at an increased risk of disease, it is decisions that they make regarding how they live that has a greater impact on their health outcomes. This is governed to a large extent by the environment they live, work and spend their time in. In New Zealand, the leading cause of death is cardiovascular disease, accounting for four out of every 10 deaths, followed closely by cancer.¹ Poor nutrition, physical inactivity, excess body weight, smoking, increased stress, lack of sleep and excess alcohol consumption are behavioural risk factors that contribute to the increased prevalence of these conditions by creating increased stress on the immune system.² Over time, the inflammatory response of the immune system that is responsible for removing pathogens from the body begins to attack healthy cells, causing low grade inflammation of the vascular cells that is now known as the underlying mechanism responsible for the progression to cardiovascular disease, diabetes and some cancers.³ Inflammatory cytokines released from adipose tissue are linked to the development of insulin resistance and type 2 diabetes.⁴ Inflammatory responses by immune cells are associated with atherosclerosis⁵ and the systemic and local production of cytokines is a contributing factor to the origin of certain cancers.⁶ Intervening to address lifestyle factors that contribute to chronic inflammation will reduce the risk of developing cardiovascular disease, diabetes and some cancers. At a population level, as lifestyle habits begin to improve, prevalence rates of these diseases and their intermediate endpoints (such as obesity, hypercholesterolaemia, hypertension and insulin resistance) will decrease, reducing the amount of public health money spent on disease management.

As such, nine of the 13 health objectives as set out by the New Zealand Health Strategy relate to health conditions that can be modified by lifestyle factors.⁷ The

public health approach over the last decade has moved from the traditional medical model of treating disease to preventing it. Health promotion has taken the settings approach and interventions that are run in communities, schools and in the home aim to change health behaviour and risk factors that lead to poorer health outcomes. The workplace is recognised as another setting in which education, risk assessment and environmental modifications can take place to aid in behaviour change.^{8,9}

The benefits of workplace health promotion from a public health perspective are well understood; the worksite is a setting whereby health promotion can be actioned in all strands of the Ottawa Charter (Figure 1-1), as a comprehensive health promotion (or wellness) programme following best practice guidelines intervenes at all levels within the organisation. A programme is developed to integrate health goals at the policy and managerial levels, and the physical environment is improved to encourage healthy behaviour, such as changes to food availability. These serve to create a supportive environment which encourages the adoption and maintenance of healthy behaviour for all employees. Wellness programmes are broadly designed to deliver primary prevention initiatives including components such as health risk assessments (HRAs), smoking cessation, nutrition and physical activity education and activities, and stress management techniques are examples of such components. These enable individuals to develop skills that help them make positive changes to their health behaviour and serve to reduce risk of chronic disease and improve employee health efficiently and cost effectively. Indeed, preventing low risk individuals from moving into the high risk category will likely result in the most cost savings over time.¹⁰ However, within the framework of a wellness programme high risk individuals can be targeted specifically through the provision of risk reduction programmes if required. Workplace wellness programmes can deliver messages to an engaged audience in a setting that has existing and efficient communication channels; most adults are employed and therefore health messages can reach population groups such as men and minority groups often missed by public health campaigns; and parents and potential parents are targeted, which could result in downstream effects to the home environment.^{11,12}



Adapted from World Health Organization (WHO), 1986.

Figure 1-1: Workplace health promotion in the context of the Ottawa Charter

1.2 Statement of Problem

It is clearly advantageous to implement workplace wellness programmes from a population health perspective, as a comprehensive wellness programme that can improve the health behaviour and health outcomes of the employees has, in the long term, the potential to reduce population level chronic disease risk and the reliance on an already over-extended public health system. However, there needs to be a solid business case to convince companies to invest in order for it to be a sustainable vehicle for health promotion. Internationally there is increasing recognition that better management of employee health and related performance outcomes may drive economic development and company profits, a concept known as health and productivity management.¹³ In countries such as the United States (US) and Canada, the employer is responsible for medical care costs of their employee, and with research providing evidence that a healthier employee costs less in medical expenditure and days off due to illness,¹⁴ the employer has a vested interest in the health of their employees. Further, literature suggests employees feel more valued in an organisation that offers a wellness programme and therefore they are less likely to look for alternative employment, reducing company costs associated with staff turnover.¹⁵ Finally, on top of the expenses associated with poor employee health, the presenteeism, has been estimated to be up to three times that of absenteeism costs.¹⁶

These reasons have led to over 90% of US organisations offering one or more health initiative in the workplace.¹² In New Zealand though, medical expenditure and employee insurance claims are met by the public health system and therefore the benefits of a wellness programme are less apparent. Indeed, the field of health and productivity management is a relatively new one in the local setting. Despite reports from the Organisation for Economic Co-operation and Development (OECD) that New Zealand lags behind other countries in respect to productivity gains and that close to 70% of our gross domestic product (GDP) is the result of our service industry, there appears to be little interest from the broader business and government sector of the potential benefits that could be gained from adopting business strategies related to employee health outcomes. Whether this is related to a lack of knowledge of the relationship between health and productivity remains unclear. It is also unknown to what extent health risk factors affect both the health status and the productivity of the New Zealand workforce. For health and productivity management to be adopted by companies on a large scale within New Zealand, an evidence base that outlines these issues needs to be established. In the absence of evidence that shows improving employee health can result in an increase in profits, there is little likelihood that business will engage in health promotion. Prior to developing robust workplace health promotion programmes that follow best practice guidelines, collecting New Zealand relevant data on the health risks salient to employees is necessary. Illustrating the effects the health risks have on productivity in the workforce is the next step. Alongside this, gaining an insight into the values, beliefs and attitudes around health and work among employers and employees would be useful to gauge the climate for health and productivity in New Zealand.

1.3 Statement of Purpose

The overall aim of this research was to contribute to the limited body of knowledge that exists in health and productivity management in New Zealand by investigating health risk factors that affect working adults, and to examine relationships between these and productivity measures in a sample of working adults in New Zealand. Specific objectives were to:

1. Review the existing literature of the health risk factors and the work-related attributes that are associated with measures of productivity in the workforce (Chapter two).
2. Develop an online, New Zealand-specific HRA tool (Chapter three).
3. Investigate the percentage of people who adhere to population-based guidelines for fruit and vegetable consumption, physical activity recommendations and maintain a healthy weight, and examine the relationship between health conditions and health behaviour in a sample of New Zealand employees (Chapter four).
4. Undertake a case study analysis in one organisation to illustrate the utility of a New Zealand- specific worksite audit tool to:
 - a. Identify and prioritise physical activity and nutrition-related attributes of the policy and physical environment in the workplace that may be inhibiting healthy behaviour and that could be feasibly improved to encourage physical activity and healthy eating (Chapter five).
 - b. Examine if there is a relationship between physical and policy attributes of the workplace environment and nutrition and physical activity related behaviours of the employees (Chapter five).
5. Examine the association between employee health risk factors and perceptions of support for health behaviour in the workplace (Chapters six and eight).
6. Investigate the associations between health risk factors, overall health risk and productivity in a sample of New Zealand employees (Chapter seven).

For the purposes of this thesis, the following definitions are used to describe work-related measures: Absenteeism refers to employees who are away from work due to ill health, and presenteeism is a term used to describe employees coming to work but not functioning at full capacity (related to sub-optimal health behaviour or health). Productivity is the accumulated effect of both measures used and refers to either the individual employee, or the productivity of the business as a whole.

1.4 Significance of Research

The field of health and productivity in New Zealand is in its infancy and this is the first exploratory study that has investigated health risk factors in a sample of New Zealand employees. This body of work contributes to the literature in a number of ways. Firstly, this research necessitated the development of a New Zealand-specific HRA tool that enables the collection of health risk and health behaviour data comparable to both national and international population-based surveys. In addition, it utilises productivity measures used extensively in the international workplace literature that will not only identify health risk factors contributing to reduced work performance, but will allow for between country comparisons. This has not previously been examined in New Zealand.

There is no research that has investigated the clustering patterns for recommended population-based health guidelines of fruit and vegetable consumption, physical activity and maintaining a healthy weight in New Zealand adults. These are the key behaviours which reduce the risk of chronic disease, but the extent to which these co-exist is unknown. In addition, associations between specific behaviour patterns and health conditions known to affect work performance have not been previously examined. The HRA tool has allowed both of these to be examined for the first time in Study one.

Individual behaviour change is more successful when the physical and psychosocial environment in which the individual operates is supportive of such a change. There have been limited studies, none of which were conducted in New Zealand, that have investigated the relationship between the health culture of an organisation and employee health risk factors; Study one utilises the Lifegain Health Culture Audit (LHCA) to do so. The development of a publicly available audit tool to identify attributes that facilitate or inhibit healthy behaviour is important to advance health and productivity management in New Zealand. This thesis work describes how the tool can be used in both small and large worksites across New Zealand to prioritise environment attributes for intervention. In addition, Study two assessed the relationship between the environmental attributes of the worksite and employee physical activity and nutrition related behaviours, which few studies have reported.

This doctoral thesis represents the first investigation of employee health and how it relates to productivity in the New Zealand workforce. It encompasses the development and implementation of a New Zealand-specific HRA, along with the implementation of a publicly available audit tool, both of which advance the field of health and productivity management in New Zealand. This research contributes to a business case for using workplaces as a setting for health promotion which, over time, has the potential to reduce population level chronic disease without draining public health reserves.

1.5 Study delimitations

The purpose of the research was to develop and test New Zealand-specific workplace measures related to health and productivity. The HRA was designed to be an online tool for use in employed populations with predominantly computer-based roles. As such, this was a requirement of companies recruited for this research. While the audit tool has been designed to measure environmental attributes of a wide range of worksites and industries, its use in this research was confined to the population group described above. This was to enable associations to be drawn between the domains measured by the HRA and the audit tool. For these reasons, this doctoral research was not intended to be representative of the wider New Zealand working population and caution should be applied when generalising to different industries and job types across the New Zealand workforce.

Further parameters specific to this research are as follows:

1. With the exception of the worksite audits undertaken (Chapter five), all other data were self-reported and as such are open to reporting bias.
2. The data collected were cross-sectional and therefore no causality can be inferred.

1.6 Role of candidate

The overall research hypothesis was conceived by the candidate who was part of a wider research team to undertake the development of New Zealand workplace specific tools in paid work commissioned by the Ministry of Health and Sport and Recreation New Zealand (SPARC) as part of the Mission On government initiative. The health risk assessment (HRA) tool was developed by the candidate who undertook the background research, constructed the tool and pilot tested it as part of the initial commissioned research. Data analysis and write up resulting from the implementation of the HRA was undertaken by the candidate as part of the doctoral research. The candidate then used the tool in research separate to the original project for the purpose of the doctoral research, and was responsible for all aspects of the research process (company recruitment, HRA implementation, database management, data analysis and write up.) The candidate was one of three people responsible for the development and pilot testing of the workplace audit tool that was also part of work commissioned by the MoH and SPARC. The utility of the tool was then tested for use in an organisation with 23 worksites across New Zealand, for the purpose of the doctoral research and separate to the Mission On initiative. The candidate was responsible for the workplace audits, data analysis and research write up. Finally, the candidate was one of two facilitators to conduct the focus groups and was responsible for transcribing, analysing and writing up the results of the third study within this doctoral research. While funding was received by the research group to develop the HRA and environmental audit tool as part of the Mission-On initiative, the candidate did not receive personal funding and undertook the research as part of her doctoral studies.

1.7 Thesis structure

This doctoral work is presented as a series of chapters that have been submitted for publication in peer-reviewed journals and represent a logical progression of studies. Taken together, this doctoral work forms a coherent thesis under the pathway two. The thesis structure and research objectives are outlined in Figure 1-2. A literature review (Chapter two) is followed by a chapter outlining the development of an HRA tool (Chapter three), followed by four descriptive, cross sectional studies (Chapters

four through seven), and one qualitative study (Chapter eight) that integrate to construct an exploratory study of health and productivity management in New Zealand. These are detailed on the following page. Each chapter is prepared in paper format, with their own introduction, methods, results and discussion sections. The final chapter links the studies and summarises the key findings and recommendations that have emerged from this body of research, contextualising it in the wider New Zealand environment (Chapter nine). The preface serves to link each chapter to the thesis as a whole. This thesis fulfils the requirements of the AUT University Doctorate of Philosophy by presenting an original investigation and analysis of employee health risk factors and the workplace environment, an original contribution to the health and productivity management field, which is in its infancy in the New Zealand environment.

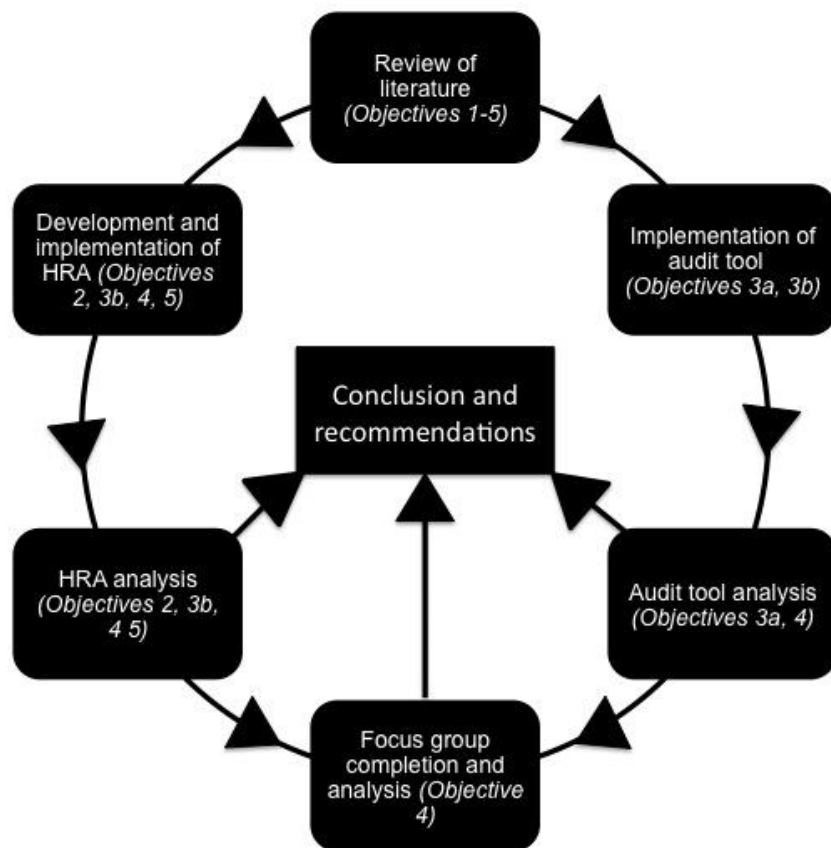


Figure 1-2: Overview of Thesis structure

1.8 Research Chapter Contributions

Chapter 2: *Health factors, workplace environment and effects on productivity. A review of literature.*

Williden, M. (80%; lead author, main contributor), Schofield, G.M. (10%), Duncan, S.J. (10%)

Chapter 3: *Development of a health risk assessment tool.*

Williden, M. (70%; lead author, main contributor), Schofield, G.M. (20%), Soper, C (10%)

Chapter 4: *Is overweight, physical inactivity and not meeting fruit and vegetable recommendations linked with risk of chronic health conditions in a working population in New Zealand?*

Williden, M. (70%; lead author, main contributor, 100% data collection, 80% statistical analysis), Duncan, S. (20%), Schofield, G.M. (10%)

Chapter 5: *The development and implementation of a worksite environmental audit tool.*

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Chapter 6: *Associations between employee health and the health culture at work.*

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Chapter 7: *Establishing links between health risk factors and productivity in the New Zealand workforce.*

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Chapter 8: *Employee health and the work environment: a qualitative analysis.*

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Chapter 2. Literature Review

2.1 Preface

In the international setting, there is a solid evidence base for a relationship between health and productivity in the workplace, with a plethora of literature outlining the detrimental impact that sub-optimal lifestyle behaviours have on health risk factors and subsequent workplace related costs. In the international environment, where employers pay employee medical claim costs, an employee who presents with health issues as a result of poor lifestyle choice costs the employer more in insurance claims. Moreover, these employees are also more likely to have higher rates of absenteeism and reduced work performance. This evidence is the basis for employers to offer health promotion programmes within their company to help improve health behaviour, reduce employee health risk and increase overall productivity. In order to promote sustainable behaviour change, attention has moved from individual behaviour change to investigating factors of the workplace environment that affect health behaviour.

Very little is known about the health of New Zealand employees in relation to work factors. In order to advance the field of health and productivity management within New Zealand it was necessary to develop an HRA tool that can measure relevant health risk factors in the context of the work environment. This review is the background document that justifies the inclusion of the health domains in the HRA and briefly outlines each in the broader context of public health, before focusing on workplace specific associations. It also critiques literature investigating the elements of the workplace environment found to be associated with employee health and productivity.

2.2 Health risk factors

The health risk factors that have been found to impact on work related outcomes and covered in the following review include smoking, stress, sleep, alcohol, nutrition, overweight and obesity, physical activity and chronic conditions.

2.2.1 Smoking

The relationship between smoking and health

The adverse effects of cigarette smoking on health are well understood. Once touted as a stress reliever and appetite suppressant, the harmful and addictive effects of tobacco did not begin to be realised until the early 1940s.¹⁷ The negative effects that tobacco has on the rates of ischemic heart disease, cerebrovascular disease, chronic airway obstruction and lung cancer in the smoking population are no longer disputed. The relative risk of suffering a non-fatal myocardial infarction in adults aged 35 – 64 years was found to be between 1.7 and 4.9 greater for smokers who are part of the WHO Multinational MONitoring of trends and determinants in Cardiovascular disease (MONICA) cohort (a project designed to investigate the determinants of cardiovascular disease).¹⁸ The risk is highest for those smokers who fall into the younger category (in those aged 50 years and younger), and accounted for 50% of non fatal myocardial infarctions.¹⁸ Cigarette smoking adversely affects almost all of the body's major organs and is not only responsible for negatively impacting the health of those that smoke, it also has indirect yet severe effects on others who are around those that choose to smoke. While major causes of death and disease attributable to smoking are clear, researchers are still uncovering negative health outcomes associated with smoking that were previously unexamined.¹⁹ There is now sufficient evidence to infer casual relationships between smoking and a host of cancers, cardiovascular diseases and respiratory illnesses.¹⁹ In addition, fertility, bone health and health status as a whole are all confirmed as being negatively impacted upon by smoking.¹⁹ Bunn et al. reported that non-smokers were almost twice as likely to report having a better overall health status when compared to smokers in a US population-wide survey of 45, 630 employees.²⁰

In New Zealand it is estimated that over 5000 deaths annually can be attributed to smoking-related causes in both smokers and those exposed to second-hand smoke, equating to 17% of all deaths in New Zealand.²¹ Those that smoke at the age of 20 years die on average 14 years earlier than their non-smoking counterparts due to smoking-related causes. The number deaths attributed to exposure to second hand smoke exposure is estimated to be between 174 – 490 each year in New Zealand.²²

A meta-analysis of morbidity and mortality data from studies included in the Asia Pacific Cohort Studies Collaboration (APCSC) found that during a median eight year study period, 40% of current smokers died from cardiovascular disease and 35% from cancer.²³ Smokers were twice as likely to die from all-site cancer and five times more likely to die from respiratory illness than those who had never smoked.²³ Research from New Zealand indicates the health risks associated with both exposure to tobacco smoke and smoking have additive adverse effects on health. Non-smokers exposed to second hand tobacco smoke were found to have an 82% greater chance of suffering from an acute stroke compared to those who were not exposed in a population-based case control study. This risk increased from four-fold to six-fold amongst those people who smoked and were exposed to environmental tobacco smoke when compared to the control population.²⁴

Smoking in New Zealand adults

An individual is defined as a current smoker if they have smoked more than 100 cigarettes in their life time and on at least one occasion per month.²⁵ According to the New Zealand Health Survey, 19.9% of adults over the age of 15 years fall into this category, and over 90% of these smoke at least once a day.²⁶ This prevalence is a record low since surveillance of tobacco use began over three decades ago. The New Zealand Health Survey undertaken in 2002/03 found the prevalence rate of smoking was 23.5%.²⁷

While there was no gender difference found in the prevalence rates of smoking, Pacific people were most likely to be defined as a current smoker (at 42.2 %) compared to Māori (26.9 %) and New Zealand European and Other (18.9 %). When

adjusting for age, Māori women were over two times more likely to report being a smoker when compared to women of other ethnic groups, and Pacific and Māori men were 1.5 times more likely to be categorised as a current smoker.²⁶

Given the negative effects of second hand smoke exposure in those who are non-smokers, it is relevant to note that one in ten children and one in 13 adults are exposed to second hand smoke in the home in New Zealand.²⁸ In line with other countries who impose similar legislation, the Smoke-free Environments Amendment Act (2003) has had a marked effect on the level of second hand smoke exposure experienced by non-smokers in the workforce.²⁸ It was estimated that 21% of New Zealanders were exposed to second hand smoke in the working environment in 2003.²⁸ While the original Smoke-free Environments Act banned smoking in covered office workspaces, it did not include workplaces such as indoor industrial worksites or hospitality settings.²⁸ Surveys conducted annually from 2003 to 2006 revealed a drop in exposure to 8% amongst the respondents who worked.²⁸

The association between smoking and work-related factors

Smokers may be less productive in their jobs compared to non-smokers for a number of reasons. If smokers are suffering from chronic conditions related to smoking (such as pulmonary disorders and others as listed above), their on-the-job performance may be indirectly impaired. In addition, smokers are more likely than non-smokers to experience insufficient sleep, thereby impacting on their ability to function properly throughout the day.²⁹ Losses of production can be directly attributed to tobacco through the amount of time spent on smoking breaks.³⁰ In many companies employees who smoke can have breaks in addition to those typically allocated. This time has been estimated to be between six and 10 minutes. Ryan and Campin estimated that an additional 64 minutes per employee per week were spent smoking tobacco products in their examination of employee smoking practices in the workplace.³⁰ This was larger than the 30 minutes estimated by Parrott³¹ due to the instigation of smoke free workplaces, resulting in employees travelling to designated smoking areas. They found that employees who reported smoking during work hours were overrepresented in the estimation of time lost during work hours due to all causes, with less than a quarter of employees making up almost half of lost time on the job.³⁰

Investigations into the effects smoking can have on productivity in the workplace have focused on both objective and subjective measures and have had mixed results. Halpern et al. assessed employers reports on productivity at an airline reservation call centre and compared them to the employees self measures of productivity using the Health and Work Questionnaire (HWQ).³² The employer measures of productivity, including calls logged, number of flights sold and lag time between calls, did not differ significantly between current, former and never smokers. However, it is interesting to note that former smokers who had quit less than a year earlier had the lowest productivity rating using employee measures of productivity and subjective productivity was significantly lower on two subscales of the HWQ.³² Employees own rating of how productive they were as assessed by others was also significantly higher for an individual who had never smoked (8.3 out of 10) compared to former and current smokers (8.0 and 7.7 out of 10, respectively). There were no differences found in measures of own productivity, relationship with supervisor, irritability or concentration and focus.³² Overall productivity as measured by the HWQ failed to find differences between the groups. The authors note, however, that the mean age of the respondents was lower than that of the general working population, and as a self-selected sample, survey respondents may have been healthier than those that did not respond.³² In addition, the study was set up as a feasibility study for a workplace smoking cessation study, and as such no power calculations were conducted to establish respondent numbers needed to find statistical significance of differences for the productivity measures. A larger number of respondents that were more representative of the general working population may have found different results.

The Wellness Inventory (WI), a tool to measure absenteeism and productivity losses due to health conditions was used to determine the association between productivity and smoking status in a representative sample of employees in varying occupations.²⁰ This was collected from 2001-2005 in the US and, while current smokers reported working more hours per year than non-smokers, the 76.5 hours lost due to presenteeism was significantly more than the 42.8 hours per year reported by non-smokers.²⁰ When combined with absenteeism data, current smokers cost their

employees close to \$US2000 dollars more per year in lost time compared to their non-smoking counterparts.²⁰ Company level mistrust has been found to be associated with a higher likelihood of smoking and a higher likelihood of cessation relapse in employees,³³⁻³⁵ and, while not a measure of work performance, trust in the employer is a key element for employee retention and productivity.³⁶

Halpern et al. investigated the differences between 300 current, former and never smokers in days absent from work in 300 employees of a large airline in the US.³² They found that current smokers had close to four days absent from work during the study period of four months, which was significantly greater than both former never smokers (2.4 and 1.33 days absent, respectively).³² Easton estimated the costs from loss of production that are attributable to smoking to be \$545 million per year to the New Zealand economy in 1990.³⁷ Tsai et al. compared days absent from work for a number of health risk factors in a population of Petrochemical employees, and found that the number of days absent for a current male smoker was 13.3 days per year, six more days than men who do not smoke.³⁸ In females, 23.3 days were lost during the year due to smoking status compared with 12.3 days for a non-smoker. In a population wide survey in Taiwan, Tsai et al. used the human capital approach (which assumes the cost of absenteeism is equivalent to wage across all job types) and estimated that the wages or salary lost due to the amount of time spent away from work cost the Taiwanese economy an additional \$US178 million per year in absenteeism and a further loss of productivity equal to \$US733 million due to time spent during work in smoking breaks.³⁸ Bunn et al. found a significant difference in the days reported absent over a one year recall between smokers (4.9 days per year) and non smokers (4.4 days per year).²⁰

It should be noted that methodological differences in computation of absenteeism and associated costs exist between studies. For example the human capital approach may be applicable in occupations which might lend themselves to having anybody occupy a given role, some others cannot simply rely on another person stepping in to replace the absent worker.³⁹ In New Zealand there has been sparse research investigating the productivity of smokers compared to non-smokers in the workforce.

Costs of smoking to the public health system

The monetary costs associated with the treatment of tobacco related health issues are huge, both internationally and in New Zealand.⁴⁰⁻⁴² While it appears that more and more money is spent on adverse health effects, in reality earlier reports of costs associated with smoking are likely to have underestimated the problem. As relationships between tobacco and other health problems are unveiled and better understood, the costs of more and more health conditions are being attributed to the indirect and direct effects of smoking.¹⁹ In New Zealand, it is estimated that \$NZ1.5 billion dollars can be attributed to the health costs associated with smoking.⁴³

Cost savings associated with reduced smoking rates

Given the monetary costs associated with smoking and reduced productivity in the workforce, employers would benefit from a reduction in smoking rates across the board. It would follow that unscheduled breaks for people who smoke would decrease and accordingly the hours lost on the job would also be less, therefore increasing productivity. Lower smoking rates would in the long term reduce the health costs associated with smoking that would otherwise impact on work-related factors such as absenteeism and employee medical claims.

For a business that runs a smoking cessation programme for its employees there can be considerable financial gains in the long term. Halpern et al., using a hypothetical model projected the cost of implementing a cessation programme to smokers in the workplace was \$91-92 over two years and approximately \$594 over 20 years. The increasing costs were due to multiple attempts by a single employee to quit smoking, and also successful people leaving the model and being replaced by new smokers in the time period. However, this cost was offset by the benefits associated with reduced health care and increased productivity in the job to return \$1.94 - \$2.54 for every dollar spent over approximately 10 years.³² While the costs of providing a smoking cessation programme initially seem large, it is important for any business considering this to think about it as a long term investment as opposed to a short term cost, and structure it accordingly into policy. Offering a range of cessation programmes, including web-based, group counselling and a telephone help-line may

maximise the uptake and subsequent abstinence rates of employees choosing to quit smoking⁴⁴, and additional financial benefit has been found from investing in more than one approach.⁴⁵ Benefits may also be achieved by promoting existing cessation programmes currently available through the public health system, and this strategy is also less expensive for employers.⁴⁶ This would also help create antismoking social norms within the workplace, which has been found to be a strong predictor of smoking cessation.⁴⁷

Most of the costs related to health care are likely to be realised in the long term with the reduction in population smoking rates. Hurley and Matthews⁴⁸ calculated that the health funds spent on the National Tobacco Campaign (NTC) in the first six months in Australia resulted in a savings of \$AU740.6 million of direct healthcare costs related to reduction in preventable diseases and premature death.⁴⁸ While there is no comparable New Zealand study, an evaluation of Quitline in New Zealand (a publicly funded smoking cessation programme) estimated savings of over \$2,500 for each person who called and successfully quit.⁴⁹ The acute reductions in health problems associated with smoking and exposure to smoke could lead to improved productivity at work, given the relationship between physical health and productivity.⁵⁰ While not an outcome of this study, a comparison of abstainers and those that did not quit smoking at three and 12 months after attending a smoking cessation seminar found that mental and physical health, vitality and social and physical functioning all improved when measured on the Short Form 36 (SF-36) Health Survey.⁵¹ These improvements also extended to the 12 month follow-up for abstainers. Specific health problems such as respiratory problems have also been found to decrease significantly shortly after a reduction in both exposure to environmental tobacco smoke and smoking itself. A Norwegian study of 1525 employees found that respiratory problems decreased amongst hospitality workers five months after a ban in indoor smoking.⁵² These effects, as expected, were greatest for those people who also quit smoking as a result of the ban, with a reduction in respiratory conditions such as a morning cough, phlegm cough, wheezing and coughing through the day.⁵² Such reductions again would clearly result in a better quality of health which may infer an improvement in productivity at work.

2.2.2 Stress

The relationship between stress and health

Work stress has received much attention in both academic literature and popular media due to the increasingly pressured work environment in today's society. Work stress can be defined as the individual's response when the demands and expectations of their job exceed their perceived capability.⁵³ While some stress in the job can motivate and challenge employees in their role, too much stress over a long period of time can lead to significant physical and mental health problems if individuals feel they do not have the knowledge or skills required to complete the tasks expected of them.

The aetiology of stress on the job is known to have a psychological and physiological basis. While perception of a stressful situation is unique to the individual, the physiological response to stress, once evoked, is not. The release of hormones (such as catecholamines) in response to stress is a normal reaction. Cortisol levels increase in the body which enables a surge of energy, lowers sensitivity to pain and allows heightened homeostasis in the body.⁵⁴ The evolutionary advantage of the fight or flight response to acute stress is obvious. However, acute life-endangering stress is not usual in most modern workplaces. Chronic (or long lasting) stress is more prevalent, where the fight or flight response is neither a usual nor appropriate reaction.⁵⁵ Yet in many cases we experience the same physiological outcomes over a long period. Chronic stress can lead to an overproduction of stress hormones over time, elevating the levels of circulating cortisol. Chronically high levels of cortisol can reduce immune function, impair glucose metabolism and raise blood pressure, risk factors associated with more serious health issues such as cardiovascular disease (CVD) and diabetes.^{56,57} People who have reported they feel pushed for time to complete daily tasks have been found to have significantly higher salivary cortisol levels than those who do not report such pressure.⁵⁸ The same study found that men reporting a high effort-reward imbalance and a degree of over commitment at work had a higher amount of cortisol in the morning and during the day. Steptoe et al.⁵⁹ further demonstrated the significant relationship between job strain and salivary cortisol as high job strain individuals

had significantly higher early morning cortisol levels. Not all research has found this relationship between stress and hormones,^{60,61} though methodological and population differences may account for these differences

The link with stress hormones has also led to research investigating stress in the workplace and risk of coronary events. Lynch and colleagues showed the progression of atherosclerosis was greater in men that worked in jobs with high demands yet little economic reward.⁶² Similarly Wang et al. analysed the Canadian Population Health Survey and reported the same association in women with high physical demands within their jobs.⁶³ The Belstress study measured the number of coronary events over a three year period in men initially free from heart problems and found that risk of a coronary event was inversely associated with the level of support male employees received at work.⁶⁴ The risk of a coronary event declined from 2.91 to 1.45 per 1000 person years as the level of social support increased in the workplace. This investigation was one of the first to show a significant relationship between the social environment and cardiovascular health in the workplace,⁶⁴ and this has been supported by further similar studies.⁶⁵ Vital exhaustion (VE), characterised by unusual fatigue, a lack of both physical and mental energy, an increase in irritability and a feeling of demoralisation⁶⁶ has been found to be an independent risk factor for coronary heart disease⁶⁷ and may be a consequence of long term chronic stress.⁶⁸ Kudielka et al.⁶⁹ measured the relationship between plasma fibrinogen (a protein involved in blood clotting, of which elevated levels have been associated with increased risk of cardiovascular disease) and VE in a sample of otherwise healthy teachers and found a significant association between VE and fibrinogen levels in males after controlling for depressive symptoms and lifestyle factors associated with CVD risk.⁶⁹

High levels of stress in the workplace have also been associated with a greater number of both acute and chronic health conditions in a population-based sample of adults in the United Kingdom (UK).⁷⁰ A significant difference was found in reported hypertension and rates of depression amongst those who experienced higher levels of stress in the Bristol Stress and Health at Work study, an epidemiological study of 17,000 adults.⁷⁰ Gastro-intestinal problems were reported at a higher rate over the

previous 12 months for this group also.⁷⁰ Further, there was a negative impact on health behaviours with both poor sleeping patterns and increased smoking rates found in those reporting higher stress levels.^{70,71} High stress levels at work have also been associated with poorer nutritional habits, lower levels of PA, a greater likelihood of smoking and a higher frequency of alcohol consumption during the week.^{70,72} Psychological work demands experienced by the employee can negatively impact on stress levels. In addition, factors such as long hours, lack of time to complete tasks and ambiguity over job expectations and requirements are all risk factors for psychological distress.^{53,73} A New Zealand longitudinal study found that women and men who fell into the highest tertile for reported higher psychological job demands (related to work hours and time pressures) were 2.0 to 2.2 times more likely to have a major depressive disorder (MDD) or general anxiety disorder (GAD).⁷⁴ Men who reported lower social support at work were also more likely to present with a MDD or GAD and this association remained when controlling for history of mental disorders. Indeed the researchers found that 45% of new cases of depression and anxiety were attributable to work stress.⁷⁴ Similarly, a nationwide Canadian Health and Wellbeing Survey used Karasek and Theorell's job-strain model to determine concepts related to job stress, such as scope for decision making, social support and psychological job demands.⁷³ Briefly, the model predicts that low psychological demands (such as time pressures and hours worked) and high decision latitude (made up of decision authority and skill discretion, involving variety and opportunities to use skills in the job) are conducive to low psychological distress in the workplace. Conversely, a job that has minimal autonomy in decision making, requires long hours and unrealistic expectations to complete tasks has a high risk of creating stress.⁵³ Robertson Blackmore et al. found that lack of social support at work was significantly positively correlated with depression in both men and women, who were 2.7 and 2.3 times more likely respectively to meet the diagnostic criteria for depression within the previous 12 months.⁷³ Finally, Hilton and colleagues found that people working long hours, a non-traditional gender roles for their occupation or in the sales industry experience the highest levels of psychological distress.⁷⁵

Stress is also understood to be an interaction between both the individual and their environment. Within the work environment there may be situations that can cause an individual to have a stress response.⁵³ There have been events and factors identified as being more likely to be to cause a stress reaction for employees in the workplace. Karasek and Theorell's model of job-strain is widely used to describe the effects that decision latitude and psychological job demands have on mental health in the workplace.^{59,64,68,73,76} This is evidenced by higher levels of psychological distress found in the healthcare sector, call centres and in sales employees, where long hours, minimal autonomy in decision making, and unrealistic expectations to complete tasks are likely to be more salient.⁷⁷

Stress in New Zealand

The Quality of Life Survey conducted in 2006 highlighted that 10% of New Zealand residents had experienced negative forms of stress 'most of the time' or 'always' within the previous 12 months.⁷⁸ Those aged between 25-49 years were most likely to report they were regularly experiencing stress (11%). The Life in New Zealand Survey revealed that mental health for working age adults (those aged less than 65 years, as measured by the SF-36) generally improved as they aged.²⁶ The prevalence of psychological distress, a sign of anxiety or mood disorders was lower in adults over 45 years of age and higher in females compared to males in almost all age groups in the general population.²⁶ This trend is consistent with other population research.⁷⁹

There have been a number of studies looking at stress levels and the types of stressors experienced within specific occupation groups in New Zealand. Time pressures and treating difficult children were reported to be sources of stress very often or all of the time for around half of New Zealand dentists who responded to a postal survey regarding stress levels in their jobs.⁸⁰ Interpersonal conflict and work load issues were the two main sources of work stress in a group of government employees.⁸¹ While emotional exhaustion was moderate to high in psychiatrists who filled out the Maslach Burnout Inventory,⁸² the corresponding high levels of personal achievement reported may be protective against the negative outcomes associated with work stress.⁸³ It is difficult to directly compare the results of these studies given

the different measures used to quantify 'stress', and while most data are self-reported, the physiological effects of stress are determined by the presence of perceived stress which is measured by these questionnaires. In New Zealand then, there is no good picture of the effects of stress in the workplace for the wider population group. And while the Quality of Life Survey suggests stress could be an issue for a significant proportion of adults, there is no information on the source of the stress and whether it is related to work, relationships or other factors. Further, if respondents were asked specifically about stress within the workplace there may be a greater percentage of people reporting higher stress levels due to contextualising. Finally, little is known of the implications stress has on productivity within the New Zealand workplace, and this alone warrants further investigation.

The association between stress and work-related factors

Billions of dollars every year are lost to employers through the effects that psychological stress has on the levels of absenteeism and lost productivity⁸⁴⁻⁸⁸ Iverson estimated that stress costs employers €2.68 m annually in lost productivity, the equivalent of over 10,700 work days.⁸⁸ It has been estimated that high stress among US employees costs the economy \$US0.6 million in absenteeism and over \$US3.6 million per year in presenteeism.⁸⁹ In Australia 3.2 days per employee per year are lost to stress-related absenteeism and presenteeism, costing the economy close to \$15 billion per year, two-thirds of which are realised by the employer⁹⁰. Further, the Australian Work Outcomes Research Cost-benefit survey of close to 77,500 workers found psychological distress had a greater impact on absenteeism and presenteeism than other investigated health conditions.⁹¹ Employees scoring high on the Kessler-6 (K6) scale of psychological distress reported a 4.3 times higher risk of presenteeism, an impact over three times greater than on absenteeism with a relative risk of 1.2.⁹¹ Stress is the number one cause of long term illness among non-manual workers in the UK, and it has been estimated that 12.8 million days per year are lost through stress-related illnesses.⁹² Employees reporting higher stress levels are more likely to be absent from work for six or more days compared to other employees.⁷⁰ Lost time on the job was significantly associated with the amount of reported stress, with those in the high stress category estimating that over a quarter of their time spent at work in the previous four weeks was lost to presenteeism,

compared to just under 15% in the low stress group.⁷⁰ Perceptions of productivity did not differ among stressed and non-stressed UK workers in the Bristol Stress and Health survey,⁷⁰ though the single-item question used may not be the best measure for assessing productivity.

Working conditions that are linked to higher stress levels are also associated with absenteeism. High job strain, either by itself or alongside other factors such as low support in the job,⁶⁸ and high job demands,⁹³ increases the number of days absent from work and is associated with higher disability pension payments in some working populations.^{94,95} High levels of job strain and job demands, alongside job control and job demands were also a significant contributor to the number of days absent in a cross-sectional survey of Danish workplaces over two years.⁹⁶ Low decision making ability is another major contributor to stress in the workplace⁵³ and research has found that a considerable amount of absenteeism can be explained by this factor in those who felt they had minimal autonomy in decisions in their position.^{68,97}

Costs of stress to the public health system

Stress-related costs tend to be associated with a host of interrelated factors. The American Institute of Stress estimate that workplace stress costs the nation \$US300 billion per year.⁹⁸ This is not dissimilar to the £100 billion per year estimated in 2005 the UK, 10% of the gross national product.⁹² Australian figures suggest that stress-related worker's compensation costs in excess of \$AUD10 billion.⁹⁰ In a large study of over 45,000 employees undertaking a health risk assessment Goetzel and colleagues found that being highly stressed was one of the largest determinants of utilising healthcare costs.⁹⁹ When combining high stress and depression levels, the expenditure costs were close to 150% more than people without any risk factors for CVD.⁹⁹ Stress was one of the most commonly reported risk factors when determining medical expenditure in a large cohort (n = 6543) of Japanese employees in an electrical company.¹⁰⁰

Cost savings associated with reduced stress levels

Programmes that target either stress management or mood disorders such as depression and anxiety in the workplace have been shown to reduce psychological stress levels among employees.¹⁰¹ Over time this has the potential to save employers a significant amount of money through reduced turnover, absenteeism and lost productivity.¹⁰² In Steffick et al.'s review of depression management, there were improvements in worker productivity and absenteeism rates after employees received help for depressive symptoms. A web-based intervention that focused on stress management, prevention and early treatment of mood disorders and reducing the misuse of alcohol as a coping strategy was successful at reducing stress levels among participants.¹⁰¹ Those that used the programme also reported better time management skills, improving their productivity at work. Employer recognition of work-related aspects that increase work stress and aggravate depressive symptoms may be a useful first step towards helping those experiencing depressive symptomology, as individuals showed fewer symptoms of depression when moves were made within their jobs to change their work tasks after time away from work.¹⁰³

Positive associations have also been drawn between health promoting behaviours and the measures of workplace stress, such as emotional exhaustion and role conflict. Pomaki et al. found that doctors who engaged in more health promoting behaviours such as getting enough sleep, exercising regularly, keeping a healthy diet and weight and choosing not to smoke, were protected against both emotional exhaustion and depressive symptoms even when experiencing a high amount of role conflict.¹⁰⁴ This suggests that a programme encouraging health promoting behaviours may temper the deleterious effects of stress that lead to losses in productivity and increased absenteeism. While individual level programmes have been successful for targeting stress and mood disorders in the workplace, organisational factors contributing to such conditions are an avenue where there is more scope for stress reduction. The impact of intervening at this level is likely to be far greater given the aforementioned influence organisational structures and job factors have on stress, and it is

recommended that job strain, job demands and effort-reward balance are all targeted to reduce the risk of job stress and subsequent productivity losses.^{105,106}

While stress is targeted in workplace wellness programmes run in New Zealand organisations, there is no information available to determine the extent stress impacts on the New Zealand workforce as a whole, and there have been no robust evaluation studies to determine the efficacy of these programmes in reducing stress levels of employees. Further, there have not been any investigations to establish if stress impacts on productivity in New Zealand employees, and what the potential cost of this might be. Finally, there is no New Zealand evidence that a successful stress reduction programme would reduce absenteeism and increase productivity, thereby reducing the overall business costs that are associated with stress in the workplace. This is a largely untapped research area in New Zealand.

2.2.3 Sleep

The relationship between sleep and health

It is generally accepted that adults require seven to nine hours sleep a night for good health. Indeed, in the first part of last century the average amount of time spent sleeping was nine hours a night. Sleep times now are reported to be closer to 7.5 hours,¹⁰⁷ with a large percentage of people reporting sleep durations of six hours or less. During sleep we experience different phases of sleep patterns, and while stage one seems to have negligible impact on recovery, stage two involves basic recovery making up around 50% of our total sleep time. Stages three and four are grouped under slow-wave sleep and this is where the majority of cellular repair takes place, with the secretion of growth hormone in conjunction with the suppression of cortisol allowing recovery after the day's activities.¹⁰⁸ The final stage is the rapid eye movement (REM) phase, where dreams occur, and people tend to cycle through the sleep patterns throughout the night, with REM increasing in amounts as the night progresses with less time spent in stages three and four.¹⁰⁸

While sleep deprivation in the short term leads to mood disturbances, motor performance impairment, a reduced ability to concentrate and fatigue,¹⁰⁹ chronic

sleep deprivation has been linked to more serious health conditions such as insulin resistance, CVD, and higher mortality.¹¹⁰ Cross-sectional and longitudinal studies have consistently shown that sleep duration and quality can adversely affect health in a range of population groups. Women who slept less than five hours a night were almost six times as likely to have low high density lipoprotein (HDL) cholesterol (a risk factor for CVD) when compared to those sleeping between six and seven hours per night.¹¹¹ Eguchi and colleagues found men who slept less than 7.5 hours per night were at a greater risk of a coronary event, and this was heightened when combined with a higher systolic blood pressure at night.¹¹² The Singapore Chinese Health Study found a higher rate of CHD mortality if sleep duration was less than five hours per night.¹¹³ Indeed shorter sleep duration itself is associated with a higher blood pressure, higher triglycerides and a higher total cholesterol.^{114,115} Even minor shifts in sleep time can have an adverse impact; Jansky and colleagues found the incidence of cardiovascular events increased in the two week period after daylight savings compared to the two weeks prior to, when analysing data over a 20 year period.¹¹⁶ This was particularly in people aged less than 65 years and it is worth noting that the lifestyles that many people lead today suggests that the increased demands from work and family lead to a habitual decrease in sleep time that might equal one to two hours per night.¹¹⁰

Sleep deprivation has been found to have a negative impact on immune function in those that have both acute and chronic loss of sleep hours. Immune cell levels within the blood stream experience diurnal variation and the disruption of the normal sleep-wake cycle affects the production of immune cells, highlighting the importance of adequate sleep time for immune system maintenance.¹¹⁷ Sleep deprivation brings with it similar effects on the immune system as the presence of an infection in the body. Research has found that white blood cells (specifically leukocytes and monocytes), the production of which is linked to the presence of infection, increase in studies of severe sleep deprivation.¹¹⁸ Natural killer cells have been found to decrease after mild sleep deprivation of four to eight hours in healthy adults,¹¹⁸ and there is an increase in circulating interleukin 6 (IL-6) cytokine cells, a proinflammatory marker, after even one week of a two hour sleep debt.¹¹⁹ While levels attenuate once a normal sleep pattern is resumed, regular loss of sleep is likely to

have implications for immune function long term. Further, C-reactive protein (CRP), a marker of inflammation in the body, has been found to rise to levels indicative of CVD risk after several days of sleep deprivation.¹²⁰

Hormonal changes also occur with sleep deprivation. The levels of leptin and ghrelin, hormones involved in appetite regulation, are both influenced by the amount of sleep obtained on a regular basis. A lack of sleep lowers leptin levels and increases ghrelin levels, driving appetite and hunger levels up.^{108,121} Levels of cortisol and growth hormone within the body are also affected,¹⁰⁷ along with sympathetic nervous system activity, all of which can lead to impaired glucose metabolism and decreased insulin sensitivity. These hormonal changes are linked to obesity with epidemiological studies finding associations between increasing body fat levels,¹²² BMI,^{114,123-125} central adiposity¹²⁵ and sleep deprivation. Further, complications associated with type 2 diabetes are exacerbated in some populations with shortened sleep or decreased sleep quality¹²⁶ and the risk of developing diabetes in those who do not currently have the disease is greater.¹²⁷⁻¹³⁰ While the causal pathway is unclear, it is thought to be linked to glucose intolerance.¹⁰⁹

Sleep habits of New Zealand adults

There are very little data in New Zealand that report the general sleep habits of the population. However cross-sectional analysis of data gathered as part of the New Zealand Blood Donor Health Study, a population-based survey of 15,687 participants which investigated the risk of injury associated with behavioural determinants, reported that 60% of participants in paid employment were dissatisfied with the amount of sleep they got per night.¹³¹ A workforce survey in Australia found 56% of participants got, on average, less than seven hours of sleep per night and one in five felt exhausted during the work day.¹³² A report released from the National Sleep Foundation in the United States found those people working shift work (defined as starting a shift after 6pm at night and before 6am in the morning) were more likely to sleep less than six hours a night on a workday.¹¹⁰ The average length of time spent sleeping on work days was six hours and 40 minutes and 44% of participants report sleeping less than seven hours per night. Forty-four percent said that, during the week, had difficulty getting to sleep or staying asleep, woke up

frequently throughout the night or they woke up feeling unrefreshed. One third reported snoring at least a few nights in the last month.¹¹⁰

The association between sleep and work-related factors

Working irregular hours can impact on sleep patterns and become a mediating factor when investigating the relationship between sleep, absenteeism and productivity. Much of the research investigating the relationships have focused on shift workers¹³³⁻¹³⁶ or people who have been diagnosed with sleep disorders such as sleep apnoea¹³⁷ or insomnia¹³⁸⁻¹⁴¹.

Employees who work irregular hours can suffer more from absence related to disrupted sleep patterns, however much of the research conducted on this has been equivocal. While Dionne and Dostie found that sickness absence was increased because of shift work,¹³⁶ Admi and colleagues found that even nurses who reported disrupted sleep patterns were no more likely to be absent than those who were more adaptive to shift work.¹³⁴ The relationship between sickness absence and lack of sleep in a Swedish population was attenuated when depressive symptoms were accounted for¹³⁵ and shift-work nurses who were satisfied with their work and work environment did not report more absence from work.¹³³

A recent review of absenteeism in an insomniac population found that rates of sickness absence were 1.4 to 2.2 times higher compared to people who were good sleepers.¹⁴¹ Close to 45% of sickness absence could be attributed to insomnia in Daley et al.'s¹³⁸ study investigating the effects of insomnia in a working population. However, Philip et al. used sleep logs and the Basic Nordic Sleep Questionnaire to establish whether people who meet the criteria for insomnia had a higher rate of absenteeism in a French cohort.¹³⁹ They found no increase in absenteeism once other health complaints were controlled for,¹³⁹ however these conditions that increase time away from work may be the result of sleep deprivation. This indeed was the case in a recent examination of work-related absence in Finland, which found that during a mean follow-up of 3.3 years, sleep disturbances five to seven nights per week predicted work disability due to a number of disorders including mental disorders,

diseases of the circulatory and nervous system and musculoskeletal disorders, after controlling for other health factors.¹⁴² In addition, sleep disturbances prior to disability were associated with higher likelihood of not returning to work after work disability from mental disorders and musculoskeletal diseases.¹⁴²

Very few studies have specifically looked at sleep disturbances and absenteeism in a representative sample of the working population. However, one such study found those who reported sleep disturbances were more likely to record intermediate (14-90 days) and long term absences (90 or more days) over the following two years.¹⁴³ People suffering from sleep disturbances but who did not meet the full criteria for insomnia syndrome were absent for more than double the amount of time compared to people who were good sleepers in a population sample of the working population in Canada.¹³⁸ Rugulies and colleagues linked sleep disturbances with sickness absence in their baseline analysis of the Danish Work Environment cohort, finding the likelihood of being absent for more than 16 days in the last year almost double in those that suffer from a poor quality sleep.¹⁴⁴ Employees with insomnia missed a mean of 3.1 more workdays annually than those without insomnia in an analysis of nearly 300,000 people over a six year period.¹⁴⁵ Interestingly, while Ihlebaek and colleagues found that the population prevalence of sleep problems and tiredness did not increase over a seven year period, there was a substantial increase in those recording a sickness absence from these complaints.¹⁴⁶ It is perhaps not surprising to find that people with insomniac complaints have a higher rate of absenteeism than people who have no sleep difficulties. As sleep disturbances are often a symptom of an underlying condition, it is important to control for this in any analysis of sleep effects.

Sleep deprivation and/or poor quality sleep might also impact negatively on cognitive function and therefore reduce productivity. Indeed Leager and colleagues report over a two fold increase in presenteeism for employees with insomnia.¹⁴⁷ Daley et al.¹³⁸ reported that participants in a cross-sectional study categorised as having insomnia-like symptoms (without meeting the full insomnia syndrome criteria) lost significantly more hours through reduced productivity compared to good sleepers. This was mostly attributed to fatigue.¹³⁸ Compared with employees

who did not experience frequent night-time awakenings, respondents who woke during the night three or more times had the greatest work performance and productivity impairments across a wide range of dimensions on the Works Limitations Questionnaire (WLQ), including judgment, creativity, motivation, and energy.¹⁴⁸ The same research group estimated that sleep disturbances were costing the employer close to \$US2000 annually in lost productivity¹⁴⁹. While not looking specifically at productivity, Philip et al.'s analysis of employees found (perhaps not surprisingly) a significant association with daytime somnolence and poor sleep quality.¹⁵⁰ This excessive daytime sleepiness may have implications for the quality of work that is able to be produced, though this was not investigated by the authors. Godet-Cayré et al. reported an annual cost of over €1062 to the French employer per year in lost productivity associated with insomnia.¹⁴⁰ However for people who have not been diagnosed with a sleeping disorder or present with symptoms that would suggest a disorder, the area is sparse in terms of the relationship between self-reported sleep duration and quality and productivity on the job. Mulgrew et al. followed up patients receiving treatment for sleep apnoea and found those that scored high on the Epworth Sleepiness Scale (ESS), a self-report questionnaire assessing the tendency to fall asleep in a given situation throughout the day, reported a reduced productivity as measured by the WLQ.¹³⁷ Specifically, when comparing the least sleepy group with the sleepest group, three of the four WLQ dimensions; time management, mental processing-interpersonal interactions and work output were significantly limited a large percentage of time. Of those that responded to the follow-up two years later, these limitations were largely reduced after treatment for sleep apnoea.¹³⁷ While this study gives evidence for the effects sleep deprivation can have on work productivity, it is noted that this was a particular group of predominantly middle aged men whose mean BMI classified them as obese and were diagnosed with a sleep disorder. There is no New Zealand-specific research that has investigated the prevalence of sleep disorders or sleep difficulties in employees and the potential impact this might have on work performance.

It is recognised that the relationship between sleep and work is not one directional, and job demands can also impact on the dimensions of sleep. Research indicates that sleep duration and quality is significantly worse for workers who report a higher

workload and an atypical work schedule.¹⁵¹ An analysis of work demands found that sleep disturbances were more prevalent in those reporting a high effort reward imbalance (ERI).¹⁴⁴ At five year follow up, new cases of sleep disturbances were related to high ERI in men only.¹⁴⁴ Similar findings were observed in a number of studies investigating work demands and sleep quality in employed populations.^{152,153} and his sleep deprivation can in turn affect on the job productivity.¹⁵⁴ Starting work before 6am in the morning or after 10pm at night may be independently associated with a poorer cognitive performance regardless of sleep duration.¹⁵¹ There is no New Zealand data examining this, but it is worth noting that a significantly higher proportion of people in the New Zealand Census reported working outside of the conventional ‘8am – 6pm’ work day period.¹⁵⁵ It is not known whether elongated hours reflect an inability to complete required tasks within the allocated work hours or if this is a strategy to negotiate a work-life balance. In any case, that work is being conducted over and above ‘normal working hours’ has implications for sleep patterns and productivity,¹⁵⁶ particularly if there is little time dedicated to unwinding in the evening.¹⁵⁷ Further, recuperation, sleep and recovery can be impaired if employees are spending time outside of work on work-related tasks as opposed to leisure pursuits.¹⁵⁶ Importantly, the vast majority of employees are not in positions where their long working days are followed by subsequent time off that can be used for recovery. For example, while positive emotional and physical effects have been found in shift workers employed on a 12 hour rotation, this is related to the subsequent time outside of work, and not necessarily to the job characteristics.¹⁵⁸ This spill-over may have implications for how productive employees can be within working hours.

Cost of sleep disorders to the public health system

It is difficult to estimate the financial burden of sleep deprivation and associated disorders given that it is a risk factor for more serious health disorders. Global estimations have, however, placed it in the realm of billions of dollars annually due to the direct and indirect costs of sleep disorders.¹⁵⁹ There have been few analyses specific to particular countries; however in the US, sleep disorders are estimated to cost \$US15 billion in health care expenses and \$US50 billion in lost productivity each year.¹⁶⁰ Kleinman’s database research was consistent with this finding, which

revealed additional annual mean costs that were over \$US2000 greater for employees with insomnia compared with controls, and an estimated annual cost of insomnia in the US labour force of approximately \$US15.0-17.7 billion.¹⁴⁵ An economic analysis of the financial burden in Australia equated to 0.8% of the country's gross domestic product in 2004, at \$AU7.5 billion. This was taking into account both direct and indirect costs of sleeping disorders, including sleep apnoea, restless leg syndrome, work accidents, motor vehicle accidents and other associated conditions.¹⁶¹ A New Zealand comparison cannot be drawn as there are no country-specific data, and the prevalence of people who do not meet the criteria for a sleep disorder yet chronically sleep less than what is recommended has not been measured. This illustrates the lack of knowledge of the true extent of a financial burden of sleep deprivation in New Zealand.

Cost savings associated with reducing sleep disorders

As the relationship between sleep and other conditions is interlinked, intervening in aspects of lifestyle that are not only directed at sleep quality and quantity can be effective at improving these aspects. An educational programme that targeted improved nutrition, physical activity habits, sleep habits and other health behaviours was successful at reducing the effects of restless sleep and insomnia after four weeks in a community sample of adults.¹⁶² A worksite intervention aimed to increase exercise levels over a 6 month period to improve sleep quality among participants allocated into one of two intervention groups: poor sleepers (as measured by the Pittsburgh Sleep Quality Index (PSQI)) and shift workers. In addition to prescribed exercise sessions, employees also engaged in educational sessions that informed on strategies to alleviate disturbances to sleep due to shift work and nutrition information.¹⁶³ The intervention was particularly successful for women shift workers, with a reduction in the PSQI score, however there were no differences between baseline and post-intervention for male participants,¹⁶³ perhaps due to woman completing more of the aerobic exercise sessions that were prescribed. Taking daytime naps has been suggested as a method to increase alertness and productivity throughout the day. While naps of short duration (less than 40 minutes) have been found to be beneficial in research conditions,^{164,165} this has yet to be

determined in a real-life setting with respect to improving business outcomes. In Spain, home of the siesta, just 24% of working adults still partake in the midday nap as longer commutes and greater work demands take precedence.¹⁶⁶ However sleep interventions could be a cost effective way to reduce problems related to sleep deprivation in the workplace, though it may be difficult to achieve buy-in from organisations. While there have been many interventions to show that health risk can be improved in a population through a general workplace health promotion programme,¹² there is scant research available to show that sleep specific interventions help improve sleep quality in an otherwise healthy population. In addition, there is no evaluation of a New Zealand wellness programme that evaluates its effect on sleep quality or duration. Finally, productivity improvements and a subsequent reduction in business costs is yet to be established, leaving the question of sleep deprivation largely untapped in both New Zealand and internationally.

2.2.4 Alcohol

The relationship between alcohol and health

Most adult New Zealanders consume an alcoholic beverage at least occasionally, making it the most commonly used recreational drug in the country.¹⁶⁷ Alcohol intake is widely recognised as a health behaviour that has both beneficial and detrimental effects on health depending on dose and frequency of consumption. It appears that there is a J-shaped relationship with regards to the health impacts of alcohol; those who abstain or are very light drinkers have been found to have higher rates of all-cause mortality, CHD and some cancers compared to their moderate-drinking counterparts.¹⁶⁸ The health benefits realised by a moderate consumption of alcoholic beverages are believed to be related to the anti-oxidant properties of compounds in red wine and, to a lesser extent, white wine and beer. Polyphenols are one anti-oxidant compound that has been found to reduce the oxidative stress activity implicated in the development of lifestyle diseases.¹⁶⁹ Moderate drinking is beneficial for the immune system¹⁶⁹ and the risk factors associated with lifestyle disease, such as blood lipids, systemic inflammation, blood clotting and blood pressure.^{170,171} Aside from the physiological health benefits, moderate alcohol consumption can also have a positive psychological role. Like most westernised

countries, many social occasions in New Zealand include consuming alcohol and in the workplace in particular, sharing a few drinks is regarded as a way to unwind and relax at the end of the working week. This informal way of interacting can help enhance workplace relationships among colleagues, and moderate alcohol consumption is positively related to stress reduction and overall mental and social wellbeing.^{172,173}

The negative health implications related to chronic consumption of large amounts of alcohol are well understood. The World Health Organization (WHO) list addictive substances as one of the leading causes of mortality throughout the world.¹⁷⁴ The consumption of more than two to three standard drinks per day puts people at a higher risk of a raft of health conditions including CHD, liver and kidney problems, diabetes, cancer and stroke.^{171,175} The abuse of alcohol is interrelated with other adverse health behaviours; those who drink heavily are more likely to smoke cigarettes, have a poor diet and less likely to participate in physical activity.¹⁷⁶⁻¹⁷⁹ These interrelations of unhealthy behaviours serve to compound the existing health issues associated with heavy alcohol intake. While moderate alcohol intake can help enhance mental and social wellbeing as noted above, there are psychological and social implications of heavy drinking. The presence of mood disorders such as anxiety and depression are associated with alcohol addiction,¹⁸⁰ and the ability to be a contributing member of society in a positive way is reduced. Alcohol dependence can have negative implications for relationships both at home and at work, and performance at work is diminished.^{181,182} Indeed, the consequences of excessive alcohol consumption is estimated to be the largest substance abuse problem in the Norwegian workforce.¹⁸³ In addition, the contribution of alcohol as a cause of mortality related to traffic accidents, drowning, violence and suicide is acknowledged.¹⁸⁴⁻¹⁸⁶

Alcohol consumption in New Zealand

The latest New Zealand Health Survey found that at least eight out of 10 adults of working age (between 18 and 65 years) had consumed an alcoholic beverage in the previous twelve months, with men more likely than women to report consumption.²⁶ Alcohol patterns were reported based on the WHO Alcohol Use Disorders

Identification Test (AUDIT) and one-fifth of adult New Zealanders reported a hazardous drinking pattern in the previous 12 months. This classification identifies those individuals with an established drinking pattern with the potential to lead to future adverse health conditions that have not yet manifested.¹⁸⁷ Men were more likely to report a hazardous drinking pattern, with over 25% of men aged 35-44 years scoring highly on the AUDIT.²⁶ This pattern remains even after adjusting for socioeconomic status. A higher prevalence of hazardous drinking behaviour is reported in Māori and Pacific compared to all adults who had consumed an alcoholic drink in the previous 12 months. Despite the increase in awareness of problematic drinking behaviour within the New Zealand culture in recent years, the prevalence of hazardous drinking appears to have remained unchanged over the last 10 years.²⁶

The association between alcohol and work-related factors

While alcohol is not a necessary component of socialising among colleagues, the effects that moderate consumption has on enabling some people to feel more comfortable are often recognised.^{188,189} There is a large body of research investigating the link between alcohol consumption and workplace accidents in the occupational health and safety field.¹⁹⁰⁻¹⁹² Research has emerged over the last twenty years investigating the relationship between work factors and alcohol consumption. A framework used to explain the association explores compositional factors (factors that the employee brings to the relationship that are known to influence alcohol consumption, such as family history, gender, age), job-specific factors (related to aspects such as the type of job, job demands and level of perceived control) and interactional factors (social constructs that influence the consumption behaviour of the individual, such as social norms of the group) to try and explain the relationship.¹⁹³

Unlike earlier studies,^{194,195} Moore and colleagues found that, once compositional factors were controlled for in an analysis of different occupation types, there were no differences in alcohol consumption levels between the groups.¹⁹⁶ While this may suggest that compositional factors (specifically age, gender, ethnicity, education, relationship status and income) are the most important determining factors to explain

the work-alcohol relationship, the authors note that characteristics of the job and not the job type itself are likely to have an influencing role.¹⁹⁶

Job-specific factors that have been studied in relation to alcohol intake include both physical and psychosocial aspects. High¹⁹⁷ and low¹⁹⁸ job demands, low control,^{199,200} job strain,²⁰⁰ and physical fatigue related to the job²⁰¹ have all been related to an increased prevalence of heavy and / or frequent alcohol consumption within the working population. Bobak and colleagues found that a high imbalance between effort and reward was related to heavy drinking in an analysis of three Eastern European countries but there was no association with job control.²⁰² A longitudinal study investigating organisational justice surveyed over 15,000 local government employees over three years.²⁰³ The authors found that those employees reporting low procedural justice (i.e. organisational procedures and decisions were unjust, biased and inconsistent) were more likely to be heavy drinkers at time point two (three years) after adjustment for baseline characteristics including alcohol consumption. Frone²⁰⁴ investigated the use of alcohol in relation to work overload and job security and while no relationship was found between the consumption of alcohol within two hours of beginning work, work overload was positively associated with the frequency and quantity of alcohol consumed both during and after a work day (within two hours of finishing work). Job insecurity was significantly related to the frequency and quantity of alcohol consumed during the workday and furthermore, these relationships between work stress and context-specific alcohol intake were significantly different to the consumption patterns reported in overall alcohol use.²⁰⁴ This may indicate that previous studies finding no correlation between work stress and alcohol consumption¹⁹⁹ may not account for the temporal use in relation to the work day. Finally, low supervision on the job, the availability of alcohol at work and the lack of knowledge or enforcement of alcohol policies by managers or supervisors are associated with alcohol consumption in the workplace.^{193,205-208}

In contrast to other studies,¹⁹⁷ Jones et al. found employees reporting high job demands and long work hours had a lower overall alcohol consumption, the increased amount of time spent at work reducing their overall leisure time.²⁰⁹ Health

behaviour was measured daily over a four week period, however, and this technique may alter the behaviour of participants as they know they are being studied. Similarly, no relationship was found in Marchand's investigation of the contribution of organisational culture to alcohol consumption.²¹⁰ However, data analysed did not include measures of management or supervisory styles, factors important in determining the culture of the workplace.

The social climate within the workplace has been found to be a predictor of drinking patterns, with women more likely to drink heavily if they had been criticised by their supervisor or experienced interpersonal conflict at work.²¹¹ With regards to workplace drinking behaviour, a positive work environment (where employees feel valued, have good interpersonal relationships with both supervisors and colleagues and experience good team support) is less likely to be permissive of excessive drinking in the workplace.²¹² Research is equivocal as to the extent that workplace norms influence overall drinking behaviour; while no relationship has been found between the two,^{205,213} others link a less permissive workplace to less frequent or heavy drinking behaviour out of the work environment.²¹⁴

In summary, occupational and individual factors both explain differences in alcohol consumption patterns in the workplace; the relative importance of each is yet to be determined. Differences in population groups, instruments used to determine work factors and alcohol consumption, and variables considered within the studies may account for some disparity mentioned briefly here.

The association between alcohol and work productivity measures

The prevalence and cost of injuries and fatalities within sectors of the workforce due to alcohol consumption have been covered in depth within the occupational health literature. While alcohol-related injuries both inside and outside of the workplace that result in employee absence are covered here, the occupational health literature is not the focus of this review. Rather, it is the association between drinking patterns and employee absenteeism and productivity that is of interest and many studies have

investigated the links between the amount of alcohol consumed and the subsequent affects it has in these domains.

Research investigating absenteeism and heavy drinking has produced mixed results. In one study of over 7,500 employees, heavy drinkers (16 and 24 standard units for females and males respectively) had a relative risk of 1.3 for medically confirmed sickness absence of more than three consecutive days compared to moderate drinkers.²¹⁵ In New Zealand, Jones and colleagues recorded that heavy drinkers were significantly more likely to record an absence from work in the previous year when compared to people consuming low amounts of alcohol.²¹⁶ While this amounted to just one half of a day of alcohol-related absenteeism per year, just one day was recorded for each period absent, potentially underestimating the magnitude of the problem.²¹⁶ Roche and colleagues found that people whose drinking behaviours placed them at both short and long term health risk were 12 – 22 times more likely to report missing at least one day of work in the three months prior to the survey due to alcohol related reasons.²¹⁷ Further, annual data of registered sickness absence spanning over 40 years in Norway found a 13-fold increase in sickness absence for manual workers for every one litre increase in annual alcohol consumption,²¹⁸ a finding similar to an earlier Swedish study.²¹⁹ Male transport operators had an increased likelihood of absenteeism in the previous 12 months if they were heavy drinkers or reported problem drinking indicators such as dependence or binge-drinking.²²⁰ Similarly, the frequency of heavy episodic drinking over the previous month was positively associated with the number of days of absence recorded in the subsequent 12 month period.²²¹ Conversely, Ames, Grube and Moore¹⁸¹ found no difference between the days absent per year for workers they classified as heavy drinkers compared to light drinkers in their random sample of employees in a manufacturing plant. However, differences exist in reported absenteeism that may in part be due to occupation type. Workers that are paid by the hour might take fewer days off work as this could affect their income. There is also the suggestion that those identified as ‘heavy drinkers’ may be less likely to miss work so as not to draw attention to any potential drinking problem.²²²

The investigation of the economic impact of drinking behaviour has unveiled interesting statistics. Earlier studies have found that people who drink moderate amounts tend to earn more than those that abstain,^{223,224} an association that remains even after controlling for number of factors.²²⁵ Interestingly women who abstain do not have as much of a penalty to their earnings as men do,²²⁵ perhaps highlighting a societal norm associated with drinking patterns. Heavy drinkers, however, tend to earn less compared to any group, highlighting the financial burden that excess drinking can pose to organisations. Up to 15% of lost working days in the UK can be attributed to alcohol-related reasons, costing the British economy £13.4 billion.²²⁶ It was estimated that \$NZ15.7 million per year was attributable to such absences in the New Zealand population in 1992. In 2001, alcohol-related absenteeism was estimated to cost the Australian economy over \$AU1.6 billion per year,²²⁷ and low risk and occasional high-risk drinkers are the most costly due to the number of people in these categories. This is in line with other research,²²⁸ indicating that workplace programmes targeting drinking behaviours need to be inclusive of all employees and not just those considered ‘problem drinkers.’

Productivity loss because of both drinking on the job and the consequences of a hangover can be a significant cost to businesses, and are often considered to outweigh losses associated with absenteeism.²²⁷ In the US and Scotland, figures are estimated be \$US119 billion and £200 million per year respectively.^{229 226 181}

Sleeping on the job and having problems with specific tasks or other co-workers were issues reported significantly more often in those people reporting to work with a hangover.¹⁸¹ The prevalence of drinking before and during work hours has obvious implications on work performance such as intoxication, withdrawal symptoms from alcohol and being hung-over.¹⁸² For example, Ames et al.’s research in a manufacturing plant found the phenomenon of ‘on the job’ drinking is as high as 23%, whereas a nationally representative sample found approximately 7% of US employees drank alcohol during formal work hours.¹⁸² Fifteen percent of employees had either come to work under the influence of alcohol or suffering the effects of a hangover at least once in the past year and management occupations were one of the highest risk groups.¹⁸² The implications this may have on workplace policy regarding alcohol use may be significant, the author suggesting that if impairment

from alcohol consumption is not treated as a serious issue from those who set workplace policies, it will be more difficult for issues regarding impairment to be addressed.^{182,206}

Like most research, the issue of how alcohol consumption affects the workplace is not without its limitations. Definitions of what constitutes a ‘heavy’ or ‘binge’ drinker vary from study to study. For example Ames et al.’s definition of ‘heavy drinker’ was consuming 10 or more drinks in one session¹⁸¹ whereas other researchers consider five or more drinks problematic drinking behaviour.^{26,230,231} The period of time being assessed for drinking habits is not standardised and studies reporting on intake over the last 30 days as opposed to six or 12 months may miss those people whose work performance is impaired on an infrequent yet still significant basis.¹⁸² Furthermore, consuming alcohol on the job and its affect on work performance is not a standardised concept.¹⁸² For example while it may be that people drink within formal working hours, if this is at the end of the week as part of the frequent social gathering among colleagues prior to the weekend then this is unlikely to impair work performance and, if anything, may help build collegiality among colleagues.¹⁷³ To measure the true extent of workplace-related alcohol issues, standardised measures of drinking patterns and productivity within a defined time period need to be established.

Cost savings associated with reducing alcohol-related problems

While research has shown that workplace interventions can reduce problem drinking among employees,²³²⁻²³⁴ few studies have investigated whether this can subsequently improve productivity. However, the investment in a brief intervention run alongside the usual care programme in one company, whereby targeted employees were offered feedback information, education, skill-building, and practical advice within a framework that utilised motivational interviewing rather than psychotherapy (usual care) resulted in a cost-savings estimate of \$1200 more per at-risk employee, compared to the usual care group.²³⁵ Likewise, the cost benefit analysis of providing a Screening Brief Intervention and Referral to Treatment (SBRIT) programme estimated the value to be \$771 per employee that utilised it.²³⁶ These two studies suggest the employer has much to gain from investing in programmes to minimise

heavy drinking patterns in employees. Further, to offer these in the context of a work environment with policies, norms and values that promote safe drinking habits is likely to be most beneficial in terms of minimising risky drinking behaviour among employees. In New Zealand, Jones et al. have linked productivity and alcohol use to the workforce.²¹⁶ However an updated investigation of alcohol intake and productivity that can be compared to international statistics is long overdue.

2.2.5 Nutrition

The relationship between nutrition and health

Poor nutritional habits are one of the most prevalent yet modifiable risk factors for chronic disease and poor health. Historically, the body's ability to store fat for fuel was a survival mechanism during the inevitable times when food was scarce. This evolutionary 'blue print' has not changed, yet the food environment has markedly. There is now an abundance of food that is energy dense, nutrient poor, easily accessible and, when coupled with a lack of activity, causes an energy imbalance. The chronic overconsumption of dietary energy in excess of needs is responsible for the obesity epidemic that is independently associated with the increasing prevalence of cardiovascular disease, cancer, type 2 diabetes and the precursors which cause significant morbidity and mortality.^{1,237-239} In New Zealand it is estimated that 8000-9000 deaths each year are attributed to sub-optimal nutritional habits,¹ and it is this reason that, of the 13 health priorities set out by the New Zealand Health Strategy seven of them are nutrition-related.⁷ Approximately 4,500 deaths (17% of all deaths) in 1997 were attributable to high cholesterol, 3,500 (13%) to high blood pressure, 3,000 (11%) to high BMI and 1,500 (6%) to inadequate vegetable and fruit intake.¹ In addition, poor nutritional habits are related to conditions unconnected to obesity, yet can result in poorer quality of health and wellbeing. The term 'toxic environment' has been coined to describe the increase in availability of high-energy, high fat, nutrient-poor food.

Cardiovascular disease and cancer risk has been found to be clearly linked to dietary habits such as a high intake of saturated and trans fats, refined carbohydrates and

sodium-rich food, and a low intake of fruit and vegetables.²⁴⁰ One of the earliest studies investigating dietary characteristics and chronic disease risk, the Seven Countries Study found that mortality from CHD was significantly correlated with both saturated and trans fats.²⁴¹ This is now a well-established relationship²⁴⁰ with many epidemiological studies also reporting an increased risk of CHD with trans fat.²⁴² A high total fat intake, and saturated fat in particular is also linked with an increased risk of breast cancer,²⁴³ and polyunsaturated fats, particularly the long chain omega-3 fatty acids, are protective against CVD²⁴⁴ and breast cancer risk.²⁴³

Fruit and vegetables are low in energy, high in fibre and are rich sources of vitamins, minerals, anti-oxidants and phytochemicals that are protective against chronic disease. The Nurses' Health Study and the Health Professionals' Follow-up study in the US found the relative risk of cardiovascular events from 1984 - 1998 was 0.87 and 0.88 for three servings and five servings per day of fruit and vegetables respectively.²⁴⁵ This was compared to a referent group of 1.5 servings per day. This has been corroborated in other population studies; a higher vegetable intake was inversely associated with breast cancer risk for post-menopausal women in the same cohort over an 18 year follow up.²⁴⁶ A cohort of 11,000 health conscious people had a 21-32% reduction in ischemic heart disease, cerebrovascular disease and all cause mortality with a daily intake of fresh fruit,²⁴⁷ corroborating with research in similar cohorts.²⁴⁸

Investigators studying the diet and cancer link in the European Prospective Investigation into Cancer and Nutrition (EPIC) found lung cancer risk was reduced in all participants for every 100g increase in fruit intake (hazard ratio (HR) = 0.86) and reduced in smokers with every 100g increase in vegetable intake (HR = 0.71).²⁴⁹ The World Cancer Fund have evaluated the evidence for a reduced risk of cancer with fruit and vegetable consumption and conclude there is probable evidence that constituents (such as folate, carotenoids, beta-carotene, lycopene, vitamin C and selenium) of fruit and vegetables are protective of cancer in the oral cavity, oesophagus, stomach and colorectum.^{239,250}

Dietary fibre or non-starch polysaccharide (NSP) intake is inversely associated with risk of obesity, type 2 diabetes, CHD and colorectal cancer.^{240,250,251} The fibre in

grain cereals such as oats helps lower cholesterol and CHD,²⁵² with a reduced risk of CHD of 25% seen in the Nurses Health Study.²⁵³ A randomised cross-over trial of people with type 2 diabetes found that, compared to a fibre intake of 24g per day, 50g of fibre per day reduced 24 hour plasma glucose and insulin levels by 10% and 12% respectively when measured every two hours, and significantly reduced blood lipids.²⁵⁴ This supports the Finnish Diabetes Prevention Study finding that the progression of diabetes was slowed (HR = 0.38) in the highest compared to the lowest quintile of dietary fibre (above the median intake) and dietary fat (below the median).²⁵⁵

There have been epidemiological studies on overall dietary patterns to establish the risk of major chronic disease and characteristics of dietary intake. A 10% increase in scores for the Recommended Food Score index (RFS; focusing on intakes of fruit, vegetables, lean meats, wholegrains and low fat dairy products), the Alternative Healthy Eating Index (AHEI; similar to the above but excluding potatoes, including a polyunsaturated to saturated fat ratio, alcohol intake and soy intake) and the Mediterranean Diet Score (MDS; focusing on high intakes of fruit, vegetables, nuts, fish and legumes and low intakes of red and processed meat and dairy products) were associated with 12%, 11% and 7% reduction in risk of breast cancer in post-menopausal women respectively.²⁴⁶ For women in the National Institute of Health American Association Retired Person's cohort, only the Healthy Eating Index 2005 (HEI-2005; based on the recommended US Dietary Guidelines) was predictive of a lower colon cancer risk (RR = 0.80), whereas men in the highest quintile for scores on the AHEI, RFS, MDS and the HEI-2005 had between 25-29% reduced risk compared to men in the lowest quintile.²⁵⁶ In addition, overall dietary patterns supporting the Mediterranean diet were found to be protective against CHD.²⁵⁷ The RR for CHD and stroke was significantly lower (0.76 and 0.82 respectively) in women following the Dietary Approaches to Stop Hypertension (DASH) diet that recommends significant dietary changes including a reduction in sodium, an increase in low fat dairy products and fruits and vegetables over 24 years of follow up.²⁵⁸ Indeed the DASH diet that incorporates these dietary factors has been found to be more successful at reducing hypertension than a reduction in sodium alone.²⁵⁸

Dietary patterns that are high in refined carbohydrates, processed meat and sugary beverages were predictive of insulin resistance in the Whitehall II study, with a 51% increased risk of type 2 diabetes after adjusting for confounders.²⁵⁹ An energy dense diet has been found to be correlated with an increased diabetes risk, obesity and the metabolic syndrome.^{260,261} Further, links have been established between sugary beverage intake and BMI²⁶²⁻²⁶⁴ and though it has been postulated that this is mediated through an increased energy intake, a recent review concluded the evidence for this is sparse.²⁶⁵ While there have been links found between overweight and sugary beverages, they have not been established in the New Zealand population. Parnell and colleagues found no association between BMI and dietary intake from sucrose and sugars in beverages using the National Nutrition Survey data collected in 1997 (NNS97),²⁶⁶ a finding that is in agreement with an analysis of the National Health And Nutrition Examination Survey (NHANES) and Continuing Surveillance of Food Intakes in Individual's (CSFII) survey data in the US.²⁶⁷ These analyses were cross-sectional in nature and the authors could not comment on habitual intake and weight gain. Particularly in the US, high fructose corn syrup is used to sweeten sugared drinks, and the amount available in the food supply has increased in parallel with the obesity epidemic. It is thought that the differences in appetite regulation associated with fructose metabolism may lead to an increased body weight,²⁶² however this has been disputed when compared to similar sweeteners.²⁶⁸ More exploration needs to be undertaken to fully understand the relationship.

Nutrition status of New Zealanders

The WHO estimates that an increased fruit and vegetable consumption could save 2.7 million lives worldwide, and recommend that countries set a minimum goal of 400g/day.²³⁷ The NNS97 found that adults in New Zealand eat an average of 412g per day, but the majority of adults (58%) consuming less than 400g per day.¹ Men have slightly higher intakes than women (420g v 404g), which correlates with their higher energy intake. The Health Targets, as set by the Minister of Health, are for 70% of adults to be eating at least two serves of fruit, and 62% at least three serves of vegetables.²⁶⁹ The latest Health Survey reported 64% of adults were meeting the target for vegetables, with significantly more women (68%) than men (56%) meeting the target.²⁶ Pacific and Asian men and women were least likely to consume

adequate intakes. The target for fruit intake, met by 60% of adults, was also more likely to be met by women compared to men (68% and 50%, respectively).²⁶ Māori and Asian women were slightly less likely than other population groups to have two or more serves per day. Over time it appears that fruit and vegetable intake has increased,²⁶ yet there is still a significant portion of New Zealand adults not meeting the recommendations.

While total fat intake has decreased over time, New Zealand adults are still consuming more fat than the recommended maximum intake of 30-33% total dietary energy per day.²⁷⁰ Total energy from fat was 35% in the NNS97, with a mean intake of 110g and 72g per day for men and women respectively.²⁷¹ Both men and women were consuming 15% of their total energy from saturated fat, higher than the recommended maximum of 12%,²⁷⁰ and than that of their Australian counterparts (12.7%).²⁷² Dietary fibre intakes within New Zealand are lower than that recommended by the Nutrition Taskforce of 25-30g,²⁷⁰ and men have a higher median intake than women (23g and 18g respectively),²⁷¹ due to their higher daily energy intake.

Costs of nutrition-related disorders to the public health system

The burden of nutrition-related disorders on the health care system worldwide is substantial, and poor diet is one of the most costly, yet most preventable risk factors for non-communicable disease.²⁴⁰ It has been estimated that 8,000-9,000 deaths each year are attributable to poor nutrition in New Zealand.¹ Calculations of avoidable mortality due to an reduction in nutrition-related risk factors estimated that 300 lives could be saved if the population mean for cholesterol reduced by 0.1 mmol/L by 2011 and 282 lives saved for a reduction in systolic blood pressure by 0.5 mmHg.¹ It was also estimated that the avoidable mortality for a slowing down in the BMI increase from 1.3 kg/m² to 1.0kg/m² would result in a further 282 lives saved, and finally if the mean vegetable intake increased by 40g an additional 334 deaths would be avoided.¹ Gundgaard and colleagues estimated up to 1.3 years of life expectancy and a reduction of 19-32% in cancer incidence could be prevented if fruit and vegetable intake increased from 250g to 400-500g in the Danish population without a concurrent rise in healthcare costs.²⁷³

Many of the conditions which cost employers more in health insurance and medical claims (such as obesity and high glucose levels)⁹⁹ are underpinned by poor nutritional habits. Goetzel and colleagues found women who had high blood glucose, blood triglycerides and blood cholesterol levels had medical claim costs more than \$500 per annum higher than if they were within normal ranges of these health indices.¹⁴ Though not a measure of actual dietary intake, and there are individual factors that contribute to high levels, they may also be indicative of poor nutritional habits. However, there has been a lack of association between health care costs and dietary habits in much of the research conducted, even when controlling for chronic health conditions.^{99,274} This may be due to methodological issues when measuring diet-related factors; habitual nutrition patterns may not be reflected in a cross-sectional study, those at high risk may have already changed their diet according to their health condition, or people may inaccurately report their intake, making it difficult to establish an association.²⁷⁵ Further, nutrition is a complex area that is difficult to measure from one to two self-report items, and the gold standard for dietary intake measurement (duplicate diets) is intensive, expensive and would be impractical as part of a health risk assessment in the workplace.²⁷⁵

The association between nutrition and work-related factors

There have been a number of cross-sectional studies that have investigated modifiable health risks and their influence on absenteeism and productivity. While there was no association found between a poor diet and absenteeism, Pelletier and colleagues found that those who regularly ate foods of poor nutritional quality or fewer than three serves of fruit and vegetables daily were reported higher presenteeism levels compared to people at low risk of a poor diet (7.5% and 3.5%, respectively).²⁷⁶ There have been a number of studies that have aimed to reduce health risk factors, absenteeism and improve productivity within the workplace through comprehensive health promotion programmes that have included nutrition components.^{12,277-279} Pelletier and colleagues found that changing diet risk from high to low resulted in a 4% decrease in presenteeism after participation in a workplace wellness programme.²⁷⁶ Many have been successful at improving outcomes related to nutrition, such as cholesterol, body weight or blood pressure.²⁷⁷⁻²⁸³ Further, those

that report business-related outcomes suggest the investment in workplace health promotion is more than offset by reductions in absenteeism and improvement in productivity.^{12,277,284-286} Participation in the American Heart Health programme resulted in almost twice as many employees reporting a reduction in the number of days absent from work compared to non-participants.²⁸⁷ However as most of these programmes have multiple components, risk reduction due to nutrition-related factors is largely unknown, particularly because of the complexities associated with dietary data collection, and that most data collected within the programmes are self-report.

Programmes that target nutrition changes such as fruit and vegetable intake through environmental changes, price reductions and restructuring choices available at worksite food providers have been successful at increasing consumption.²⁸⁸⁻²⁹⁰ An intervention which improved the availability of fruit and vegetables within the worksite canteens also significantly increased the consumption of fruit and vegetables by an average of 95g per day after a one year follow-up in a variety of worksites.²⁹¹ Strategies included price reductions, increased availability and addition of fruit and vegetables to existing dishes and as garnishes, depending on the worksite needs. If the intervention target individual behaviour change the sustainability of these behaviours over the long term is less clear.²⁹² The Healthy Employee Lifestyle Program (HELP) was successful at increasing the number of participants who ate three or more servings of vegetables, but did not significantly influence other dietary habits.²⁹³ This was achieved through providing feedback on HRA scores regarding where behaviour changes could be made, educational seminars over lunch, and promotional resources. Self-reported fruit and vegetable intake was rewarded through a points-based scheme over a 12 month period. There were no points awarded for changes in other dietary behaviours, and environmental or policy changes around the nutrition environment were not addressed.²⁹³ No changes were found in fruit, vegetable and total fat intake in a 12 month intervention assessing the efficacy of increasing the available nutritional information on products at the worksite canteen.²⁹⁴ However, the authors did not report whether there was an increase in the availability of fruit, vegetables and dishes low in fat compared to baseline levels, or that information was provided on existing food choices.²⁹⁴ The type of intervention described by both Perez²⁹³ and Engbers,²⁹⁴ focusing

predominantly on the provision of information without accompanying environmental or policy changes to support behaviour change, has largely not been successful in any setting.²⁹² Finally, while adults with higher fruit and vegetable intake also report greater functional health compared to low fruit and vegetable consumers,²⁹⁵ there is limited information that this alone results in an improvement in productivity or reduction in absenteeism within the workplace.

An area that may give some insight to the effects nutrition has on productivity could be drawn from research conducted on the breakfast consumption patterns of children and, to a lesser extent, college students and concentration and work performance at school. One study found that eating a bigger meal in the morning improved concentration levels of children in class when compared to a smaller meal,²⁹⁶ and a recent review found that academic performance was improved through the consumption of breakfast.²⁹⁷ Adolescents who regularly consume breakfast report less mental distress and higher grades compared to breakfast-skippers²⁹⁸ and college students consuming a breakfast drink took less time to recall items on a memory exercise and perform a spatial attention task compared to non breakfast consumers.²⁹⁹ The type of carbohydrate (CHO) may also be important; the low glycaemic index (GI) CHO, which releases glucose at a slower rate, has been found to improve spatial memory and attention span compared to a high GI breakfast.^{300,301} A similar finding has been found in adults,³⁰² though this was a population with type 2 diabetes and therefore metabolic factors specific to the condition may alter findings. Finally, memory was better maintained in adult females who consumed a low GI meal compared to a high GI meal, where memory progressively declined over a period of 3.5 hours.³⁰³

Meal size and macronutrient composition is another area which has been studied in relation to cognitive performance. One study investigating performance, meal composition and size found that subjects significantly improved on a Paced Auditory Serial Addition Test (PASAT) after consuming a smaller test meal (1450 kilojoules less) that was lower in CHO compared to the baseline meal.³⁰⁴ There were no differences in perceived satiety or alertness as measured by the Stanford Sleepiness Scale (SSS), suggesting the difference found was not due to differences in fatigue. These findings are in agreement with other work on meal size³⁰⁵ as is Hewlett and

colleagues who found an improvement of 30-40% in a verbal accuracy task and an increase in speed in an item search when the same energy content and volume was spread over four meals instead of two.³⁰⁶ Finally, women dieters following a low CHO diet for two weeks performed better on spatial memory tasks and less self-reported confusion when compared to a diet following traditional dietary recommendations.³⁰⁷ While some research has been conducted in the workplace, the study size is likely too small and the shift-work aspect too specific for conclusions to be extrapolated to other working populations. Further, caloric restriction in D'Anci and colleagues' study³⁰⁷ over a period of two weeks also makes it difficult to generalise to the wider population. However, that meal consumption, composition and size affects cognition and mood has implications for workplace productivity, given that at least one meal is typically consumed just prior to or during a work day. Further research is required in this relatively untapped area.

In summary, the positive association between good nutritional intake and population health warrants the inclusion of nutritional components in any workplace wellness programme. A recent review of the effectiveness of worksite interventions to improve employee diets found that fruit and vegetable intake generally improved but there were no business-related outcomes measured (such as absenteeism, presenteeism, overall productivity) to determine the overall cost-effectiveness of the interventions.³⁰⁸ Nutrition interventions included in a multi-component programme are more likely to be successful if other key factors were also present: 1) inclusion of a physical activity component; 2) enlisting dietitian involvement in nutrition education; 3) increasing the availability of healthy food options in the cafeteria and advertised them accordingly; 4) tailoring individual feedback on diet; 5) involving employees in planning and implementing programmes; 6) reducing prices of healthy food items in vending machines; and 7) using the stages of change theory as the foundation for the programme.³⁰⁹ To extend these recommendations, it would be important to include policy-based and environmental changes that create a supportive workplace for improved nutrition which are required for any initiative to be successful in the long term.³⁰⁸ While research shows an improved dietary intake through workplace nutrition programmes, it is less clear that this results in an increase in productivity. Well designed and evaluated intervention trials to address

this are important to further establish a business case for nutrition-related wellness initiatives.

2.2.6 Physical activity (PA)

The health benefits of being physically active have been recognised for a long time, yet many people do not partake at a level which would classify them as ‘physically active’. Physical activity (PA) guidelines have evolved as the knowledge base increases, and the most recent guidelines utilising the latest evidence come from the US, released in late 2008. The US Department of Health and Human Services recommends adults undertake a mixture of both moderate and vigorous intensity aerobic training, and resistance training using weights each week for maximum health benefits.³¹⁰ Moderate PA (MVPA) is defined as being undertaken at a level of 3 – 5.9 times the intensity level of rest on an absolute scale, and includes brisk walking, water aerobics, bicycling slower than 16 kilometres per hour, tennis doubles and general gardening. Vigorous PA (VPA) is six times the intensity of rest and includes jogging and running, tennis singles, aerobic dancing, hiking uphill with a heavy pack and heavy gardening that increases the heart rate.³¹⁰ New Zealand PA guidelines for adults were last updated in 2001 and also include recommendations for both moderate and vigorous intensity PA. Table 2-1 below outlines the PA guidelines for New Zealand and other national guidelines.

Table 2-1. PA guidelines for selected countries.

New Zealand PA Guidelines for Adults ³¹¹	US PA Guidelines for Adults ³¹⁰	Australian PA Guidelines for Adults ³¹²	UK PA Guidelines ³¹³
<p>View movement as an opportunity, not an inconvenience.</p> <p>Be active every day in as many ways as possible.</p> <p>Put together at least 30 minutes of moderate-intensity physical activity on most if not all days of the week.</p> <p>If possible, add some vigorous exercise for extra health benefit and fitness</p>	<p>All adults should avoid inactivity. Some physical activity is better than none, and adults who participate in any amount of physical activity gain some health benefits.</p> <p>For substantial health benefits, adults should do at least 150 minutes (2 hours and 30 minutes) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) a week of vigorous-intensity aerobic activity, or an equivalent combination of both, performed in bouts of at least 10 minutes spread throughout the week.</p> <p>For additional and more extensive health benefits, adults should increase their aerobic physical activity to 300 minutes of moderate-intensity, or 150 minutes of vigorous-intensity activity, or an equivalent combination of both. Adults should also do muscle-strengthening activities that are moderate or high intensity and involve all major muscle groups on 2 or more days per week, as these activities provide additional health benefits.</p>	<p>Step 1 – Think of movement as an opportunity, not an inconvenience</p> <p>Where any form of movement of the body is seen as an opportunity for improving health, not as a time-wasting inconvenience.</p> <p>Step 2- Be active every day in as many ways as you can</p> <p>Make a habit of walking or cycling instead of using the car, or do things yourself instead of using labour-saving machines.</p> <p>Step 3 – Put together at least 30 minutes of moderate-intensity physical activity on most, preferably all, day.</p> <p>You can accumulate your 30 minutes (or more) throughout the day by combining a few shorter sessions of activity of around 10 to 15 minutes each.</p> <p>Step 4 – If you can, also enjoy some regular, vigorous activity for extra health and fitness</p> <p>This step does not replace Steps 1-3. Rather it adds an extra level for those who are able, and wish, to achieve greater health and fitness benefits.</p>	<p>For general health, adults should accumulate a total of at least 30 minutes of moderate intensity activity on five or more days of the week</p>

The relationship between PA and health

The health benefits for PA are well understood, yet worldwide there is a high prevalence of inactivity among western nations. While this is arguably the individual choice of many people, technological and industrial advancements have resulted in sedentary

behaviour being the default option for much of the population.^{314,315} Historically, occupational, lifestyle and environmental factors required people to be physically active as a part of everyday life. However, the ever-increasing demands of the modern society have turned time into a commodity, and the aforementioned advances have resulted in continuing efforts to find more time efficient ways to complete day-to-day tasks. Many people now have to seek out PA rather than it being a necessary part of everyday life. In addition to this are technological advances that increase sedentary leisure time options and are preferred over a more physically active pursuit for some people. Two to three thousand deaths each year in New Zealand are attributable to physical inactivity, making an increase in PA participation a priority for the New Zealand Government.⁷

There is a significant amount of evidence that details the health benefits of being physically active. PA is well known to improve mental health and physical functioning^{310,316} and be protective against musculoskeletal disorders such as osteoporosis and injuries.³¹⁷⁻³¹⁹ The increase in energy expenditure through PA (which can account for up to 20% of an individual's total energy expenditure) enables the maintenance of a healthy weight and the increase in cardiovascular fitness provides more energy and the ability to sustain physical and endurance tasks for much longer than physically inactive people. PA reduces the risk of morbidity and mortality from a large number of chronic diseases. It is effective at reducing blood pressure (BP) at levels of 40 minutes aerobic activity, 3-5 times per week; while the reductions are greater in those who are hypertensive (-6.9 / -4.9 mmHg), small but significant decreases can also be found in normotensive individuals (-2.4 / -1.6 mmHg).³²⁰ While more evidence is required for resistance training, it appears that this would be a good adjunct to aerobic training for hypertensive individuals.³²¹ Participating in PA is also advocated for its ability to reduce very low density lipoprotein (VLDL) levels, and it raises HDL and reduces LDL for some people, risk factors associated with CVD risk.³¹⁰

Not only does PA lower BP (particularly systolic BP) and triglycerides in the blood, and enable people to lose and maintain a healthy weight through energy expended, those who are physically active reduce their risk of all cause mortality by 30% independent of

these factors.³¹⁰ The evidence supports a ‘some is good, more is better’ message, and while 2.5 hours of MVPA per week is recommended, those in groups who typically participate in lower levels of PA (less than 2.5 hours per week) have significantly reduced risk compared to their sedentary counterparts.³²²⁻³²⁵ Significant reductions in cardiovascular disease risk are also conferred with PA participation, and, these benefits are realised with lower amounts of activity when comparing physically active people to a sedentary reference group.³²⁶ While there is a dearth of information regarding frequency, the Nurses Health Study found there was a 36% decreased risk of coronary events for those walking at three miles per hour or more compared to a group walking at a pace of less than two miles per hour.³²⁶ Walking briskly or participating in vigorous activity conferred the same benefits; it seemed the metabolic equivalent of the task (MET; the term used to describe the energy cost of an activity) hours per week were the important factor.³²⁷ A low fitness level in young adulthood has been found to be a predictor of developing cardiovascular complications later in life.³²⁸

The relationship between PA and stroke risk appears to be similar to that of CVD. A review of studies found a 28% reduction in risk of all strokes for both men and women undertaking vigorous PA compared to a referent sedentary group.³¹⁰ In addition, occupational PA is also protective against stroke risk, and those who report moderate intensity occupational PA reduce the risk of all strokes by 36% compared to sedentary occupations in a meta-analysis of cohort studies.³²⁹ Research also supports PA as a preventive measure for type 2 diabetes and the metabolic syndrome (the clustering of risk factors that increase risk of chronic disease), with a lower incidence of both seen in physically active people. Laaksonen and colleagues found that 3 hours of MVPA per week reduced the risk of the metabolic syndrome by 45% and those in the highest fitness category ($V_{O2} \max \geq 35.7$ ml/kg /min) had a 64% reduced risk of adverse metabolic health in their study of middle-aged men.³³⁰ This protective effect of fitness has also been found in women and men in a younger age group, with those below the 20th percentile for fitness having an 87% increased risk of developing the metabolic syndrome compared to those above the 60th percentile.³²⁸ Indeed, fitness promotes insulin sensitivity, the transport of glucose to the muscles and a lower heart rate, all of

which contribute to a decrease in diabetes risk.³¹⁰ There was a 46% decreased risk of developing diabetes at the six year follow up for a cohort of people with impaired glucose tolerance who were encouraged to increase their exercise participation compared to a control group.³³¹ While meta-analyses have found that BMI attenuates the relationship between diabetes risk and PA, a 20-30% reduction in risk has still been found regardless of body size.³³² In addition, while moderate and light PA are able to reduce the progression to diabetes for some groups, not all cases of diabetes are prevented, suggesting that vigorous activity may be necessary in those who are already high-risk,^{332,333} though the optimal intensity and frequency at this stage is unknown.

Physical activity has been consistently shown to be protective of certain cancers in a large number of prospective studies conducted worldwide.^{334,335} Breast cancer risk was significantly reduced by 15-20% for women regularly engaging in activity, and the effect was greater for post-menopausal women and for women who regularly undertook MVPA over the long term (20 years).^{336,337} The strength of evidence for a protective effect against endometrial cancer is not as strong, though a recent prospective study found light and moderate PA was associated with a reduced cancer risk among overweight and obese, but not normal weight women,³³⁸ and a reduced risk of 52% was found for women in the highest tertile of activity compared to the lowest tertile for household but not recreational PA in the EPIC trial.³³⁹ Colon and rectal cancer risk was reduced by 21% and 24% respectively for middle-aged men engaging in both light and moderate PA five or more times per week.³⁴⁰ This was not seen in women in the same prospective study, though there was a trend towards a reduced risk.³⁴⁰ No association was found in a previous study of Danish adults of a similar age group, but both suggest an increased risk with increasing sedentary time.^{340,341} In addition, PA may be protective against lung cancer for former or current smokers.^{342,343}

Finally, there is an emergence of research investigating the effects of prolonged physical inactivity on health risk indicators, and while this is a relatively new domain, it appears that being sedentary for prolonged periods increases the risk of poor metabolic and cardiovascular health independent of vigorous activity that is performed.^{344,345} Around

60-90 minutes of PA per day is estimated to be required for sustained weight loss,³⁴⁶ an amount that is difficult for most people to fit into their leisure time PA. This instead requires more activity through other domains, such as occupation, active transport and through domestic duties in order to prevent weight gain and with it the burden of poor health.^{347,348} Indeed researchers have found an association between sitting time (both occupational and leisure-related) and BMI and health risk;^{347,349-351} given that PA accounts for approximately 20% of total energy expenditure,³⁵² targeting PA through other PA domains is a way to improve health risk.^{314,315,346,347}

Physical activity levels of adult New Zealanders

In New Zealand there is a large proportion of the population who do not currently meet the recommended PA guidelines. The most recent Active New Zealand Survey released by Sport and Recreation New Zealand in 2008 (SPARC) found that over half (52%) of adults are not achieving the recommended 30 minutes of activity five times per week.³¹¹ In addition to this, 13% participated in less than 30 minutes of PA in total for the previous week. The group most at risk of not achieving the guidelines were Asian adults (21%), and men (52%) were more likely than women (44%) to meet the guidelines.³¹¹ The previous population survey found 68% of adults were considered active, with 69% of men and 66% of women participating in greater than 2.5 hours of PA per week. Moreover, 52% reported participating in more than five hours of PA per week.³⁵³ However, the methodological differences between the two surveys make it difficult to compare results. In the US, more than 64% of adults are meeting the updated US recommendations, and while this is noticeably larger than the New Zealand population prevalence, the removal of frequency and duration requirements from the recommendations (due to the lack of evidence) has contributed to more people meeting the guidelines. If the previous guidelines were in place, just over 48% of people in the US would be considered active, 51% of men and 47% of women.³⁵⁴ In Australia the most recent population survey found just 30% of adults over 15 years were meeting current recommendations.³¹² The survey asked only for exercise from sport and recreation, however and did not include occupational, active transport or PA from other activities, which contributes to PA quota for 28% of New Zealanders.³¹¹ In Canada 49%

of adults are considered at least moderately active (equivalent to walking 30 minutes per day)³⁵⁵ and in England, 40% of men and 28% of women reported meeting the recommended guidelines in 2006.³⁵⁶

The costs of physical inactivity

Given that physical inactivity is associated with an increased prevalence of chronic and other health conditions, the financial burden it imposes on the health system is great.^{357,358} Physical inactivity accounts for close to 7% of the burden of disease and over 13,000 deaths in Australia 1996.³⁵⁸ A conservative estimate of \$AU377.4 million was attributed to illness related to physical inactivity for six major conditions; CHD, type 2 diabetes, breast and colon cancer, depression and stroke.³⁵⁸ Increasing the percentage of people meeting PA guidelines by just one percent was estimated to save 122 lives per year from CHD and type 2 diabetes deaths in those under 70 years and \$3.6 million per annum in health care costs in Australia in 1996.³⁵⁸ In England the costs of illness attributable to physical inactivity have been estimated to be as high as £8.2 billion annually³⁵⁹ and the direct costs associated with CHD, stroke, breast, colon and rectal cancer, and type 2 diabetes to be £1.03 billion per year.³⁶⁰ One hundred and twenty-one deaths per year in Northern Ireland could be avoided if the number of sedentary people aged less than 75 years decreased from 20% to 15%, resulting in an economic benefit of £131 million.³⁶¹ This number is derived from the estimated indirect human costs of death and lost productivity, and direct medical costs. To reduce the burden of morbidity associated with physical inactivity would save a further £0.62 million per year.³⁶¹ This is considered a conservative estimate as it only includes costs related to three health conditions, and the negative effect of physical inactivity has far wider health implications. The cost of physical inactivity in Canada was estimated to be 2.5% of total health care costs, or \$CAD2.4 billion in 1999³⁶² and Colditz' analysis of inactivity in the US was conservatively estimated at \$US24 billion.³⁶³ Finally, Garrett and colleagues estimated that medical costs claimed by members of a health plan company attributable to physical inactivity cost \$US83.6 million in the year 2000, or \$56 for every member enrolled.³⁶⁴

The employer also faces considerable costs associated with physical inactivity. Goetzel estimated that people classified as sedentary had annual medical costs 10% higher than those who were regularly vigorously active.⁹⁹ In addition, they were 20% more likely to have very high annual medical costs. Physical inactivity was the only factor found to be predictive of total health care costs in a study of office workers and modifiable risk behaviours, an employee was estimated to cost 2.4 times more in health claims if exercising less than one or two times per week.³⁶⁵ When compared against sedentary employees, Wang et al. found being regularly active at least once a week saved \$250 per employee per year compared to the sedentary population, across all BMI categories.³⁶⁶ In addition, research groups have estimated that, for every day active a week there is a 2.9-4.7% decrease in health care costs.^{274,367}

Physical inactivity has also been associated with increased absenteeism in the workplace; the odds of having a sick day due to ill health in the previous 12 months was greater for employees surveyed in the Netherlands who were physically inactive.³⁶⁸ Jacobson and Aldana, when investigating the lifestyle habits of 79,070 people in 250 worksites across the US, found that people reporting no exercise were significantly more likely to be absent during the previous year compared to those reporting at least one day where they undertook 20 or more minutes of vigorous PA per week.³⁶⁹ Interestingly there were no additional benefits of exercising more than two days per week; however, as the PA being measured was for at least 20 minutes of vigorous activity per session, the accumulation effect of lower intensity or shorter bouts would not have been taken into account. Perhaps the groups doing less vigorous activity undertook the same total volume of activity in a week as those reporting more vigorous PA sessions. An earlier study found a stronger relationship for absenteeism and PA among women than men,³⁷⁰ however, fitness was determined by a step test as opposed to self-report, and variables (such as time of day, tiredness, stress, PA conducted prior to the test) could interfere with the results of the step test. Serxner et al. found employees who are not as physically active are more likely to be absent,³⁷¹ and company records of absenteeism revealed a dose-response relationship between cycling to work and days absent. Fewer sick days were taken by people who cycled more often, at a pace equivalent to MVPA,

and for longer distances in a cross-sectional study of over 1200 Dutch employees,³⁷² and military personnel who exhibited less strength and endurance fitness were more likely to have longer absence periods.³⁷³

The relationship between PA and work-related factors

The findings of research investigating PA levels and productivity within the workplace are mixed. Pronk and colleagues found that being physically active and physically fit was independently associated with higher overall job performance and job quality when assessing modifiable health risks and work factors.³⁷⁴ Similarly, a reduction in productivity by 1.9% as measured by the work limitations questionnaire (WLQ) was found for those who were physically active less than once a week in an investigation of health risk of 28,375 employees.³⁷⁵ The same research group used the WLQ to show that, compared to employees who utilised an on-site fitness centre, non-users were more likely to report limitations on time management (OR 1.62), physical work (OR 1.58), required outputs (1.41) and report an overall work impairment (OR 1.41).³⁷⁶

Burton et al. utilised a different productivity measure for their investigation on health risk and work impairment in a group of call centre employees.³⁷⁷ The WPI (as explained previously) failed to find an association with PA and productivity, a finding explained by the authors as a result of the relatively young mean age of participants (33.2 years).³⁷⁷ This is in contrast to Boles et al. who found that physical inactivity was a significant risk factor for reduced productivity using the WPAI-GH measure in their study of corporate employees.³⁷⁸ The percentage of physically inactive employees reporting being present at work but unproductive was 8%, significantly greater than the 5.3% of active employees.³⁷⁸ While it is difficult to compare studies that use different tools to measure the same outcome, this result is not only in agreement with Pronk and colleagues³⁷⁴ and Burton et al.'s study using the WLQ,³⁷⁶ it also employs a definition of physically active that may better separate those who are physically fit from those who are not. Boles and colleagues grouped people according to whether they were physically active at a moderate or vigorous intensity for 30 minutes four or five times a week, a much stricter definition than 'at least once a week'.³⁷⁷ While the relationship

between PA and productivity is by no means conclusive, there is a suggestion that physically fit and physically active people are more productive than their less fit and sedentary counterparts. However, as concluded by a recent review of the relationship between these variables,³⁷⁹ in the workplace health promotion field there needs to be more definitive measures of productivity, 'physically active' along with an alignment of indices of productivity to enable researchers to better understand the PA and productivity relationship.

In New Zealand there is no research that links employer costs such as productivity losses or absenteeism with PA levels of employees, and therefore comparisons cannot be made to what is known internationally. Similarly, the context that PA is carried out in, be it in leisure time or as incidental activity, is still to be examined with regards to productivity. There is also no New Zealand research investigating sitting time with these measures or other health risk factors. This research needs to be conducted to understand the relationship between PA and productivity measures in the workplace, in order to further the field of workplace health promotion in New Zealand.

Cost savings associated with PA

A reduction in chronic disease symptoms and prevalence among those who are physically fit intuitively suggests that participating in PA will reduce absenteeism and improve productivity. However, research designed to test this hypothesis has thus far proved equivocal.¹¹ A Dutch study found that participating in at least one supervised PA session per week as part of an employee fitness programme significantly reduced absenteeism during the first year of intervention by 4.8 days.³⁸⁰ This was compared to the low participation (less than one session of PA) and a control group. Participation in the PA session was the only measure of PA, therefore the activity of individuals who preferred another type of activity (for example, team sports or individual endurance pursuits) would not have been included in the analysis. It would have been interesting to get a total of PA participation, and to stratify groups into more meaningful PA categories to investigate if there are differences in varying levels of PA participation. Positive results were also found by Burton and colleagues who used computerised

tracking to assess the association between the use of a fitness centre for employee wellness participants and sickness absence in a large organisation over a one year period.³⁷⁵ They found that sickness days were almost half that of non-participants after adjusting for confounding variables, saving the company \$258 per employee per year.³⁷⁶ Similar to Lechner et al., this study did not measure PA participation per se; however the fitness centre was available for use at an individual's leisure as opposed to at scheduled times, potentially removing barriers associated with conflicting schedules and enabling it to be utilised more often. This may make it a more meaningful measure of PA frequency and positively impact on absence away from work.

Van Rhenen and colleagues investigated the efficacy of four one-hour sessions of PA combined with relaxation techniques over an eight week period to reduce sickness absence among both stressed and non-stressed employees within a workplace.³⁸¹ There were no differences in sickness absence at one year follow-up for participants compared to a control group. The authors concluded that PA was marginally effective at reducing sickness absence among stressed employees but had no effect for those who were not stressed.³⁸¹ However, not only did van Rhenen and colleagues fail to report any evaluation of the intervention itself, there appeared to be no measure of usual PA patterns at baseline or at follow-up throughout the year, which one would argue to be essential in determining the efficacy of the intervention.

On-site fitness centres, subsidised memberships and supervised exercise sessions are not only a costly component of a wellness programme for an organisation to invest in, they are preferred by only a small proportion of individuals in general³¹¹ who are likely to already be participating in regular PA and are not necessarily the target group. Their impact, then, on the group most in need of improved health behaviour would arguably be minimal. Innovations such as web-based (or 'virtual') PA programmes and messages, however, have the potential to reach a broader group and have scope for a wide variety of PA options to be adopted in both an individual and team format. They are able to appeal to individuals of all levels of fitness and PA experience with the ability to set PA goals personalised to their needs. Furthermore, their influence on PA frequency and

duration can be easily quantified through computerised tracking of sessions, log-ins and progress through any internet-based PA challenges at a fraction of the cost of other workplace PA components.

Herman and colleagues investigated health risk and participation rates for an incentive-based virtual fitness centre (VFC) participation over 12 months for 24,996 International Business Machine (IBM) employees who completed an HRA baseline and follow-up.³⁸² The VFC included an internet-based team challenge, progress reports, consultation with exercise science professionals and individual goal setting. Completion of 3 x 20 minute exercise sessions per week for 10 out of 12 consecutive weeks qualified employees for a \$150 cash rebate,³⁸² of which 21,393 were able to collect. Risk factors measured included physical inactivity, smoking, BMI, stress, cholesterol and perceived health. The risk of physical inactivity decreased significantly for these employees by 8.6% as measured by the HRA, indicating that the increased activity was maintained over the 12 month period despite the rebate being offered for just three months. A smaller yet still significant decrease in physical inactivity was found for participants not meeting the rebate requirements. Health risk significantly decreased among VFC participants, with a 4.1% lower risk in participants who moved down a risk category from high (5+ risk factors) to medium (3-4 risk factors) or low risk (0-2 risk factors).³⁸² Furthermore, absenteeism in the 12 month period decreased among the rebate group. Even with the rebate, a web-based PA programme may be a cost-effective, easy to implement option for employers looking to improve the health status of their employees given the costs of an unhealthy workforce.

As PA is significantly related to health risk, and poorer health risk is related to increased absenteeism and reduced productivity, the intuitive notion that PA improves these work-related factors has yet to be fully established in the workplace health promotion field.³⁸³ Like any successful workplace health initiative, PA components will likely be much more successful over the long term when part of a broader wellness programme. Integrating PA into policy, identifying and removing barriers that prevent employees from participating in initiatives that occur within the workplace, and targeting the

disengaged employee are all key factors to enable this. The potential of the workplace to facilitate the increase in PA levels and improve health, wellbeing and productivity, while promising, is another area that requires more research particularly in the New Zealand context where at present no research exists.

2.2.7 Overweight and obesity

The relationship between body weight and health

Overweight and obesity are continuing to increase worldwide, and the associated health impact of these are driving public health professionals, researchers, and stakeholders from government and non-government organisations to examine physiological, societal, psychological and environmental factors that underpin the population epidemic. Obesity is defined as the accumulation of excess body fat, and is measured at a population level by BMI, an individual's weight (in kilograms) divided by the square of their height (in metres). In adults a BMI of 18.5 – 24.9 kg/m² is considered within a healthy range; the WHO categorisation of overweight is from 25 – 29.9 kg/m² and there are three classes of obesity, from 30-34.9 kg/m² (I), 35 – 39.9 kg/m² (II) and 40 kg/m² and above (III).²⁴⁰

The BMI cut-offs have been determined according to the health risks associated with being over an ideal body weight, though the research indicates that the relationship of excess body fat to risk of morbidity and mortality is on a continuum that begins within the 'healthy BMI' range.³⁸⁴ Further, weight gain throughout life is an independent risk factor for disease regardless of initial weight status. The site for fat accumulation is an important predictor of disease, and central adiposity places a person at an increased risk of adverse health conditions compared to fat stored subcutaneously. This is thought to be due to having an increased blood flow, more adipose cells per unit of mass and more cortisol and testosterone receptors,²⁴⁰ increasing the likelihood of the hormonal disturbances that underpin endocrinal disorders. These factors place an individual at a much greater risk of health conditions that account for a large percentage of mortality from non-communicable disease on a global scale. In addition, the RR of morbidity

from a range of health conditions is markedly increased which, while non-fatal, impact greatly on quality of life.

There is a large body of evidence to show that an obese individual is at greater risk of psychosocial problems as a result of social and cultural attitudes towards people who carry excess weight. Negative stereotypes are associated with obese people in many facets of society, from children as young as seven³⁸⁵ to health professionals such as doctors, the latter preventing many obese people seeking help for complications related to the disease.³⁸⁶ Puhl and Bronwell's review of discrimination and obesity found that obese people are more likely to be less educated, earn less, and passed over for promotions or positions compared with their normal weight peers.³⁸⁶ Non-fatal health conditions which are painful and debilitating, including osteoarthritis from both the excess body weight and pro-inflammatory disturbances^{387,388} and gout³⁸⁹ are increased in overweight people. Over 65% of people who suffer from sleep apnoea are obese, and excess body fat is a known risk factor for this disease.¹⁵⁹

Fat cells in the body also act as endocrine cells, both producing hormones and being an end-point for hormonal activity in the body. As such, excess body fat results in hormonal disturbances responsible for adverse health outcomes, particularly central adipose tissue. Thus, breast, colon and prostate cancer risk is increased with increasing body fat,^{390,391} and mortality from cancer at any site is also increased with excess body weight.³⁹¹ Increased insulin resistance from obesity is one of the major risk factors of type 2 diabetes,^{392,393} and excess adipose tissue increases the inflammatory response within the body, an independent risk factor for CVD.³ Obesity not only increases the RR of conditions predisposing an individual to CVD (such as hypertension and hypercholesterolaemia³⁹⁴), population studies have found it is independently associated with CVD risk.^{395,396}

Overweight and obesity in New Zealand

Overweight and obesity in the New Zealand population has increased markedly over the last 20 years. The New Zealand Health Survey 2006/07 found that 36.2% of adults in New Zealand were classed as overweight and a further 26.5% were obese.²⁶ Obesity is more prevalent in the Pacific population than any other ethnic group, with close to two-thirds of Pacific adults over the age of 15 years with a BMI over 30kg/m². This compares to 41.7% of Māori adults and 24.3% of European / Other. Obesity prevalence was lowest among the Asian population, with just 11% classified as obese.²⁶ There are a number of contributing factors to account for these differences, including demographic, cultural and societal factors, and people of Pacific and Māori background being over-represented in the lower socio-economic groups within New Zealand.²⁷¹ A comparison of obesity rates from 2002/03 to 2006/07 Health Surveys reveal that more people who are now classified as obese (though the increase in prevalence was not significant).²⁶ In 2002/03, 24.8% of women and 23.4% of men were classed as obese; this rose to 26% and 24.7% respectively.²⁶ It is important to note that, while the 2006/07 survey used the WHO cut-offs for overweight and obesity, and the 2002/03 used higher cut-offs for Māori and Pacific people, the 2002/03 dataset was reanalysed to be comparable. While research has found that, at a given body weight people of Māori and Pacific descent have a lower health risk than European population groups (due to body composition differences),³⁹⁷ the decision to use WHO cut-offs enables international comparison of obesity levels, as can be seen in Table 2-2 below.

Table 2-2: The mean BMI and the prevalence of obesity among men and women from population-based surveys.

Country, year	Age range	Mean BMI (kg/m ²)		Obesity (%)	
		Males	Females	Males	Females
New Zealand, 2006/07 ²⁶	15 years and over	27.3	27.1	24.7	26.0
Australia, 1999-00	25 years and over	26.9	26.4	19.3	22.2
England, 2004 ³⁹⁸	16 years and over	27.3	26.8	22.7	23.2
United States, 1999-00 ^{399,400}	20 years and over	27.9	27.6	30.4	39.7
Canada 2004 ⁴⁰¹	N/R*	N/R	N/R	22.9	23.2

*N/R: not reported

As can be seen from Table 2-2, obesity is a global issue. The WHO estimate that the number of adults who are obese is over 400 million worldwide, with the prevalence increasing to over 700 million by 2015.³⁸⁴ The mean BMI of the adult population ranges from 22-23 kg/m² in Africa and Asian countries to 25-27 kg/m² elsewhere, including North America and parts of Europe.³⁸⁴ As can be seen from Table 2-2, Australia and New Zealand data are comparable to this. While there are nations such as China where the population prevalence of overweight and obesity is much lower than that reported here (for example, the mean BMI was 22.4kg/m² for both men and women in the 2005 China Health and Nutrition Survey (CHNS)).⁴⁰² This is an increase from the CHNS in 1999, along with an increase in prevalence of those with a BMI over 25 kg/m². While the overall rate of overweight increased 5.8% in men and 2.6% in women, the increase was predominantly in the urban centres as opposed to the rural centres.⁴⁰² There are differences in the prevalence of obesity among the nations outlined in Table 2-2, however populations were measured in different years and different age groups were used. Despite this, population surveys provide clear evidence that obesity is increasing.

The contributing factors to the increase in overweight and obesity point overwhelmingly to the changes in lifestyle over the last few decades. Certainly there are genetic factors that predispose individuals to the risk of overweight and obesity, however these cannot account for the shifts in BMI distributions that have occurred worldwide.⁴⁰³ While this increase is due to a dietary energy imbalance, where there is an excess of calories being consumed compared to those that are expended, the behavioural factors responsible are far more complex. Most people now agree that it is a combination of individual, societal and environmental factors which encourage people to over-consume calories and lead sedentary lifestyles. It is beyond the scope of this review to discuss in detail these factors. However, food is far more accessible now than ever before, much of which is energy dense, yet nutrient poor,⁴⁰⁴ served in large portions⁴⁰⁵ and is less expensive than food that is more nutritious.⁴⁰⁶ Technological advances have enabled people to become more energy efficient when carrying out daily tasks, reducing the amount of incidental PA that is necessary to help maintain energy balance. Further, the

fast-paced lifestyles led by many in westernised society leaves little time for leisure-time PA, and sedentary options are more available.⁴⁰⁷

Costs of overweight and obesity to the public health system

There is a plethora of research investigating the costs of obesity to the public health system and to employers. Swinburn and colleagues estimated that \$NZ135 million was attributable to obesity-related health care in New Zealand in 1997, at an obesity prevalence of 14%. They included the proportion of hospital services, general practitioner, pharmaceutical and laboratory costs of six conditions (gallstones, type 2 diabetes, CHD, hypertension, post-menopausal breast cancer and colon cancer) that were attributable to obesity.⁴⁰⁸ This analysis did not include a number of other health conditions related to obesity (for example musculoskeletal disorders and stroke), and a large percentage of type 2 diabetes is estimated to be undiagnosed in New Zealand.⁴⁰⁹ Consequently, as current day figures for obesity are now over 10% more than that in 1997, this value is undeniably on the conservative side. A similar analysis of Australian data in 2005 found that \$AU873 million were the direct costs of obesity-related disorders,⁴¹⁰ comparable to the result of Swinburn and colleagues⁴⁰⁸ when population size is taken into account. Direct medical costs in China (in US dollars) were estimated to be \$US2.74 billion for obesity-attributable stroke, CVD, type 2 diabetes and hypertension costs⁴¹¹, and Colditz attributed \$US70 billion medical costs to obesity in 1995 dollars in the United States,³⁶³ a total projected to increase to \$US698 billion by 2030 if the prevalence of obesity continues to increase at the same rate.⁴¹² Finally, a systematic review of the burden of obesity in European countries found, while up to €10.4 billion could be attributed to obesity-related health care expenditure, accounting for between 0.09 – 0.61% of gross domestic product, this is considered to be a conservative estimate.⁴¹³

Obesity also presents a significant financial burden to employers. Finklestein and colleagues estimation of costs to the US workplace are over \$US73.1 billion, with 37% of full time employees who are obese accounting for 61% of the total costs associated

with absenteeism, presenteeism and medical care expenditure.⁴¹⁴ Indirect costs associated with absenteeism, disability pensions, premature mortality and presenteeism have been estimated to outweigh the direct costs related to medical expenditure,⁴¹⁵ totalling between \$US204 and \$US1627 per obese person depending on the variables measured.⁴¹⁶ Aldana and Pronk found a consistent relationship between obesity and increased absenteeism in their review in all but one study which had a small sample size (n = 176).¹¹ Wang and colleagues estimated that for every unit increase in BMI above 25 kg/m² employers were paying an additional \$119.70 and \$82.60 for medical costs and pharmaceutical claims respectively,⁴¹⁷ confirming a relationship reported by other researchers.^{367,418} An early study investigated the risk of disability and death due to obesity in a large Finnish prospective study of 31,129 employed people with health risk data followed up for an average of 11 years.⁴¹⁹ They found that, of pensions related to cardiovascular and musculoskeletal complaints, one quarter of disability pensions in women and one eighth of those in men could be attributed to overweight and obesity. Further, premature disability was explained by having a BMI over 25 kg/m² in one third of women, and 13% of men, though risk of death from obesity was not significant.⁴¹⁹ A more recent study that failed to find a relationship between BMI and mortality was conducted over 10 years among a large cohort (n = 19,513) of construction workers.⁴²⁰ Given that BMI is a less useful measure of adiposity in a population of active people, this could have masked the true effects of body fat in employees in a physically demanding occupation who may have more muscle mass, and therefore a higher BMI, than people in more sedentary occupations.

A large scale study of Swedish men found that obesity at 18 years was predictive of disability pension claims later in life⁴²¹ and Ferrie and colleagues found that a BMI ≥ 23 kg/m² was predictive of short-term absence from work amongst women, and both men and women with a BMI ≥ 25 kg/m² at age 25 had an increased likelihood of being absent for greater than seven days at a time of 58% and 59% respectively.⁴²² Furthermore, men who were overweight at aged 25 years and at baseline (between the ages of 35-55 years) had a RR of 2.61 of a long term sickness absence compared to their normal weight peers at Phase I of the Whitehall study. Research investigating BMI and short-term disability

(STD) in 17,622 white collared workers in the US and found that workers classified as obese using WHO cut-offs had a longer duration of a STD compared to their normal or overweight colleagues. Further, logistic regression revealed that BMI was an independent predictor of STD, with a RR of 1.24 and 1.76 for overweight and obese workers respectively.⁴²³ A smaller study by Jans and colleagues had a similar finding, with overweight and obese men who were inactive were more likely to be absent from work for more than seven days, and for a longer duration than those who had a BMI under 25 kg/m².⁴²⁴ Overweight and obese employees lost 1.5 and 2.5 times more days due to absence in Tsai and colleagues 10 year follow-up in the petrochemical industry, at a cost of nearly \$US1.89 million per year⁴²⁵ and Gates and colleagues estimated that an additional \$US433 per employee with a BMI \geq 35 kg/m² was lost due to increased time away from work.⁴²⁶ While Moreau and colleagues failed to find a significant association between BMI and absenteeism in a cohort of over 21,000 Belgian employees, a waist circumference of \geq 102 cm and \geq 88 cm in men and women respectively increased the likelihood of having a high incidence of annual sick leave.⁴²⁷ They estimated that 999 absent days per 1000 workers could be saved through reducing central adiposity.

These studies are not without their limitations and while there were some adjustments made for confounders, PA and diet were not controlled for in some studies, and given their relationship with cardiovascular disease and health, this could have affected results. For example, a physically active overweight or obese person can have a lower health risk than a sedentary normal weight individual, as PA can mediate the metabolic risks associated with overweight.⁴²⁸ This therefore makes it less likely that a disability pension will be utilised regardless of weight status, as was the case in Jans et al.'s research.⁴²⁴ Health risk assessment information was recorded at a different time to when the STD event occurred in this and other research.^{423,424} This may call into question the validity of using the disability pension as an outcome measure. In addition, different BMI cut-off points were used in some studies; Rissanen et al. for example used a BMI cut-off of 22.5 kg/m² as their reference group,⁴¹⁹ placing normal weight individuals within the overweight category, according to the WHO classifications. This could mask

the real effects of overweight. Despite these limitations, there is a link continuing to be established between obesity and employer costs such as absenteeism and STD, however in New Zealand there is no robust research that links obesity to absenteeism.

The association between overweight and obesity and work-related factors

Absenteeism and medical expenditure are easily quantifiable costs of poor health, from which conclusions about the financial burden of obesity in business can be measured. However in this service-driven economy the indirect cost of obesity to employers through loss of productivity is estimated to be far greater.⁴¹⁵ Obesity-related disorders account for a substantial loss of productivity in the workforce⁴²⁹ and researchers have begun more recently to establish the independent role of being overweight or obese on productivity losses. Goetzel and colleagues calculated that presenteeism was 10% and 12% higher for overweight and obese employees respectively, at an additional cost of \$201 and \$644 over and above that of a healthy weight employee.⁴³⁰ Data from the National Health Interview Survey in the US was used to show that obese people were significantly more likely to report being limited in their role due to a physical, mental or emotional problem.⁴³¹

The WLQ was used by Gates and colleagues to show that those with a BMI $\geq 35\text{kg/m}^2$ lost an additional 1.2% of time through presenteeism, resulting in \$US506 more per employee per year than other workers.⁴²⁶ The WLQ was used to find that those with a BMI $\geq 30\text{ kg/m}^2$ had a small but significant increase in productivity loss in a large US workforce sample.³⁷⁵ The same research group had earlier found that close to 5 hours per week were lost while at work among those with a BMI in the at-risk category in a smaller group of call centre operators (n = 564), where productivity was objectively measured by the total handle time of each call and the amount of time operators were unable to answer calls.³⁷⁷ Bernaards and colleagues found that obese men were less productive than lean or overweight men when investigating productivity of employees using the WHO Health and Productivity Questionnaire (HPQ),⁴³² which is contrary to the findings of Pronk and colleagues who found no association between job performance and obesity using the same measure.³⁷⁴ Boles et al. used the Work Productivity and

Activity Impairment Scale (WPAI) to investigate links between impairment in work activities and BMI.³⁷⁸ While they found that a greater percentage of time was lost by workers with a BMI ≥ 25 kg/m², this was not significant once other variables were controlled for.³⁷⁸ A low response rate for Pronk may explain the lack of association, however, as only 29% of the invited sample participated, and a self-selected group may be healthier than those who choose not to take part. Further, the researchers defined overweight as a BMI of over 27 kg/m² rather than 25 kg/m²,³⁷⁴ and obesity and overweight were not investigated separately by Boles and colleagues.³⁷⁸ Both studies could have masked differences between healthy weight, moderately overweight and obese respectively by not defining the groups by standard BMI health risk categories. It should be noted that different population groups were used to examine the obesity-productivity relationship and Bernaards et al.'s finding of lower productivity was conducted in employees with musculoskeletal problems.⁴³² The authors did not rule out the possibility of an unmeasured variable mediating the relationship, resulting in lower general health overall.

Overall, these findings demonstrate that the impact obesity has on performance in the workplace has the potential to be substantial, yet remains equivocal. Measurement of performance is largely based on self-report as the workforce becomes increasingly service driven, and with that comes inherent limitations associated with subjective data. Further research is necessary to determine the full effect obesity has on productivity, and given that there are a larger number of people in the workforce who fall into the overweight category, additional information on this group is required. Furthermore, given that close to two-thirds of the New Zealand adult population is overweight or obese, and 70% of the gross domestic product is accounted for by the service industry, the obesity-productivity relationship within New Zealand needs to be examined.

Cost savings associated with reducing obesity and overweight.

Workplace health promotion has the potential to reduce the overall costs of obesity to the workforce through reduced absenteeism and increased productivity. It is well

known that many health risk factors are reduced with a reduction in bodyweight (such as musculoskeletal problems, respiratory disorders and cardiovascular health indicators) which have all been found to be a significant financial burden to employers.^{16,414} However, while experts in the field have projected return on investment (ROI) of \$1.17 for every \$1.00 spent on company obesity prevention programme⁴³³ there is a dearth of controlled trials that clearly show investing in a long term workplace health promotion programme to reduce obesity results in a ROI for the employer. Notwithstanding that many studies have found a reduction in weight loss in the short term^{283,434,435} the long term benefits are unclear. Much research focuses on individual behaviour change, yet it is increasingly recognised that combining this with organisational and environmental change is likely to result in a more sustainable reduction in weight.^{12,436,437} One study to address this issue has compared a control group (who has access to the company health promotion programme, comprised largely of individual behaviour change components) with two treatment groups to establish which might be more successful at reducing obesity in a large company across 12 worksites in the US.⁴³⁸ A moderate treatment group had health promotion messages and increased availability of healthy food within cafeterias, work meetings and in vending machines. Physical activity posters encouraging stair use were also utilised.⁴³⁸ The third group focused on fostering leadership support for health promotion and integrating it into company business strategy by establishing health goals as part of the sites' management plans, making managers accountable for health improvements of their employees and sending progress reports related to these goals to senior corporate leadership. Site leaders received training on health promotion topics and leaders for health promotion within the worksite were established.⁴³⁸ Second year results found that weight differences between the control and the two treatment groups (grouped together for analysis purposes) were largely due to an increase in weight in the control group.⁴³⁰ While the maintenance of weight can in itself result in cost savings to the employer, as Carls et al. have calculated in their analysis of employee cost data from a large organisation over a six year period,⁴³⁹ the Goetzl study found the percentage of obese employees in the intervention group reduced.⁴⁴⁰ Allowing a longer time period may see more beneficial results as people shift into a lower risk category. Further, while researchers in the field have

estimated ROI for employers through theoretical scenarios,⁴⁴¹ there is a lack of research investigating the cost-effectiveness of specifically reducing obesity through a workplace health promotion programme.⁴³⁷ Finally, research proving a business case for workplace health promotion within the New Zealand environment is necessary to encourage the business sector to invest, as there is currently no literature in this field.

2.2.8 Chronic conditions

The presence of chronic health conditions can have a significant impact in the workforce, not only on employee wellbeing but also the time that can be spent working productively throughout the day. A health condition is defined as a physical or mental illness that has been diagnosed by a health care professional in the last six months.²⁶ Symptoms associated with chronic health conditions persist on a day to day basis and encompass ailments that can have high personal and financial costs with serious health implications such as cancer, or conditions that may not impact an individuals' day to day life in a way that necessitates significant intervention, such as rhinitis. While these conditions clearly have different health outcomes, their impact on employee wellbeing and the costs related to hours lost at work or on-the-job productivity make them significant to the employer. Below is a brief description of the major health conditions known to impact on workplace factors, their associated costs and a summary of the effects a workplace health programme can have on reducing the risk of chronic conditions.

Hypertension

Hypertension (or high blood pressure) increases the amount of work placed on the body's organs and can result in damage; over time systolic blood pressure has been found to be an independent risk factor for CVD.⁴⁴² Hypertension is typically asymptomatic and therefore only those that have regular health checks are likely to pick up that they are hypertensive. The risk of hypertension increases with age, it can be an inherited condition or brought on by modifiable lifestyle factors including (but not

limited to) smoking, high stress levels, salt intake or obesity as a result of physical inactivity and a poor diet.⁴⁴² It is recommended that individuals keep their blood pressure lower than 120/80 mmHg, and a reading of 140/90 mmHg is considered at a level high enough to warrant medication. Pre-hypertensive individuals (those who have a reading between 120/80 mmHg and 140/90 mmHg) are encouraged to make lifestyle changes to lower their blood pressure.⁴⁴²

The prevalence of people on medication for hypertension increases with age, and within the New Zealand workforce, while less than 1% of those aged 25-34 years report taking medication for high blood pressure, this increases from 12.6 and 12.7% for men and women respectively in the 35-45 year age group to over 25% of people aged between 45-64 years.²⁶ True prevalence of hypertension is almost certainly underestimated as many people are likely to be undiagnosed given the asymptomatic nature of the condition.

Cost of hypertension

As the workforce is an ageing one, and obesity is increasing within the adult population, the potential impact of hypertension on the employer may not be fully realised within New Zealand. However, the cost of hypertension to the employer has been estimated to be \$392 per employee per year, based on a number of research studies and a large healthcare claims database.⁴⁴³ Compared to other health conditions, this had one of the greatest impacts.⁴⁴³ An analysis of the Medical Expenditure Panel Survey (MEPS) in the US found normal weight individuals with hypertension had a higher healthcare expenditure and resulted in more days absent from work. Further, a greater productivity loss was found, particularly in those who were also obese, with 622 hours lost per annum.⁴²⁹ Hypertension was estimated to account for 556 lost days in absenteeism and presenteeism across close to 1300 employees, equating to 1.6% of total company costs⁸⁸. Data from the National Health and Wellbeing Survey (NHWS) of over 19,500 individuals who had a BMI over 27 kg/m² concurred with Sullivan et al.'s findings.⁴⁴⁴ Kiiskinen and colleagues found that those with a diastolic blood pressure reading above

105 mmHg lost 2.6 years of work over a 19 year period compared to people categorised as normotensive.⁴⁴⁵

While there is no New Zealand data, it is estimated that 14% of workplace productivity losses in Australia can be attributed to hypertension.¹⁶ No relationship was found between hypertension and work factors among the Dow company employees, a large science and technology company with a varied workforce including both blue and white collar employees,⁴⁴⁶ though blood pressure cut-offs used were greater than the WHO classification of 140/90 mmHg to define chronic disease risk. Similarly the 160/100 mmHg cut-off used by Lynch and colleagues to define risk in their observational study found no relationship between medical expenditure and hypertension.¹⁰⁰ Further, Kiiskinen's group cut-off of <95mmHg for diastolic blood pressure (DBP) for normotensive could explain why no difference was found for those considered mildly hypertensive with a DBP between 95 mmHg and 105 mmHg.⁴⁴⁵ Higher absenteeism and impaired work has been found in those who fall into the pre-hypertensive category compared to employees with an ideal blood pressure reading,³⁸ suggesting that the effects of higher blood pressure may be missed if all individuals below the traditional hypertension cut-off point are grouped together.

Hypercholesterolaemia

It has long been established that high circulating levels of lipids in the blood (termed hypercholesterolaemia) increase the risk of coronary heart disease (CHD). While there is a genetic link between the amount of low density lipoprotein cholesterol (LDL-C) that is produced in the body and circulating LDL-C levels, the lifestyle factors that impact on LDL-C levels and subsequent plaque build-up (atherosclerosis) include dietary fat intake (specifically the amount of saturated fat consumed), smoking and physical inactivity.⁴⁴⁷ While hypercholesterolaemia is defined as those individuals with total cholesterol levels at or above 6.5 mmol/L, the National Heart Foundation in New Zealand recommend that total blood cholesterol levels are kept below 4mmol/L, as there is an increasing risk of CHD with increasing blood cholesterol levels beyond this point.⁴⁴⁸

In the New Zealand population, men aged 35-64 years are more likely to be taking medication for hypercholesterolaemia than women of the same age.²⁶ While only 0.7% of the population take medication in the 25-34 year age group, this increases exponentially with age, to 4.4% in men aged 35-44 years, 10.8% in the 45-54 year age group to 22.2% for men aged 55-64 years. For women, the increase is not as high, but still quite marked, from 1.7% for those aged 35-44 years, to 5.3% in the 45-54 year age group. The number receiving medication for hypercholesterolaemia almost triples to 15.8% in the 55-64 year age bracket.²⁶ Similar to hypertension, the true prevalence of hypercholesterolaemia is likely to be underestimated, given that many people who may be diagnosed choose to make lifestyle behaviour changes to reduce their cholesterol level as opposed to taking medication. In addition to this, there is likely to be a large number of people in the population that have high cholesterol but remain undiagnosed given that a blood test is required to confirm hypercholesterolaemia which is essentially an asymptomatic condition.

Cost of hypercholesterolaemia

Hypercholesterolaemia in the workforce has consistently been found to impact on costs associated with medical care, rates of absenteeism and productivity. High cholesterol accounted for a 46% increase in medical costs,⁴⁴⁹ and over three extra days absent per year could be attributed to high cholesterol levels among employees in the US MEPS database⁴²⁹ with an additional 451 hours lost productivity, both figures increasing by over 50% in those with a BMI over 30 kg/m².⁴²⁹ Kannan et al.'s analysis of the NHWS also found a significant increase in hours lost through reduced productivity in those with a BMI > 27 kg/m².⁴⁴⁴ An Australian survey found no association between hypercholesterolaemia and presenteeism or absenteeism; however theirs was a relatively small sample and with a mean age of 39 years, not necessarily representative of the population.⁴⁵⁰ Currently there are no New Zealand data on the relationship between absenteeism, productivity and hypercholesterolaemia.

Heart disease (CHD, CVD and IHD)

Ischaemic heart disease (IHD) is a result of atherosclerosis in the coronary arteries, narrowing them to the point that they may not deliver an adequate supply of oxygen to heart. This initially causes angina (a tightening in the chest, causing discomfort) and can lead to more serious conditions such as a myocardial infarction that can cause heart failure. Again, while heredity factors can place an individual at an increased risk of IHD, lifestyle factors such as alcohol consumption and smoking, along with physical inactivity, inadequate fruit and vegetable intake and a BMI over 25 kg/m² are both independent risk factors for IHD and contribute to hypertension and hypercholesterolaemia which in turn increase the risk of IHD. Diabetes that is not managed properly is also linked with an increased risk of IHD.^{451,452} The risk of IHD increases with age, and while the risk is 1.3% or less for both males and females younger than 45 years, this increases to 4.4% and 10.3% of men in the 45-54 and 55-64 year age groups respectively in the New Zealand population²⁶. For women the increase is not as great, with less than 2% being diagnosed with angina or hospitalised for a myocardial infarction in the 45-54 year age group, rising to 6% for those aged between 55-64 years.²⁶

Cost of heart disease

Over 135,000 days lost from work were estimated due to CHD in the UK, costing an estimated £1.02 billion in 2004.⁴⁵³ While an estimation of absenteeism and presenteeism from survey data by Lamb and colleagues in the US found that CHD cost the employer just over \$327,000 per year, this was a small sample of employees recruited from a health fair and, with a mean age of 41 years, are likely to be more aware of their conditions and perhaps more interested in health than the general population. Goetzel et al. analysis which combined database information and research studies estimated the prevalence of heart disease to be an average of 6.4% in the US working population, resulting in an average of \$1,257 per employee lost due to absenteeism, and \$13 for every hour lost due to presenteeism.⁴⁴³

Type 2 diabetes

The prevalence of type 2 diabetes is increasing in New Zealand and accounts for between 85-90% of all diabetes cases. It is related to lifestyle factors and physical inactivity and a high proportion of body fat mass that is centrally located are the two most salient risk factors. For most, the treatment is lifestyle related, and a low GI diet along with regular PA that includes moderate and vigorous exercise can lead to weight loss and an improvement in insulin sensitivity. People who do not make lifestyle changes may experience a worsening of symptoms to the point that they may require insulin to be administered to manage their glucose levels. The health complications of untreated type 2 diabetes include blindness, neuropathy and renal failure, and can increase an individual's risk of developing IHD.^{409,452,454}

The global prevalence of diabetes has increased dramatically over the last 30 years due to lifestyle changes. In a representative sample of adults over 18 years in the US, 9% reported being diagnosed with diabetes by a healthcare professional and a further 14% were considered at high risk of developing the disease.⁴⁵⁵ This is almost double the prevalence rate of New Zealand adults (5%) which increases with age.²⁶ Further, people of Pacific descent were three times more likely to have diabetes than other ethnic groups.²⁶ It should be noted that the true prevalence of diabetes has been estimated to be double the reported rate due to undiagnosed cases of type 2 diabetes.⁴⁰⁹

Cost of type 2 diabetes

Diabetes impacts markedly on both absenteeism and productivity losses. Sullivan et al.'s analysis found medical care expenditure was significantly greater and an additional three days per year absent and over 430 hours per annum productivity was lost due to diabetes.⁴²⁹ A similar relationship was found in Kannan et al.'s data, with diabetes showing the strongest association with reduced productivity in people with a BMI > 27 kg/m².⁴⁴⁴ Goetzel et al.'s estimate of five days lost through absenteeism and a further 0.9 hours per day through presenteeism results in \$US257 per year costs to employers⁴⁴³

which is lower than Iverson et al.'s estimates of close to five days lost productivity due to presenteeism and absenteeism combined.⁸⁸ Musich and colleagues found 6.3 hours per month were lost through diabetes-related absenteeism, significantly higher than those without the condition.⁴⁵⁰ In 2007, one in 10 healthcare dollars in the US were attributable to diabetes, with \$US2.6 billion lost through absenteeism, \$US20 billion through lost productivity and a further \$US0.8 billion lost through unemployment due to diabetes.⁴⁵⁶ While a detailed analysis is not available for New Zealand, the \$NZ600 million currently attributed to diabetes is projected to cost the health system \$NZ1.77 billion dollars by 2022.⁴⁵⁷

Allergies, asthma and chronic obstructive pulmonary disease (COPD)

Respiratory and autoimmune conditions can impact on an individual's ability to perform effectively on a day to day basis and are a common complaint among the population. Allergies, asthma and respiratory illnesses such as chronic obstructive pulmonary disorder (COPD) all have the potential to impact on employee wellbeing, productivity and hours absent at work. Eighty-two percent of the employer costs associated with an allergy were related to presenteeism costs, and total costs per employee were estimated to be \$US271 per year in one estimate,⁴⁴³ and account for close to 4% of company costs when accounting for both absenteeism and presenteeism.⁸⁸ This may be lower than other conditions but the prevalence of allergies within the population is approximately 24%²⁶ and therefore this has a widespread impact on employers. Asthma is an inflammatory respiratory condition that is typically diagnosed before an individual is ten years old. While asthma is a condition that can be managed, it has been found to negatively impact on absenteeism and presenteeism of individuals who experience symptoms regularly.⁴⁵⁸ Globally, the costs associated with the negative impacts of asthma exceed that of many other chronic conditions due to lost time through absenteeism and reduced on-the-job productivity.^{16,459} The prevalence of New Zealanders who are medicated for asthma is just over 11%²⁶ and the overall costs related to asthma are estimated to be around \$US99 per year in the US,⁴⁴³ with another estimate of 102 days lost per year to asthma-related absenteeism and presenteeism.⁸⁸ New Zealand research found those working within the farming industry, food processors, laboratory technicians and employees

working in the plastic, rubber or chemical industries tended to have a higher risk for symptoms associated with asthma.⁴⁶⁰

Chronic obstructive pulmonary disease (COPD) is a term used to define disorders of the lungs that restricts air flow to the lungs. Unlike asthma, COPD is rarely diagnosed in those aged less than 50 years as it is related to tobacco smoking and is irreversible.⁴⁶¹ In New Zealand, 7.4% of women and 5.6% of men over the age of 45 years reported they have been diagnosed with COPD.²⁶ Allergies, asthma and respiratory illness make close to a third of productivity lost in Australia due to health conditions,¹⁶ and while COPD affects a smaller proportion of people, it is associated with a higher work impairment than other disorders.⁴⁴⁶ Lost productivity accounted for 67%, 50% and 41% of total costs in France, the Netherlands and the UK respectively, and total costs per patient range from \$US1023 - \$US5646.⁴⁶² In New Zealand the costs of COPD are estimated to be \$NZ1 billion when accounting for lost productivity due to absenteeism, unemployment and time away from work due to being in a carer role.⁴⁶¹

Arthritis

Arthritis is an inflammatory disorder of the joints and is a debilitating condition often associated with adults older than the working population. However, significant fractions of people of working age are affected by one of three types of arthritis, the pain of which impacts on their ability to perform daily tasks. Particularly, rheumatoid arthritis has been found to explain 80% of arthritis cases in the 25-55 year age group in the US,⁴⁶³ the costs of which have been estimated at \$4224 more for the employer than an employee free of the condition.⁴⁶⁴ The prevalence of any type of arthritis in the New Zealand population increases with age, and while a quarter of those in the 55-64 year age group report the presence of arthritis, this decreases, yet is still present, in the younger age groups. Arthritis was one of the most common complaints for those reporting lost productivity in Collins et al. survey of the Dow company workforce⁴⁴⁶ and 4% of lost productivity within the Australian workforce has been attributed to arthritis¹⁶. US National Survey data attributed absenteeism costs of \$469 for female workers

and \$520 for male employees, equivalent to approximately three lost workdays and \$US10.3 billion (women = \$5.5 billion; men = \$4.8 billion)⁴⁶⁵ Iverson et al. suggest 5.6% of total company costs are due to arthritis-related productivity losses⁸⁸ and finally Kessler and colleagues found that, while productivity was not reduced amongst those with arthritis, they reported an increased effort to produce work, and increased absenteeism compared to their colleagues.⁴⁶⁶

Depression

The most common mood disorder that is diagnosed within the population is depression, and in New Zealand this affects women in the 25-34 year age group more than any other group.²⁶ The overall prevalence for men tends to be lower than women in any age group and, while the incidence of women reporting that they have been diagnosed with depression is relatively stable across the working age population, it ranges from 7.5% in the 25-34 year age group to just over 12% in men aged 55-64 years.²⁶ A recent Australian survey of the workforce found 12% of individuals had been diagnosed with depression in the last three months¹³² and in the US, the population prevalence of depression is estimated to be close to 5%.⁴⁶⁷ Depression is considered one of the major causes of disability by the WHO⁴⁶⁸ and impacts on the health of the individual and their ability to perform in their job. Depression is estimated to account for 19% of total productivity losses in the Australian workforce¹⁶ and the effect that depression has on work impairment has been reported as being higher than other chronic conditions in the US, with one study estimating total costs of medical care, absenteeism and presenteeism to be close to \$US19,000 per annum for the Dow company workforce,⁴⁴⁶ and Henke estimates an increase of 25% in medical claims and sickness disability over those without depression.⁴⁴⁹ Cutting back on hours worked along with increased absenteeism has been estimated to cost the employer \$US182 - \$US395 per person every month in the US⁸⁵. In addition, it has been estimated that absenteeism and lost productivity make up 77% of the societal costs of depression.⁴⁶⁹ These are both borne by the employer and result in 440 million lost work days, more than hypertension and CHD combined.⁴⁶⁹ To date there is limited New Zealand data investigating the costs of depression to

employers, however the New Zealand Mental Health Survey found that mental health disorders resulted in 2.3 days per month where the respondent was unable to work at all, and almost seven days where the amount of work able to be completed was reduced.⁴⁷⁰

Migraine headaches

A migraine can incapacitate an individual and impose a significant negative impact on their ability to function throughout the day. The prevalence of migraines is greatest in those aged between 25-55 years and women are particularly susceptible. This is true in the New Zealand population; 9.5% of all adults report suffering from migraine headaches, with a two and a half times higher incidence in women.²⁶ This is comparable to reported prevalence in both Australia and the United States.^{132,471} The debilitating nature of the condition results in significant personal costs to the individual as every aspect of their daily life is affected. The costs to businesses are just as great due to hours lost at work through absenteeism and reduced productivity. Iverson and colleagues estimated over 2,700 days per year were lost in absenteeism and reduced productivity due to headache-related illness.⁸⁸ Six percent of productivity losses in the Australian workforce are related to migraines and headaches¹⁶ and Hawkins et al. estimated that the burden of illness related to migraines was \$US12 billion annually in the US when they investigated the indirect costs of absenteeism.⁴⁷¹ For people who listed the condition as their primary health concern on the Stanford Presenteeism Scale, migraines accounted for 23.4% of work impairment.⁴⁴⁶ Finally Goetzel et al. found that migraines were one of the most costly conditions for employers as most of the costs were predominantly due to lost productivity.⁴⁴³

Chronic fatigue syndrome

Chronic fatigue syndrome (CFS) is a condition characterised by a number of physical and psychological problems such as persistent pain, fatigue, depressive symptoms and cognitive dysfunction which may be part of CFS or co-morbid symptoms associated with it. The prevalence of CFS within the adult population is less than 0.3% in New Zealand, however due to the complex nature of the condition on an individual level it

has the potential to impact on the employer due to hours lost at work and reduced productivity. Though the prevalence is small, chronic fatigue related symptoms account for a significant burden on employers with regards to reduced productivity in the workforce,⁴⁷² and a review of work-related impairment found those with CFS had difficulty getting out of bed, made errors at work and had an over-reliance on colleagues,⁴⁷³ and White et al. found 29.8 days per year were lost through fatigue-related illness in 2005 when comparing medical claims data.⁴⁷⁴ The work-related costs attribute a significant portion of the overall financial burden, estimated to be over \$US10,000. A full recovery from the physical and cognitive impairments from CFS occurs for just a small percentage of sufferers, and a large proportion of the costs are related to friends and relatives providing care and through lost employment.⁴⁷⁵

Musculoskeletal disorders

The presence of chronic musculoskeletal disorders, including occupational overuse syndrome and back pain can impair physical and cognitive functioning of the employee and impact on quality of life. Though investigations have found that those who are unable to work through a musculoskeletal disorder return to work within a month,⁴⁷⁶ many of these experience work impairment and a recurrence of symptoms, particularly in those that suffer shoulder, arm and back pain.

The causes of musculoskeletal pain are not necessarily work related, however the ongoing disabilities have been found to be associated with physical and psychosocial factors related to the workplace, including stress and minimal accommodation for the disability.^{476,477} In addition, a monotonous work role, high job strain, low social support and low job control have all been associated with an increased risk of musculoskeletal disorders.⁴⁷⁸ People who are overweight are more likely to suffer from symptoms related to musculoskeletal disorders and it is estimated one million people lose time at work each year through the pain associated with these conditions.⁴⁷⁷ An Australian survey found that back pain was one of the most common complaints from employees, with a reported increase in presenteeism of nearly 22% compared to those without.⁴⁵⁰ Further,

it was estimated that 8% of all productivity losses could be attributed to back, neck and spinal problems within the Australian population.¹⁶

In the US the presence of back and upper limb musculoskeletal disorders is estimated to cost the economy between \$45-\$54 billion annually⁴⁷⁷ and White et al.⁴⁷⁹ analysed medical claims data and found that, at 30.8 claims per year, employees with neck or back pain had 1.6 times the number of claims compared to the average employee. Iverson and colleagues estimated 7.5% of company costs in one large organisation could be attributed to neck and/or back pain.⁸⁸ There is no New Zealand data that links musculoskeletal pain to work-related losses in the employed population, though 24% of adult New Zealanders experienced back or neck pain lasting longer than six months in the New Zealand Health Survey.²⁶

Cancer

In New Zealand approximately 16,000 people are diagnosed each year with cancer,⁴⁸⁰ the most common sites being prostate, breast, large bowel and the skin.⁴⁸¹ In the US, there are approximately 3.8 million working age adults who have cancer.⁴⁷⁶ While there are a number of people who are unable to work due to their illness, an increasing percentage of people are going back to work as early detection and successful treatment of cancer advances. However, this brings with it many challenges faced by both the employee, with physical, emotional and cognitive impairments,⁴⁸² and employer, in terms of reduced productivity and staff turnover as employees who initially go back to work after successful treatment may later resign due to these impairments.⁴⁸³ However the perceptions around cancer in the workplace can also impact on the survivor returning to work, and the assumption that the employee is no longer as capable in their position can have implications for the psychosocial environment⁴⁸² which may work to reduce productivity in itself. In Australia it is estimated that 4% of overall productivity losses in the employed population are due to cancer.¹⁶ An estimated \$US3,133 is lost per year through costs related to absence due to any cancer in Goetzel et al.'s analysis of employer costs⁴⁴³ and White and colleagues attributed additional costs of over \$US12,000 per year to the employer, with 35% of that due to indirect costs, including

absenteeism.⁴⁷⁹ In New Zealand there is no data available that detail cancer-related losses to the employer.

Programmes to reduce impact of chronic disease within the workforce

The chronic conditions that have been outlined briefly above, along with a plethora of other conditions that affect the working population impact not only on the quality of life of the person affected, but the employer also. Not all conditions are preventable, and genetic, social and environmental factors interact to place an individual at increased or reduced risk of disease. However, while some conditions are unavoidable, the reduction of symptoms and associated co-morbidities can be targeted through a workplace health programme and such programmes are successful at improving the day to day life of those afflicted.^{284,443} Importantly from a business perspective, investment in such programmes can be cost-effective, and reduce absenteeism, staff turnover and increase productivity resulting in a return on investment.²⁸⁴ While there are programmes that specifically target certain conditions (such as depression, where treatment through the workplace resulted in the reduction of disability days to just below two per 10 day period, compared to almost 4.5 per 10 days just prior to treatment⁴⁸⁴), incorporating the key messages into a broad workplace health programme that targets lifestyle change has the potential to reduce the risk of a number of conditions where the symptoms and risk factors are the same. For example a programme aiming to reduce the risk of diabetes among the workforce was successful at reducing BMI and cholesterol, and improving fitness at the end of six months in addition to improving glucose tolerance.⁴³⁴ A multi-site wellness programme targeting multiple risk factors successfully reduced absenteeism among participants of the wellness programme, saving \$US15.60 for every dollar invested,²⁸³ however there was no effect on short term health costs. As many of the targeted health risk factors have long term health implications, it is likely that a programme such as this would prevent the development of symptoms in participants who have lifestyle habits that could lead to an increased risk of disease, yet have not had a chance to progress.

Aldana's evaluation of the workplace health promotion literature found that modifiable risk factors such as cholesterol, glucose, BMI and PA are successfully improved through workplace health promotion (WHP) and reduce costs to employers.²⁸⁴ Given that these health outcomes are related to CHD, depression and are related to symptoms of arthritis, asthma, CFS and musculoskeletal disorders^{384,451,452,476} there is evidence to support the adoption of such programmes in the workplace to improve health outcomes for employees and in turn reduce absenteeism, staff turnover and increase productivity.²⁷⁷ There is emerging evidence that the investment in such programmes is more than offset by these business outcomes,²⁸⁴ yet to date there is no New Zealand data on the association between chronic conditions and productivity, or whether an improvement in symptoms relates to an improvement in productivity and associated business outcomes.

2.3 Environmental attributes of the workplace

2.3.1 Attributes of the physical environment associated with health behaviour

Physical attributes of the environment have received attention over the last two decades as researchers acknowledge that a large part of behaviour is governed by the environment in which an individual operates. This can be directly or indirectly affected by policy-related decisions that determine the provision or otherwise of facilities and the rules that support behaviour.^{485,486} Further, the social environment can exert a level of influence to support or maintain healthy behaviour that is as salient as any physical factor.⁴⁸⁷ Indeed the most successful workplace health programmes are deemed to be those in which company leadership, policies, norms and culture are aligned to promote the adoption of healthy behaviour.⁴⁸⁸ Interpersonal relationships, organisational aspects and policy-related factors within a workplace need to be investigated in a formative evaluation prior to a wellness intervention being initiated. The socio-ecological model assumes that positive changes in both the physical and the social environment will lead to improvements in individual behaviour which, in a workplace setting, may extend to

increases in productivity given the associations between health behaviour and productivity outcomes.³⁷⁵ The influence the environment has on employee behaviour patterns is not limited just to the specific features of the site that they work in. The immediate surroundings of the workplace have implications for eating and PA habits, as does the wider community that it exists in.⁴⁸⁹

There has been an emergence of research that has focused on the PA and food environment within a community and how certain aspects can either facilitate or inhibit the health behaviour of an individual. A community that would be supportive of PA is one which has easily accessible recreational centres, parks, playgrounds, trails for walking and running, and cycle lanes for active transport, and those people who live closer to these facilities are more physically active overall.⁴⁹⁰ Neighbourhood design is associated with PA levels and mixed land use, residential density, proximity of destinations and street connectivity all increase the ‘walkability’ of an environment.^{490,491} In addition, features of the neighbourhood that are more easily modified are associated with walking behaviour. Perceived car parking difficulty has been found to encourage walking in neighbourhoods, as has easy access to transit (such as bus stops or train stations), particularly in neighbourhoods with high access to key destinations.⁴⁹² Aesthetic attributes of a neighbourhood encourage PA and a recent review of PA environments confirms a positive association with both walking and recreational activity.⁴⁹³

While much of the research regarding associations between the physical environment and PA is focused predominantly on the residential areas of individuals, one study investigating associations between activity and locations around the workplace found a positive association between moderate to vigorous activity and residential housing units and population density located within one kilometre of an individual’s workplace.⁴⁹⁴ This may be because high residential housing units tend to be apartment style housing which may be located above retail shops, increasing the destination type activity throughout the work day. Alternatively there may be features specific to workplaces located in suburban areas which attract a more active employee. At any rate, Troped et

al.'s study⁴⁹⁴ and the aforementioned factors highlighted by Sallis⁴⁹⁵ are relevant from a workplace perspective, however, given that is where working adults spend a large proportion of their day. If they are going to engage in PA before, during or after work then the aforementioned factors may be salient facilitators or inhibitors of activity.

In addition to the environment in close proximity to the workplace, a number of environmental factors within the workplace can influence PA levels. Aesthetic improvements to the stairwell, putting up motivational signs around the building, and adding music have all been used successfully to increase employee use of stairs during the work day.⁴⁹⁶ Bennie and colleagues reported that facilities to enable employees to engage in activity at and around work (such as bike storage and showering facilities) made them more than twice as likely to be active.⁴⁹⁷ Employees in Lucove et al.'s research said that onsite fitness facilities and policies related to PA, including paid time off to exercise, were two influential factors to engaging in leisure time PA.⁴⁹⁸ Building PA strategies into company policy is advocated as a way to encourage activity around the workplace, and walking meetings, car park availability and flexible work hours to encourage active commuting are three strategies that are examples of this. However, the effectiveness of these policies is influenced by management support, as evidenced by a number of studies that have found alcohol policies also predict drinking practices and behaviours in the workplace.^{205,212,214,499} Ames, Grube and Moore's investigation found it was not the existence of the policy, but the enforcement of it, that predicted drinking norms and alcohol availability.²⁰⁵ These norms subsequently predicted an increase in drinking behaviour prior to and during work, compared to one in which an alcohol policy was enforced.²⁰⁵ The existence of the policy, therefore, might not be a salient factor in determining behaviour if it is not promoted and supported by management.⁵⁰⁰

Altering the information environment has also proved to be successful in influencing activity levels in the workplace. Increases in stair use have been observed with the use of promotional posters,⁵⁰¹ and point-of-decision messages are advocated as a cost-effective PA intervention.⁵⁰² Interestingly, a New Zealand study found step counts were reduced with the use of poster messages to encourage PA⁵⁰³. However, the steps were

measured by a pedometer and not by observation, and no measure of compliance was reported. In addition, the authors note that their study was limited by a small sample size and the multiple messages used on one poster may have limited the effectiveness of the intervention;⁵⁰³ research suggests that the use of posters to promote PA is more successful when the messages are simple and specific.⁵⁰⁴

Similar to PA, environmental factors affecting employee food choices are not limited to the workplace. Fast-food outlets, cafes and restaurants, grocery stores, and vending machines at or near the workplace are likely to be utilised by workers during and outside of work time.²⁹⁰ Lunch was preferentially purchased at fast food outlets by 43% of employees when surveyed regarding lunchtime practices, particularly those aged 35 years or less.⁴⁸⁹ In addition, foods were chosen due to convenience, taste and cost rather than health reasons,⁴⁸⁹ results that are found in other contexts for food purchasing decisions.^{505,506} However, the ability to purchase healthy items for lunch is also a function of the availability of such items in the surrounding workplace environment⁵⁰⁷ and employees have stated that the availability of healthier food options at a reduced cost within the workplace would encourage them to purchase better food choices,^{505,508} supported by literature showing the positive impacts of increased availability on fruit, vegetable and fat consumption.⁵⁰⁹ A recent study in bus transit workplaces found that increasing the availability of healthy food options in vending machines, along with reducing the prices by at least 10% resulted in an increase of purchases of these food types.⁵¹⁰ Similarly, a Danish study found that increasing access to healthy food choices and reducing the availability of unhealthy options increased the consumption of fruit and vegetables by 95g per day from baseline to five year follow up.⁵¹¹ The provision of cooking facilities and a lunch room for employees also increases the likelihood of bringing lunch from home,⁴⁸⁹ enabling food preparation to be perceived as more convenient. Certain groups within the employed population may be less influenced by this, as both employees under 35 years and obese employees were found to purchase more often than other sub groups of the employed population.⁴⁸⁹

Posters that are displayed as part of a nutrition intervention within the workplace have had mixed success. A review of studies that have used multi-component interventions to change dietary behaviour and increase the awareness of healthy food choices within the workplace by posters, flyers and newsletters found dietary patterns can be significantly altered by changes in the food environment in addition to other nutrition intervention components.⁴⁸⁵ In one of the only published workplace studies conducted in New Zealand, nutrition displays in the cafeteria and monthly 30 minute workshops for a period of six months resulted in a reduced fat intake, increased vegetable intake and PA, improved nutrition knowledge and reduced systolic blood pressure in the intervention group when compared to the control site.²⁸¹ This is not always the case however, despite the provision and advertising of healthier choices, and Steenhuis et al. found those who were aware of a high fat intake were more likely to purchase healthier options.⁵¹² At present there is sparse research that investigates the physical environment in New Zealand workplaces with regards to access to healthy food or the provision of cooking facilities, and its relationship with decisions around lunchtime food consumption.

2.3.2 Attributes of the social environment associated with health behaviour

Environmental support necessary for a healthy, productive worker is not limited to physical aspects of the workplace (such as the provision of fruit to support healthy eating, or showers to encourage active commuting to work). What is equally important is the culture of the workplace, and research has shown a positive association between this supportive workplace culture and employee health, health behaviour and productivity.⁵¹³⁻⁵¹⁵ A healthy organisation is recognised as that which emphasises, supports and facilitates healthy behaviour^{486,516-518}. This is more likely to be achieved at the organisational level if those within all levels of management recognise the relationship between health and productivity, and the importance of organisational culture in mediating this link. In addition, colleague support for health behaviour is also recognised as an important predictor for engaging in health behaviours.⁵¹⁹⁻⁵²¹

Norms and values are linked to health behaviour in the workplace, and influence the level of perceived support for engaging in health behaviour. Managerial and co-worker's perceptions of health behaviour, and subsequent support impacts on employee engagement; employees participating in a walking programme at work noted that it was more difficult to exercise during the day as their manager perceived time away from the desk as unproductive time, despite reporting to the managers of an increase in energy and motivation due to increased activity.⁵²² This highlights the necessity for managerial support of health promotion if these efforts are going to be effective.⁵²³ Indeed, Hammond's intervention study included instructing managers to promote the intervention and act as role models, thus supporting in influencing employee intervention participation,⁵²⁴ Similarly, a nutrition policy promoted by management as part of the Working Well trial was effective at changing nutrition norms around the workplace, with employees reporting that they felt supported by both colleagues and managers in their efforts to choose low fat food choices.⁵²⁵ Visible norms and values related positively to healthy eating patterns in hospital-based employees, with a lower fat and higher fruit and vegetable intake found in those who perceived their co-workers supported their efforts to eat a healthy diet.⁵²⁶ These studies support earlier research conducted by Ribisl and Reischl, who found that nutrition and PA norms were positively associated with healthy diet and increased PA levels.⁵²⁷

Gilson, McKenna and Cooke found that employees at a University that instigated a walking programme which included frequent follow up and monitoring felt their efforts were being recognised by the institution. Further, the provision of resources such as pedometers provided them with tangible evidence of support from their employer.⁵²² The same study found that some participants reported that negative attitudes from colleagues who did not view walking at work as 'normal behaviour' made it difficult to engage,⁵²² whereas employees were two and a half times more likely to be physically active when the opposite was true,⁴⁹⁸ aligning with the findings of previous studies of the importance of social support for engaging in health promoting behaviours.⁵²⁸ Finally, Linnan and colleagues found worksites less accepting of smoking behaviour had a lower overall smoking prevalence in their investigation of manufacturing worksites.⁵²⁹

There is a plethora of research that exists to suggest how the workplace culture as a whole can impact on employee psychological distress and overall wellbeing. Employees in Peterson's research highlighted manageable levels of stress as a key factor for a healthy work environment,⁵¹⁴ and Steinhardt reported that lower job stress related to increased job satisfaction, thus a more favourable perception of the work environment as a whole.⁵¹⁵ Perceived social support within the workplace was one of the key predictors of stress levels in Guillent et al.'s and Parke's research of psychosocial factors and health outcomes.^{520,530} While very little research has been conducted on the association between the culture of an organisation related to healthy behaviour and psychological distress, Ribisl and Reischl who found that perceptions of a health climate in the workplace were negatively impacted by job stress.⁵²⁷

A positive relationship has also been found between a supportive workplace environment and work performance.^{106,531} Supervisor support was significantly associated with presenteeism in Caverley and colleagues research of work factors and worker productivity, and had a larger impact on presenteeism than absenteeism.⁵³¹ A lower level of social support from colleagues was correlated with an increase in presenteeism over time, and the social climate of the workplace was significantly associated with both presenteeism and absenteeism for employees in Karlsson et al.'s study of psychosocial work factors, employee health and productivity.¹⁰⁶ They found that this relationship was mediated by employee health.

There is a dearth of literature that evaluates the additional impact environmental changes in the workplace can have on reducing health risk, though one large-scale obesity prevention programme that instigated environmental changes found little effect on weight loss after increasing awareness of healthy food over a two year period, when combined with an individual weight loss programme.⁴⁴⁰ The authors concluded the environmental changes were of a low intensity nature, and suggest it is the intensity of the changes which will influence the extent to which health outcomes can be improved.⁵³² The provision of healthy food in a vending machine, for example, might

only make a difference if the unhealthy food options become less available and thus the choice is removed. The links between physical attributes and health behaviour are clearly important in terms of employee health. For employers though, it is necessary for the resulting behaviour changes to positively affect productivity in order for them to see a benefit in making sometimes quite costly changes in the workplace environment. For those employers paying healthcare costs of their employees, this can be quantified, and indeed the research in this area is quite convincing that a workplace health promotion programme that is successful at changing employee behaviour can also reduce employer medical expenditure.¹⁴ As already mentioned, there is less research that investigates if changing the environment and policy will result in improved employee productivity and cost-savings to the employer. In addition, any environmental research here is likely to be a part of a comprehensive programme with multiple components including individual level, managerial level and organisational level initiatives, making it difficult to disentangle the individual effects. The aforementioned Dow study recently implemented by Goetzel's research group has yet to publish research looking at productivity changes among their intervention groups, and differences between the moderate and intensive group to see whether there is any additional productivity improvements with environmental level intervention is the first step here.⁴⁴⁰

It is difficult to disentangle both the social and the physical environment and the impact these have on encouraging behaviour, as it is likely to be an integration of the two which will have the greatest effect.⁵³³ For example, the presence of increased information around nutrition through physical environment changes, along with nutrition policies in the workplace, is likely to increase awareness and discussion of healthy eating among employees. This in turn creates a supportive culture around healthy eating and subsequently can work to improve or encourage already healthy nutrition habits. This relationship therefore further points to the importance of a multi component workplace health programme that includes interventions within all levels of the workplace as likely to be most effective for behaviour change and subsequent increases in employee productivity.

2.3.3 Tools to measure the workplace environment

There are only a few published studies which investigate physical attributes of the workplace environment related to health behaviour⁵³⁴⁻⁵³⁶ and fewer still that look for relationships between the two variables. This is perhaps unsurprising given the field of environmental research is in its infancy with respect to relationships to health behaviour.⁵³⁷ Nonetheless, the environment tools that do exist are based on subjective measures, and an individual's perceptions of the environment, or a physical audit of structural attributes of the workplace and surrounds that potentially inhibit or facilitate healthy behaviour. The Checklist for Health Promoting Environments at Work (CHEW) instrument is a 112 item checklist that measures health promoting characteristics of the work environment by direct observation, and in testing was found to have acceptable interclass correlation coefficients between 0.8-1.0.⁵³⁴ It has been used to examine the physical environment, information environment, and features of the surrounding neighbourhood environment with respect to PA opportunities, healthy food choices, alcohol consumption and smoking policies within and around the workplace.^{534,538} The physical environment of the workplace refers to features such as elevator access, kitchen facilities, showering facilities for employees and availability of healthy food options that are associated with healthy behaviour. Health promoting messages via posters, emails and company intranet are assessed as part of the information environment, and the availability of PA spaces, and healthy food options within walking distance are two examples of what is measured as part of the surrounding environment. The CHEW was designed to provide a description of behaviour-specific observable features of workplace environments, and to enable comparisons across different workplaces.

An adaptation of the CHEW tool, called the Environmental Assessment Tool (EAT), was developed to measure the workplace environment specifically for physical and social-organisational attributes related to obesity and nutrition.⁵³⁹ The 105 question scale is divided into three areas; the PA scale assesses access to and availability of car parking and facilities for securing bicycles; stairs and elevators; showers and changing facilities; signage and bulletin boards containing messages pertinent to PA; and PA and fitness

facilities.⁵³⁹ The nutrition scale focuses on vending, cafeteria, and other food service options and facilities, and signage and bulletin boards pertinent to diet and weight management. Characteristics of the organisation that were assessed include work rules, written policies, and existing health promotion programming and services.⁵³⁹ Aside from the focus on obesity as opposed to the overall health promoting factors of the workplace, the prevailing difference between the CHEW and the EAT tools is the inclusion of organisational attributes related to support for PA and nutrition. In addition, the pilot testing of the EAT tool found good predictive ability for employee absenteeism measures based on environmental characteristics when used for formative evaluation purposes.⁵⁴⁰

Beresford and colleagues modified the CHEW tool and assessed the impact of changes to environmental characteristics of a workplace from baseline to two years follow up in their intervention in 35 small-to-medium businesses.⁵⁴¹ They found significant improvements in the PA and nutrition information environment only, and no discernable changes occurring in the physical environment or the organisational environment. They pointed out that it is likely over time, with the messages of being physically active and eating healthier being more salient, the increase in numbers doing this might increase the demand for bike storage provisions, healthier vending machine and improved stairwell interiors, thus forcing change in these areas which require more of a cost outlay.⁵⁴¹ Furthermore, Pronk and Kottke outline the essential principles that should be encompassed for an effective health promotion programme in the workplace, and recommend starting small to assess sustainability and uptake of PA programmes.⁵⁴²

There have also been research groups which have developed audit tools to specifically measure the workplace environment support for PA. Blunt and Hallam report on the development of the Worksite Supportive Environments for Active Living Survey, designed to measure the perceived physical and organisational support for PA addressing seven domains across 28 items.⁵⁴³ The domains include perceptions of the outdoor environment, the social environment, the information environment for both structured and lifestyle activity, the indoor fitness facility environment and the transit

environment. Testing of this instrument found it to be a reliable and valid measure of the perceived PA environment, but has yet to be utilised in a research setting.⁵⁴³

Dannenberg and colleagues described the development of a walking tool to measure the potential for active recreation at lunchtime and around work hours.⁵⁴⁴ Though tools to measure community walking routes have been designed previously, these focused more specifically on children and traffic speed and volume, rather than the needs of those in the work environment.⁵⁴⁴ Features measured on this tool included pedestrian facilities, pedestrian-vehicle conflicts, crosswalks, route maintenance, walkway width, roadway buffer, universal accessibility, aesthetics, and shade as important factors for increasing the likelihood of walking.⁵⁴⁴ While this tool has been used in a multisite comparison of walking route attributes and the possible environmental support,⁵⁴⁵ as yet there is no published research that has used the ‘walkability’ audit to investigate the association between these factors and PA levels in the workplace.

Tools assessing the environment are most useful for the planning and evaluation of a workplace health promotion programme, to assess what feasible changes are able to be made to the existing structures to facilitate healthier PA or nutrition behaviours. Parker et al. were able to detect environmental changes in the workplace after one year when assessing pre and post-intervention EAT scores. While it would be a useful investigation to assess if there is any relationship between health behaviour and the environment, as has been found in the wider community setting, the few studies investigating this have not found any meaningful associations between the two.^{535,546} Nigg and colleagues found no logical association between environment attributes measured on the CHEW and BMI among employees working in the hotel industry⁵⁴⁶ and there was no association between health behaviour outcomes and physical environment attributes measured using the EAT tool after a one year weight management intervention.⁵³⁵ Research in the school environment has found associations between food availability and food intake, though this setting is not necessarily comparable, given that school lunch programmes dictate access to food choices, and children are restricted by overarching rules which may prevent them from leaving school during school hours.⁵⁴⁷

Perhaps sub-group analysis of results would reveal more of an intervention effect, and future analysis might (for example) look specifically at those people who choose not to bring their lunch from home. Another explanation for a worksite environmental tool being unable to predict health behaviour or intervention success on health behaviour could be due to workforce stability. Adults often move places of employment throughout their working career. Any intervention effect in the long term may be diluted by this transient workforce and indeed, a limitation of the intervention study for which the EAT tool was designed for found marked differences between the demographic variables of the original cohort of employees compared to those in the follow up data collection.⁴⁴⁰ Health behaviours take time to change, and a cross sectional analysis, or a relatively short follow up period may not be captured by the attributes measured on an environmental audit tool. Finally, when a workplace is situated in a geographical location where there is ready access to healthy food options and PA opportunities, the workplace environment is likely to exert less of an influence on behaviour. Though both worksite specific tools measure the surrounding environment, transport options may increase access to more opportunities, making the work environment less of a salient factor.

A recent review of nutrition environmental interventions points to gaps in the research that need to be addressed including policy and environmental changes.³⁰⁸ Intuitively, the policies associated with healthy eating and PA can affect behaviour, and indeed workplace policies that include paid time off for PA have been found to be positively associated with being active,⁴⁹⁸ at this stage there is no research which shows the efficacy of policies governing healthy food in the workplace. Further, Sorensen points to the need to develop policies which address the differing needs of small versus large workplaces, given barriers related to infrastructure and physical environment create distinct challenges in both settings²⁹⁰ and work with food vendors to establish best strategies.

2.4 Summary

As the review of literature outlines, there is a plethora of research that identifies how modifiable health behaviours contribute to health risk which, over time, reduces productivity in the workplace. There is also convincing evidence of the impact that the physical and social environment has on employee health behaviour and productivity. However, there are just a handful of studies that have linked health outcomes and the workplace in the New Zealand context and none that have investigated work related outcomes. In order to advance the field of health and productivity management, these concepts need to be examined in the local setting.

Chapter 3. The development of a New Zealand-specific health risk assessment tool

3.1 Preface

The literature review in Chapter two outlined the health-related factors and environmental attributes that contribute to poor employee health and reduced productivity in the workplace. It is important to measure these factors in an organisation to be able to implement a workplace wellness programme that targets health risk factors specific to the employees. Monitoring changes to the risk factors and productivity over time gives an indication of the programme's effectiveness; not only with regards to improving health behaviour, but also whether the investment in a programme can improve employee productivity. The ability to compare this information to population health data is useful from a company perspective as it will help draw parallels with population health messages. The company can then tap into existing resources targeting health behaviour and increase the cost-effectiveness of their programme. While there are a number of tools to measure employee health and productivity, prior to this thesis there was no instrument available to measure these in the New Zealand context that could also be compared to population health data. The purpose of this chapter is to summarise the role that an HRA tool has in the context of a workplace health promotion programme, discuss the advantages and disadvantages of using an HRA in the workplace and explain the development of an HRA that is specific to the New Zealand environment.

3.2 Introduction

An HRA is a screening tool used in the workplace health context as a key element in developing and evaluating wellness programmes. It is a systematic approach whereby health behaviour and risk factor information is collected from individuals and interpreted to identify risk of poor health. The HRA has evolved from a traditionally medical-based process by which very little information about behaviour was collected alongside an extensive physiological screening regime, historically designed to measure risk of CVD in employees.¹⁵ As awareness of the effects that lifestyle choices have on the development and prevention of chronic disease grew, HRAs developed into an

assessment focusing less on the biomedical outcomes (such as blood cholesterol and BP measurement) and more on whether employees are meeting public health lifestyle recommendations designed to reduce chronic disease risk.⁵⁴⁸ An HRA is administered to employees in the form of a self-report questionnaire that typically includes questions related to PA levels, smoking status, nutrition, sleep patterns and stress levels. In addition, self-report measures of productivity such as absenteeism and work performance can also be incorporated, and are becoming increasingly useful as more and more of the workforce is situated in the knowledge based economy where productivity cannot be measured by more tangible outcomes such as units per hour. Awareness of the importance of the psychosocial environment on employee health and productivity has also resulted in the inclusion of scales related to an individual's perception of the culture and work satisfaction.

There are a number of advantages to using an HRA over medical screening. An HRA is a cost-effective tool that can be administered in a workplace through existing communication channels. It can be delivered online through an email, the organisation intranet or via a website, enabling it to be delivered to all employees with computer access regardless of company size. It requires fewer resources and data can be collected electronically, creating a database of employee health information that establishes a risk profile for the company. An advantage at both the individual and the company level is that it can be used as an intervention tool. It has the ability to provide participants with immediate, tailored feedback based on their overall health risk, a strategy that has been found to be more effective when encouraging health behaviour change, particularly when behaviours are prioritised according to level of risk.^{486,549} In addition, as it is based on behaviour and not biometric measures, participants may better relate to the feedback provided, as it connects more to what they do on a day-to-day basis.

At a company level, the information collected can be used to provide baseline data of the proportion of individuals who fall into a high risk category. This can be related to productivity measures such as absenteeism and work performance (which may be company collected data or based on employees' accounts) and can help inform the

design of a workplace wellness programme that targets the health behaviours that most need addressing. Furthermore, a comprehensive HRA will also enable employees to indicate what they would include in their wellness programme. Being involved in the development increases the sense of ownership they feel towards the programme and increase employee participation.⁴⁸⁶ Information around employee perceptions of the psychosocial environment will alert employers to opportunities for improving workplace culture and fostering a supportive setting which is important for behaviour change.⁵¹⁸ It can also help with the identification of high risk individuals who might need additional screening and/or disease management services and, particularly in the US and Canada where employers are responsible for paying for the medical care costs of their employees, it is useful at the health policy level for companies to be able to tailor health plan services to the needs of their employees.⁵⁵⁰ Finally, when administered multiple times throughout the programme, it can be used as an evaluation tool to identify the success of individual programme components and the overall wellness programme at reducing employee health risk and improving productivity.

As with any self-report data, there are limitations to using an HRA over other data collection methods. Though it covers a wide range of health behaviours and other information, by necessity it is both broad and brief as it is typically administered in the workplace and in work time. It is therefore unable to collect information that is as comprehensive as a qualitative interview or physiological screening. Despite strategies which are put in place to help increase the response rate, those most likely to complete an HRA will be the 'worried well' (those in good health who seek unnecessary treatment or advice) and people contemplating health behaviour changes.⁵⁵¹ So while the workplace offers a setting that is able to target individuals often missed by other health promotion campaigns, identifying the needs of those at greatest risk can still be a challenge. This can also bias the aggregate health risk data of the population towards a healthier profile that does not accurately depict the employee population as a whole.¹⁵ Regardless of these limitations, research shows that it is a worthwhile investment for employers to help maintain the health status of an already healthy employee, with

research showing that it is costly for these healthy employees to move from low into the moderate risk category.⁵⁵²

There are a number of HRAs that have been developed and employed to inform the design of workplace health programmes and to evaluate their effects on health behaviour and productivity.⁵⁵³⁻⁵⁵⁵ While these tools are not country-specific per se, the questions used are those drawn from population surveys of the country they were developed in. Thus, while question comprehension has extensively tested in that particular population, terms used and foods included may be more meaningful in its original setting. In New Zealand, there was no instrument developed that was specific to the local environment to assess individual health risk and its relationship to workplace productivity measures. It is useful to both the public and private sector for the HRA data to be comparable to national health data; asking questions already used in population surveys (e.g. the New Zealand Health Survey²⁶) enables this to occur. Likewise, assessing how the health behaviour of the employees aligns with public health messages such as sufficient PA and maintaining a healthy weight is useful for the formative stages of the programme. These comparisons can help the company build a cost-effective wellness campaign around existing resources that are publicly available where appropriate. From a public health perspective, having data that are comparable to available population data can help build a case for workplace wellness programmes in New Zealand. Reducing chronic disease risk in any setting is going to reduce stress on the already burgeoning publicly-funded health system. In the long term, comprehensive workplace wellness programmes that are successful at reducing health risk in the population will reduce the cost to the public health system. However, these benefits need to be salient to both businesses and the government. From a business perspective, a healthier workforce is linked to a more productive workforce, and the return on investment for a workplace health programme has been estimated to be up to four times the initial financial outlay.^{12,556} Further, there is a financial benefit for companies to track productivity data against national health goals. A comprehensive wellness programme has the potential to reduce population level risk behaviours that are targeted by population health messages. Evidence of this strengthens the case for policy changes in favour of businesses investing in workplace

health, as seen in countries such as Australia and the US.⁵⁵⁷ In New Zealand there are currently no company tax benefits for implementing a wellness programme; policy changes may make it more attractive for them to do so. Convincing evidence for workplace health promotion needs to be accrued, and a New Zealand-specific HRA tool is the first step in this process.

3.3 Methods

HRA development

The survey was designed not only to measure health behaviour risk factors and productivity, but also to consider opportunities for workplace intervention. The domains that were included are found to impact on both health and productivity in the workplace, and encompassed the main population risk behaviours as outlined in the New Zealand Health Survey.^{26,377} Along with measuring individual behaviours and productivity, including a scale that measured the culture of the workplace was also deemed important given the aforementioned links between productivity, health and the psychosocial environment.

The first step was to conduct a literature review to ensure items that were relevant to health and workplace productivity were included. Initially computer database searches (Expanded Academic ASAP, Medline (OVID), ProQuest 5000 International, Science Direct, Sage Full Text Collections) were conducted for articles in the English language literature published between 1980-2007. Key words used for searching included: PA tool, employee, evaluation, health, nutrition, stress, productivity, absenteeism, presenteeism, sleep, occupation, PA, culture, workplace, and worksite. Abstracts were assessed for appropriateness and the bibliographic references of included papers were searched to ensure all available literature was covered. In addition, the grey literature was explored for relevant information and the aforementioned keywords were searched in Google Scholar for additional literature. International websites such as the Public Health Agency of Canada's Active Living at Work, Centers for Disease Control and Prevention's (CDC) Workplace Safety and Health and the World Health Organisation

online publication library were investigated for publications relating to workplace health. Where applicable, threads were followed. Along with the literature review, a consultation process was undertaken with both industry and academic experts in the fields of public and workplace health. A number of questions were drawn from relevant validated instruments^{26,553-555,558-561} and where necessary, others were developed based on practical experience and research knowledge of those involved in the consultation process.

3.4 Results

Survey items

Outlined below are the domains included in the questionnaire, with a description of where they were derived from. In order to encourage HRA uptake the help of a software company was enlisted to create a system which would administer the HRA and be able to provide immediate feedback once participants had completed the questionnaire. Screen shots, such as the welcome page below (Figure 3-1) are included to illustrate the HRA online platform. The full questionnaire can be found in Appendix C.

- Nutrition
- PA
- Psychological distress
- Sleep patterns
- Alcohol
- Smoking status
- Weight status
- Chronic conditions

- Family history of health conditions
- Productivity
- Workplace culture

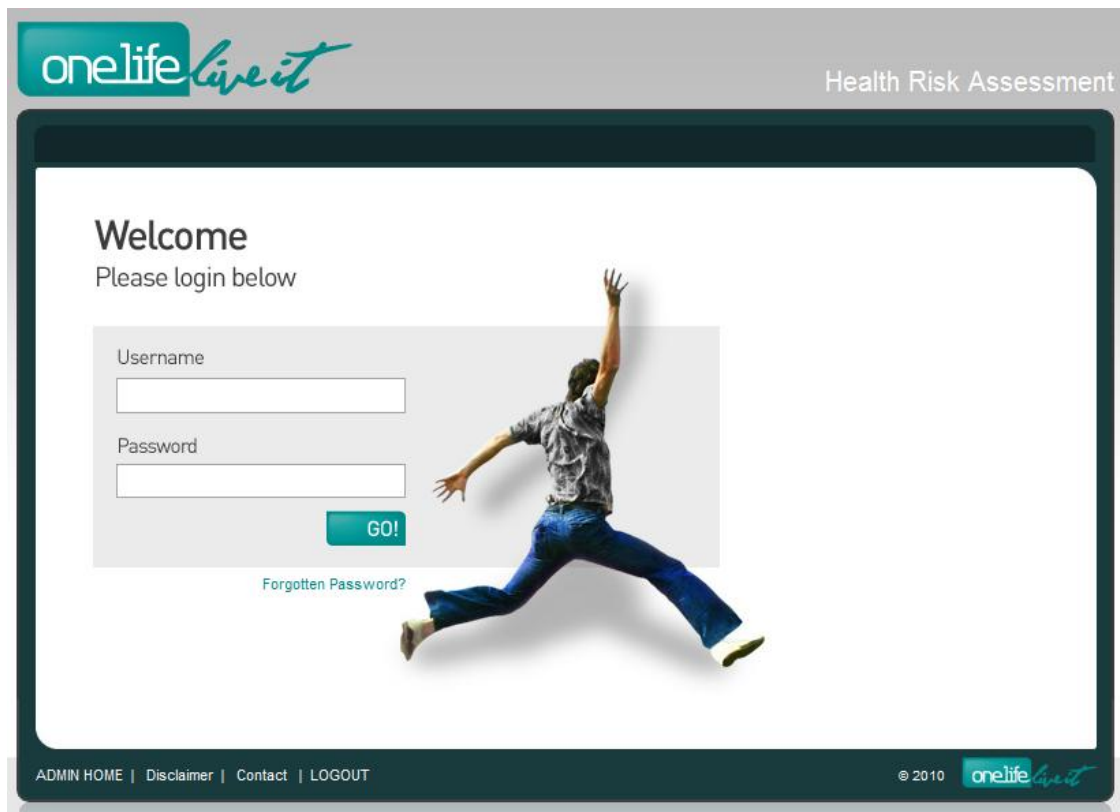


Figure 3-1: Welcome page of the HRA.

Nutrition

Participants were asked to report on four patterns of nutrition behaviour. Fruit and vegetable consumption was assessed separately using validated questions from the nationally representative New Zealand Nutrition Survey.²⁷¹ Participants were asked how many servings of vegetables and fruits they consumed each day over the past seven days.²⁷¹ Those that reported meeting the recommendation of three servings of vegetables and two servings of fruit were categorised as meeting the recommendations for a healthy diet.⁷ The number of serves of sugary beverages consumed by participants per day was assessed using an item from the National Nutrition Survey,²⁷¹ due to the increasing

population consumption of these beverages that has occurred at the same time as increasing obesity prevalence.²⁶⁵ Finally, as skipping breakfast is related to a poorer nutrient profile, a reduced ability to concentrate, and an increased risk of overweight, a question concerning breakfast consumption during the working week was also included.^{299,562}

Physical activity

The New Zealand Physical Activity Questionnaire Short Form (NZPAQ-SF),⁵⁶³ which has been widely used in national surveys and other published research, was used to describe the PA patterns of the respondents. This questionnaire has been validated in New Zealand adults aged 15 years and above.⁵⁶³ Participants were categorised as either active or inactive according to the New Zealand Physical Activity Guidelines (at least 30 minutes of moderate to vigorous PA each day on five or more days per week).³¹¹ In the first iteration of the survey, a readiness to change question was used instead of the NZPAQ-SF. The rationale for initially assessing readiness to change was to target PA promotion in the workplace at the stage of readiness most appropriate for the target audience. However, the pilot study data showed the use of one question, while having the advantage of taking less time, was not as useful as knowing actual duration and frequency of activity. In addition, a question relating to occupational sitting time was included as those who sit for more than 300 minutes a day have increased odds of having a BMI greater than 25 kg/m², even when reporting PA equal to the recommended levels.³⁴⁹ Questions related to stair usage and walking to and from meetings were developed by the academics and practitioners in the field of public health and workplace health to reflect the occupational demographic of the respondents. These characteristics are also able to ascertain the relevancy of health initiatives promoting increased activity in the workplace which, when implemented, have been found to be successful at increasing PA of employees.⁵⁰² How people choose to travel to and from their place of work can have significant environmental, economic and individual health implications, with the decline in PA levels and subsequent increase in chronic health problems related to decreasing active transport methods.⁵⁶⁴ Questions related to transport-related PA

patterns were adapted from a published tool⁵⁵⁸ to determine the percentages of participants engaging in active transport.

Psychological distress

The Kessler-6 (K6) scale of non-specific psychological distress was included⁵⁵⁴ in the HRA. The K6 is a six-item questionnaire developed to screen for broadly defined mood and anxiety disorders rather than a specific disorder and as such the questions are of a non-threatening nature. It can identify individuals at risk of mental health disorders such as anxiety and depression and shows appropriate validity for the study population, with a score of 0.89 (confidence intervals (CI): 0.88,0.90) when accuracy was measured using receiver operating characteristic (ROC) curves.⁵⁶⁵ Further, it is included in its longer form in the New Zealand Health Survey.²⁶ The K6 asked participants to consider how often over the previous 30 days they felt worthless, hopeless, as if everything was an effort, nervous, restless, and that nothing could cheer them up. On a scale of 0-4 they are asked to report how often they have felt this way, from none of the time (0) to all of the time (4). Previously published methods were used to group individuals into low levels of psychological distress (0-7), moderate levels of psychological distress (8-12), and high levels of psychological distress (13-24).⁵⁶⁵

Sleep patterns

There were no short scales to assess sleep patterns that have previously been used in the New Zealand context, and after consultation with experts in the field of sleep research, four questions were included to measure quantity and quality of sleep (Gander, P, personal communication, February 2007).¹⁰⁹ Three of these questions, modified from a questionnaire designed for a workplace wellness programme and validated in a similar working population,⁵⁵³ asked participants to report how often they experienced waking early, difficulty falling asleep and difficulty staying asleep. A fourth sleep question was added and asked participants if they had ever been told that they snored, as snoring can be indicative of sleep apnoea.⁵⁶⁶ Figure 3-2 is the screenshot of the sleep questions on the computer platform, and is included as an example of how the HRA questions appear online.

Logged in as Mikki Williden | My HRAs | Logout STEP 6 of 8

Sleep Behaviours

The next questions ask about your typical sleep patterns.

During the past 4 WEEKS, how much of the time did you have a problem with falling asleep?

During the past 4 WEEKS, how much of the time did you have a problem with waking up frequently during normal sleeping time?

During the past 4 WEEKS, how much of the time did you have a problem with waking up too early?

According to what others have told you, how often do you think you snore?

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Figure 3-2: The sleep questions as they appear online in the HRA.

Alcohol

Due to time constrictions, drinking patterns were assessed with just one question, and after consultation with public health researchers regarding the most appropriate question to use, participants were asked to record the number of alcoholic drinks they typically consumed in one sitting. Binge drinking behaviour was defined as more than four drinks in a sitting for females and six drinks for males.⁵⁶⁷

Smoking status

Participants were asked whether or not had smoked fewer than 100 cigarettes in their life, and if they were smoking now, every day, or every few days. Those that had smoked less than 100 cigarettes in their lifetime, or who were former smokers, were grouped into the ‘non-smoking’ category. Validated questions from the nationally representative New Zealand Health Survey²⁶ were used to assess both drinking and smoking behaviours.

Weight status and health conditions

Weight status was assessed by asking participants to state their height and weight, from which BMI was calculated as weight divided by squared height. Those reporting a BMI of 25 kg/m² to 29.9 kg/m², or 30 kg/m² or greater were categorised as overweight or obese respectively.³⁸⁴ The presence of certain health conditions, known to effect workplace productivity, was included in the HRA. Thirteen conditions were included and participants were asked to comment on whether they had been diagnosed or received treatment for these within the past six months. In addition, given that family history of some health risk factors can predispose individuals to increased risk of chronic conditions and chronic disease, participants were asked to report on family history on nine health conditions. The health conditions are listed below, with an asterisk denoting those asked in the family history question.

- Anxiety
- Arthritis*
- Asthma, bronchitis or emphysema
- Back or spinal problems*
- Cancer*
- Chronic fatigue syndrome*
- Depression or bipolar disorder*
- Diabetes*
- Heart disease*
- High blood pressure*
- High cholesterol*
- Migraine headaches
- Sinusitis or allergic rhinitis (hayfever)

Productivity

Productivity was assessed using questions on absenteeism and work performance that were extracted from the WHO Health and Productivity Questionnaire (HPQ).⁵⁵⁵ Briefly, absolute absenteeism was quantified by subtracting the number of hours employees worked in the previous four weeks from the number of hours their employer expected them to work during a four week period. Relative absenteeism divided by the absolute absenteeism value by the expected hours of work and was expressed as a percentage: a negative value indicated extensionism (working longer hours than expected) and a positive value conveyed absenteeism. The measure of absolute work performance required employees to report their own performance over the past 28 days on a scale of 0-10, which was converted to a percentage from zero (a complete lack of performance) to 100 (on task all of the time). Relative work performance required employees to rate the average worker in a position similar to theirs on the same scale, and this value was divided this by the absolute work performance value. The values were delimited to between 0.25-2.00. These questions have been validated and widely used as a part of other HRAs in similar populations to assess self-reported productivity.⁵⁵⁵

Workplace culture

The culture of the organisation has been found to be an important determinant of employee engagement in health behaviour and health initiatives in the workplace⁵¹⁸. Specifically, colleague and manager support for healthy eating and PA, in an organisation which implicitly values employee health through policies and procedures can positively influence health behaviour adherence.⁵¹⁸ The health culture of the organisation was assessed using the Lifegain Healthy Culture Audit (LHCA) short form, a 23-item questionnaire that was developed specifically for the workplace environment and investigates five constructs of the workplace culture in relation to health behaviour⁵⁶¹: (1) 'Cultural norms' refer to the boundaries around expected and accepted ways to behave related to health issues; (2) 'Cultural values' relate to the collective beliefs associated with the importance of health; (3) 'Social support' refers to the amount of informational, emotional and instrumental resources a co-worker gives to another regarding a personal health issue or initiative; (4) 'Organisational support'

measures the services, policies and facilities provided by the company to encourage employees to partake in healthy behaviour; and (5) 'Organisational climate' is the employees' attitudes, feelings and perceptions of workplace social and structural support that influences individual health behaviour change, and is transient in nature.⁵⁶¹

Participants are asked to rate their level of agreement from 'strongly agree to strongly disagree' with statements relating to the five constructs.⁵⁶¹ The instrument has been tested for validity within a similar working population.⁵⁶¹

Other items

In addition to the above, the HRA also included questions related to demographics, hours worked, travel to and from work, occupational sitting time and location of workplace so that data related to workplace location and health behaviour could be matched to physical environment information that was also collected as part of the overall doctoral research.

Pilot testing

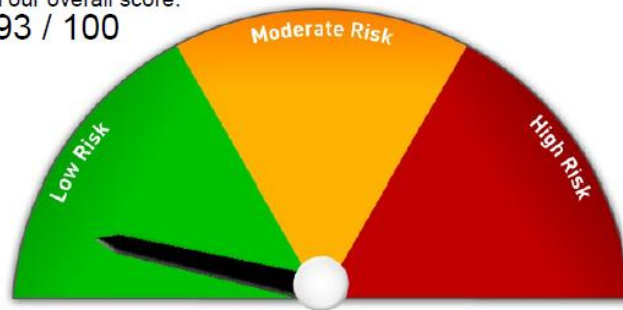
Once developed, the questionnaire administration and roll out was pilot-tested in a convenience sample of 20 adults of working age (12 female, eight male, aged 22-53 years) who were similar to the target population of a professional working group with easy access to a computer during their work day. This was to assess for comprehension and length. This feedback resulted in minor changes to the appearance of the questionnaire on the online survey tool, but, other than those mentioned previously regarding PA, no changes were made to the length or the wording of the questionnaire.

3.5 Scoring and feedback

An HRA typically calculates an overall health score based on participant responses to the health domains (as illustrated by Figure 3-3). This enables individuals to quantify their risk based on behaviour and provides them with a tangible result with which they use as a baseline to measure the success of any changes. This is seen to be particularly

important for younger employees who may have poor health habits, but have not yet accumulated significant risk factors that could motivate them to make behaviour changes¹⁵. An overall score however can be misleading, and a behaviour which places an individual at high risk (such as smoking) may be negated by good scores in other health domains. Therefore, presenting a separate score for each domain and providing feedback can give a clearer picture of actual health risk. Some HRAs choose to calculate a 'biological' or 'risk factor' age based on a method used in gerontology research, whereby algorithms are used to determine the number of years either lost or gained due to the presence or absence of a risk factor. While there are strengths and limitations to each scoring method, it must be acknowledged that individual factors not measured by the HRA, or the clustering effect of certain risk factors influence a person's health status in ways that are not able to be measured by a self-report questionnaire. The main function of assigning a score is for the purpose of motivating individuals to alter their behaviour and not to quantify risk for medical purposes. This HRA, therefore, not only provided an overall score and risk category, each health domain was presented separately with recommendations for behaviour change. Table 3-1 outlines the scores allocated to each health domain.

Your overall score:
93 / 100



Score	Rating	Comment
0 - 32	At Risk	You are at high risk of developing a number of illnesses. Changes to your current lifestyle are needed. We recommend you consult your doctor within the next 2 weeks.
33 - 50	Poor	You are at risk of ill health. Changes to your current lifestyle will improve your health. We recommend you consult your Doctor within the next month.
51 - 70	Average	You could improve your current and future health by making some changes to the lifestyle choices you are making. Consider reviewing the responses you made in this health risk assessment with your Doctor.
71 - 85	Good	You maintain a healthy lifestyle most of the time and are aware of your own wellbeing.
86 - 100	Excellent	Great result! Your current lifestyle is adding years to your life and life to your years.

Figure 3-3: Overall score and risk category as illustrated by the HRA feedback.

For the purposes of feedback, scores in each domain were divided into low, moderate and high risk categories and colour coded green, orange and red respectively as a simple representation of a participant's status within that domain (as can be seen in Figure 3-4). A brief description of the health significance of the domain was given, and feedback was structured around two to four simple strategies for improving behaviour if participants were classified in the moderate or high risk categories. Encouragement for maintaining behaviour was provided for the low risk category and all suggestions were based on recommendations and ideas already salient in the company health initiative or from well known public health campaigns as a way to strengthen already familiar messages. Targeting it to the participant's level of risk and providing simple ideas were key features of the feedback in order to provide relevant information and to increase self-efficacy around adopting some of the strategies⁵⁶⁸. Links to reputable websites were included where necessary to direct participants to more information.

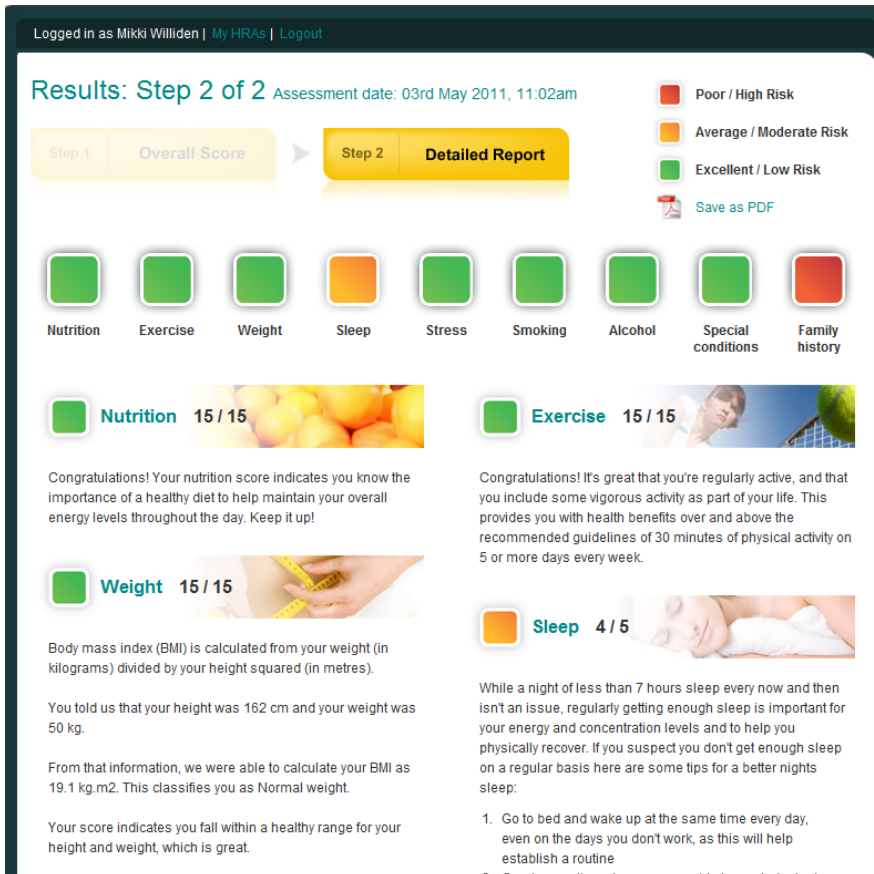


Figure 3-4: Scores and risk category for individual health domains on the HRA.

Table 3-1: Scoring allocation and category cut-off for the nine health domains

Health domain	Survey items	Maximum score and score breakdown	Level of risk
Nutrition	Vegetable consumption Fruit consumption Sugary beverage consumption Breakfast consumption	15 Each question worth 3.75 pts	Low ≥ 10 Moderate 7.5 – 9.9 High < 7.5
PA	SPARC guidelines for activity ³¹¹	15	Low ≥ 10 Moderate 7.5 – 9.9 High < 7.5
BMI	WHO guidelines for weight classification ³⁸⁴	15	Low 15 Moderate 7.5 High ≤ 5
Smoking	Smoker or non smoker	15	Low 15 High 0
Sleep	Waking too early Waking during night Difficulty falling asleep Snoring	5	Low > 4 Moderate 1.26-4 High ≤ 1.25
Psychological distress	K6 scale ⁵⁵⁴	10	Low ≥ 8 Moderate 6-7.9 High < 5.9
Alcohol	ALAC guidelines ⁵⁶⁷	10	Low 10 Moderate 5-7.5 High ≤ 2.5

Health domain	Survey items	Maximum score and score breakdown	Level of risk
Chronic conditions	13 health conditions <ul style="list-style-type: none"> • Anxiety • Arthritis • Asthma, bronchitis or emphysema • Back or spinal problems • Cancer* • Chronic fatigue • Depression or bipolar disorder* • Diabetes* • Heart disease* • High blood pressure* • High cholesterol* • Migraine headaches • Sinusitis or allergic rhinitis (hayfever) 	10 points (subtract 2 or 1 for every reported, to a maximum of -10)	Low ≥ 8 Moderate 5-7 High <7
Family conditions	9 conditions <ul style="list-style-type: none"> • Arthritis • Chronic fatigue syndrome • Back or spinal problems • Cancer* • Depression or bipolar disorder* • Diabetes* • Heart disease* • High blood pressure* • High cholesterol* 	5 points (subtract 0.5 or 1 for every reported, to a maximum of -5)	Low ≥ 5 Moderate 3-4.9 High <3
Total	9 Domains	100	Low $\geq 70-100$ Moderate 50-69.9 High <50

* Chronic conditions and family conditions with 2 or 1 subtracted from score respectively

Scoring methods

From the nine health domains measured, an overall score of 100 was assigned as the maximum HRA score. Nutrition, PA, BMI and smoking were each allocated a score of 15, based on the strength of available evidence of their association with chronic disease risk as informed from the Ministry of Health Burden of Disease report.¹ The scoring system is outlined in Table 3-1 above.

The four nutrition questions were allocated a score of 3.75 each. The number of points distributed within the questions differed according to the number of choices provided. For vegetable consumption, each serving reported scored 0.94 (for less than one serve per day to two serves per day), for a maximum of 3.75 if eating three or more servings. Fruit consumption was allocated 1.25 points per serving for less than 1 serve per day, 2.5 points for 2 serves per day and 3.75 for reporting two or more serves per day. Scoring for breakfast consumption and sugary beverage consumption was similar, though as there are no public health guidelines for these behaviours, the more favourable options were allocated maximum points. These were summed to give an overall score of 15, and then recommendations were made based on the lowest scoring question. If there were questions that participants scored equally low on, feedback was prioritised in the order of vegetables, fruit, sugary beverage and breakfast respectively, and focusing on behaviour change in just one area was preferred to avoid overwhelming participants with information.

Participants were scored in the PA domain according to the PA classifications as specified by the Active New Zealand Survey.³¹¹ Those who were sufficiently active and included vigorous activity during their week scored the maximum 15 points allocated to this domain. Those who were sufficiently active but did not include vigorous activity scored 10 points, and those who were insufficiently active scored five points. People who reported less than 30 minutes of activity throughout the week were classes as sedentary and as such scored no points.

Body mass index (BMI) categories were defined according to the WHO guidelines and participants who were calculated with a BMI of 25.0 – 29.9 kg/m² or 30 kg/m² and above scored 7.5 or no points respectively. Those lower than 25.0 kg/m² scored the maximum 15 points. The limitations of BMI as a true representation of individual health risk were acknowledged in the feedback for the moderate to high risk categories, and participants were encouraged to seek further information if they felt that their BMI accurately reflected their weight status.

Participants who were categorised as smokers scored no points in this section, and non smokers scored the maximum 15 points. For smoking, only two levels of risk were presented, and links to Quitline⁵⁶⁹ and the company's Employee Assistance Programme (EAP) were included in the high risk category feedback. Feedback for this section was not based around the harmful consequences of smoking, which are well known in the public sphere, but instead focused on the positive aspects of becoming a non-smoker.

In the sleep category, each of the four questions was allocated 1.25 points for a maximum score of five points based on the participants' reported sleep patterns. The cut-off between the low, moderate and high risk categories was determined by summing together possible responses whereby participants' reported that they experienced little to no sleep difficulties. The exception to this was a participants' response to the question regarding snoring. If they reported that they snored 'often' or 'always' and their overall score was above the 3.64 cut-off which would have placed them in the low risk group, their score was reduced to a maximum of 3.5 and they were re-categorised into the moderate risk group. This is due to the relationship between sleep apnoea (of which snoring is indicative of) and other, more serious health conditions.⁵⁶⁶

The number of alcoholic beverages consumed in one sitting was scored based on the Alcohol Advisory Council of New Zealand's guidelines on safe drinking practices.⁵⁶⁷ Females and males were categorised as high risk if they reported consuming more than four or six beverages in a typical session, respectively. Moderate risk was defined as

three or four drinks for females, and three to six drinks for males, and low risk was consuming less than the amounts listed above in a typical drinking session.⁵⁶⁷

Participant responses to the K6 measure for psychological distress were summed for a maximum score out of 30, and then divided by three to give a score out of 10. Though a higher score on the actual K6 instrument reflects a greater level of psychological distress,⁵⁵⁴ to be congruent with other measures on the HRA, a higher score here was indicative of lower levels of distress. Both chronic and family conditions had a scale that reduced according to the presence of a health condition. Participants started with 10 points and lost one or two points when reporting the presence of a chronic health condition, to a minimum score of zero. Conditions which result in a greater loss of quality of life or place participants at greater risk of CVD were assigned a score of negative two compared to the other health conditions investigated. These included chronic fatigue syndrome, depression, high blood pressure, high blood cholesterol, diabetes, cancer and heart disease, given the strength of evidence for their association with both employee productivity and with CVD.¹⁴ A family history of certain health conditions was allocated a maximum of five points, with half to one point deducted for a family history of conditions placing individuals at higher risk of heart disease.

3.6 Conclusion

The development of a New Zealand-specific HRA that assesses individual health risk factors and their relationship to workplace productivity measures is an essential tool as part of a comprehensive wellness programme. An online HRA designed to be completed within work time does not allow for more detailed information to be obtained regarding employee health risk, as practical constraints such as completion time limit the number of questions that can be included. However, it is a cost-effective way tool to use in the formative stages of a wellness programme to identify behaviour patterns among employees that could then be targeted for improvement through a health initiative. An HRA of this kind can also identify those high risk individuals requiring more intensive intervention. It is useful in the first instance as a motivational tool for encouraging behaviour change, and when administrated at multiple times throughout the programme,

it can be used to assess the effectiveness of initiatives that are in place.⁵⁵⁰ A New Zealand-specific HRA is important in determining health risk association with workplace productivity, as while a healthier workforce is linked to a more productive workforce, evidence of this has yet to be established in the New Zealand environment. The HRA presented here is an important step in the advancement of health and productivity management in New Zealand, to the benefit of the public and private sector alike.

Chapter 4. Is overweight, physical inactivity and not meeting fruit and vegetable recommendations linked with risk of chronic health conditions in a working population in New Zealand?

4.1 Preface

As highlighted in Chapter two, the development of an HRA to measure health risk and environmental factors that contribute to work productivity was necessary for the advancement of workplace health promotion in the New Zealand environment. Once this had been completed, implementing it in a sample of New Zealand employees to assess their health habits was a necessary (and evident) next step. Though the literature in the international context had provided background information that informed the development of the HRA, it was important to establish to what extent these health risk factors and sub-optimal behaviour patterns exist in the New Zealand working population. As the items used in the HRA are sourced from New Zealand population surveys, the tool can be used to assess the percentage of respondents who adhere to basic population health messages that minimise risk of chronic disease and compare to the known population values? This information is important from a public health point of view when assessing the most effective way to target behaviour change in the health promotion context. Linking behaviour patterns with other health conditions known to affect employee productivity begins to paint a picture of health and behaviour in the context of the New Zealand workforce, the foundation for using the workplace as a setting for health promotion. This chapter serves to establish any associations between these factors in a sample of New Zealand employees.

4.2 Introduction

Maintaining a healthy weight, being physically active and regularly eating fruit and vegetables are three of the most important health behaviours for reducing the risk of CVD and many other chronic disorders. These behaviours often exist in conjunction with one another, whereby the presence of one behaviour can promote adherence to another.^{245,570} The New Zealand Health Survey reported that over 50% of New

Zealanders are physically active, 60% eat three or more servings of vegetables and 64% meet their recommendation for the number of serves of fruit per day.²⁶ However, just one third of New Zealanders are of a healthy weight,²⁶ and international research suggests that very few individuals abide by multiple health behaviours. For example, Ford et al. reported just 6.8% of people in the US have a healthy weight, are physical active, do not smoke and eat the recommended servings of fruit and vegetables,⁵⁷¹ a similar finding to other studies.⁵⁷²⁻⁵⁷⁴ Tobias and colleagues looked at the clustering of behaviours in the New Zealand population,⁵⁷⁵ but did not include healthy weight in their analysis; thus there is no New Zealand data reporting the number of individuals adhering to more than one of these three key recommendations and thereby minimising the risk of poor health.

The lifestyle behaviours associated with chronic disease risk are not only important in terms of mortality, but are also associated with many ongoing physical and mental health conditions that significantly impact on quality of life. Physical inactivity, obesity, and poor dietary patterns are linked to musculoskeletal and joint pain, respiratory disorders,⁵⁷⁶ fatigue⁵⁷⁷ depression and anxiety^{578,579} hypercholesterolaemia and hypertension, chronic disease,^{447,580} and some cancers.²⁵⁰ The most commonly reported adverse health conditions in the New Zealand Health Survey were medicated hypertension (13%) and asthma (12%), with back and neck disorders, arthritis, and migraines also common;²⁶ however, the associations between these disorders and common lifestyle behaviours have yet to be characterised in this population.

The cost of suffering these conditions is not limited to the individual and their quality of life. Employers face increased employee medical costs, increased absenteeism¹¹ and increased presenteeism (where employees are present at work yet not functioning to their full capacity)³⁷⁵ as consequences of poor employee health. In the US it has been shown that obesity and physical inactivity drive up the insurance claim and medical costs of employees when compared to their more healthy counterparts,^{99,552} Both the US and Australia estimate obesity-related medical costs in the adult population to be in the realm of \$US30 billion and \$AUS21 billion annually.^{414,581}

The poor health of an employee is also felt in increased absenteeism;³⁶³ Australian research estimated \$AUD7 billion is lost to absenteeism due to modifiable health behaviours annually.¹³² In addition to this direct cost, a further \$AUD25.7 billion has been estimated to be lost to presenteeism per annum as the indirect cost of employees who engage in poor lifestyle habits which lead to a greater number of adverse health conditions.^{16,132} As the workplace is increasingly being utilised in New Zealand as a setting for health promotion, it is important to establish the extent to which health behaviour clusters are associated with health conditions within the New Zealand workforce, thus encouraging employer driven health promotion efforts to dually target more than one behaviour outside of the medical model. Clustering is said to occur if the observed prevalence of behaviours exceeds that of the expected prevalence⁵⁷⁵ and the clustering of behaviours has been investigated in Australia⁵⁸² and in the US,^{573,583} and in relation to existing health conditions.^{578,584} Tobias et al. reported that 29% of participants in the 2006 New Zealand national health survey had a healthy lifestyle, defined as having a healthy diet, meeting PA recommendations, practising moderate drinking patterns and being a non-smoker.⁵⁷⁵ Furthermore, while Tobias and colleagues report on particular clusters of behaviours in New Zealand, the authors did not link the clustering of the healthy weight, fruit and vegetable intake or PA to health outcomes. Though it is a nationally representative sample, we cannot comment on the relationship between behaviour clusters and overall health risk for the participants. Thus, the aim of this study was to first; report the prevalence of individuals adhering to three health behaviours and the degree to which these behaviours cluster within this population, and second; to investigate the associations between specific clusters of behavioural risk factors and risk of health conditions in a working population.

4.3 Methods

Participants

Participants were employees of nine organisations invited by email to participate in an online HRA. The organisations included both public and private sector companies, and

included companies from engineering, insurance, IT, advertising, and a law firm. The organisations were recruited due to the nature of their core business requiring employees to be predominantly computer-based. Organisation size ranged from 72 to 994 employees, and the number of worksites within each ranged from a single worksite to 23 different locations across New Zealand. Email invitations were sent to 3,438 employees to complete the HRA within work time. Two follow-up emails were sent out over a two week period. The study was approved by the New Zealand Northern Regional X Ethics Committee, and data were collected from December 2009 to March 2010 (Appendix A).

Health Risk Assessment

The HRA was an online questionnaire that asked participants to report on nine health domains that were included due to their established links to health and productivity in the workforce.³⁷⁵ For the purposes of this analysis, the focus was on just three of the domains: fruit and vegetable consumption, physical inactivity and having a BMI over 25 kg/m². Though being overweight is not a behaviour, it is the consequence of a number of behaviours that result in an energy imbalance leading to weight gain. The HRA also included questions related to demographics and the presence of health conditions within the last six months. The questions were derived from previously validated questionnaires and population surveys after consultation with health professionals and experts in related health fields. Once developed, the questionnaire was pilot-tested in a convenience sample to assess for comprehension and length.

Weight status was assessed by asking participants to report their height and weight, from which body mass index (BMI; kg/m²) was calculated. Those recording a BMI 25 kg/m² or greater were categorised as overweight.³⁸⁴ Participants were asked to recall the time spent in physical activities over the last week using the New Zealand Physical Activity Questionnaire Short Form (NZ PAQ-SF), a modified version of the International Physical Activity Questionnaire (I-PAQ) that has been validated in the New Zealand population.⁵⁶³ Activities were categorised as walking or as moderate or vigorous physical activities, and participants were categorised as either active or inactive according to the New Zealand Physical Activity Guidelines (which state that ‘active’

people are those who participate for at least 30 minutes per day five days per week).³¹¹ Finally, fruit and vegetable consumption was assessed using questions from the New Zealand Nutrition Survey.²⁷¹ Participants were asked how many serves of vegetables and fruits they consumed per day over the past seven days.²⁷¹ Those that reported meeting the recommendation of three servings of vegetables and two servings of fruit were categorised as meeting the recommendations for a healthy diet.⁷

The participants were also asked to report whether they had been diagnosed by a health professional with, or experienced symptoms of, thirteen health conditions: arthritis, asthma, sinusitis, cancer, back pain, depression, occupational overuse syndrome (OOS), chronic fatigue syndrome (CFS), migraines, diabetes, heart disease, high blood pressure or high cholesterol. These were included after consultation with health professionals and a review of literature, with the question derived from the New Zealand Health Survey.²⁶

Statistical analysis

The three risk factors (physical inactivity, insufficient fruit and vegetable consumption, and overweight) were coded dichotomously based on whether participants met the recommendations for PA, fruit and vegetable consumption and a healthy weight. Groups were then formed based on all possible combinations of behaviour. In all, nine groups (ranging from presence of all three behaviours to absence of all three behaviours) are presented. The expected prevalence rates of the health behaviour combinations are the product of the observed prevalence of those individual behaviours. Chi squared analyses were performed to establish if there were differences between observed and expected prevalence rates, with significance determined at $p < 0.05$. Student's t-tests were used to determine whether the mean number of health conditions differed between the groups of health behaviours. Results were analysed for the group as a whole, and then separately for males and females to determine whether there was any gender effect. Logistic regression analysis was used to quantify the associations between each cluster of risk factors and the presence of health conditions when adjusted for sex, age, and ethnicity. Significance was determined at the $p < 0.05$ level.

4.4 Results

The HRA was completed by 1,296 participants (447 male, 849 female, an overall response rate of 38%) aged 18 to 65 years with response rate for each organisation ranging from 13-90%. Response rates for each company are listed in Table 4-1. Demographic information for the population sample is presented in Table 4-2, with the overall sample being similar of New Zealand adults in terms of ethnic make up, although more females than males responded to the survey. Compared to the New Zealand population, participants had a lower BMI and participated in less PA (44.3% compared to 50.5% of New Zealanders). Only 38.5% met the recommended number of vegetable serves per day, and 45.1% ate two or more serves of fruit, lower than the national averages of 64.1% and 60.0% respectively.²⁶

Table 4-1. Individual company response rates

Company type	Total employee population	HRA completion		
		Total;(n (%))	Males	Females
Advertising agency	70	9 (13)	3	6
Law firm	124	111 (90)	65	46
Engineering company	220	36 (16)	26	10
Insurance firm	922	330 (36)	137	193
IT company	221	70 (32)	43	27
Government department 1	522	208 (40)	54	154
Public Health Unit	364	164 (45)	62	102
Energy supplier	784	328 (42)	49	279
Telecommunications	213	40 (19)	8	32
TOTAL	3438	1296 (38)	447	849

Table 4-2. Demographic and health behaviour information of respondents.

	N(%)	Total group (%)	Male (447, 34.5%)	Female (849, 65.5%)
Age group				
18-29y	289 (22.3)		89 (19.8)	200 (23.6)
30-39y	418 (32.3)		144 (32.2)	274 (32.3)
40-49y	335 (25.8)		128 (28.6)	207 (24.4)
50-59y	184 (14.2)		60 (13.4)	124 (14.6)
60y+	70 (5.4)		26 (5.8)	34 (5.2)
Ethnic group	1296			
NZE	1053 (81.3)		376 (84.1)	677 (79.7)
Māori/PI	131 (10.1)		29 (6.5)	102 (12.0)
Asian	112 (8.6)		42 (9.4)	70 (8.2)
BMI (kg/m ² ; SD)	1296	25.7 (7.74)	26.46 (6.46)	25.35 (8.38)
PA minutes (SD)	839	371.87 (859.9)	432.1 (816.99)	339.2 (879.5)
PA days (SD)	839	4.12 (2.13)	4.10 (2.08)	4.14 (2.16)
PA recommendations (N,%)	839	372 (44.3)	314 (41.4%)	242 (46.1)
Vegetable intake (serves/d (SD))	1207	1.82 (1.22)	1.67 (1.29)	1.90 (1.17)
Fruit intake (serves/d)	1205	1.19 (1.54)	1.10 (1.56)	1.24 (1.53)

The prevalence of being a healthy weight, physically active or meeting fruit and vegetable recommendations, along with the observed and expected prevalence of all combinations of behaviour are outlined in Table 4-3. Just 3.8% of participants met all three recommendations, compared to an expected prevalence of 6.1%, (determined by multiplying together the individual behaviour prevalence rates) and the observed prevalence of people failing to meet any of the recommendations (20.9%) was almost the same as the expected (20.6%), given their individual occurrence. Slight clustering was also found for the group who were overweight and did not meet PA guidelines, with an O/E ratio of 1.05 (p<0.08).

Table 4-3. Percentage of participants adhering to health recommendations.

Behaviour	Observed (%)	Expected (%)	Ratio (O/E)
FV	29.4	-	-
PA	44.5	-	-
HW	46.7		
FV and PA yes	7.6	13.0	0.58
HW and PA yes	14.3	20.8	0.69
HW and FV yes	12.7	13.7	0.93
HW and FV and PA yes	3.8	6.1	0.63
FV and PA no	23.5	39.2	0.60
HW and PA no	31.0	29.6	1.05
HW and FV no	35.0	37.6	0.93
HW and FV and PA no	20.6	20.9	0.99

FV – met and vegetable recommendations; PA – met PA guidelines; HW – met healthy weight recommendation

The prevalence of health conditions reported by participants is listed for the group in Table 4-3. In total, 61.5% of the group reported having at least one health condition in the previous six months, slightly less than the population average of 65.7%²⁶. While the latest national health survey showed that medicated hypertension and asthma were the two most frequently reported conditions²⁶, in this group sinusitis (23.6%) and back pain (21.2%) were the two most commonly reported conditions.

Table 4-4. Prevalence of health conditions.

Condition	Total (%)	Male (%)	Female (%)
Any health condition	797 (61.5)	263 (58.8)	534 (63.5)
Arthritis	89 (6.9)	24 (5.4)	65 (7.7)
Chronic Fatigue Syndrome (CFS)	33 (2.5)	6 (1.3)	27 (3.4)
Occupational Overuse Syndrome (OOS)	90 (6.9)	15 (3.4)	75 (8.8)
Asthma	160 (12.3)	43 (9.6)	117 (13.8)
Back pain	275 (21.2)	92 (20.6)	183 (21.6)
Cancer	13 (1.0)	5 (1.1)	8 (0.9)
Depression	103 (7.9)	28 (6.3)	75 (8.8)
Diabetes	20 (1.5)	8 (1.8)	12 (1.4)
Heart Disease	10 (0.8)	4 (0.9)	6 (0.7)
Hypertension	122 (9.4)	49 (11.0)	73 (8.6)
High cholesterol	132 (10.2)	67 (15.0)	65 (7.7)
Migraine	201 (15.5)	44 (9.8)	157 (18.5)
Sinusitis	306 (23.6)	68 (15.2)	238 (28.0)
Other	89 (6.9)	33 (7.4)	56 (6.6)

Figure 4-1 presents the mean number of health conditions and the odds of reporting a health condition for each combination of risk factors. Four clusters of risk factors were found to report a greater number of health conditions compared to those people who did not fall into those groups. Compared to those people who were of a healthy weight, the mean number of health conditions reported for people who were overweight was significantly higher (1.03 compared to 1.48, $p < 0.001$). Those who were overweight and inactive had a higher number of health conditions (1.08 v 1.55; $p < 0.001$), as did people who did not meet fruit and vegetable recommendations and were overweight (1.17 v 1.46; $p < 0.001$). People who were inactive and did not meet fruit and vegetable recommendations also reported a higher number of health conditions when compared to those meeting the recommendations for these health behaviours (1.12 v 1.40; $p < 0.05$). When looking separately at men, the only cluster reporting significantly greater number of health disorders were those in the overweight group (1.19 v 0.94; $p < 0.05$, data not shown). For women, this relationship also remained (1.66 v 1.07; $p < 0.001$) and women who were overweight and did not meet fruit and vegetable recommendations reported significantly greater number of health conditions (1.64 v 1.23; $p < 0.01$, data not shown).

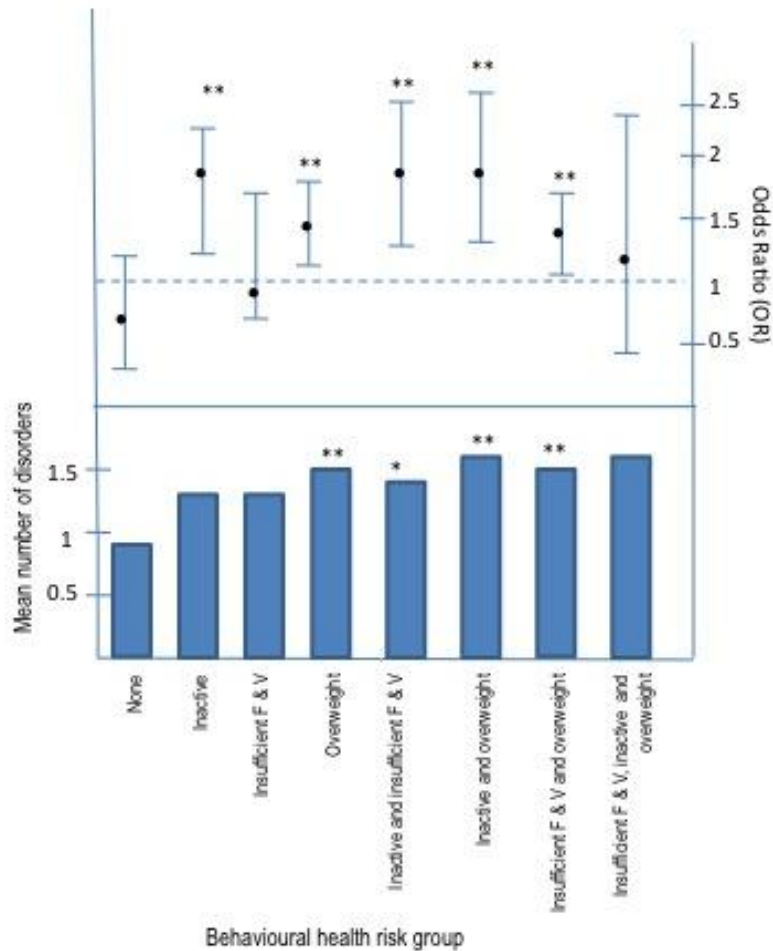


Figure 4-1: Mean number of disorders and Odd Ratios (OR) of disorders for each behavioural risk cluster.

Five clusters of risk factors had significantly greater odds of reporting a health condition compared to those not in the clusters. After adjusting for ethnic group and age, the odds of having a health condition were significantly higher for people who were inactive (OR 1.70; 95% CI 1.28-2.26), overweight (OR 1.45; 95% CI 1.16-1.83), and who were inactive and did not meet the fruit and vegetable recommendations (OR 1.82; 95% CI 1.34-2.49). Further, people who were both inactive and overweight had greater odds of reporting a health condition (OR 1.85; 95% CI 1.35-2.54), as did the people who fell into the inadequate fruit and vegetable consumption and overweight cluster (OR 1.35; 95% CI 1.08-1.77). The odds of women who were inactive and did not meet fruit and

vegetable recommendations were over two times greater (OR 2.04; 95% CI 1.38-3.02) and those who were both inactive and overweight (OR 2.67; 95% CI 1.74-4.11, data not shown). Significantly higher odds were also seen in the inactive cluster (OR 1.92; 95% CI 1.34-2.76), the overweight cluster (OR 1.77; 95% CI 1.34-2.37) and for women in who reported inadequate fruit and vegetable intakes and who were overweight (OR 1.75; 95% CI 1.28-2.40, data not shown). Men in this sample were not at greater odds of reporting a health condition based on the clustering of behaviour.

4.5 Discussion

While the prevalence of people engaging in one particular health behaviour might be quite high (for example, the New Zealand Health Survey found over 50% of New Zealanders were physically active, and 64% meet their recommendation for the number of serves of fruit per day²⁶), there are very few people who follow a pattern of healthy behaviour that is optimal for reduced chronic disease risk. In the present study, reasonable proportions of people were of a healthy weight (47%) and met the PA guidelines (45%), and close to one third met the fruit and vegetable recommendations. However, only 3.8% of the participants engaged in all three behaviours. Analysis of Behavioural Risk Factor Surveillance System (BRFSS) data in the US found that just 3% of respondents maintained a healthy weight, ate five or more serves of fruit and vegetables, did not smoke and were regularly active.⁵⁸⁵ Similarly, Poortinga reported just 5.7% of men and 6.8% of women in the 2003 English Health Survey were regularly active, did not smoke, practiced moderate drinking patterns and met fruit and vegetable recommendations.⁵⁸⁶ Other population-based research shows comparable findings.^{580,582,587,588}

Clustering is said to occur if the observed prevalence of behaviours exceeds that of the expected prevalence.⁵⁷⁵ If these behaviours were statistically dependent we would expect a prevalence greater than 6.1%. While few people followed all three health behaviours, almost 80% of people engaged in at least one behaviour, and individuals who adhere to one health behaviour (such as being regularly active) are more likely to

be motivated to adopt another²⁴⁵ suggesting that campaigns with simple messages, yet targeting more than one health initiative may be useful in increasing the numbers adhering to public health recommendations.

Despite differences in public health recommendations, what is consistently shown is that very few people in the population adhere to basic population health messages that will reduce likelihood of lifestyle disease. Lack of knowledge is unlikely to be an explanation, particularly in the present study of professional working adults. Indeed New Zealand research found 80% of New Zealanders were aware of the “5+ a day” fruit and vegetable campaign and 84% knew the benefits of PA.⁵⁸⁹ This suggests that aspects other than individual factors may be more influential in decision making that occurs around these two behaviours. Social support is arguably one of the most important factors for the adoption of, and adherence to, healthy behaviour.^{518,590} Likewise, a physical environment supportive of PA and healthy eating will encourage these behaviours,^{485,591,592} both of which are key to maintaining a healthy weight.

The second finding in this study was that individuals with a BMI of 25 kg/m² or greater reported significantly more health conditions than those who were in the healthy weight range, independent of the other behavioural risk factors. This relationship was also found in three groups of behavioural risk factors: when overweight was combined with inadequate fruit and vegetable intake; when it was present with physical inactivity and when people failed to meet the recommendations of both fruit and vegetable consumption and PA independent of BMI. These findings support well known research linking a greater number of adverse health outcomes to overweight, physical inactivity⁵⁹³ and inadequate fruit and vegetable consumption.²³⁷

Though being inactive in itself did not increase mean health disorders compared to those meeting the PA recommendations, the odds of reporting a health condition was 1.70 times greater if individuals were physically inactive. The odds increased when inactivity was combined with overweight and for the inactivity and inadequate fruit and vegetable consumption cluster (1.85 and 1.82 respectively). This result is not surprising given the

association between these behaviours and a number of both cardiovascular risk factors and health conditions (such as back pain, hypertension, high cholesterol) and is in line with Ford et al.'s finding of a risk reduction for clusters of behavioural risk of normal weight and activity, and activity and fruit and vegetable intake.⁵⁸⁴

The results also demonstrate that behavioural risk factors show a stronger association to health conditions in women compared to men. The only evidence of an association between the selected risk factors and health outcomes in men was an increased mean number of disorders for those who were overweight. In women, the mean number of disorders increased in those who were overweight in addition to those who were overweight and did not meet fruit and vegetable recommendations. Furthermore, females who were inactive and those who were both inactive and overweight had 1.92 and 2.67 times greater (respectively) odds of reporting a health condition compared to the reference group. The combination of inactivity and inadequate fruit and vegetable consumption also doubled the odds of women having a health condition, and overweight women not meeting fruit and vegetable consumption had 1.75 times greater odds of having a health condition. Focusing on improving health behaviour within the workplace could lead to fitter, healthier employees that report fewer health conditions, thus reducing the overall cost to the employer and the organisation.

Interestingly, these gender differences were not observed in previous research.^{584,594-597} One possible explanation is that the present study has grouped specific clusters of behaviours together rather than just focusing on one behavioural risk⁵⁹⁵⁻⁵⁹⁷ or number of health behaviours adhered to.^{590,598} Further, a smaller percentage of participants were male, therefore smaller sample numbers will reduce the strength of an association between independent and dependent variables.

The present study found that physical inactivity and overweight resulted in greater odds of having a health condition compared to those in the highest risk group. Ford and colleagues found the combination of never having smoked and having a BMI < 30 kg/m² resulted in almost the same reduction of risk as someone who was placed in the

lowest risk category with a hazards ratio of 0.26.⁵⁸⁴ Banda and colleagues found a 47% reduced risk of hypertension among men in the lowest risk category when investigating health behaviour adherence,⁵⁹⁹ and Hu et al. found a 90 % reduction in risk of type 2 diabetes among women who followed a healthy diet, did not smoke, were physically active, were of a healthy weight and consumed alcohol in moderate amounts.⁵⁸⁰ While it would be expected that individuals reporting non-adherence to the three behavioural risk factors would have greater odds of reporting a health condition, this was not found in the present study. This analysis was a cross-sectional one, thus only looked at health behaviour at one point in time. As previously mentioned, the stability of diet and PA health behaviours in some populations may not allow for inferences to be established as these have been found to change over time. The age range of participants in the present study is lower than that of other studies, and perhaps the increase in health risk is realised at an older age. Furthermore, methodological variation could account for differences in the results found in this analysis. Measures used to quantify diet, overweight and PA differs between studies, and time frames used also vary.

There are several limitations of the present study that should be acknowledged. This is not a representative sample of the workforce in New Zealand and thus the actual associations between health risk and health conditions of the New Zealand population may differ. The response rate was just over a third of all employees, which, while low, is not unusual for an online questionnaire of this type.⁶⁰⁰ Best practice guidelines were followed when recruiting participants, such as personalised email invitations, incentives to participate and reminder emails sent to non-respondents⁶⁰⁰. Subsequent research may improve the response rate further by addressing the email from the organisation chief executive officer (CEO) or another individual in the management team to indicate support for participation from upstream in the company. The companies self selected whether they would be involved and then the employees chose to participate in the online HRA. In addition, no information was available for non-respondents. As four of the companies participating were doing so as a baseline measure of the wellness programme, it is likely that health was a more salient topic for them than employees who chose not to participate. They may be healthier, then, compared to a more

representative group and indeed, the BMI of this group was lower than the population mean BMI of 27.4 kg/m².²⁶ Relatively few participants fell into the higher risk categories and had the HRA participation rate been higher, stronger associations between behaviour and risk may have been found. While a lower BMI could suggest participants have underestimated their weight and overestimate their height, which often occurs with self-reported information,⁶⁰¹ people working in professional occupations (such as the participants in this research) have been found to be report more accurately.⁶⁰² Fruit and vegetable consumption was lower in this cohort than the national average, so too was participation in PA that was deemed sufficient to be 'physically active.'²⁶ This suggests that, while the health profile of these participants may be better than the New Zealand population in some aspects, this does not hold true for all behavioural risk factors. As mentioned, the cross-sectional nature of this study doesn't allow for deeper investigation into health behaviours or inferences of causality. Improving health behaviours may not necessarily change the prevalence of health conditions within this population as other relationships or individual factors not examined may predispose people to certain conditions. Future research of a longitudinal nature would build on this initial investigation, and provide more detail of the impact of lifestyle behaviour on a number of health conditions. Further, an analysis of the impact this relationship has on the productivity of the employee could provide justification for employer investment in workplace wellness programmes within New Zealand.

4.6 Conclusion

This study is the first to link behavioural risk factors to health conditions in the New Zealand population. It also moves beyond the medical model to describe risk and instead focuses on the behaviours that lead to multiple health conditions in the long term. Being overweight, insufficiently active and not meeting fruit and vegetable recommendations places women at an increased risk of health conditions compared to those with healthier lifestyle habits. The identification of health behaviour clustering could help with a more targeted approach to health promotion messages, particularly in the workplace setting. Further, as specific subgroups may be more at risk of suffering symptoms of

health conditions (as found in this analysis), targeting these health behaviours simultaneously could reduce the impact of the health condition and poor employee health over time.

Chapter 5. The development and utility of a workplace environmental audit tool

5.1 Preface

Chapter two described the need to create an environment that supports healthy behaviour in the workplace. The preceding chapter identified that few people met all three recommendations for being physically active, meeting fruit and vegetable guidelines and maintaining a healthy weight. Moreover, the co-existence of more than one sub-optimal behaviour increased the likelihood of reporting a health condition that is associated with reduced work productivity. As the working population spends at least one-third of their day in the workplace environment, it is important to identify attributes of the workplace that may inhibit healthy behaviour. This information can then be used in the formative stages of a workplace wellness programme; when combined with employee health risk data, features of the worksite can be prioritised for intervention. An audit tool that measures attributes specific to New Zealand workplaces, then, is essential for this process. Just prior to undertaking this doctoral research, a New Zealand worksite environmental audit tool was developed by AUT researchers and practitioners in the field of health and productivity and was available for use in the public sector. The following chapter describes its development and illustrates its implementation in a case study analysis.

5.2 Introduction

Evidence has emerged over the last two decades of the impact the physical and policy environment has on lifestyle behaviour and health outcomes of individuals. Health promotion efforts have moved from the wider community environment to investigate more specifically the effects that environmental attributes of settings such as the home, school and work environment have on health behaviour. Food choices and PA habits

during the work day are also likely to be influenced by the accessibility of choices both within the workplace and in the surrounding environment, and these are in some way determined by workplace policies and organisational support for messages regarding healthy eating and PA.⁶⁰³ Making changes to the workplace environment at multiple levels has been successful at improving health behaviours of employees.⁴⁸⁵ While changing the environment is often more challenging, more costly, and the overall effects less transparent than initiatives targeting the individual in the short term, over a longer time period an environment that has been altered to support health behaviour is likely to result in sustainable changes at the individual level.⁴⁹³

A number of tools that measure the workplace environment have been developed by research groups to provide assistance when planning a workplace health promotion programme. Earlier tools looked specifically at workplace factors to support CVD risk reduction, such as the Heart Health Check⁶⁰⁴ and the Working Well tool.⁶⁰⁵ More recently, the Checklist of Health Promoting Environments in the Workplace (CHEW) was developed by Oldenburg and colleagues to measure the physical and information environment of the workplace and the surrounding environment in relation to nutrition, PA, alcohol consumption and smoking behaviour.⁵³⁴ An adaptation of this, the Environmental Assessment Tool (EAT), was developed to measure the workplace environment specifically related to obesity and nutrition and, like the CHEW instrument, it addresses the physical and information environment, but also extends to assess social-organisational attributes.⁵³⁹ Research groups have reported that both tools have good utility when designing and evaluating environmental changes as a part of a workplace health programme, though attempts to predict intervention outcomes or to find associations between environmental factors and health risk factors such as BMI have proven less successful.^{535,546}

Worksite tools that measure environmental attributes related to healthy behaviour are not only important in the research context, they are necessary for those in the industry to be able to target priority areas within their own organisation. There has been a call for such tools that are able to be used in the public sphere, where advocacy groups can

administer them and provide an evidence base for health promotion in the work setting.⁵⁶⁴ In order for this to be a meaningful process, it is necessary for an audit tool to include items relevant to the environment that is being measured and be able to prioritise areas for improvement. There was no such tool available in New Zealand that was freely available for use. As workplace health promotion is less advanced in New Zealand compared to countries such as Australia and the US, where a number of tools exist to measure the workplace environment, an important step in this field was to design a tool specific to New Zealand worksites. The availability of this tool will guide those in the industry to develop a systematic approach to designing and evaluating workplace interventions. This direction is important for building a successful workplace health promotion environment that is sustainable in the New Zealand context. The aims of this study were to (1) describe the development of a workplace audit instrument designed to assess environmental barriers and enhancers of PA and nutrition within the workplace; (2) to demonstrate the utility of the instrument by auditing multiple worksites; and (3) to determine if there is any relationship between environmental attributes and individual health indices.

5.3 Methods

Development of Walk the Talk audit tool

The Walk the Talk audit tool is a 120-item instrument designed to measure the PA and nutrition environments within the workplace. It had four objectives: (1) identify existing policies or practices that either encourage or inhibit healthy eating and PA practices within the workplace; (2) identify gaps in the health promotion practices of the workplace; (3) provide a measure of how well the workplace environment supports healthy lifestyles; and (4) be used as a tool for formative and process evaluation purposes as part of a workplace wellness intervention to assess changes over time.

Five existing audit tools^{534,606,607} (S. Duncan, written communication, 2 February 2007), (E Rush, written communication, 2 February 2007) informed the design, the framework

and the basic content for the audit tool, but because of the paucity of literature at the time of development, many items were developed by an advisory panel that included experts in the field of worksite health promotion in both the academic and industry sectors. The items in the tool were chosen due to both their known associations with PA and nutrition behaviours in the workplace^{493,608} and their relevance to a variety of organisations, so it need not be amended for individual worksites. Item development occurred over the course of three in-depth meetings, and Table 5-1 describes the 10 domains of the tool.

Table 5-1 Audit tool domains.

Section	Description	Example items
1. Organisational policy	This section assesses workplace policy which, in this context, is regarded as a written guideline that governs practice within the worksite. This section also refers to less formalised organisational principles, values, and/or operating guidelines of the organisation.	<ul style="list-style-type: none"> • Guiding policy promoting overall health and wellbeing • PA and nutrition related policies (i.e. catering, flexitime for PA opportunities) • Opportunities for wellness initiatives related to health, PA or nutrition (health checks, EAP, nutrition/PA seminars, encouraging PA during day, provision of fruit)
2. Worksite environment	This section assesses what actually occurs at the worksite, rather than governing policies.	<ul style="list-style-type: none"> • Posters promoting activity/healthy eating • Sports teams • Discouragement of fundraising using unhealthy food items • Weight loss meetings onsite
3. Food and drink preparation areas	This section assesses the general quality of food and preparation areas	<ul style="list-style-type: none"> • Provision of toasters/microwaves • Low fat milk, no salt • Chairs/tables to eat

Section	Description	Example items
4. On site cafeteria	This section focuses on food choice and cooking practices of onsite cafeteria	<ul style="list-style-type: none"> • Wholegrain bread/fruit • Clear labelling of healthier choices • Healthy foods competitively priced
5. Snack boxes/Vending machines	This section assesses the snack and beverage choices of vending machines or snack boxes onsite	<ul style="list-style-type: none"> • Diet soft drink/water • Nuts, dried fruit, muesli bars, appropriate portion sizes • Healthy foods competitively priced
6. Externally provided food contractors	This section assesses food choices provided by an external provider to employees either during the working day or at work-related events (e.g. catering service).	<ul style="list-style-type: none"> • Low fat, low sugar, low salt items available • Priced competitively
7. Elevator and stair use	This section assesses features of the elevators and stairs within the workplace in relation to PA promotion	<ul style="list-style-type: none"> • Posters promoting stair use at elevator entrance • Stairs marked 'stairs' not exit • Well lit
8. Surrounding environment	This section identifies potential PA and healthy eating opportunities within easily accessible distances	<ul style="list-style-type: none"> • Bike lanes • Fitness facilities • Healthy food options • Green, open spaces
9. Travel provision	This section assesses car parking provision and support for public transport	<ul style="list-style-type: none"> • Car parking provided free or charge or for fee • Provision of timetables for public transport • Encouraging walking where possible for meetings during day

The presence or absence of a feature is scored either with +1 or 0 with respect to its optimal state (1 = preferred state, 0 = non-preferred state). The purpose of the simple

scoring system was twofold: first, it minimises subjectivity in the scoring and enables assessors to highlight areas of priority for intervention purposes, and second, it aligns with the intended use by human resource or health and safety staff within the workplace (and not necessarily research or health professionals with expert knowledge in health promotion).

Administration of the audit tool in an organisation

The tool was initially pilot tested in two large worksites (>750 employees) to test for ease of use, comprehension of questions, length of the questionnaire and appropriateness of the scoring system. A human resources manager and a member of the health and safety staff completed the audits, and were interviewed afterwards by a member of the advisory panel for feedback. This pilot testing phase resulted in minor amendments to the structure.

Following the pilot phase the tool was administered in an organisation that was also taking part in an HRA survey designed to measure the health and productivity of employees (the details of which can be found in Chapter three). Briefly, a large nationwide insurance firm with 23 different worksites and 922 full time employees across the country was one of five organisations invited to take part in the health and productivity study. An online HRA was administered to employees and asked about nine different health domains (PA, nutrition, sleep habits, alcohol and smoking habits, BMI, psychological distress and chronic conditions), worker productivity, and the workplace culture in relation to health behaviour. The study was approved by the New Zealand Northern Regional X Ethics Committee, and data were collected from December 2009 to April 2010. The tool can be found in Appendix D.

The environmental audit was administered at each worksite within four months of the HRA being completed. To avoid inter-rater differences among audits, one assessor conducted all of the audits and was accompanied by a designated staff member within the worksite to ensure no aspects of the environment were overlooked. However, prior

to the audit process taking place, the assessor and a person independent of the research both used the tool and individually conducted practice audits of two worksites separate to those reported here. The results of the audits are presented here as a practical demonstration of its utility.

Data analysis

Data were analysed using SPSS for Windows v 17.0.0 (SPSS Inc., Chicago, IL) and Microsoft Excel (2007). Partial correlation coefficients were used to assess the relationship between participant's responses on the PA and nutrition domains in the HRA and the relevant WTT domains after adjustment for gender, ethnicity, and age group. Cohen's guidelines⁶⁰⁹ to determine magnitude of correlations have been augmented by Hopkins⁶¹⁰ and were used here for interpreting the correlation coefficients. The magnitudes of correlations are trivial (0.0-0.1), small (0.1-0.3), moderate (0.3-0.5), high (0.5-0.7), very high (0.7-0.9), or near perfect (0.9-1.0). Confidence limits were set at 90% and were used to estimate the likely range of the magnitude.

5.4 Results

The findings of the audit in the organisation are listed below under each section heading, with a brief summary of the main findings across the company. Table 5-2 lists the mean score, the range of scores across the company, and highlights the priority areas which can be feasibly addressed in the worksites investigated.

Table 5-2: The audit tool scores and priority areas for intervention.

Section	Score	Range	Priority areas
1. Organisational policy	22/33	-	Promotion of incidental PA in the workplace Policy-driven nutrition options regarding food accessibility and catering options.
2. General worksite environment	10 (med = 12)/22	5-15	Promotion of activity throughout the work day and fruit accessibility
3. Food and drink preparation areas	8.5/12	8-10	Removal of TV and communal salt from food preparation space. Provision of signs promoting healthy eating practices.
4. On site cafeteria	11.2	10-12	Removal of salt from tables, promotion of healthy food options, and implementation of healthy food practices.
5. Snack boxes/Vending machines	2.5/7	2-4	Provide, label and promote healthy food and beverage options
6. Externally provided food contractors	2.3/6	2-4	Company-wide policy regarding healthy food options at meetings
7. Elevator and stair use	6.75/14	5-9	Promotion of stair use at elevator location.
8. Surrounding environment	6/7	5-7	-
9. Travel provision	4.3/11	2-7	Provision of timetables and travel subsidies to promote public transport use.

Case study results of the worksite audit

Section 1a: Organisational policies, guidelines and operating principles

This section was constant across the organisation, and as such there was one score to be reported (22/33 or 66.7%). The organisation had a health and safety policy which included aspects of wellness, with flexi-time options, employee-assistance programmes and space for breast feeding mothers the most often reported initiatives as part of this policy. PA and nutrition related seminars were conducted in the larger worksites located in major cities as opposed to smaller sites.

Section 1b: PA

The organisation had policies specifically in place to promote PA in and around the workplace, with flexi time for commuting and opportunities for subsidised PA events at the worksite and in the community. An employee wellness allowance, offered every year, provides employees the opportunity to purchase fitness equipment, gym memberships and other health-related items. There was no active encouragement of stair-use or active breaks within work time.

Section 1c: Food and nutrition

While the provision of safe and hygienic food preparation areas, and safe drinking water, tea and coffee was available at all worksites, discouraging unhealthy food-related fundraising, or employees taking meals away from their workspace was not actively promoted with the company. Further, there was no policy in place with regards to the provision of healthy food in vending machines or work-related meetings or events. These items were governed largely in house for each worksite.

Section 2: General worksite environment

This section varied widely depending on the worksite. The maximum score given was 15 out of a potential 22. Those that scored highest tended to be larger sites where facilities available (such as on site showers or facilities for storing bicycles or other fitness equipment) were part of the infrastructure of the building. Seminars regarding nutrition and PA tended to take place in these centres also. All sites had access to information regarding PA and nutrition, due to a company-wide intranet which was updated regularly. Fruit was made available to employees once a week but this was at the discretion of the local manager, rather than a company-wide implementation, and tended to happen in the larger centres. Company size dictated the likelihood of company sports teams. While provision of breast-feeding space is part of the company policy, a

few sites did not have dedicated space, and at no site were active (walk and talk) meetings encouraged.

Section 3: Food and drink preparation area

There was very little variation in the scores for the food and drink preparation area and all scored close to the upper end of the scale. Common reasons worksites failed to score points were availability of salt, a television (encouraging sedentary behaviour) present in the food preparation area, and failing to have signs promoting healthy eating.

Section 4: On-site cafeteria

The majority of worksites (75%) did not have an on-site cafeteria. Those that did have a cafeteria offered healthy food and beverage options that were priced competitively, and the majority did not have a deep fryer on site. However, healthy food options were not actively promoted above other high fat, high sugar items, and healthy food practices (such as using trim milk for beverages unless standard milk is requested). It should be noted that these cafeterias were owned and operated by third parties and not the organisation itself.

Section 5: Snack boxes and vending machines

Just eight of the 23 worksites had snack boxes and/or vending machines, and scores were at the lower end of the scale. While those worksites with vending machines that provided beverages had sugar free options available, there were few (if any) healthy food choices available in any of the vending machines or snack boxes on site. For those that did, there was no promotion of these choices over and above other options, and no price differential to encourage their purchase.

Section 6: Externally provided food contractors

Seventy percent of worksites used outside contractors for providing food for company meetings or gatherings. While healthy options were offered by most caterers, and dietary requirements considered at most worksites, preference for high fat, high sugar and high salt options governed the majority of choices made. As there was no company policy regarding food catering for meetings, the choices were largely at the discretion of those ordering the food.

Section 7: Elevator and stair use

The accessibility of stairs in the multi-storied buildings with which the worksites were located tended to be away from the main entrance, enclosed and not well labelled. They were not easily accessed, either requiring a swipe card, or were locked, and most were marked 'exit' and not 'stairs.' There was no promotion of using stairs in any of the buildings. The stairs were all well lit, clean and had safety features.

Section 8: Surrounding environment

The majority of the worksites had access to space for PA, healthy food options readily available from surrounding providers and bus stops for public transport use. Therefore the scores were all near the upper end of the scale. The main section where a point was lost was the presence of bicycle lanes on the connecting roads.

Section 9: Travel provision

Three of the 23 worksites offered car parking to their employees for a fee, and only the larger centres offered car parking for free to select employees. While walking was encouraged where possible to attend meetings, travel subsidies and timetables to encourage the use of public transport were not features of the travel environment in this organisation.

Association between PA and nutrition behaviours and audit tool scores

Three hundred and twenty one (34.8%) of the 922 eligible employees completed the online HRA. From these, 257 (27.9%) indicated which worksite they were located in (ranging from 3-138 employees per worksite); this is the final sample size used in the analysis of worksite and behaviour. Table 5-3 outlines the characteristics of these employees with regards to demographic and health behaviour information.

Table 5-3: Demographic and health behaviour characteristics of employees.

	Sample n = 257, (n, %)	Those in organisation who completed HRA (n = 321) (n, %)
Male	105 (40.9)	137(42.7)
Age group		
18-29y	63 (24.6)	64 (19.9)
30-39y	83 (32.3)	94 (29.3)
40-49y	75 (29.2)	99 (30.8)
50-59y	22 (8.6)	39 (12.1)
60y+	14 (5.5)	25 (7.8)
Ethnic group		
NZE	184 (71.6)	239 (74.5)
Māori/PI	28 (10.9)	34 (10.6)
Asian	45 (17.5)	48 (14.9)
BMI (mean, SD)	25.8 kg/m ² (7.41)	25.65 (7.60)
PA min/ week (mean, SD)	576 (935.10)	598 (912.35)
PA Days/ week	4.42 (1.86)	4.47 (1.86)
Met PA rec (%)	109 (42.4)	140 (43.6)
Fruit serves/ day	2.42 (0.77)	2.44 (0.77)
Vegetable serves /day	2.68 (0.59)	2.70 (0.56)
Met FV recommendations (%)	66 (25.7)	67 (20.9)
Sugary beverage serves /wk	2.14 (1.62)	2.09 (1.63)
Breakfast / wk	3.79 (1.43)	3.82 (1.42)

While information is unavailable regarding the comparison of these employees to other employees within the organisation as a whole, no differences were found between these employees and employees who did not provide location information. With the

exception of a trivial to small association between breakfast consumption and section four (the onsite cafe), and with PA and section nine (travel provision), all other associations between the audit tool and PA and nutrition behaviour were trivial (Table 5-4).

Table 5-4 . Correlations between physical activity and nutrition behaviours and the audit tool.

	Section 1 Organisational policy			Section 2 General worksite environment			Section 3 Food preparation areas			Section 4 Onsite cafeteria			Section 5 Vending machines/ snack boxes			Section 6 Externally provided food contractors			Section 7 Elevator and stair use			Section 8 Surrounding environment			Section 9 Travel provision		
	r	90% CL		r	90% CL		r	90% CL		r	90% CL		r	90% CL		r	90% CL		r	90% CL		r	90% CL				
	r	L	U	r	L	U	r	L	U	r	L	U	r	L	U	r	L	U	r	L	U	r	L	U			
BMI	0.03	-0.08	0.14	-0.06	-0.05	0.16	0.03	-0.08	0.14	0.08	-0.1	0.1	0.01	-0.1	0.1	0.04	-0.06	0.15	0.09	-0.02	0.19	0.01	-0.1	0.1	0.04	-0.06	0.15
FV	0.09	-0.02	0.19	0.05	-0.15	0.06	-0.02	-0.09	0.13	0.08	-0.1	0.1	0.04	-0.06	0.15	0.04	-0.06	0.15				0.04	-0.06	0.15			
SB	0.08	-0.1	0.1	-0.06	-0.05	0.16	0.09	-0.02	0.19	0.01	-0.1	0.1	0.03	-0.08	0.14	0.03	-0.08	0.14				0.07	-0.04	0.17			
B	0.07	-0.03	0.17	0.03	-0.08	0.14	0.03	-0.08	0.14	0.1	0.0	0.20	0.03	-0.08	0.14	0.03	-0.08	0.14				0.01	-0.1	0.1			
PA min	0.01	-0.1	0.1	0.08	-0.1	0.1													-0.06	-0.05	0.16	0.08	-0.1	0.1	0.04	-0.06	0.15
PA days	-0.02	-0.09	0.13	-0.06	-0.05	0.16													0.04	-0.06	0.15	0.01	-0.1	0.1	-0.17	-0.22	0.01
PA rec	0.01	-0.1	0.1	-0.06	-0.05	0.16													-0.06	-0.05	0.16	0.03	-0.08	0.14	-0.16	-0.06	0.28

BMI: body mass index; **FV:** fruit and vegetable consumption; **SB:** sugary beverage consumption; **B:** breakfast consumption; **PA min:** total number of PA minutes previous seven days; **PA days:** number of days active the previous seven days; **PA rec:** if met PA recommendations; **CL:** confidence limits; **r:** correlation coefficient; **L:** lower bound; **U =** upper bound

5.5 Discussion

The primary aim of this chapter was to describe the development and investigate the utility of a New Zealand-specific audit tool for assessing the PA and nutrition environments within an organisation. Its intended purpose is to be freely available for industry use identifying priority areas that management can focus on to promote healthy behaviour within their company. The results highlight a number of areas which have the potential to be improved to create an environment more supportive of health behaviour.

Recommendations for worksites

The variation in scores for section two of the tool (which measures the general work environment) highlights the impact that having team leaders and managers who value health and wellbeing can have on the creation of a supportive workplace environment. Additionally, some items measured in this section demonstrate elements specific to individual worksites. In this sample, some of the worksites had too few people who were able to create sports teams or running groups; thus, this limitation was not necessarily related to an organisational element that could be targeted for intervention. However, some opportunities, such as the provision of fruit at work, scheduling of nutrition or PA seminars, and being involved in a subsidised sporting event or work based challenge were at the discretion of the team leader. It is well evidenced that there will be greater uptake of PA and nutrition initiatives in the workplace if there is support at a managerial level.^{523,524} Initiatives targeting management awareness of health and productivity may be one avenue to increase support in the general workplace environment and encourage managers to take on board some of the available initiatives. Educational components of health promotion programmes are viewed as more successful if run in conjunction with higher level changes to business policy structures.⁴⁸⁶ Managers in the high intensity arm of Goetzel et al.'s obesity management programme were trained in health promotion topics, had their employees' health outcomes worked into the site management plans, and were required to send related progress reports to senior corporate

management.⁴³⁸ Being held accountable for employee health improvements is one example of engaging leadership in company-wide wellness programmes.

Few of the worksites had specific initiatives in place to advocate for an active commute. It has been established that a workplace supportive of active transport to and from work (the provision of travel subsidies, easy access to transport timetables, flexible work hours to allow travel, and facilities such as showers and storage) is likely to result in fewer people choosing to drive. Those that use public transport instead of their own vehicle tend to be more physically active.⁶¹¹ While research suggests that those already active are most likely to benefit from a workplace initiative encouraging active transport rather than those most at need,⁶¹² there is value in supporting already active individuals to maintain that behaviour. The company in this example could instigate some low cost initiatives to promote active transport or use of public transport, such as allowing employees some flexibility for starting and finishing work to fit in with bus, train or ferry timetables, and promote this policy along with the timetables through the staff intranet and on notices throughout staff meeting areas. This could specifically target employees who currently pay for car parking throughout the day, such as those where work premises are situated in the central business district of a city.

The company did not offer employees parking per se, but some of the smaller centres had free to use car parking available close to work, thus there was no financial incentive for those with vehicles to think about alternative options for travelling to work. Other initiatives may be more successful for employees in this situation, and the promotion of active transport could be framed in a way that illustrates the benefits to health, wellbeing and weight loss, and not necessarily promoted for ease of travel. Studies suggest those that are at risk of poor health outcomes often underestimate the potential health benefits of incidental activity or walking.⁶¹³ Company-wide involvement in public initiatives, such as the Go By Bike campaign run jointly through the Ministry's of Health and Transport and Bikewise New Zealand,⁶¹⁴ may be an avenue where the company can align business outcomes with employee health behaviour. It would be a forum where the organisation can publicly portray a sense of corporate social responsibility and jointly targets activity as an individual level. In addition, tying active transport to other beliefs that are not strictly

health-related (such as environmental issues) may be another way to encourage those who would not normally consider doing it.

Increasing stair use within the company is one area of opportunity that was not currently being utilised in worksites that were located in multi-level buildings. At no worksite were signs promoting stair use over elevators to increase PA, a low-cost strategy found to be effective for increasing PA in the workplace.^{501,502,615} A recent review concluded that the modest increase in the percentage of people using the stairs at work could result in an overall improvement in PA levels at the population level and subsequently improve population health outcomes.⁵⁰² In addition, promoting activity throughout the workday by encouraging ‘active meetings’ was another concept unused by any of the worksites. It is well known that the cumulative effects of small amounts of activity can have an impact on overall health.⁶¹⁶ The removal of the television set that featured in many of the food preparation and dining area may encourage employees to use the break time as an additional opportunity for PA. The promotion of the benefits to being more physically active, along with suggestions on how to achieve this could increase the PA levels of the employees without the need for structured or costly activity options. In addition, smaller yet well planned initiatives may be rolled out initially to assess whether levels of uptake among employees will increase the demand on other facilities related to activity such as bike storage areas, or stairwell interior redecorated.^{541,542} As the audit tool is designed to prioritise target areas for intervention, this can be evaluated in future audits conducted as part of a wellness programme process evaluation.

Overall, the onsite nutrition environments were similar regardless of the location of the workplace. All worksites had food preparation areas that allowed for employees to bring food from home, which has been associated with healthier food habits.⁴⁸⁹ However, the ability to purchase healthy items for lunch is also a function of the availability of such items in the surrounding workplace environment.⁵⁰⁷ As convenience is one of the most important factors influencing food choices at lunch time, more so than taste or cost,⁴⁸⁹ information regarding healthier choices in the direct vicinity of the workplace could be useful to promote healthy eating for those choosing to purchase their lunch, which was an under-utilised initiative across worksites in this case study. Indeed a reduction in total fat intake was observed

among those people who considered their fat intake to be high when changes to the cafeteria menu were made and promoted as part of a workplace nutrition intervention,⁵¹² and the provision of labels on healthier food items was positively associated with food choices made in a cafeteria in health conscious individuals.⁶¹⁷ While few worksites in this case study had onsite cafeterias, the principle of providing information related to food choice remains valuable and opportunities to promote healthy lunch box options could be utilised as a low cost nutrition initiative. However, influencing the dietary intake of those who might need it most may be as challenging in the workplace environment as other health promotion settings. The research conducted by Steenhuis and colleagues reaffirms that merely making information available is not enough to effect dietary change in all sub-groups and points to the value of utilising other avenues within the workplace to do so. They provided feedback on participants' dietary intake, thereby making them aware of where improvements might need to be made. This, combined with nutrition information at the cafeteria resulted in a successful strategy for fat reduction⁵¹² and has been found in previous studies.⁴⁸⁵

Nutrition promotion messages integrated into interactive and innovative health activities have been found to change the culture of the food environment, whereby choosing to eat healthier options was no longer viewed in a negative light, they also made the employees feel more valued.⁶¹⁸ The success of these initiatives is likely due to the consistent messages being promoted as part of a comprehensive programme, elements known to be most effective at improving health outcomes in the workplace.⁴⁸⁶ In this demonstration, the audit highlighted that the addition of messages which are simple, concise, and frequently updated could be implemented into worksites. Aligning this with another activity, such as a shared lunch with the focus on the nutrition message for the month, is an example of a low cost initiative integrating innovation with information, and could increase the relevance of the message to the employees.

The available food through vending machines, snack boxes and organisational or employee fundraising efforts will have different implications for employees depending on accessibility of other choices, job role and flexibility to leave work to prepare or purchase lunch items. One third of the worksites had vending machines or

snack boxes, where there were few healthy alternatives available, and no signage promoting the healthy option present. Indeed even those choices that would be deemed a healthier choice than some of the traditional snack box foods, such as chocolate bars or potato crisps, were served in portion sizes which equated to a similar energy intake. Population research in similar sub-groups shows that convenience is a driving factor behind food purchasing decisions⁴⁸⁹ though employees would welcome healthier options within their organisation.⁵⁰⁸ It is promising that French and colleagues found employees chose healthier options particularly when these were discounted in price compared to more unhealthy alternatives.⁵⁰⁹ Ultimately, engaging the vendors of snack boxes and snack machines to replace high fat, high sugar and high salt items for healthier alternatives would impact on the food intake of employees who choose to purchase items in the absence of other food. However, this is not necessarily an easy task given they may be obligated to offer certain brands of snack products, and other vendors who do offer healthier choices may be more expensive. In this case study, the company is recommended to purchase healthier snack options (such as a lower kilojoule muesli bars, single sized portions of nuts and fruit, and sugar free drinks) and create their own snack box; thereby covering the cost of purchasing the items and offering more nutritious snack options for their employees.

In this company, the catering options available for meetings and work events were not governed through a health related policy at the company level and instead left to the discretion of the individual responsible for ordering the food (in most cases, a member of the administration team). In most instances, while dietary requirements were considered and the opportunity to order healthy food at comparable prices was available, this was often passed over for less healthy alternatives. The findings within this organisation for the nutrition environment overall suggest a need for a company-wide policy that governs the food choices within the worksites. Removing the option to opt-out of the fruit delivery, choosing a snack box or vending machine provider that can supply better food options within the workplace, writing a policy that governs the types of foods that are provided for in meetings and at work events and including regularly updated messages throughout the organisation with regards to nutrition to be salient throughout the worksites should be a priority for this company. This will remove the disconnect that currently exists between nutrition

messages and available food options, strengthening the healthy eating message that currently exists in some worksites and making it more effective overall.⁶¹⁹

Correlations with nutrition and PA behaviours

A primary purpose of a workplace audit tool is to assess attributes that contribute to the PA and nutrition environment of the organisation, make recommendations based on the assessment, and to evaluate changes occurring as a result of the recommendations. Some investigators have extended beyond this to explore whether associations can be drawn between the workplace environment and employee health status.^{535,546} Detecting associations using the tool might be considered as evidence for utility of changing behaviour in the future.

As adults spend at least a third of their day at work, it seems intuitive that the environment around them may be in some part associated with eating behaviour, PA habits, and weight status. While not the primary focus of this research, we used the audit tool to investigate if a relationship existed between the physical environment and PA and nutrition related behaviours. At best, there was little correlation between the variables measured in this sample (with r ranging between -0.17 and 0.17). Both Parker et al. and Nigg and colleagues reported similar findings in their exploration of associations between the physical work environment and biometric or behaviour measures.^{535,546} The small associations found in this sample do not necessarily mean there is no relationship between health status and the physical work environment. Those who answered the HRA may not be in job roles requiring regular attendance to catered work meetings, therefore limiting their exposure to less healthy food options. Alternatively, it may be that the questions on the HRA didn't cover the food options frequently available at meetings and, had other nutrition variables been measured (such as foods high in fat, sugar and salt) a relationship may have been found. This may also be the case for food options in the snack boxes and vending machines. Associations that have been found between sugary beverage consumption and the availability of such drinks in younger population groups,⁶²⁰ have not been found here. However, just eight of the 23 worksites reported they had vending machines, so it is likely the numbers were too few to draw any conclusion.

With just 25% of worksites measured having a cafeteria onsite, it is to be expected that any relationship between the nutrition variables and the health attributes of the cafeteria is likely to be small. Indeed the association found with breakfast consumption has wide confidence limits, making it difficult to draw any strong conclusions about a relationship. While it is promising that having a cafeteria that offers healthy options nearby may be associated with breakfast consumption (which is itself associated with better nutrient intake and healthy weight status^{621,622}), this does not mean that the breakfast choice of the employee is going to be a healthier choice. Further, it is unknown how many employees consume breakfast at work or at home; given that it is defined as ‘the first meal of the day, prior to 10am’, it is likely that the home environment is going to have a far greater influence on this variable.

The worksite environment had no more than a trivial relationship with fruit and vegetable consumption in this sample. This is in contrast to previous research showing associations between intake of fruit and the provision of fruit at work⁶²³. The links between consumption and availability are often studied in the context of a workplace wellness programme, where fruit is provided along with the promotion of the health benefits through posters, signs and with or without educational seminars and related nutrition initiatives. While fruit was offered at a number of the worksites, without these other elements of a wellness campaign, it is possible that the people who were consuming it were those that would do so anyway. Further, having a food preparation area at the worksite is likely to encourage employees to bring their lunch from home;⁴⁸⁹ again, the present study found no strong links between these two variables. Time scarcity is one factor that has been found to influence food intake, both at and away from work.⁵⁰⁶ Increasing fruit and vegetable consumption can, for some people, mean additional planning and preparation that they perceive as being time consuming.

The only association found in this sample between PA levels and the environment was with travel provisions. This is in line with research showing that active commuting is beneficial for the number of steps for the day,⁶¹¹ and suggests that flexible working hours, the limited availability of free parking, and the close proximity to public transportation all encourage employees to use methods other than private vehicles for transportation to work. It is interesting that travel provision

was associated with the number of physically active days but not overall time spent in activity. This might mean that activity related to travel to work is used as a substitute for other, more structured activity when people choose to drive instead. However, given the observational nature of this research, it is difficult to interpret the relationship between these variables without more in-depth investigation.

This research was designed to test the utility of the audit tool and highlighted many areas of the PA and nutrition environment that could be improved through low cost initiatives.

5.6 Conclusion

The audit tool highlighted key areas within the organisation that could be addressed in a cost-effective manner to improve the worksite environment and encourage more PA and better eating habits among the employees. In the long term, this could help reduce the risk of employee poor health and improve their productivity. This tool is designed to specifically address features of the PA and nutrition environment; thus a more comprehensive workplace audit tool may provide more insight into the health environment in industries where smoking and alcohol consumption may be salient health issues alongside PA and nutrition (such as blue collar workplaces). While few associations could be drawn between behaviour and the work environment, this may be due to the homogeneity of the sample, as information on behaviour was only available for those employees answering the HRA and indicating their worksite location. Health, PA and nutrition may be more salient topics for these people and the worksite environment therefore may exert less of an influence on their behaviour than employees who chose not to participate. Future research across different organisations would provide more variation in the factors such as the policy environment and thus may elicit associations. In addition, factors of the home environment and in the wider physical environment, not measured by the audit tool, may be more salient in determining behaviour. These issues require further investigation.

While the priority areas are only generalisable to the selected organisation, this research highlights the utility of the tool in assessing both small and large worksites.

Furthermore, it could be implemented multiple times throughout the year to assess how the priority areas targeted have changed in response to recommendations made. The availability of this tool will guide those in the industry to develop a systematic approach to designing and evaluating workplace interventions. This direction is important for building a successful workplace health promotion environment that is sustainable in the New Zealand context. Previous research suggests that recommendations to change the environment as part of a low-cost, yet effective health promotion campaign as a result of the audit could have a positive influence on employee health in the long term. This has yet to be studied in a New Zealand environment, and the development of this tool is an important step in addressing this.

Chapter 6. Associations between employee health and the health culture at work

6.1 Preface

Assessing the impact the workplace has on health behaviour extends beyond the physical and policy attributes that were identified in Chapter five. While the audit tool identified and prioritised features of the worksite that could be targeted for intervention, most of these were not associated with employee health behaviour. The preceding chapter highlighted some likely reasons for this, including that factors more salient than the physical or political environment (and not measured with the audit tool) may be more influential when determining an employee's health behaviour. Indeed, the social environment has been found to be as important for encouraging health behaviour when investigated in other health promotion settings. It is therefore reasonable to posit that prevailing values, attitudes and beliefs held by the employer, immediate manager and colleagues may exert some influence over an individual's behaviours. This has led others in the field of health and productivity management to develop instruments to measure the relationship between the social environment and health behaviour, however few have focused specifically on the health culture. Embedded in the HRA developed as part of this doctoral research (and described in Chapter two) is the LifeGain Healthy Culture Audit (LHCA), one of the only tools designed to specifically measure the health culture of the organisation. The following chapter investigates whether the health culture is associated with health behaviours in this sample.

6.2 Introduction

It is generally acknowledged that a supportive environment is fundamental to individual health behaviour change.^{284,493} As well, recent research has provided compelling evidence that health behaviours can affect productivity in the workplace.^{14,432,624} This has resulted in an increase in attention surrounding

modifiable health-related factors within the work environment and employee productivity.^{106,527,625} An organisation that values the wellbeing of employees and has health embedded into company structures and policies is more likely to have healthy, motivated employees that add value to the business, particularly if the employee perceives that these values match their own health goals.⁵²⁷ A healthy organisation is recognised as one which emphasises, supports and facilitates healthy behaviour.^{486,516-518} In addition, colleague support for health behaviour is recognised as an important predictor for engaging in health behaviours.⁵¹⁹⁻⁵²¹

While the relationship between organisational culture as a whole and employee health has been previously examined,^{106,626} the role that health culture plays in influencing the individual behaviours of employees is poorly understood. The aim of the present study was to investigate the relationship between employees' health behaviours and their perceptions of the health culture of their work organisation.

6.3 Methods

Participants

Participants were employees of five organisations invited by email to participate in an online HRA. The organisations were from the private sector, and included law, engineering, insurance, information technology, and advertising firms. Email invitations were sent to 1,412 employees to complete the HRA within work time. Two follow-up emails were sent out over a two week period. The study was approved by the New Zealand Northern Regional X Ethics Committee, and data were collected from December 2009 to March 2010 (Appendix A).

Health risk assessment

The HRA was an online questionnaire that included questions regarding seven health risk factors: body mass index (BMI), PA, fruit and vegetable consumption, sleep patterns, alcohol consumption, smoking status, and psychological distress. These risk factors were selected due to their proposed links to health and productivity in the workforce.³⁷⁵ The details of the questionnaire development and scoring are detailed in chapter three. Briefly, BMI was calculated from reported weight and height (BMI;

kg/m²) and participants were asked to recall the time spent in physical activities over the last week using the New Zealand Physical Activity Questionnaire Short Form (NZ PAQ-SF), a modified and validated version of the International Physical Activity Questionnaire (I-PAQ).⁵⁶³ Fruit and vegetable consumption per day over the previous seven days was assessed using questions from the New Zealand Nutrition Survey,²⁷¹ and sleep was assessed by employees answering four questions regarding sleep quality and quantity,¹⁰⁹ which were drawn from a questionnaire designed and previously used in a similar working population.⁵⁵³ Questions from the nationally representative New Zealand Health Survey were used to assess drinking patterns and smoking status.²⁶ Finally, the K6 scale of non-specific psychological distress was included.⁵⁵⁴ The K6 is a six-item questionnaire developed to identify individuals at risk of mental health disorders such as anxiety and depression, as indicated by a score over 12 on the K6 scale. This tool shows appropriate reliability and validity for the study population.⁵⁶⁵ The sum of health behaviours was determined by whether participants met recommendations for fruit and vegetable consumption, PA, smoking, alcohol consumption, healthy weight, experienced few sleep disturbances and having a K6 score below 12.

The health culture of the organisations was assessed using the LHCA, a 23-item questionnaire that was developed specifically for the workplace environment and investigates five constructs of the workplace culture in relation to health behaviour: cultural norms, cultural values, social support, organisational support, and organisational climate.⁵⁶¹ The instrument has been tested for validity in a similar working population.⁵⁶¹

Statistical Analysis

Data were analysed using SPSS for Windows v 17.0.0 (SPSS Inc., Chicago, IL). Partial correlation coefficients were used to assess the relationship between participant's responses on the health domains and the LHCA, adjusted for gender, ethnicity, company, and age group. Cohen's guidelines⁶⁰⁹ to determine magnitude of correlations have been augmented by Hopkins⁶¹⁰ and were used here for interpreting the correlation coefficients. The magnitudes of correlations are: trivial (0.0-0.1), small (0.1-0.3), moderate (0.3-0.5), high (0.5-0.7), very high (0.7-0.9), or near

perfect (0.9-1.0). Confidence limits were set at 90% and were used to estimate the likely range of the magnitude.

6.4 Results

The HRA was completed by 510 participants aged 18-65 years; an overall response rate of 36% (a range of 13-90% for the organisations). Table 6-1 shows the demographic information and the scores for the LHCA constructs and health behaviour measures. There were no differences related to gender, age or ethnicity and therefore the results are presented as one group.

Table 6-1: Demographics of participants and scores on the LHCA and health behaviour measures.

Demographic information	All participants
<i>Age group (n (%))</i>	
18-29y	125 (23.9)
30-39y	166 (32.5)
40-49y	134 (26.3)
50-59y	59 (11.6)
60y+	26 (5.1)
<i>Ethnic group (n (%))</i>	
NZ European	404 (79.2)
Māori/PI	47 (9.2)
Asian	59 (11.6)
LHCA scores (mean, SD)	
Sum LHCA (maximum score 105)	74.00 (11.48)
Cultural norms (maximum score 40)	27.58 (4.45)
Cultural values (maximum score 5)	3.84 (0.80)
Social support (maximum score 30)	18.18 (4.18)
Organisational support (maximum score 5)	3.49 (0.98)
Organisational climate (maximum score 25)	17.65 (3.35)
Health domain (mean, SD)	
BMI (kg/m ²)	25.2 (6.70)
Fruit serves per day	3.15 (1.13)
Vegetables serves per day	3.56 (0.83)
PA minutes per week	655 (1114.2)
Days active per week	4.53 (1.81)
Sleep (score out of 5)	3.02 (1.13)
Non smoker (n(%))	437 (85.8)
Alcohol (drinks per session)	2.41 (1.4)
Everyday distress (K6 Score)	10.0 (4.3)
K6 > 12 (high psychological distress; n (%))	105 (20.5)
Sum of seven health risk factors	4.15 (1.28)

Small to moderate associations were found for psychological distress, with correlations between -0.17 and -0.30 for the five constructs of the LHCA (Table

6-2). In addition, the sum of the LHCA correlated with the sum of health behaviours ($r = 0.13$, 90% CL: 0.04, 0.21) and being a non-smoker ($r = 0.12$, 90% CL: 0.05, 0.19). All other observed correlations were trivial, although the levels of uncertainty extended beyond multiple categories and therefore it is difficult to be certain of the population magnitude (data not shown).

Table 6-2. Correlations and confidence limits for psychological distress and constructs of the Lifegain Healthy Culture Audit (LHCA).

LHCA	r*	90% Confidence Limits		Association
		Lower	Upper	
Cultural norms	-0.17	-0.24	-0.10	Small
Cultural values	-0.18	-0.25	-0.11	Small
Social support	-0.19	-0.26	-0.12	Small
Organisational support	-0.24	-0.31	-0.17	Small
Organisational climate	-0.30	-0.37	-0.23	Moderate
Sum of LHCA	-0.26	-0.33	-0.19	Small

* r = correlation coefficient

6.5 Discussion

In this study, people who reported a less supportive work environment had higher levels of psychological distress. A less supportive work environment was also reported by people who smoked and by people who reported fewer health behaviours overall. Psychological distress scores are indicative of the amount of stress an individual experiences and are able to differentiate people who are at risk of depression, anxiety and other mood disorders. Very little research has been conducted on the association between the health culture of an organisation and psychological distress; however, these results concur with Ribisl and Reischl who reported perceptions of the health climate in the workplace reduced as job stress increased.⁵²⁷ Research investigating workplace culture as a whole has consistently found lower stress levels are reported as a key factor for a healthy work environment.^{514,515} Perceived social support within the workplace was one of the

key predictors of stress levels in Guillent et al.'s and Parke's research of psychosocial factors and health outcomes^{520,530} and perceptions of an unsupportive workplace environment, as measured by organisational policies, practices, procedures and employee feelings of value, have been linked with poorer mental health in the broader context of workplace culture.^{627,628} This study goes another step and suggests specific changes to the health culture of the organisation, such as the integration of health promotion policies could improve mental health outcomes.

Smoking status was associated with how supportive participants found the overall work environment. Linnan and colleagues found a similar association for salaried workers when investigating smoking prevalence and health-related norms in their investigation of manufacturing worksites.⁵²⁹ An unsupportive work environment may lead to an increase in undesirable behaviour as a coping mechanism.⁶²⁹ Alternatively, workplaces are now smoke-free in New Zealand (aside from designated areas in some organisations), and individuals may feel that there is increasing stigmatisation attached to being a smoker.⁶³⁰ Indeed, the prevalence and subsequent acceptance of smoking in New Zealand has declined over the last three decades.⁶³¹ This may impact on an employee's perception of their work environment.

The association found here between adherence to a greater number of health recommendations and the workplace culture supports other research⁶³² and could work in either direction. A supportive culture can increase work satisfaction, wellbeing and ultimately employee health and health behaviour.^{12,633} On the other hand, research suggests healthier people are more likely to have higher self esteem and self efficacy, and a more positive outlook. Therefore they are going to view the workplace culture as more supportive in general, which would include the culture around health behaviour. It is also possible that a synergistic relationship exists such that both scenarios are in place concurrently.

Causality in this study cannot be established and the question of whether health status affects the perceptions of workplace support or vice versa cannot be answered here. In addition, that the findings of an association between health behaviour and the health culture of an organisation are, in fact, related to another factor that was not

investigated cannot be ruled out. Other sources of support for health behaviour may be more salient than work-related support for variables where no correlation was found. Alternatively, LHCA scores across a number of diverse worksites may show more variation, and associations between nutrition behaviours and PA that have been found previously may be elicited. At the very least, given the individual and the work-related costs associated with poor employee mental health, and the evidence base for improving mental health through workplace wellness strategies, further investigation into the link between health culture and psychological distress that has been found here is warranted.

Chapter 7. Establishing links between health risk and productivity in a New Zealand workforce

7.1 Preface

Examining the workplace for its potential as a health promotion setting required an exploratory analysis of potential relationships between health behaviour, health risk factors and the work environment. Prior to this research, there had been few studies that investigated health behaviour and its association with workplace environments. Chapter four identified relationships between health behaviour and health conditions that are found to increase costs for the employer in the international setting, though currently there is no New Zealand research that shows the same. Further, Chapters five and six investigated attributes of the workplace environment that could be targeted for intervention in a workplace wellness programme, which may improve health behaviour and over time reduce the number of health conditions present. This suggests that the workplace would be a logical setting for health promotion from a population health perspective, however for a company to invest resources into this (be it time or money), it is necessary to create a business case. The low-cost initiatives identified in Chapter five that could promote healthy behaviour in the workplace still require resources for planning, implementation and evaluation. In countries such as the US, this investment has proven to be worthwhile, with clear evidence linking reduced medical care expenditure and days absent from work with healthier employees. Further, comprehensive wellness programmes have improved employee health outcomes, increased productivity and reduced their overall costs to the employer. In New Zealand, where an individual's medical costs are met by the public health sector, the tangible benefits of workplace health promotion are less clear. Establishing a business case then, which links healthy employees with a higher level of productivity in the workplace, is the next logical step in this exploratory research, and is the purpose of the following chapter.

7.2 Introduction

Poor nutrition, physical inactivity, excessive alcohol intake, and smoking are the leading causes of chronic disease in developed and developing countries.³⁸⁴ As the number of people affected by these four risk factors increases worldwide,³⁸⁴ so does the burden on the public health systems responsible for the management and treatment of downstream chronic disease. However, it is not only health systems that are under pressure by increasing costs; employers are also affected by the impact poor health has on work and indirectly economic performance. It has been proposed that absenteeism, employee turnover, and presenteeism (present at work yet not able to function at full capacity) are all influenced by modifiable health behaviours that lead to poor employee health.^{11,443} As well, sleep deprivation and increased stress levels – common in many vocations^{75,153} – are associated with chronic health disorders independently of other risk factors.^{55,109} These behaviours often cluster together making high risk employees particularly unproductive and a burden on the employer.

Substantial savings can be made at the business level by improving health behaviours, and subsequently the health of the employee, using the workplace as a setting.^{12,377} Integral to this investment in human capital is industry and locally relevant evidence for an association between health risk and productivity. Internationally it is clear that medical claims and health insurance costs met by the employer are higher among individuals at greater health risk.^{99,100,413} Indeed, in the US it is estimated that 90% of all organisations invest in wellness initiatives in an effort to reduce costs associated with poor employee health within their company.¹² In countries with a state-administered health system (such as New Zealand) the employer does not meet the insurance costs of its employees, and consequently the benefits of investing in such programmes are less tangible. It is therefore crucial that evidence of the associations between health and work performance is collected to convince employers that privately-funded health programmes represent a worthwhile return on investment.

One approach for linking health with work performance is to examine the effect poor lifestyle patterns have on absenteeism and presenteeism, two domains that are clearly

linked to productivity. In Australia, it was documented that individuals in the lowest category for health-related behaviours reported 18 days absent per year compared to just two days absent for those in the highest category.¹³² This is consistent with data collected globally, including the US,^{11,14} South Africa,⁶³⁴ and the UK.^{31,422} Alcohol and smoking have both been linked with reduced productivity in the New Zealand workforce;^{216,635} a finding that is consistent with international evidence.^{32,636} Lack of PA and psychological distress is also associated with increased absenteeism,^{371,373,600} and the impact that nutrition behaviour can have on productivity of employees has been mixed, with low fruit and vegetable intake impacting on presenteeism,²⁷⁶ but not on absenteeism or health care costs.^{378,443} The increase in irregularity and duration of work hours has meant more of the working population may be affected by sleep disturbances related to work, which are costly to the economy in reduced productivity at work^{137,141,143} and increased health care utilisation.¹⁵⁹ While some studies have investigated stress levels in particular occupation groups in New Zealand (such as dentists,⁸⁰ psychiatrists⁸² and government employees⁸¹), this has not been investigated in relation to productivity in the New Zealand workforce.

In New Zealand, there is a paucity of up-to-date information regarding lifestyle patterns and work productivity. Therefore the primary aim of this study was to undertake the first investigation of the associations between health risk factors, absenteeism, and presenteeism in the New Zealand population. A secondary aim was to examine whether an increasing number of health risks is associated with increasing absenteeism or reduced work performance.

7.3 Methods

Participants

Participants were employees of nine organisations invited by email to participate in an online HRA. Five organisations completed the HRA as part of a baseline measure for a workplace wellness programme, and four companies were approached to participate as the employees had easy access to computers during work time. The organisations were selected from both the public and private sector, and included law, engineering, insurance, information technology, and advertising firms. Email

invitations were sent to 3,438 employees to complete the HRA within work time. Two follow-up emails were sent out over a two week period. The response rate for each organisation ranged from 13-90% with an overall response of 38% (1,296 participants). From this initial sample, 549 were excluded due to incomplete data, resulting in a final sample size of 747 participants (57.6%; 274 male, 473 female) aged 18 to 65 years. The study was approved by the New Zealand Northern Regional X Ethics Committee (Appendix A) and data were collected from December 2009 – March 2010.

Health Risk Assessment

The HRA was an online questionnaire that required participants to respond to questions regarding seven health risk factors: body mass index BMI, PA, fruit and vegetable consumption, sleep patterns, alcohol consumption, smoking status, and psychological distress. These risk factors were selected due to their proposed links to health and productivity in the workforce.³⁷⁵ The HRA also included questions related to demographics, hours worked, absenteeism and productivity, and their perception of the health culture of the organisation. Questions were derived from previously validated questionnaires and population surveys, and were reviewed by an advisory board that included professionals from the fields of PA, nutrition, public health and workplace health. Once developed, the questionnaire administration and roll out was pilot-tested in a convenience sample of 20 adults of working age (12 female, eight male, aged 22-53 years) to assess for comprehension and length. This feedback resulted in minor changes to the appearance of the questionnaire on the online survey tool, but no changes were made to the length or the wording of the questionnaire.

Weight status was assessed by asking participants to state their height and weight, from which BMI was calculated as weight divided by squared height. Those reporting a BMI of 25 kg/m² or greater were categorised as overweight.³⁸⁴

Participants were asked to recall the time spent in physical activities over the last week using the New Zealand Physical Activity Questionnaire Short Form (NZ PAQ-SF), a modified version of the International Physical Activity Questionnaire (IPAQ). This questionnaire has been used in national surveys and has been validated in the New Zealand population.⁵⁶³ Participants were categorised as either active or

inactive according to the New Zealand Physical Activity Guidelines (at least 30 minutes of moderate to vigorous PA each day on five or more days per week.³¹¹ Fruit and vegetable consumption was assessed using validated questions from the nationally representative New Zealand Nutrition Survey.²⁷¹ Participants were asked how many servings of vegetables and fruits they consumed each day over the past seven days.²⁷¹ Those that reported meeting the recommendation of three servings of vegetables and two servings of fruit were categorised as meeting the recommendations for a healthy diet.⁷

Sleep was assessed by employees answering four questions regarding sleep quality and quantity.¹⁰⁹ Three of these questions were modified from a questionnaire designed for a workplace wellness programme and validated in a similar working population,⁵⁵³ and asked participants to report how often they experienced waking early, difficulty falling asleep and difficulty staying asleep. The fourth sleep question was added after consultation with sleep experts, and asked participants if they had ever been told that they snored, as snoring can be indicative of sleep apnoea.⁵⁶⁶

Validated questions from the nationally representative New Zealand Health Survey²⁶ were used to assess drinking and smoking behaviours. Participants were asked to record the number of alcoholic drinks they typically consumed in one sitting. Binge drinking behaviour was defined as more than four drinks in a sitting for females and six drinks for males.⁵⁶⁷ In addition, participants were asked whether or not had smoked fewer than 100 cigarettes in their life, and if they were smoking now, every day, or every few days. Those that had smoked fewer than 100 cigarettes, or who were former smokers, were grouped into 'non-smoking' category.

The K6 scale of non-specific psychological distress was included.⁵⁵⁴ The K6 is a six-item questionnaire developed to identify individuals at risk of mental health disorders such as anxiety and depression. This tool shows appropriate reliability and validity for the study population⁵⁶⁵ and is included in its longer form in the New Zealand Health Survey.²⁶ The K6 asked participants to consider how often over the previous 30 days they felt worthless, hopeless, as if everything was an effort, nervous, restless, and that nothing could cheer them up. On a scale of 0-4 they were asked to report how often they have felt this way, from none of the time (0) to all of

the time (4). Previously published methods were used to group individuals into low levels of psychological distress (0-7), moderate levels of psychological distress (8-12) and high levels of psychological distress (13-24).⁵⁶⁵

Finally, productivity was assessed using questions on absenteeism and work performance that were extracted from the WHO-HPQ.⁵⁵⁵ Briefly, absolute absenteeism was quantified by subtracting the number of hours employees worked in the previous four weeks from the number of hours their employer expected them to work during a four week period. Relative absenteeism was calculated by dividing the absolute absenteeism value by the expected hours of work and was expressed as a percentage: a negative value indicated extensionism (working longer hours than expected) and a positive value conveyed absenteeism. The measure of absolute work performance required employees to report their own performance over the past 28 days on a scale of 0-10, which was converted to a percentage ranging from zero (a complete lack of performance) to 100 (on task all of the time). Relative work performance required employees to rate the average worker in a position similar to theirs on the same scale, and this value was divided this by the absolute work performance value. The values were delimited to between 0.25-2.00. These questions have been validated and widely used as a part of other HRAs in similar populations to assess self-reported productivity.⁵⁵⁵

Statistical Analysis

Data were analysed using SPSS for Windows v 17.0.0 (SPSS Inc., Chicago, IL). The relationship between each health risk factor and productivity was assessed using stepwise multiple regression with each factor as an independent variable ($P_{in} > 0.05$, $P_{out} > 0.10$) and productivity (absolute and relative absenteeism, absolute and relative work performance) as the dependent variable. The variables were dummy coded as 0 or 1, assigned by determining the level of risk for each variable. Fruit and vegetable consumption, PA guidelines, BMI, alcohol consumption and smoking were coded as 0 or 1 based on whether participants met established guidelines for the particular health risk behaviour (one representing the positive or ideal state). The score of three or more out of five was used as the cut-off for sleep, based on the HRA from which the questions were sourced,⁵⁵³ and those who fell into the low and

moderate K6 categories were assigned as one, with those scoring over 12 being placed in the at-risk category. Gender, ethnicity, age group, and number of hours worked in the last four weeks were added into the model as covariates. The sum of all health risk factors (from 0-7) was also entered into the model as an independent variable to investigate if overall health risk predicted a difference in work performance variables. Analysis of covariance was conducted to assess whether participants presenting with low health risk (zero to two risk factors), moderate health risk (three or four risk factors) or high health risk (five to seven risk factors) differed in their productivity. $P < 0.05$ was used to determine level of significance.

7.4 Results

Work productivity measures and health variables

Table 7-1 outlines the demographic information and health risk factor prevalence for the study sample. Though no data were available on non-responders within the selected organisations, comparing this group to the working population of New Zealand as a whole revealed a similar ethnic breakdown. However, there were higher numbers of women and responders in the 30-39 year age group, and lower numbers in the 50-59 year age group⁶³⁷. Participants in this study reported working an average of 38.2 hours per week, similar to the national average of 37.6 hours per week.⁶³⁸ Fifteen percent of participants worked more than 50 hours per week, which is lower than the 29% reported over the workforce in New Zealand.⁶³⁹

Table 7- 1: Work productivity measures according to selected demographic and health variables.

	N (%)	Absolute absenteeism (hours past 4 weeks)	Absolute work performance (mean, SD)	Relative absenteeism (mean, SD)	Relative work performance (mean, SD)
Male‡	274 (36.7)	14.1 (53.00)	79.4 (14.0)	6.0 (39.2)	1.14 (0.51)
Female	473 (63.3)	17.25 (57.02)	81.7 (12.5)	4.0 (59.3)	1.11 (0.24)
Age group					
18-29 years	173 (23.3)	15.9 (57.2)	79.7 (13.5)	8.0 (37.4)	1.13 (0.32)
30 – 39 years	251 (33.6)	18.58 (59.18)	80.6 (14.1)	3.0 (57.8)	1.09 (0.21)
40-49 years	202 (27.0)	14.01 (48.58)	83.6 (12.2)	3.0 (58.2)	1.14 (0.56)
50-59 years	87 (11.6)	18.34 (53.86)	84.4 (12.1)	4.0 (59.3)	1.14 (0.23)
60 years and over	33 (4.4)	9.37 (64.08)	84.2 (9.37)	9.0 (24.7)	1.19 (0.32)
Ethnic group					
NZ European/Other	607 (81.3)	14.42 (51.82)	80.8 (12.9)	4.0 (52.0)	1.12 (0.36)
Māori / PI	76 (10.2)	21.75 (74.3)	80.4 (15.0)	8.0 (44.0)	1.13 (0.35)
Asian	64 (8.6)	6.5 (62.92)	82.6 (12.2)	6.0 (59.0)	1.13 (0.30)
Work <50h/wk	1099 (84.7)	20.96 (55.79)	80.7(13.25)	7.8 (55.9)	1.11 (0.37)
Work >50h/wk‡	197 (15.3)	-13.86 (43.65)	81.7 (12.34)	11.6 (26.2)	1.15 (0.30)
Risk factors					
HW - 0	405 (55.2)	17.31 (57.2)	80.2 (13.4)	5.0 (0.53)	1.13 (0.30)
HW - 1	342 (45.8)	14.70 (53.58)	81.2 (12.6)	4.0 (0.54)	1.10 (0.21)
Smoking - 0†	104 (14.9)	28.02 (62.62)	80.8 (12.6)	13.0 (0.40)	1.17 (0.69)
Smoking - 1	643 (86.1)	14.15 (54.12)	81.0 (13.1)	4.0 (0.55)	1.11 (0.26)
PA - 0‡	413 (55.3)	15.38 (55.35)	80.2 (14.2)	5.0 (0.55)	1.11 (0.28)
PA - 1	334 (44.7)	17.03 (55.90)	83.7 (12.6)	2.0 (0.64)	1.11 (0.21)
FV - 0	535 (71.6)	15.41 (55.60)	80.0 (13.0)	7.0 (0.48)	1.11 (0.38)
FV - 1	212 (28.4)	17.90 (55.58)	81.2 (12.6)	2.0 (0.64)	1.14 (0.28)
Stress - 0†‡	148 (19.8)	28.8 (70.70)	76.1 (14.1)	9.0 (0.52)	1.11 (0.37)
Stress - 1	599 (80.2)	12.93 (50.63)	82.1 (12.6)	4.0 (0.53)	1.11 (0.36)
Sleep - 0	369 (49.4)	11.5 (52.79)	80.4 (12.9)	3.0 (0.55)	1.11 (0.27)
Sleep - 1	378 (50.6)	20.59 (57.88)	81.5 (13.3)	7.0 (0.51)	1.13 (0.43)
Alcohol - 0	163 (21.8)	16.25 (52.47)	79.4 (12.8)	5.0 (0.51)	1.10 (0.23)
Alcohol - 1	584 (78.2)	16.09 (56.45)	81.3 (13.1)	5.0(0.54)	1.12 (0.38)
Sum of health behaviours					
0	2 (0.2)	89.50 (85.56)	65.0 (7.1)	5.7 (0.59)	1.18 (0.02)
1	11 (1.5)	14.36 (49.96)	70.9 (17.5)	9.0 (0.31)	1.14 (0.27)
2	60 (8.0)	10.57 (58.65)	75.2 (12.6)	2.0 (0.50)	1.04 (0.19)
3	160 (21.4)	20.13 (58.65)	79.7 (13.5)	7.0 (0.47)	1.14 (0.34)
4	218 (29.2)	17.15 (58.20)	80.6 (14.1)	3.0 (0.64)	1.10 (0.22)
5	191 (25.6)	13.47 (50.17)	83.6 (12.2)	3.0 (0.67)	1.12 (0.25)
6	92 (12.3)	14.19 (53.63)	84.4 (12.1)	7.0 (0.31)	1.11 (0.20)
7	14 (1.9)	17.64(48.58)	84.2 (9.37)	5.0 (0.42)	1.05 (0.11)
Health risk group					
Low risk (5 or more behaviours)	297 (39.7)	13.30 (58.79)	83.7 (12.0)	5.0 (0.57)	1.11 (0.23)
Moderate risk (3 or 4 behaviours)	379 (50.6)	18.40 (58.33)	80.3 (13.8)	4.0 (0.58)	1.12 (0.28)
‡ High risk (0-2 behaviours) ‡	73 (9.7)	13.89 (51.03)	74.2 (13.4)	4.0 (0.48)	1.06 (0.27)

HW: healthy weight; PA: PA; FV: fruit and vegetable consumption

‡ p<0.001 between groups for Absolute work performance; † p<0.001 between groups for Absolute absenteeism

Table 7-1 also shows the mean and standard deviations of the four measures of productivity for the demographic information, single health behaviours and multiple health risk groups. While the majority of participants reported favourably for alcohol consumption (78.2%), smoking status (86.1%), and levels of distress (80.2%), less than one half had a BMI of $< 25 \text{ kg/m}^2$ or was regularly physically active (44.5%) and just one third of the participants ate the recommended servings of fruit and vegetables per day. When grouped together, close to 40% of participants met the recommendations for five or more health behaviours and just 9.7% were categorised in the higher risk group, answering favourably for just one or two health behaviours.

Predictors of work productivity measures

Table 7-2 presents the coefficients of the stepwise linear regression model for predicting absolute work performance in the order the independent variables were entered into the equation. The only two health risk factors that entered the model were psychological distress and PA. Low to moderate levels of psychological distress resulted in an increase in work performance of 6.83% (95% CI: 4.48, 9.15; $p < 0.001$), while meeting the PA guidelines increased performance by 3.44% (95% CI: 1.59, 5.33; $p < 0.001$). In addition, males had a 1.96% (95% CI: 0.09, 3.87; $P < 0.05$) greater work performance than females, and performance increased by 1.12% (95% CI: 0.30, 1.95; $p < 0.05$) with each year of age. The final regression equation was as follows: absolute work performance = $65.925 + [6.831 \times \text{stress}] + [3.437 \times \text{PA}] + [1.122 \times \text{age group}] + [1.958 \times \text{gender}]$. There were no significant interactions between any of the independent variables ($p > 0.05$).

Table 7-2. Regression equations for absolute work performance.

Psychological distress		PA		Age		Gender		Intercept			
β	SE	β	SE	β	SE	β	SE	β	SE	r ²	SEE
7.32	1.20							75.20	1.069	0.048	13.09
7.18	1.19	3.36	0.96					73.81	1.132	0.063	12.99
6.83	1.19	3.50	0.96	1.08	0.42			69.30	2.094	0.072	12.95
6.83	1.19	3.44	0.95	1.12	0.42	1.96	0.98	65.93	2.691	0.076	12.92

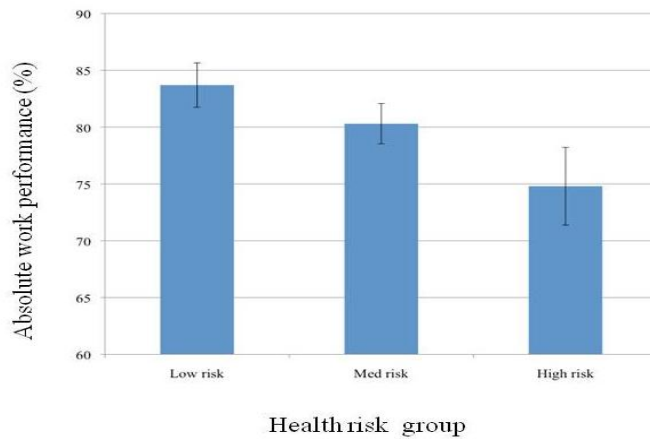
When absolute absenteeism was entered as a dependent variable into the stepwise multiple regression equation, psychological distress and smoking remained in the model once it was adjusted for the confounders (Table 7-3). Participants with high levels of psychological distress had an additional 16.8 hours away from work in the previous four weeks (95% CI: 7.4,26.5; $p < 0.001$) and smokers an extra 11.6 hours (95% CI: 0.7,22.8; $p = 0.038$). The final regression equation was as follows: absolute absenteeism = 48.21 - [34.645 x work hours] - [16.842 x stress] - [11.63 x smoking]. There was no significant interaction between any of the independent variables, and there were no significant variables that remained in the multiple regression equation for the other work productivity measures.

Table 7-3: Regression equations for absolute absenteeism.

Work hours		Psychological distress		Smoking		Intercept			
β	SE	β	SE	β	SE	β	SE	r ²	SEE
-34.89	5.79					37.34	13.97	0.050	54.30
-35.19	5.76	-15.96	4.97			45.99	14.14	0.063	53.96
-34.65	5.73	-16.84	4.98	-11.63	5.72	48.22	14.45	0.076	53.67

Small but significant differences were found for mean absolute work performance values between the low, medium and high risk groups (Figure 7-1). While linear regression analysis did not reveal a change in productivity measures when investigating the sum of health behaviours, it did show that health risk group accounted for 4% (95% CI: 2.7,5.7; $p < 0.001$) of the absolute work performance

score – so individuals grouped in the moderate and high health risk groups had a 4% and 8% decrement in absolute work performance respectively, when compared to those in the low risk group after controlling for age, gender, ethnicity and number of hours worked in the last four weeks.



*p<0.001 difference between low risk and high risk absolute work performance score

Figure 7-1. Absolute work performance for low, medium and high risk groups

7.5 Discussion

This study represents the first investigation of the associations between health risk factors and work performance in New Zealand. Employees categorised as having high levels of psychological distress reported a work performance level approximately 7% lower than those of low to moderate distress. Further, an additional 16.8 hours per month were reported absent from work for these individuals. These findings are in line with previous international research examining health risk and work productivity. The reduced work performance associated with a high K6 score estimated in this sample (equating to 2.6 of the 38.2 hours worked on average per week) was comparable to the 6.1% Hilton et al. reported for white collar workers when investigating productivity using the same instruments employed here.⁶⁰⁰ The strongest association with health risk and presenteeism in an Australian study of 224 employees was found with stress, with a presenteeism level of 26.6% for those reporting high stress levels compared to 14.7% in the low stress group.⁴⁵⁰ Stress was found to be an explanatory variable for increased presenteeism in a study of 2,264 employees: a decrease of 10% was

reported for participants who ‘sometimes or often’ experienced high levels of stress compared to 5% reported by individuals who did not.³⁷⁸ Burton et al.³⁷⁵ also observed significant differences in work performance in participants reporting high stress levels compared to those that did not, with an earlier study from the same group reporting that employees experiencing higher levels of ‘general distress’ lost more time through illness and through failure to meet an objective productivity standard.³⁷⁷ Boles et al. found that those reporting high stress also reported more time away from work compared to low stress individuals with an additional 1% of lost work hours due to absenteeism.³⁷⁸ The positive association found in the present study between psychological distress and absenteeism suggests that New Zealand is not exempt from the convincing body of evidence that stress impacts on time away from work.^{11,68,93,640}

While a moderate amount of stress has been found to be positively related to health,⁶⁴¹ if this state persists over time, physical, psychological and social health can be adversely affected.⁵³ To the author’s knowledge, this is the first study to implement the WHO-HPQ to demonstrate the negative impact of psychological distress on work productivity in a New Zealand population group. Employee productivity is reduced on both the absenteeism and work performance measures. As the K6 has been shown to identify individuals at risk of mental health issues such as depression and anxiety, it is conceivable that the effects of psychological distress start with a reduced work performance during work hours, and lead to increasing absenteeism if not addressed. Depending on the role of the employee in the organisation, there may be downstream effects that reduce the ability of other employees to function effectively in the work environment. For employers, an awareness of the stress levels of their staff and the provision of services to manage work stress may not only benefit their employees’ health but could also increase work productivity by both reducing absenteeism and increasing the effectiveness of the employees when they are at work.

The findings also showed that the failure to meet current PA guidelines was associated with perceived work performance 3.5% lower than for those who met the guidelines. Both Boles et al. and Burton et al. reported small but significant decrements in performance related to physical inactivity (2.5% and 2.0%,

respectively).^{375,378} The smaller associations reported may be due to differences in criteria measuring physical inactivity or productivity. For example, Burton et al. defined a physically inactive individual as one that exercised less than 20 minutes per week, whereas less than 150 minutes per week was used in the present study. A lower threshold for inactivity would increase the number of people who are classified as 'low risk', and in the process reduce the difference in productivity between active and inactive individuals. Clearly, the method used to define physical inactivity has a large impact on the strength of the associations with work performance. In any case, our results suggest that the promotion of PA in the work environment may be beneficial for work performance.

In this sample, smoking was associated with an additional 11.6 hours absent from work over the previous four weeks compared with non-smokers. This concurs with other research: one investigation of the differences between current, former and never smokers found that current smokers had close to four days absent from work during the study period of four months, significantly greater than both former (with 2.4 days absent) and never smokers (1.3 days absent).³² Tsai et al.³⁸ compared days absent from work for a number of health risk factors in a population of Petrochemical employees, and found that smoking status was the second most influential factor related to the number of days absent. In fact, male and female smokers were absent six and 11 more days per year (respectively) compared with their non-smoking counterparts. Bunn et al.²⁰ found a significant difference in the days reported absent over a one-year recall between smokers (4.9 days per year) and non-smokers (4.4 days per year). Despite differences in the number of hours absent, the trend for smoking to impact on days away from work (and consequently employer expenses) is consistent across the studies. Smokers have higher morbidity compared to those who choose not to smoke, with conditions such as increased respiratory problems and greater risk of non fatal CVD that contribute to a greater number of absent days.^{19,32} Further, studies have found that smokers rate their health status as lower than that of non-smokers, with reports of greater musculoskeletal pain, lower physical functioning, lower vitality and poorer general health perception.^{642,643} Those who have a lower perceived health status are also absent from work more often^{644,645} so, while the present study did not investigate perceived

health status among participants, it is conceivable that this relationship exists here even in the absence of chronic health conditions.

Interestingly, the health behaviours had differing impacts on the measures of productivity assessed. Being physically active increased work performance yet had no impact on absenteeism. It is generally accepted that there is a positive association between regular PA and mental wellbeing, with global self esteem, an enhanced mood and improved self perception often reported.⁶⁴⁶ Therefore it is likely that those who are physically active are going to rate themselves higher on a work performance scale than their sedentary counterparts. The finding that smoking was not related to work performance in this study might reflect the measure used. Previous studies investigating lost productivity while at work have found associations between time lost and smoking status that haven't been found here.^{31,32} However, these studies looked at additional minutes spent on breaks compared to the subjective measure used in this sample.^{30,31} As smokers report that cigarettes help calm them down, it is feasible they don't feel their work performance is affected by their smoking status.

Those who worked longer hours reported more time away from work, an association found in previous research,^{647,648} though this had no bearing on work performance scores. While it might be expected that working longer hours would reduce overall work performance given the potential for increased fatigue and reduced motivation,⁶⁴⁸ this is not always found in working populations,⁶⁴⁹ which is likely reflective of the number of hours overtime being worked. In the present sample, just 15% worked over 50 hours per week, less than half the prevalence reported in the New Zealand population (32%).⁶³⁹ It is therefore possible that there were too few participants working excessively long hours to impact on fatigue and subsequent motivation in the present study. Alternatively, Holden et al. found that when the expected number of hours at work exceeded 40 per week, absenteeism increased, yet decrements in work performance were only found when the expected number of hours worked increased to 60 hours per week.⁶⁴⁷ In the present study then, perhaps the increase in absenteeism was enough of a coping mechanism for the longer hours when at work, thereby having no impact on work performance.

The observation that work performance was lower for the low risk category when compared to the high risk category (five or more risk factors) supports previous findings. A work performance difference of 4% between the low and moderate risk groups, and 8% between the low and high risk groups was observed in the present study. Goetzl et al. found that employees with a cluster of health risks related to blood lipids and health behaviours reported more presenteeism than participants presenting without these risks.¹⁴ Similarly, Burton et al.³⁷⁵ investigated the number of health risks associated with worker productivity and found that every additional health risk was associated with a productivity loss of 2.4%. They also reported that a productivity decrement of 6.2% and 12.2% in the medium and high risk groups respectively when compared to the low risk group. Equivalent productivity losses in subsequent studies were 24.6% (eight risk factors)³⁷⁸ and 16% (three or more risk factors).⁴⁵⁰ While there are differences in the risk factors measured and in the definition of productivity, the decrease in work performance due to clusters of health risk factors is consistent across a variety of studies investigating different employed populations. This suggests that workplace wellness programmes would not only benefit from targeting more than one health behaviour at a time, but also to extend beyond the high risk individual to focus on those employees who would be categorised as moderate risk. While the performance decrements are not as high, a larger proportion of the workplace population fall into this category; for example in this study there are over 50% in the moderate risk group compared to 9.7% in the high risk group. Moving the moderate risk individuals into the low risk group would have a larger impact on the overall work performance of the employee population, and may have a greater financial return for companies investing in a wellness programme in the long term.

To highlight the value of investing in employee health to businesses in New Zealand, it is important to estimate the costs associated with lost productive time due to health conditions in the absence of other, more tangible evidence. However, there are currently no data in New Zealand that estimate the costs of physical inactivity to New Zealand employers, even though it is recognised as the third major modifiable risk factor for chronic disease among the population.⁷ Together with obesity and poor nutrition, the cost to the economy is estimated to be around \$500 million.⁷ Further, Easton estimated the costs from loss of productivity that are attributable to

smoking to be \$545 million per year.³⁷ The cost of high levels of psychological distress has been previously estimated for other populations⁶⁰⁰ but not in the New Zealand context. To estimate the impact of reduced productivity in this study we have used the Human Capital Method (HCM).⁶⁵⁰ Using the average working week for this population of 38 hours, a conservative 46 weeks of the year working (to allow for annual leave and public holidays), and an average wage of \$21.52, loss of work performance based on psychological distress and inactivity equated to a cost of \$3809 annually for the employer in lost employee wages due to reduced work performance, with a further \$4158 attributable to the effects of high levels of psychological distress on time away from work. The same approach estimates the cost of smoking to employers in the present study to be \$2870 per employee per year, and if overall health risk is estimated to decrease work performance by 4% to 8%, (equating to 133.4 hours or 266.8 hours respectively) \$2870 or \$5740 per employee per year using the working parameters above. For these organisations then, over \$3.3 million is lost annually based on the above figures. While the costs of implementing a comprehensive workplace wellness programme vary, evidence shows a positive return on investment over time.^{12,277} Interestingly, while the performance decrement is greater for those with most behavioural risk factors, the costs attributable to being at a moderate health risk (and presenting with three or four behavioural risk factors) is greater for the employer given the number of employees in this group. This highlights the value of a workplace wellness approach targeting all employees, and not just those at high risk.

As with any economic conversion estimating the cost of lost productivity, the HCM has limitations. Employee-based assumptions often include that each person wants to work productively and that they start work at with a 0% productivity loss.⁶⁵¹ As productivity loss has been calculated over and above that reported by an employee who does not fall into a health risk category, this calculation is not limited by these assumptions. Calculating productivity losses also assumes that all hours of the day should be equally productive; given the occupation of the participant (working in office-based jobs in insurance, law and in engineering) this may be a reasonable assumption. The HPQ calculated productivity loss at one point in time, though we have extrapolated to estimate the cost over one year which could under or overestimate the amount of lost productive time if there are changes in productivity

over the year. Further, the HCM uses daily wage calculations and fails to account for reduction in work output from an employee who works as part of a team.⁶⁵² Despite these acknowledged limitations, estimating the costs of lost time due to reduced productivity is a valuable exercise to highlight the cost of poor employee health in the absence of an objective measure.

There are several limitations of the present study that should be acknowledged. There was a low response rate (38%) and this is not a representative sample of the workforce in New Zealand; thus the actual associations between health risk and productivity within the New Zealand population may differ. The companies self-selected whether they would be involved and then the employees chose to participate (or not) in the online HRA, therefore it is likely that health is a more salient topic for them than employees who chose not to participate. Relatively few participants fell into the higher risk categories and had the HRA participation rate been higher, stronger associations between behaviour and productivity may have been found. The cross-sectional nature of this study does not allow for deeper investigation into health behaviours or inferences of causality. Improving health behaviours may not necessarily improve productivity in this population as it cannot be ruled out that factors not examined may predispose people to both sub-optimal health behaviour and reduced work productivity.

In summary, psychological distress and physical inactivity significantly reduced work performance in this population. In addition, absenteeism was increased among those who reported high levels of psychological distress and in participants who smoked. Finally, both moderate and high risk individuals had lower work performance scores compared to employees with few health risks. While the cost savings that could occur with an improvement in health risks for this population are not able to be established, previous research has found that moving employees from a high to low risk category of health behaviour has resulted in cost savings to the employer. Future research should investigate the impact a workplace wellness programme has on overall work productivity in the New Zealand environment, as tangible benefits to employers are harder to establish given New Zealand employers are not responsible for health care or medical insurance claims of their employees. The body of evidence that employers would benefit from workplace health

promotion programmes that target lifestyle behaviours is mounting and this study is the first to show that New Zealand is no different to other populations in this respect.

Chapter 8. Employee health and the work environment: a qualitative investigation.

8.1 Preface

In Chapters four to seven, the health behaviours of employees and the associations with both the workplace environment and productivity were explored. Findings from the preceding chapters suggest that there could be mutual benefit for the public health and the business sectors to utilise the workplace as a setting for health promotion. For this to be successful, it is necessary to engage employees at all levels of the workplace. As health and productivity management is a relatively new field, particularly in New Zealand, employee expectations with regard to the employer's role in promoting health have yet to be explored. Though this research suggests that the workplace exerts some effects on the health status of employees, and that employee health and health behaviour affects measures of productivity, a more in depth investigation is warranted. Chapter eight uses qualitative research methods to gain insight from employees within one organisation on four issues: the value they place on being healthy; what they do to maintain their health; how work impacts on this; and the responsibility they feel their employer has in helping them manage their health. Conducting focus groups with the general employee group and those in management roles allows for differing opinions to be explored.

8.2 Introduction

The value that individuals place on their health is in part evident by the behaviours they undertake to maintain it. However, work commitments can impact on time available to devote to health behaviour, be it preparing healthy lunch options or engaging in PA during work time. While the intention to adhere to healthy habits may be intact, a perceived lack of time is one of the barriers to carrying out such behaviour often cited in international research.^{238,493,608} Employees in New Zealand are reporting longer working hours⁶³⁹ which, when combined with job characteristics such as high demands and low control, contributes to increasing stress levels in the work environment.⁵³ If lack of time prevents employees from engaging in activities

to alleviate job stress, this can impact on employee health, wellbeing and subsequent work performance.⁶⁴⁷

The employer can play a role in the adherence and maintenance of health behaviour, and there is convincing evidence that health initiatives in the workplace not only improve the health habits and health outcomes of employees, they can also reduce employee absenteeism, medical costs and staff turnover.^{284,653} However the most successful programmes are those which achieve buy-in from all levels within the organisation, and research shows that the existence of health initiatives in the workplace may not be enough to promote health if underlying beliefs and values regarding health are negative, manifesting in an unsupportive work environment.^{654,655} Indeed, the attitudes of colleagues, managers and employers towards health behaviour are associated with participation in workplace health initiatives, adherence to health behaviours and individual health outcomes.^{526,527}

The climate for health and productivity is well understood in countries such as the US and the UK, where workplace wellness has been wide spread since the 1980s.⁶⁵⁶ In New Zealand, it is a relatively new concept and the benefits of establishing company level buy-in and a work environment supportive of health behaviour may not be salient, even in workplaces that have health initiatives in place. To the best of the author's knowledge, there have been no studies within New Zealand that have investigated these concepts, and therefore the aim of this research was to conduct focus groups to investigate employees' and team leaders' values and attitudes around health, health behaviour, and the responsibility they feel their employer has in helping them manage their health.

8.2 Methods

The organisation

Participants were team leaders and employees of an organisation recruited for a related, earlier study. The organisation was a nationwide insurance company with 23 worksites across New Zealand. It has an active wellness strategy that includes

health-related policies and initiatives for employees and worksites which include a wellness subsidy, an internal communications network provides that regularly updated fitness and nutrition news, fresh fruit bowls at some locations and organised physical activities. Some of these are at the discretion of the manager or team leader, however. The participants for this qualitative research are located within the Central Business District of a large urban centre and as such have easy access to healthy food options and opportunities to use public transport. In addition, there is an onsite fitness facility available for use and fitness classes organised and run in-house.

Participants

Three focus groups were conducted with employees (aged 23-54y) and consisted of a team leaders focus group (n=9; four males, five females), a male employee group (n=6) and a female employee group (n=9). The researchers felt it was important to separate those in team leader roles from the employees they manage to allow for open discussion of the focus group questions and minimise inhibitions of conversation due to differing power relations. Only those that had completed an online HRA as part of a related, earlier study were invited to participate via the organisation intranet. No incentives were offered, however as the focus groups were conducted over a lunch time period, refreshments were provided.

Data collection

The focus groups lasted between 45-60 minutes and were conducted at the organisation. A female and male investigator facilitated the female and male employee focus groups respectively, and both were present during the team leader's focus group. The focus groups were audio taped, with additional notes taken to supplement the recorded information. Focus group questions and prompts were developed from information already collected as part of the online HRA (Appendix C), which investigated the health risk habits of employees, self-reported work productivity and employee perceptions of the culture of the organisation related to health behaviour (see Chapters three, six and seven). The guiding questions were based around employee perceptions of how their health affected their work performance, how work affected their health and wellbeing, and if they thought their

organisation had any responsibility for helping employees manage their health.

Specifically, the overarching questions were:

- Question 1: What do you do on a day to day basis to keep yourself healthy?
- Question 2: How does work impact on your health?
- Question 3: Should the workplace take responsibility for the health of the employee?
- Question 4: In what way are you supported at work for your health?

Participant consent forms were collected prior to the commencement of the focus groups, and the focus group recruitment and protocol were approved by AUT University Ethics Committee (AUTECH; Appendix B). Data were collected in December 2010.

Data analysis

A number of qualitative data analysis methods were employed to ensure the information being recorded was accurate and as intended by the participants. Member checking occurred throughout the focus groups, with the facilitator summarising what had been discussed and confirming the accuracy of the synopsis with the participants.⁶⁵⁷ The focus group recordings were transcribed, and peer debriefing occurred through reviewing of transcripts by the facilitators to verify they were correct.⁶⁵⁸ Thematic analysis of the transcripts enabled meaningful data to be elicited from the transcripts and higher order categories were established.⁶⁵⁹ Sub-themes were then identified and discussed between facilitators.⁶⁵⁹

8.3 Results

The focus group data analysis revealed several key sub themes arising from the guiding questions. These are outlined below with quotes from the focus group participants included to represent the major findings related to each research question.

Question one: What do you do on a day-to-day basis to keep yourself healthy?

When asked what they did to keep themselves healthy, the only unprompted (and most frequently cited) behaviour mentioned by participants in all groups was exercise. The main activities mentioned were walking and working out in the gym, which many did throughout the day or before and after work. Some participants mentioned active commuting fitted in well with their schedule: *“...in summer I tend to walk home once or twice a week”*. For others, exercise throughout the day gave the opportunity to get away from work, as opposed to sitting down the entire time: *“... just for something to do, rather than just sitting, cos, for me, I’ve just gotta get away from the desk otherwise I’ll keep working. And for me, that isn’t healthy.”* The benefits of exercise here extended beyond the activity itself, and related more to enabling people to remove themselves from the work environment. For most people, having access to an onsite gym and group fitness classes were convenient ways to fit exercise in: *“That’s why I joined the gym downstairs here because I’d previously belonged to a gym outside and I found that going out and coming home again was that hurdle, you know.”* However, this was not the case for all participants, who preferred not to mix work and leisure: *“I just can’t wait to get away from the place and get home again, so I don’t really want to stick around and use the gym here.”*

In general, most participants agreed that exercising increased their energy levels and sense of wellbeing: *“Yeah I play a lot of sports ...and it makes me feel better throughout the day as well”* *“...everything is circulating and it gives you a bit of that feel good feeling, and it clears your head.”* In addition, this roll on effect led them to improve other health behaviours: *“It’s a whole mindset; I find that when I’m exercising I’m also watching my diet more.”* Most people who exercised said they did so for stress relief and as a coping mechanism for the demands of their job: *“And (when) I’m exercising my whole mood is improved and I’m able to cope with busy days more and I’m not at the end of it feeling mentally exhausted or stressed and I’m just in a more positive space”* When they were unable to fit in their PA, it was acknowledged that this adversely affected their stress levels: *“but I’ve missed it (exercise) this year, and I’ve been unable to do it and my stress levels have gone up.”*

Question two: How does work impact on your health?

Almost all participants recognised the contribution of their job to their stress levels, regardless of their role within the company, from team leaders: *“Yeah I know we keep talking about stress but, well for me, it’s the hard-paced fast work environment where you’re giving giving giving, as managers that’s what we constantly do.”* to those working in roles in-house and not directly dealing with the public: *“it’s a pretty stressful job, because it’s a people facing job and our customers are you fine people here, and of course when you get stressed and busy, we also get stressed and busy.”* The concept of different types of stress was only acknowledged by the team leaders, who felt that some stress in the job was stimulating, challenging and enjoyable: *“you realise that there are lots of different types of stress and if you do it for people who appreciate it then you can handle that kind of stress...”* and alternatively things that occurred in the workplace beyond their control were those which could create high and unhelpful levels of stress: *“I think it’s the people related stress, and you can hear it from the people in this room, it’s the hardest to deal with.”*

The main source of stress for the employees was the workload: *“I guess in that sense they can bite the bullet and hire more people, and keep the workload at a reasonable level that will allow people to actually have time to step away and do stuff... it’s a company decision which is impacting upon your health.”* The view that workload influences their decision making around health behaviours was shared among employees: *“I think that the workload is really dictating my ability to leave the office to get something more healthy (to eat)”*, *“I’ve been living at my desk lately and I feel exhausted and I think it comes down to that I’m not eating properly, as I’m eating at my desk ...whatever I can find.”* This had a carryover affect to how they felt outside of work and their motivation to engage in health behaviour: *“... (I) leave work, get home, watch the news and go to bed cos I’m knackered, and then I get slack with exercise and eating well.”*, *“...sitting in an office for 8 hours and coming home, you’re just exhausted.”*

For team leaders, while workload was acknowledged as a source of stress, their role in managing staff was more significant: *“I think also one of the most stressful things*

is staff...when you're managing a team of people, that is probably 70% of your time, taken up, making sure they're okay." In addition, their role as managers meant that they were the person who had to manage customer complaints that were unresolved by the staff below them: *"...it doesn't matter how well our claim handlers deal with the claims we get 'put me through to the manager - I will not talk to anybody else.' It does get to me sometimes; sometimes it gets to be very personal."* In particular, the females who managed staff in the team leader focus group voiced that ensuring their staff were coping with the demands of the job was the major source of unwelcome stress: *"...coaching (the staff), keeping them happy and ensuring they're not too stressed. That's a huge stress in itself."* These same sentiments were not as salient for the male participants.

While exercise played a key role for many people in managing their stress levels, other activities undertaken to deal with stress included watching television, playing computer games, cooking, and reading. In addition, alcohol was acknowledged as a way to unwind at the end of the day: *"Chardonnay is a big help."* Female team leaders in particular viewed social support from friends as a key way to cope with work-related stress: *"that's a really good stress relief, you know, sharing things with people who know us inside and out. Love us warts and all and I think that really helps, you know, it can be a bit of a battleground at times."*

Question three: Should the workplace take responsibility for the health of the employee?

Despite the universal agreement that work affected their health and their health behaviour, there were mixed opinions in the focus groups regarding whether it was the company's role to look after employee health. Employees who did not agree felt the company should not be regulating aspects of their lives outside of their job: *"I don't know that they should be interfering in personal stuff really", "no one really wants the employer telling you what you should or shouldn't do."* Despite these views, what was evident was that almost all employees agreed their own productivity at work was reduced if they saw a colleague was not working effectively due to poor lifestyle decisions. In this context, they felt that the company should take an interest in the employee's health behaviour: *"when you can clearly see those obvious signs*

and why people are sitting at their desk and surviving their day while you are working hard, it is demotivating, and I think that that's when the organisation needs to step in and take responsibility, I mean people wouldn't want to be confronted by those things, but when it's affecting other people and their performance, then too bad, they should be." Those in favour of the organisation taking an active role cited the time spent at work over a week as a key reason: *"Eight hours a day, five days a week. Yeah there should be something..."* particularly when the issue revolved around workload or it was apparent that an employee's health impacted on their ability to function effectively in their role: *"if it's something like you're having an alcohol problem, or a drug problem, that is clearly going to cause severe problems"* *"I think they should be waving a stick when they see a pattern that perhaps is not healthy."*

The team leaders felt lifestyle and health behaviour decisions were up to the individual, and framed it as a personal responsibility issue, one the employees should not rely on the organisation for: *"...I don't think that it's the company's responsibility..."* With regards to their own role, they had similar sentiments to the employees with regards to when it was appropriate to take an active interest, and felt that it was a grey area. They agreed that, if these decisions overtly affected the employee's work performance, then it was viewed as appropriate: *"And I've got a couple of people like that and they're huge and they don't take personal responsibility for their health. One girl I actually banned (and I got HR and (health and safety manager) to support me) I banned her from having butter chicken from the downtown food hall (laughter) because every time she had it she (had a gastrointestinal issue) and was off work for two days."* Furthermore, they saw it as part of their role to encourage staff members to engage in healthy behaviour: *"I think as a manager you should be providing opportunities, and I don't think it's that you have to say 'stop eating that' or 'go and get some exercise' it's well there's opportunities even within our organisation to be doing things, even if it's walking up the stairs, getting involved in some of the sporting activities or whatever, so encouraging people to do that maybe is one way of doing it."* However, they were hesitant to agree that it was their role to say something about lifestyle if it did not obviously affect the employee's ability to work: *"Do I look after the workload and look after the pressures, but if they're physically unfit, I mean, is that taboo? Is that*

something that I step back from? Or is that a road I should go down?" Most team leaders felt that an employee's health related behaviour, with regards to nutrition and PA, was only to be addressed if work related outcomes were an issue: *"I have, like most people, specific objectives for most of my team, and it's about quantity of work, and quality of work and turnaround time, and all of that. So if they're meeting all of those objectives, I'll think 'okay so should I say something about their being overweight?' and they'll say 'well what's that got to do with my objectives?'"*

Question four: In what way are you supported at work for your health?

While the company was viewed as supportive of health behaviour by most participants, others questioned the genuineness of the support. It was acknowledged by most people that policies were in place that enabled staff to engage in healthy behaviours, such as a wellbeing allowance, flexible hours for some staff and onsite group fitness classes: *"I mean it's encouraging the behaviours, but it's not so heavy handed that it feels like you have to step up and do it."* In addition, some felt that these had a positive impact on staff, their work, and they felt valued: *"So when I came here I was like 'oh wow!' and it makes a difference, people are healthier, they are happier, they feel more energized, and therefore they are getting good productivity with their staff, so they are getting the two way thing...It's about that culture. They're creating a culture where you feel valued and you're not just a bum on a seat. You're not just the employee."* However, if it was perceived the motivation behind health-related policies was driven by a business perspective rather than a genuine interest, some employees felt this was lacking sincerity: *"I think there's definitely policies in place that would indicate that health was important. To use the word care, it's hard to tell where that motivation comes from..."* This perception of insincerity was also experienced at the manager level, with an employee who was experiencing insomnia feeling uncomfortable about coming in late, even though her team leader had suggested it: *"But sometimes you know if I only had 2 hours sleep I would text and I don't know if he was too impressed but he did say it. But I didn't feel comfortable coming in late. And sometimes I was made to feel uncomfortable, but when I was that buggered that I didn't care."* Furthermore, these policies were not available to all employees, and decisions around certain components of the company's policies, such as flexible hours and the provision of

fruit, were at the discretion of the team leader: *“We just have sugary biscuits and the coffee machine and the sugary hot chocolate...it depends on your manager.”* Thus, company-wide policies related to health and wellbeing were only meaningful to employees if they were salient at multiple levels within the organisation.

Both the male and female employees acknowledged the role their team leader plays in helping them manage their workload and stress: *“She’s there for us. I don’t know if, above her, whether they care or not. But I think individually with our managers, it’s quite good.”* These sentiments were not expressed by the team leaders in regards to their immediate superiors or the company as a whole, who felt they had no support regarding the aspects of the job that caused them stress: *“you don’t even feel that you’ve got that support,”* but that the stress of their staff was not adequately acknowledged by the company: *“...but what we don’t do is that we don’t give them enough training I believe in ... handling difficult callers, dealing with emotions, dealing with all of that other stuff that causes them the stress . You have to jump through 100 hoops to get something done for your people and they (the company) don’t think it’s valuable.”* Interestingly, though this was the general consensus among the team leaders, some highlighted that they too tried not to draw attention to the stress of their staff members: *“I don’t like to use the word ‘stress’ as to me it’s just like a red flag to a bull, you know?...People throw it around so often, you know, I’m talking from a staff perspective: “oh, I’m stressed” and suddenly the whole company is panicked “oh we’ve got a stressed staff member.”*

Colleague support was an important factor in motivating participants to engage in health behaviour, and many felt that having people around them involved in similar activities was beneficial for them: *“It can be really motivating when everyone is on board, you know with your Feetbeat and all of that, and everyone is like ‘oh yeah, I’ll be in.’”* Likewise, if this was lacking, it did not necessarily stop the participant from engaging in the behaviour, but it made a difference to how they felt: *“... yeah they make little comments and bring me down a peg or two, and you don’t really need that, you know, if they just said ‘oh, awesome’ or didn’t even say anything at all that would be better sometimes. I guess that makes it hard, that they’re negative.”* Employees and manager’s alike felt that role modelling was important, though, while the employees viewed that it was important their manager illustrated work-life

balance: *“She sets that tone, and I think it really makes a difference as all of us feel really encouraged to do something, either get out and do some exercise or leave on time.”* There was a feeling among the team leaders that it was important to their staff that they were setting an example by being visible at work, even when they might be feeling unwell: *“we get very sick and tired of the staff member that goes “ac-choo, I’m sick, I’m going home” that you tend to subconsciously go the reverse...I guess it’s that we like to set an example too, isn’t it.”* Evidently, role modelling meant quite different things to the employees compared to the team leaders.

8.4 Discussion

The two health-related concepts that were most salient for focus groups participants in relation to all four guiding questions were PA and stress. Where necessary, the discussion below is anchored back to the guiding question. Interestingly, the dialogue of how they keep healthy (Question one) centred on exercise and no other health behaviours were mentioned unprompted in this context. This may be because of more salient messages related to PA in the workplace, with many of the health-related initiatives focused around increasing activity levels (such as the fitness classes, sports teams), and less around improving other health behaviours. Further, other health behaviours (for example, choosing not to smoke), for most individuals do not require an active decision making process and instead are practiced unconsciously as part of a routine.⁶⁶⁰ These will be less likely to be reflected on when asked about health practices. Sleep patterns were overlooked in the health context by participants, and has been found elsewhere that despite being viewed as a necessity to function properly, there is a perception that sleep is not necessarily to do with health in the same way that PA is,⁶⁶¹ so therefore may not be mentioned in this context. Participants reported engaging in PA to increase energy, a benefit that may be more tangible in the short term than can be seen when undertaking other health habits (such as eating fruit and vegetables), this would make it a salient example they can draw on when reflecting on health practices.

Work-related stress was acknowledged as the main impact work had on health (Question two). Literature clearly points to workload and lack of support as two

factors contributing to perceived stress and other adverse health conditions in the workplace.^{662,663} Though research in this thesis (see Chapter five) did not find any relationship between BMI and the availability of high fat, high sugar options through snack boxes and vending machines, employees in the current study noted the relationship between work load and their ability to make good decisions around healthy eating. Longitudinal research has found that work factors such as work fatigue, high job strain and working overtime are related to weight gain^{664,665} and employee reports in this study of feeling exhausted and lacking in energy due to workload suggests there is an increased risk of overweight in this work environment, particularly when the workload was such that employees did not feel they had the time to make healthier choices at lunch. Research has shown that lack of respite from work demands, where employees are not able to disengage from their job, can lead to short term health complaints and increased time off work in the long term.^{663,666} A recognised buffer for the effects of this workload stress is support from colleagues, managers and networks outside of the work domain⁶⁶⁷ which many employees in this sample acknowledged they received. This was not the case for all employees however which can open them up to the increased risk of poor health given the aforementioned relationships between health, stress and support. While the employees discussed support from their team leaders as an avenue for coping with perceived stress, it was apparent that team leaders did not have a similar buffer from the structures above them. However, congruent with other studies investigating resources for coping with stress,^{667,668} the female team leaders found this support from social networks outside the workplace, acknowledging the importance of social relationships to allow them to unwind. The male team leaders did not acknowledge this as a coping mechanism, but many spoke of participation in team sports outside of the work environment, which is a recognised mechanism for reduced stress and psychological distress in males due to it being a chosen leisure time activity involving social interaction and time away from potential stressors.^{669,670}

The relationship between PA and perceived stress was acknowledged in all focus groups. Exercise was acknowledged not only with regards to health behaviour, but as a coping mechanism for work-related stress (Question two). Participants spoke of either their engagement in activities to alleviate work-related stress, or the consequences of being unable to participate due to work demands. The effort-

recovery model of stress underlines the importance of reprieve from stressful situations so an employee is able to recover from short bouts of stress;⁶⁷¹ this enables them to recover not only back to pre-demand levels, but gives the ability to handle that stress again if faced with it. Part of this concept is having the time outside of work to engage in activities that allow detachment from the job,⁶⁷² and PA was recognised by employees as important in this context. When those who typically exercised during the day were unable to due to work demands, sedentary pastimes were substituted as methods of stress relief, and watching television and playing computer games were examples of how they unwound. This relationship is congruent with other research showing a positive relationship between adverse health behaviours and job strain.⁶⁶⁴ It can be explained through the model of self-regulation, which postulates that certain situations require an individual to override natural habits, impulses and actions when faced with increased demands.⁶⁷³ It has been argued that this self-regulation is a limited resource independent of domain, such that when high levels of self-regulation are necessary at work, less is available for activities outside of the work sphere.⁶⁷⁴

In this sample, the experiences of the employees were congruent with this concept of a limited self-regulation, engaging in low effort activities (such as television viewing) rather than exerting themselves in PA which requires more self-regulation. Though they recognised the benefits of exercise and sport for stress relief and for health, some also highlighted that exhaustion from work was a key factor in choosing more sedentary pastimes. In these circumstances, a workplace health promotion programme can help strengthen the relationship between stress reduction and healthy behaviour. In the industry with which these employees work, whereby the nature of their job necessitates responding to situations they have little control over, work demands are changeable and can be greater than if their roles were more static. It has been found that engagement in goal-enhancing activities can reduce the depleting effects of work demands on energy sources when work demand is high.⁶⁷⁴ While employees have little control over their exposure to stressful situations, where they are often dealing with emotional people, focusing on goals related to a health promotion initiative, be it undertaking small bursts of PA or ensuring two pieces of fruit during the work day, may serve more than one purpose in this instance. Meeting these outcomes will enhance the positive affect associated with the achievement of

goals, thus reducing the depletion of cognitive energy. Further, small bursts of activity (as an example) can accumulate over the day to be substantial and increase energy levels overall. This may help an individual cope with any additional demands placed on them later in the work day, and leave them feeling more motivated for engaging in high effort activities outside of work hours.

The employees in this study recognised the importance of organisational encouragement when engaging in PA and other health behaviours (Questions three and four), and having structures in place to provide support for these is essential to prevent employees feeling that there is additional time pressures put on them by engaging in work organised activities. A study investigating the utility of a PA initiative found that, while these efforts can illustrate the organisation as a whole is committed to employee activity habits, a comprehensive strategy is necessary in order for employees to participate.^{486,675} Gilson and colleagues similarly found that job responsibilities did not permit administrative employees to increase PA during their work day despite their involvement in a work-related walking initiative.⁵²² This can also raise questions regarding the legitimacy of an organisation's interests with regards to employee health and wellbeing, as evident in this research. Employees felt their managers' providing them with information regarding company policies around health and wellbeing was tangible evidence of support for their health (Question three), important for fostering relationships between employees and managers that are important for staff productivity.⁶⁷⁶ However, some viewed the lack of company support in some health initiatives, where the company offered a sports day but did not provide funding) was indicative of a 'box ticking' exercise as has been viewed elsewhere.⁶⁷⁷ Mixed messages, whereby the company allocated money for alcohol at after-work functions and not a sports day, equated to a feelings of scepticism among some regarding the company interest in their wellbeing. Employee involvement in decision making processes regarding the allocation of resources for extracurricular activities could serve to reduce instances like these, and cultivate a sense of genuine support for employee wellbeing, as has been seen elsewhere.⁴⁸⁶

Time was a barrier for some participants in this study, who spoke of being unable to leave their desks due to workload and too tired at the end of the day to be physically active (Question two). An audit of PA opportunities revealed that the organisation

did not highlight incidental exercise as a way of increasing activity during the work day (see Chapter five). If a PA initiative included encouraging employees to take the stairs, conducting 'walking meetings' and getting up from their desks once every hour (as examples of activity), employees could accumulate small amounts of PA that, over the course of the day, would not be insubstantial. Further, the benefits of small, yet frequent bursts of activity (good for physiological and psychological wellbeing⁶⁷⁸) throughout the day may over time encourage them to prioritise activity where once they might not have.

While the team leaders and employees voiced similar issues regarding stress and health behaviour, the nature of the team leader position within the organisation meant they were exposed to additional factors affecting their stress levels and subsequent physical and psychological wellbeing. A main part of their job was people management, highlighting that "up to 70%" of their time was spent coaching employees and providing emotional support. The females in particular perceived this as an additional stress, as there was no formal training in the "soft skills" that are required to help their team members cope with difficult customers, thus adding further responsibilities to their role as team leaders. The intricacies of dealing with staff are well recognised in the literature as an area of potential concern when there are no clear structures in place that address these issues.⁵³ However, it was apparent from the focus group discussion that there was a lack of awareness from those in positions above the team leaders. In addition, while management type roles imply there is more autonomy with regards to decision making, which is linked quite clearly to reduced job stress in the literature,⁶⁷⁹ for these team leaders, having increased responsibility has instead created added pressure. For example, they are responsible for handling difficult customers on behalf of their staff, yet are governed by organisational rules that prevent them from resolving the situation in favour of the employee. Both of these factors create challenges for the team leaders that they feel are unrecognised by their staff and their superiors, increasing job stress. For this organisation, awareness of the impact that people management has on the team leaders, and providing the necessary training to help staff manage difficult customer situations, would help minimise perceived stress and the accompanying impact of it.

A discussion around absenteeism that emerged when discussing role modelling and support in the workplace (Question four) centred on two distinct themes in the team leader's focus group. On one level, the team leaders felt they could not take time off work when ill as tasks that could not be delegated would require them to work regardless. This compounded what was already perceived as excessive job demands which made it necessary to work outside of traditional work hours in order to complete. These sentiments have been voiced in other research, where a reduced work-life balance in middle management has been reported for the same reasons.⁶⁸⁰ The other theme resonating was an almost stoical response to illness, where the team leaders did not want to be seen to take sick leave despite being ill as they felt it would send an unwanted message to employees that it was acceptable to take unnecessary leave. The expectations of managers in this sample with regards to having time off work due to illness has been similarly found in other research, with Wynne-Jones and colleagues reporting manager attitudes to legitimately absent staff as unsupportive.⁶⁷⁷ This in turn affected the employees decisions regarding taking the time to recover or coming into work while ill.⁶⁷⁷ While the team leaders in this research viewed this as role modelling a desired behaviour, both of the above attitudes may be viewed as self-defeating behaviour, whereby the excessive commitment shown by team leaders leads to unintended effects.⁶⁸¹ Employees and team leaders alike felt undue pressure to come to work when ill, not only increasing employee presenteeism, but also the likelihood of longer term absenteeism and poor health in the future.^{682,683} These implications are contrary to the perceptions of the team leaders and highlight the importance of awareness raising of these relationships among managers in this organisation.

8.5 Conclusion

This research highlighted a number of important issues in the workplace that affect the working lives of both employees and their team leaders in this sample. Work-related stress extends beyond the workplace and impacts on the overall wellbeing of these employees, which may have implications for productivity in this organisation. There are a number of structures in place to help support employees in this research to engage in health behaviour, which is an important element of a healthy workplace.

However, the perceived lack of support felt by both participants in regard to workload that can dictate whether or not they engage in PA, and the lack of training related to staff management may be more salient and have a greater impact on overall wellbeing. Company policies related to health and wellbeing need to acknowledge these factors to ensure optimal health of their staff. Further, the team leader's attitudes to staff absences highlight the lack of knowledge regarding health and productivity, which should be addressed at a management level. How widespread this prevailing belief is in other organisations across New Zealand would be an interesting investigation given that health and productivity is a relatively new industry.

It is important to note that the views expressed here are particular to the team leaders and employees of one worksite within the organisation and do not necessarily reflect the wider organisational group. As participants were recruited based on their involvement in an earlier, related study it is likely they represent a group of people with an interest in health related issues. Their experience of colleague, manager and company support related to health may be different from employees choosing not to participate. Further investigation in other New Zealand workplaces and industries in New Zealand, including companies with and without health-related policies is warranted.

Chapter 9. Thesis Discussion

New Zealand is not exempt from the chronic disease epidemic that is being experienced worldwide and the government health goals reflect this, with nine of the 13 goals related to nutrition and PA related behaviour.⁷ Modifiable health behaviour related to poor lifestyle choices contribute to increasing levels of health conditions, which are costly in terms of individual and societal health. This has led those in the public and private sector to examine modifiable risk factors that lead to the development of lifestyle disease.

The environment in which we live is no longer one where maintaining a healthy lifestyle is easily achieved. Many of the day-to-day choices people make are governed not by their desire to lead a healthy lifestyle but by convenience. While health promotion campaigns exist in the public domain and most New Zealanders are familiar with the '5+ a day' and 'push play' campaigns which aim to encourage healthy eating and PA (the fundamental behaviours related to energy balance in an individual and subsequent weight gain/loss), a large proportion of individuals do not meet the recommendations promoted in these public health messages.^{26,311} It is recognised that health promotion efforts are most successful when they sit in the socio-ecological model whereby the focus is not just on individual behaviour change, but changing the environment they spend their time in⁶⁸⁴. As such, interventions to promote behaviour change have shifted to include changes to the settings where individuals spent a large proportion of their day, such as schools, churches, homes and workplaces.

Workplace health promotion is a well-established business practice in organisations in the US and in Europe where employers pay the medical cost claims of employees. Several studies have reported higher levels of employee absenteeism, turnover and insurance claims in employees of poorer health.^{14,377} Further, the financial impact of employee presenteeism (measured both by objective and subjective measures) is estimated to be close to three times that of absenteeism,^{16,443} leading workplaces to implement wellness programmes to improve employee health. Though there is little consistency in the literature with regards to estimating the ROI wellness programmes

offer, reviews of the impact they can have on business outcomes suggest there is little argument that workplace health promotion is a worthwhile investment.^{284,685}

In New Zealand the field of health and productivity management is in its infancy. Small pockets of information exist regarding workplace health promotion in the New Zealand setting. While researchers have investigated the links between job factors and particular professions (such as dentists and doctors^{80,82}), no published studies have investigated health factors in the general working population. The efficacy of a workplace health promotion programme for reducing CVD risk was examined in blue-collar workers,²⁸¹ but the resulting change in employee productivity was not examined. Moreover, changes to the policy environment of the workplace and integrating health promotion goals into business-related outcomes, two higher level components important for comprehensive workplace health programmes were not included, therefore limiting the sustainability of the workplace changes. Given that 70% of New Zealand's gross domestic product is tied to the service industry, and the latest OECD report shows New Zealand productivity has declined over the last 30 years, it is reasonable to suggest New Zealand business is noticing the effect of poor population health. However, the effects of this are less tangible here compared to countries such as the US as employee health insurance is in the public health domain and not met by employers. Though there is evidence of businesses implementing wellness initiatives to improve employee health, the relationship between employee health and employer costs have largely been ignored in the research setting. Investment in workplace health promotion has the potential to benefit not only the employer with regards to improved productivity, but in the long term could help reduce the population risk factors that are targeted by population level health messages, and therefore lessen the burden of lifestyle disease on the public health dollar. Before large-scale investment in wellness programmes will occur in New Zealand, an examination of employee health factors influencing workplace productivity measures is overdue. Once these have been established, investigation into the efficacy of workplace wellness programmes targeting the health factors can be undertaken.

The aim of this thesis was to draw on the extensive body of knowledge that exists in the international context regarding workplace health promotion and apply it to the

New Zealand setting. Specifically, it was important to first create a New Zealand-specific HRA tool to explore the health behaviours of working adults and the extent to which these relate to health conditions known to affect employee work factors, and then to examine how both behaviour and health conditions affect employee productivity in the New Zealand workplace (Chapters three, four and seven). As behaviour is influenced by the surrounding physical and psychosocial environment, an investigation of environmental factors that can facilitate or inhibit health behaviour was undertaken, with a case study analysis of one organisation with worksites across New Zealand used as an example of how workplaces may address these factors impacting on employee health behaviour (Chapters five and six). Finally, focus groups were conducted to get more insight from employees and managers on the factors they felt affected their health and their work performance, with questions drawn from findings of the previous two research studies (Chapter eight).

9.1 Summary and implications

This research provides an initial examination into the health factors and health behaviours that affect a sample of New Zealand employees. Taken together this doctoral research makes an original contribution to the body of knowledge in health and productivity management in New Zealand in a number of ways. The designing and testing of New Zealand-specific tools allows the advancement of health and productivity management in New Zealand. The results and implications of studies that utilised these tools are summarised below.

Development of an HRA tool

The development of a New Zealand-specific HRA tool that can be administered online allowed the examination of health factors and health behaviours that relate to both poor health outcomes and reduced productivity at work. The research examining the clustering of health behaviour, the relationship of health risk factors and the health culture of the workplace, and the associations between health risk factors and employee productivity are outlined below.

Clustering of health behaviour

This is the first study to report that the three key health behaviours of eating five or more servings of fruit and vegetables, being sufficiently active, and maintaining a healthy weight are carried out in isolation by significant proportions of the sample, yet just 3.8% undertook all three (Chapter four), and there was no evidence of the clustering of these three behaviours. Instead, slight clustering occurred for physical inactivity and inadequate fruit and vegetable intake. Employees who were overweight reported a significantly greater number of health conditions, as did the combination of being overweight and inactive; overweight and not meeting fruit and vegetable recommendations; and inactive and insufficient fruit and vegetable intake. The combination of two sub-optimal health behaviours significantly increased the odds of reporting any health condition (Figure 4-1, Chapter four). These findings suggest that health promotion campaigns targeting more than one health behaviour may be useful to promote public health messages in the workplace setting, given the advantages this setting has for these purposes. However, the implications of these findings on workplace factors needed to be established in the New Zealand context to begin to build a business case for workplace health promotion and encourage companies to instigate health campaigns.

Links between health risk factors and workplace health culture

The HRA tool also enabled links between the psychosocial environment and health behaviour to be explored for the first time in a New Zealand setting (Chapter six). While the literature that has linked the psychosocial workplace culture and employee health behaviour, there is little research internationally, and none in the New Zealand environment that examined the health culture of the organisation and employee health risk factors. The LifeGain Healthy Culture Audit (LHCA) was embedded in the HRA, and was used to assess perceptions of support for positive health behaviours in the workplace. Small to moderate associations were found between perceived support and psychological distress scores, smoking status and the sum of health behaviours. It is recognised that an important component of a successful workplace wellness programme is to have support from people and structures at all

levels within the organisation; evidence directly linking employee health risk factors and a health culture at work strengthens this. As causality in this research cannot be established, these results warrant further investigation into whether a culture of support encourages the adoption of healthy behaviour.

Associations between health risk factors and employee productivity

Evidence to show that health promotion is a worthwhile investment for companies is important if it is to be a sustainable avenue for health promotion campaigns in the New Zealand context. Establishing whether a relationship exists between health risk factors and work productivity factors is the first step and Chapter seven describes the findings of the first study conducted in the New Zealand setting to do this. In this sample, participants with low to moderate psychological distress levels and who were physically active reported a work performance 6.5% and 3.5% higher respectively. Overall health risk explained 4.0% of the variation in work performance. Further, high psychological distress and smoking accounted for 16.8 and 11.6 additional absentee hours over the previous four weeks.

Using the Human Capital Method (HCM) of cost estimation, it was projected that up to \$3.3 million annually was lost due to poor employee health. There are clearly limitations associated with estimating any costs associated with productivity loss; nonetheless this is the first New Zealand research to suggest that health risk factors, particularly psychological distress, smoking and physical inactivity in the workforce impact on workplace factors and the first to attempt to place a dollar value on the expected cost. Furthermore, the greatest cost to the employer in this sample was from those who presented with moderate health risk (three to four health risks) as they represent over half of the participants. While the cost savings that could occur with an improvement in health risks for this population were not able to be established, previous research has found that moving employees from a high to low risk category in health behaviour has resulted in cost savings to the employer. Future research should investigate how health risk factors impact on the productivity of employees (and costs to employers) on a national scale, and whether a workplace wellness programme can positively influence work productivity in the New Zealand environment and result in cost savings to employers.

Utility of the environmental audit tool

Chapter five in this thesis described the development and utility of an audit tool designed to measure the nutrition and PA environments in New Zealand workplaces. It is freely available for New Zealand businesses to implement and this research was the first to use one organisation (with 20 worksites across New Zealand) as a case study to illustrate how a worksite may utilise it to inform decision making around workplace initiatives to improve their physical work environment. The audit was easy to administer and highlighted priority areas that could be targeted for improvements around PA and the nutrition environment. While structural barriers prohibited behaviour in a number of the worksites, there were opportunities to implement a number of low cost initiatives around PA and nutrition that have been found in the literature to positively influence health behaviour. Furthermore, the smaller initiatives may help foster a culture around being physically active, leading to a greater demand being placed on existing structures that need improvement but would necessitate a greater financial outlay from the company. There would be more of a case for the improvements to take place in this instance, and the audit tool has the potential to illustrate this when applied at multiple points throughout the intervention to examine changes in the environment as a result of a workplace wellness programme.

Associations between health behaviour and environmental attributes

This is the first New Zealand study to examine associations between environmental attributes of the worksite and employee PA and nutrition-related factors as measured by the HRA revealed trivial associations. This was perhaps unsurprising given the smaller numbers of employees in some locations, and that worksites located in centres that have easy access to amenities for PA and nutrition are less likely to be as influential in the choices around these decision making processes. However, used in this context in a longitudinal study to assess outcomes in an evaluation of a workplace health programme is warranted.

Qualitative research

Finally, this doctoral research was the first to conduct focus groups within one organisation to understand better the expectations of employees and team leaders with regards to health, productivity and the role of the workplace in supporting employee health. Participants were asked what they did to keep themselves healthy, how their work impacted on health, if it was the company's responsibility to support their health behaviour and whether their company was supportive. The two health related topics that were most salient for both employees and team leaders were the role of PA in keeping them healthy, and the effects of stress in the workplace on their ability to maintain healthy behaviour. The employees highlighted the support garnered from their team leader was important for stress relief and health, and that the team leader had an important role in modelling healthy behaviour that supported work-life balance.

Interestingly, the team leaders talked of coming to work while unwell and the frustration they felt to employees taking sick leave 'unnecessarily'. Role modelling to them was in relation to trying to set a good example by coming to work regardless. It is of interest to establish how prevalent this lack of understanding related to employee health and productivity is among managers in other organisations throughout New Zealand, given the important role they have in fostering a workplace culture that supports health and wellbeing.

This organisation had components of a workplace health programme in place, yet both employees and team leaders felt that inconsistent messages prevailed throughout the organisation regarding the support for health behaviour, a factor noted when undertaking the audit (Chapter five). This served to undermine the efforts of the company as the focus group participants felt that initiatives were insincere. How much do New Zealand organisations know about what constitutes a comprehensive workplace health programme that will provide the most benefits to employer and employee's alike is a question that is yet to be answered and perhaps is a good starting point from the findings of this thesis.

9.2 Study limitations

The limitations of the study are as follows

1. A low response rate for the HRA (36%) reduces the ability to generalise to the wider employed population and affects the statistical power of the study.
2. The organisations were invited to participate, and participants within them were a self-select group of employees, thus this would bias the results attained throughout the research.
3. For feasibility reasons, only three focus groups were able to be conducted in the chosen organisation, and while these findings provide an insight into the views of the participants, the generalisability of these views to the wider organisation is limited.

9.3 Future directions

This thesis outlined the development of two instruments that can be used in the workplace which are cost effective, New Zealand-specific and easy to administer. This is an important first step in the field of health and productivity management in the New Zealand environment. The HRA can provide regular information regarding the health behaviour, health risk factors and productivity of employed adults that is not currently being collected. The findings that just 3.8% of those participating in this research met the national health recommendations for key population messages of being regularly active, eating five or more fruit and vegetables per day and maintaining a healthy weight need to be examined in the wider context. While reasonable numbers of the group met the fruit and vegetable guidelines and undertake regular PA, the co-existence of all three behaviours are key for minimising CVD and other chronic illness. Strategies to encourage this may need to be established if there is to be a shift in the disease prevalence in New Zealand, and workplace health promotion is a promising vehicle for this to occur.

The audit tool can provide additional information of the organisational factors, including policy and environmental attributes that could be targeted to help improve health risk factors as part of a workplace health programme. These are all components of a comprehensive workplace health programme which has the potential to improve the health risk profile of New Zealanders and reduce population level chronic disease risk. Therefore it would be advantageous for a partnership between the public and private sector to be forged. Businesses need encouragement to invest in workplace health in the absence of employer-funded health insurance and the feasibility of Government-led initiatives that encourage this should be explored. From a public health perspective, an HRA that encompasses questions that are also used in population health surveys and administered in the workplace has the potential of providing health information on groups which are underrepresented in other population surveys. Conducting the HRA in a variety of worksites could begin to build a picture of the health issues that may be workplace specific, as other studies have revealed the differing impact of health risk factors on absenteeism and work performance for different population groups⁶⁰⁰. Addressing health issues through the workplace is a promising way to reduce population health risk and business has the ability to deliver health promotion programmes that could achieve this where community level programmes are failing. For this reason, the Government is urged to investigate policy and tax incentives to promote an uptake in workplace health promotion by New Zealand businesses.

From a business perspective, there is much to be gained in the workplace from implementing a comprehensive workplace wellness programme. Employers would build a health risk profile of their workforce, and be able to link it to productivity measures such as absenteeism and work performance, either self-reported (through the HRA) or through objectively collected measures. The audit tool would give direction on policy changes, management training around health and work related factors, and programme development of components that would be of most benefit to their employees. Monitoring changes in the health risk profile of their employees over time as a result of a workplace health promotion programme, alongside regularly collected data on productivity may provide the incentive required for continued investment in these programmes. To date, the climate for health and productivity management in New Zealand is tempered somewhat by a lack of

concrete data to illustrate its benefits. The collaboration of the public and private sector has the potential to change this.

The Government has a substantial part to play in advancing health and productivity management in New Zealand, and before a partnership can be formed with businesses, the current disjuncture between different government departments needs to be addressed. Currently, the Ministry of Health (MoH) and the Department of Labour (DoL) have objectives related to work and productivity. The previous government invested heavily into Healthy Eating, Healthy Action, an initiative to address the burden of obesity-related chronic disease focusing on prevention rather than treatment. Within this, the workplace was recognised as an important, yet under-utilised setting for health promotion and as such, Walk the Talk was created jointly by the MoH and Sport and Recreation New Zealand (SPARC) to be implemented into government departments. Part of this was the development of resources (such as the audit tool described in Chapter five) designed to guide workplaces within the government sector to establish their own workplace health programmes. The intention was to make these resources available to workplaces nationwide however, since the present government has pulled funding from Healthy Eating, Healthy Action, the initiative has been largely dormant. As it stands, the website and resources for Walk the Talk remain, yet the reach of these is questionable given there is no active promotion of them in the public sphere.

The DoL on the other hand has strategies related to both business productivity, and health and safety in the workplace, yet not only do these exist in isolation of each other, there is no acknowledgement of the role improving employee health can play. The Workplace Health and Safety Strategy (WHSS) is for the most part focused on occupational health. Though Outcome Two in the WHSS relates to Preventive Workplace Cultures, the specific objectives address occupational health as opposed to health promotion.⁶⁸⁶ The High Performance Workers Initiative (HPWI) concentrates on increasing productivity related outcomes through improving the performance of employees.⁶⁸⁷ However, while employee efficiency is one of the key outcomes, recommendations are centred on skills-based training with little recognition of the role that improving employee health can play in achieving an improvement in performance. The oversight of health-related goals suggests that

stakeholders who are the drivers of policy in the DoL are not health-orientated. Indeed, the Workplace Health and Safety Council designed to advise the Government on health and safety matters is made up of those from industry and government sectors largely interested in workplace accidents. Though an important issue in the workplace, health related matters will not be addressed within this framework. Likewise, productivity matters that are of interest to the stakeholders driving the HPWI cannot be informed by health related issues if they have little knowledge of their importance; in the current climate of health and productivity management in New Zealand, it is reasonable to suggest that this is the case. Dissemination of these results is therefore important as the first stage in addressing this issue. Ultimately though, the collaboration between the MoH and DoL is a logical step to achieve outcomes that are important to both sectors. Improving population level health related outcomes can be achieved through workplace health promotion. This in turn has the potential to increase employee efficiency and subsequent business productivity. Once the alliance at the government level is established, partnering with the private sector to help deliver on these objectives should be a priority.

9.4 Thesis conclusion

Health and productivity management in New Zealand is in its infancy and this body of work provides the first exploration of health risk factors as they relate to productivity in a sample of the New Zealand working population. The development of the HRA tool allowed for research to highlight associations between health risk factors and productivity that warrant investigation at a population level to start to build a health risk profile of the New Zealand working population. International research suggests that health promotion based in the workplace setting can provide an avenue to extend the reach of public health messages to sectors of the population who are missed by national health campaigns. The efficacy of this approach, using well designed workplace intervention programmes that are based on best practice guidelines, using instruments developed for the New Zealand context, is the next step. The importance of a healthy workforce for improving business related outcomes needs to be established in the local setting to start to build a business case

for workplace health and advance the field of health and productivity management in New Zealand.

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Appendices

Appendix A: Northern Regional X Committee Ethics Approval

 Health and Disability Ethics Committees	Northern X Regional Ethics Committee Ministry of Health 3rd Floor, Unisys Building 650 Great South Road, Penrose Private Bag 92 022 Wellesley Street, Auckland Phone (09) 582 9105 Fax (09) 582 9021	
Email: pat_chaine@mo.govt.nz		
10 April 2008		
Ms Micalla Williden Faculty of Health & Environmental Sciences Auckland University of Technology PB 92 006 Auckland		
Dear Micalla		
NTX/08/03/018	Waitemata District Health Board 'WellatWork' Survey: PIS/Cons V#2, 10/04/08	
Principal investigator:	Ms Micalla Williden	
Co-Investigators:	Dr Clara Soper, Ms Jan O'Connor-Brown	
Supervisor:	Prof. Grant Schofield Waitemata DHB, Auckland University of Technology	
Thank you for your final changes. The above study has been given ethical approval by the Northern X Regional Ethics Committee.		
Approved Documents		
<ul style="list-style-type: none">• Information Sheet & Consent Form V#2 dated 10 April 2008.• WDHB Employee Survey dated 22 February 2008.• Survey Invitation (on line)• Draft Health & Wellbeing report		
Accreditation		
The Committee involved in the approval of this study is accredited by the Health Research Council and is constituted and operates in accordance with the Operational Standard for Ethics Committees, April 2006.		
Final Report		
The study is approved until 29 April 2009 . A final report is required at the end of the study and a form to assist with this is available from www.ethicscommittees.health.govt.nz (forms – progress report). If the study will not be completed as advised, please forward a progress report and an application for extension of ethical approval one month before the above date.		
Amendments		
It is also a condition of approval that the Committee is advised of any adverse events, if the study does not commence, or the study is altered in any way, including all documentation eg advertisements, letters to prospective participants.		
Please quote the above ethics committee reference number in all correspondence.		
Administered by the Ministry of Health	Approved by the Health Research Council	http://www.newhealth.govt.nz/ethicscommittees

Appendix B: AUTECH Ethics approval for focus group study:



MEMORANDUM

Auckland University of Technology Ethics Committee (AUTECH)

To: Grant Schofield
From: **Madeline Banda** Executive Secretary, AUTECH
Date: 1 March 2010
Subject: Ethics Application Number 09/162 **Health and productivity management in New Zealand workplaces: an employee perspective.**

Dear Grant

Thank you for providing written evidence as requested. I am pleased to advise that it satisfies the points raised by a subcommittee of the Auckland University of Technology Ethics Committee (AUTECH) at their meeting on 23 July 2009 and that the Chair of AUTECH and I have approved your ethics application. This delegated approval is made in accordance with section 5.3.2.3 of AUTECH's *Applying for Ethics Approval: Guidelines and Procedures* and is subject to endorsement at AUTECH's meeting on 12 April 2010.

Your ethics application is approved for a period of three years until 1 March 2013.

I advise that as part of the ethics approval process, you are required to submit the following to AUTECH:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/research/research-ethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 1 March 2013;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/research/research-ethics>. This report is to be submitted either when the approval expires on 1 March 2013 or on completion of the project, whichever comes sooner;

It is a condition of approval that AUTECH is notified of any adverse events or if the research does not commence. AUTECH approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are reminded that, as applicant, you are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

Please note that AUTECH grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to make the arrangements necessary to obtain this. Also, if your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply within that jurisdiction.

When communicating with us about this application, we ask that you use the application number and study title to enable us to provide you with prompt service. Should you have any further enquiries regarding this matter, you are welcome to contact Charles Grinter, Ethics Coordinator, by email at ethics@aut.ac.nz or by telephone on 921 9999 at extension 8860.

On behalf of the AUTECH and myself, I wish you success with your research and look forward to reading about it in your reports.

Yours sincerely

Madeline Banda

Executive Secretary

Auckland University of Technology Ethics Committee

Cc: Micalla Williden mikki.williden@aut.ac.nz, Hannah Badland. AUTECH Faculty Representative, Health and Environmental Sciences

Appendix C: HRA questionnaire

Demographic information

The following questions ask for some information about you. Please remember your responses will remain confidential.

Which age group do you fall into?

- q Less than 18 years
- q 18-19 years
- q 20-29 years
- q 30-39 years
- q 40-49 years
- q 50-59 years
- q 60-64 years
- q 65+ years

What is your gender?

- q Male
- q Female

Are you currently pregnant?

- q Yes
- q No

What is your height without shoes? (click on icon to view conversion chart)

What is your weight without shoes? (click on icon to view conversion chart)

Which ethnic group do you identify with?(one or more self-identified ethnic group may be chosen)

- q New Zealand European
- q Samoan
- q Tongan
- q Chinese
- q Maori
- q Cook Island Maori
- q Niiuean
- q Indian
- q Dont know
- q Other

Section A: Nutrition Behaviours

The following questions asks you about some of your food choices. Please remember that your responses will remain confidential

On average, how many servings of VEGETABLES (fresh, frozen, canned) did you eat per day over the past 7 days? Do not include vegetable juices. A 'serving' = 1 medium potato/kumara or ½ cup cooked vegetables or 1 cup of salad vegetables) e.g. 2 medium potatoes + ½ cup of peas = 3 servings.

- q I don't eat vegetables
- q Less than 1 serving per day
- q 1 serving per day
- q 2 servings per day
- q 3 servings per day
- q 4 or more servings per day

On average, how many servings of FRUIT (fresh, frozen, canned or stewed) did you eat per day over the past 7 days? Do not include fruit juice or dried fruit. A 'serving' = 1 medium piece or 2 small pieces of fruit or ½ cup of stewed fruit, e.g. 1 apple + 2 small apricots = 2 servings.

- q I dont eat fruit
- q Less than 1 serving per day
- q 1 serving per day
- q 2 servings per day
- q 3 servings per day
- q 4 or more servings per day

On average, how often during the working week do you eat breakfast? Breakfast is defined as consuming food or a liquid meal replacement before 10 am. Exclude coffee and tea. (Please note: you would choose '5+ days per week' if you work more than 5 days per week and consume breakfast on all of those days).

- q Never
- q 1-2 days per week
- q 2-4 days per week
- q 5 days per week
- q 5+ days per week

How often do you usually drink sugary beverages? Include energy drinks, carbonated drinks, fruit juice or cordial. Exclude diet drinks.

- q Never
- q Less than once per week
- q 1-2 times per week
- q 3-4 times per week
- q 5-6 times per week
- q 7 or more times per week

Section B: Physical Activity Behaviours

The following questions ask about your physical activity patterns. Please remember that your responses will remain confidential

The next questions ask about physical activity that you may have done in the past 7 days. Please answer each question even if you do not consider yourself to be an active person. Think about the activities you do at work, as part of your housework and gardening, to get from place to place, and in your spare time for recreation, exercise or sport. The questions ask you separately about brisk walking, moderate activity (for example carrying light loads, bicycling at a regular pace, doubles tennis) and vigorous activity (for example running hard, rugby, netball or fast bicycling). In the last 7 days, have you done more than 10 minutes of continuous walking, moderate or vigorous physical activity?

q Yes

q No

Walking

During the last 7 days, on how many days did you walk at a brisk pace? (A pace at which you are breathing harder than normal). This includes walking at work, walking to travel from place to place, and any other walking that you did solely for recreation, sport, exercise or leisure. Think about only that walking done for at least 10 minutes at a time.

q 0

q 1

q 2

q 3

q 4

q 5

q 6

q 7

How much time did you usually spend doing such brisk walking on each of those days?

-Hours _____

-Minutes _____

Moderate physical activity

During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking. (Moderate physical activity will cause a slight, but noticeable, increase in breathing and heart-rate.) Think about only those physical activities done for at least 10 minutes at a time.

- q 0
- q 1
- q 2
- q 3
- q 4
- q 5
- q 6
- q 7

How much time did you usually spend doing moderate physical activity on each of those days?

-Hours _____
-Minutes _____

Vigorous physical activity

During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, running hard, rugby, netball or fast bicycling? (Vigorous activity is activity that makes you ‘huff and puff’, and where talking in full sentences between a breath is difficult). Think about only those physical activities done for at least 10 minutes at a time.

- q 0
- q 1
- q 2
- q 3
- q 4
- q 5
- q 6
- q 7

How much time did you usually spend doing vigorous physical activity on each of those days?

-Hours _____
-Minutes _____

Please answer carefully. Thinking about all of your activities (brisk walking, moderate or vigorous), on how many of the last 7 days were you active? (“Active” means doing 15 minutes or more of vigorous activity, or a total of 30 minutes or more of moderate activity or brisk walking).

- q 0
- q 1
- q 2

- q 3
- q 4
- q 5
- q 6
- q 7

Do you usually take the stairs instead of the lift when travelling between floors in your workplace? (select not applicable if your workplace is single-storied)

- q Yes
- q No
- q Not applicable

What do you estimate is the total time that you spend sitting during an average working day? Remember to include time spent sitting whilst travelling during work hours and during breaks (do not include activities at home).

- q Less than 1 hour
- q 1 - 2 hours
- q 3 - 4 hours
- q 5 - 6 hours
- q 7 - 8 hours
- q 9 - 10 hours
- q More than 10 hours

When travelling TO work, what travel mode do you typically use for the majority of the time?

- q Private vehicle (including carpool)
- q Public transport (bus, ferry, train, taxi)
- q Walk, run or cycle

When travelling FROM work, what travel mode do you typically use for the majority of the time?

- q Private vehicle (including carpool)
- q Public transport (bus, ferry, train, taxi)
- q Walk, run or cycle

Were your answers to the questions related to physical activity affected because of illness, injury or disability?

- q No
- q Yes, because of long-term illness
- q Yes, because of long-term injury

Section C: Sleep behaviours

The following questions ask about your usual sleeping patterns. Please remember that your responses will remain confidential

During the past 4 WEEKS how much of the time did you have a problem with falling asleep?

- q All of the time
- q Most of the time
- q A good bit of the time
- q Some of the time
- q A little of the time
- q None of the time

During the past 4 WEEKS how much of the time did you have a problem with waking up frequently during normal sleeping time?

- q All of the time
- q Most of the time
- q A good bit of the time
- q Some of the time
- q A little of the time
- q None of the time

During the past 4 WEEKS how much of the time did you have a problem with waking up too early?

- q All of the time
- q Most of the time
- q A good bit of the time
- q Some of the time
- q A little of the time
- q None of the time

According to what others have told you, how often do you think you snore?

- q Always snore
- q Often snore
- q Sometimes snore
- q Rarely snore
- q Never snore

Section D: Work-life balance

The following questions ask about your work-life balance. Please remember that your responses will remain confidential

Overall, how satisfied are you with the balance between your work and other aspects of your life such as time with your family or leisure?

- q Very Dissatisfied
- q Dissatisfied

- q Neither satisfied or dissatisfied
- q Satisfied
- q Very Satisfied

About how many hours altogether did you work in the past 7 days? (if more than 97, enter 97.)

How many hours does your employer expect you to work in a typical 7-day week?(If it varies, estimate the average. If more than 97, enter 97.)

Now please think of your work experiences over the past 4 weeks (28 days). In the spaces provided below, write the number of days you spent in each of the following work situations. In the past 4 weeks (28 days), how many days did you...

...miss an entire work day because of problems with your physical or mental health? (Please include only days missed for your own health, not someone else's health.)

...miss an entire work day for any other reason (including vacation)?

...miss part of a work day because of problems with your physical or mental health? (Please include only days missed for your own health, not someone else's health.)

...miss part of a work day for any other reason (including vacation)?

...come in early, go home late, or work on your day off?

About how many hours altogether did you work in the past 4 weeks (28 days)? (click on icon for assistance with calculating hours)

On a scale from 0 to 10 where 0 is the worst job performance anyone could have at your job and 10 is the performance of a top worker, how would you rate the usual performance of most workers in a job similar to yours?

q 0 Worst Performance

q 1

q 2

q 3

q 4

q 5

q 6

q 7

q 8

q 9

q 10 Top Performance

Using the same 0-to-10 scale, how would you rate your usual job performance over the past year or two?

q 0 Worst Performance

q 1

q 2

q 3

q 4

q 5

q 6

q 7

q 8

q 9

q 10 Top Performance

Using the same 0-to-10 scale, how would you rate your overall job performance on the days you worked during the past 4 weeks (28 days)?

q 0 Worst Performance

q 1

q 2

q 3

q 4

q 5

q 6

q 7

q 8

q 9

q 10 Top Performance

The following questions ask about how you have been feeling during the past 30 days. For each question, please choose the option that best describes how often you had this feeling.

Options.

All of the time

Most of the time

Some of the time

A little of the time

None of the time

State.

...nervous?

...hopeless?

...restless or fidgety?

...so depressed that nothing could cheer you up?

...that everything was an effort?

...worthless?

Section E: Health and health behaviours

The following questions ask about health behaviours and health-related conditions. Please remember that your responses will remain confidential

Have you ever smoked a total of more than 100 cigarettes in your whole life?

q Yes

q No

How often do you now smoke?

q I dont smoke now

q At least once a day

q At least once a week

q At least once a month

q Less often than once a month

How many drinks containing alcohol do you have on a typical day when you are drinking?

q I dont drink alcohol

q One or two

q Three or four

q Five or six

q Seven to nine

q Ten or more

In the last 6 months, have you experienced symptoms from or been diagnosed by a health professional with any of the following conditions?

Yes No

Arthritis

Chronic Fatigue Syndrome

Occupational Overuse Syndrome (OOS)

Asthma, bronchitis or emphysema

Back or spinal problems

Cancer

Depression or bipolar disorder

Diabetes

Heart disease

High blood pressure

High cholesterol

Migraine headaches

Sinusitis or allergic rhinitis (hayfever)

Any other serious medical condition for which you are receiving medical treatment?

Has anyone in your immediate family (parents, siblings) ever been told by their doctor that they have any of the following conditions?

Yes No Dont know

Arthritis

Chronic Fatigue Syndrome

Back or spinal problems

Cancer

Depression or bipolar disorder

Diabetes

Heart disease

High blood pressure

High cholesterol

Any other serious medical condition for which they are receiving medical treatment?

The following questions ask about your perceptions of support for health and wellness in your workplace. Please indicate whether you agree or disagree with the following statements:

In my workplace, living a healthy lifestyle is considered important.

Strongly Disagree

Disagree

Undecided

Agree

Strongly Agree

My immediate supervisor models a healthy lifestyle.

Strongly Disagree

Disagree

Undecided

Agree

Strongly Agree

My workplace demonstrates its commitment to supporting healthy lifestyles through its use of resources such as time, space and money.

Strongly Disagree

Disagree

Undecided

Agree

Strongly Agree

People in my workplace are taught skills needed to achieve a healthy lifestyle.

Strongly Disagree

Disagree

Undecided

Agree

Strongly Agree

New employees in my work unit are made aware of the organisations support for healthy lifestyles.

Strongly Disagree

Disagree

Undecided

Agree

Strongly Agree

In my workplace, people are rewarded and recognised for efforts to live a healthy lifestyle.

Strongly Disagree

Disagree

Undecided

- q Agree
- q Strongly Agree

In my workplace, participation in healthy activities is a primary way to renew friendships and to meet new people.

- q Strongly Disagree
- q Disagree
- q Undecided
- q Agree
- q Strongly Agree

In my workplace, unhealthy behaviour such as smoking and excess drinking is discouraged and confronted.

- q Strongly Disagree
- q Disagree
- q Undecided
- q Agree
- q Strongly Agree

My workplace has a sense of community (for example, people really get to know one another, feel as if they belong and care for one another in times of need).

- q Strongly Disagree
- q Disagree
- q Undecided
- q Agree
- q Strongly Agree

My workplace has a shared vision (for example, people feel that the organisations conduct is consistent with their personal values and people are clear about how they fit in with the big picture).

- q Strongly Disagree
- q Disagree
- q Undecided
- q Agree
- q Strongly Agree

My workplace has a positive outlook (for example, people enjoy their work, celebrate accomplishments, adopt a we can do it attitude and bring out the best in each other).

- q Strongly Disagree
- q Disagree
- q Undecided
- q Agree
- q Strongly Agree

My immediate supervisor supports employees efforts to adopt healthier lifestyle practices.

- q Strongly Disagree
- q Disagree
- q Undecided
- q Agree
- q Strongly Agree

My immediate coworkers support one another's efforts to adopt healthier lifestyle practices.

- q Strongly Disagree
- q Disagree
- q Undecided
- q Agree
- q Strongly Agree

My family members and/or flatmates support one another's efforts to adopt healthier lifestyle practices.

- q Strongly Disagree
- q Disagree
- q Undecided
- q Agree
- q Strongly Agree

In my immediate workplace, it is normal for people to...

- ...be physically active (at least 4 days a week)
- ...maintain a healthy weight
- ...eat foods that are low in fat and refined sugar
- ...drink moderately if at all (that is, not more than 14 drinks per week or more than 5 drinks on a single day)
- ...use seatbelts in the car when travelling
- ...follow safety precautions at work(including practicing good lifting techniques and organising the work environment to avoid injury).
- ...not smoke
- ...stay current on medical screenings

Appendix D: Environmental audit tool

Participant Information Sheet and Consent Form (online)

(Organisation Name) Health Risk Assessment

You are invited to complete a personalised evaluation that focuses on tinana (physical health) and hinengaro (mental health), two cornerstones of wellness. This health evaluation is designed to find out about the physical health habits of (organisation name) as a group and provide (organisation name) with information that will help them develop a wellness programme to meet the needs of you and your whanau. The results of (organisation name) as a whole will be used as part of the principal investigator's doctoral research. Your participation is voluntary but all staff at (organisation name) are being asked to respond.

What are you being asked to do?

Complete a personal health evaluation

- The health evaluation will take approximately 15-20 minutes of your time and you are able to complete it during work hours. You will be asked information related to your physical activity and nutrition habits, your sleep patterns, work-life balance and other health behaviours.
- You will be asked for your input on the wellness programme that is taking place at (organisation name)
- It will ask you for some information about you and your work profile.

You can choose the 'No response' option to any question that you feel uncomfortable answering. You can decide to opt out of the health evaluation at any time and this will not affect your employment in any way.

What do you get out of it?

You will

- Have your say on what you would like to see as part of the overall wellness programme
- Receive a personalised health and wellbeing report if you wish
- Receive health and wellbeing score based on your responses to the health evaluation if you wish
- Give (organisation name) an idea of the overall health status of the workforce so as to guide evidence-based workplace health programmes

Will (organisation name) have access to my individual results?

NO. This health evaluation is completely confidential and at no time will the WDHB be able to access any of your individual results, or your personal health and wellbeing score. Only aggregate data will be made available to (organisation name) to help inform the wellness programme.

The survey data are being collected by an external agency and the results are stored at AUT University on secure servers. Hard copy results will be destroyed after they have been entered into the aggregate dataset.

The (organisation name) will receive an organisation-wide report that summarises the results. AGAIN at NO time is any individual or their responses to the questions able to be identified by the (your organisation). No one at (your organisation) will handle your individual results at any time. Staff from Vitality Works and AUT will aggregate the data.

What else will this information be used for?

This health evaluation is also being administered in workplaces across New Zealand in 2009 and 2010. Mikki Williden, (AUT University), is investigating the health status of the New Zealand workforce as part of her doctoral research, of which Professor Grant Schofield is supervising. Any material gathered from this survey that is published will in no way identify the organisation or any individual participants in any way. There is a possibility that you will be contacted for a follow-up study in the future.

What happens to the data at the end of the survey?

Data collected will be securely stored in such a way that only the researchers will be able to gain access to it. Your name will not be associated with your results after you have been sent back your individual health report if you choose to receive one.

There is a possibility that you will be contacted for a follow-up study in the future.

At the end of the project any personal information will be destroyed immediately except that, as required by the AUT University's research policy, any raw data on which the results of the project depend will be retained in secure storage for ten years, after which it will be destroyed.

Who do you contact if you have any questions?

If English is not your first language, and you need help with completing the form, please contact the principal investigator, Mikki Williden, who will arrange for assistance to be provided. If you have any queries or concerns regarding your rights as a participant in the study, you may wish to contact your professional body. If you've got any questions about this health evaluation feel free to contact the principal investigator, Mikki Williden or Professor Grant Schofield at AUT University.

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Please click 'Continue' below to acknowledge that you have read and understood the conditions of this health evaluation and agree to these conditions.

I understand that I am giving my consent to complete this health evaluation (click here)

Name: _____

Signed: _____

Date: _____

This study has received ethical approval from the Northern X Regional Ethics Committee.

Participant Information Sheet



Date Information Sheet Produced:

7 July 2009

Project Title

Health and Productivity Management in New Zealand workplaces: an employee perspective

An Invitation

You are invited to participate in a research project that is investigating employee perceptions of health, productivity and workplace support. This research is being undertaken by the Centre for Physical Activity and Nutrition Research at AUT University and as part of Mikki Williden's doctoral thesis exploring workplace health promotion in the New Zealand context. Your participation in this research is voluntary and should you decide not to participate or to withdraw from it during the process, there will be no disadvantage to you of any kind and we thank you for considering our request.

What is the purpose of this research?

Health conditions such as obesity, cardiovascular disease and diabetes are increasing in New Zealand and the workplace has the potential to either support or inhibit health behaviours such as being physically active or consuming nutritious food that can help reduce the risk of such conditions. Further, employees who report being in an environment they perceive as supportive of health behaviours have been found to be more productive during the work day. It is recognised that both the physical and the social environment can influence behaviour, but to date there has been little New Zealand research that investigates employees' perceptions of support in the workplace in relation to health behaviours. This research would like to investigate your perceptions of the workplace as part of Mikki Williden's doctoral thesis that is investigating workplace health and productivity management in New Zealand. The findings of this research will be written up for publication in a peer-reviewed journal and presented at a public health conference.

How was I chosen for this invitation?

You were selected to participate in this research because you are an employee at [insert organisation here] and you completed the online health risk assessment.

What will happen in this research?

Should you agree to take part in this project you will be asked to participate in a focus group consisting of 6-7 other employees at your workplace during a lunch break. A

private room, free of interruptions will be secured for the focus group. It will last approximately 45 minutes and there are no right or wrong answers; we are just interested in your perceptions of the workplace environment in relation to health behaviours and productivity. All information will remain confidential and no-one apart from the researchers will have access to interview material at any time. It is important that these sessions are comfortable and enjoyable for you so the precise nature and order of questions may alter as we proceed. If there are any questions that you feel particularly uncomfortable about answering, we will merely proceed to the next question. We will provide refreshments during the course of the focus group.

What are the discomforts and risks?

It is envisaged that there be no risks involved or problems associated with participating in this research.

How will these discomforts and risks be alleviated?

Should you at any stage feel uncomfortable during the interview process you have the right to refrain from participation, without any adversity being drawn to yourself or your organisation.

What are the benefits?

This study will give you the opportunity to provide input into research regarding supportive workplace environments which has the potential to inform future recommendations that are made to employers regarding aspects of the workplace that that may be help or hinder employee efforts to engage in healthy behaviours at work.

How will my privacy be protected?

In order for us to accurately document the discussions, your interview will be audio-taped and transcribed. Once this has occurred, recordings will be deleted and data will be coded so that your identity will be protected. The data collected, along with the consent forms, will be accessible to the AUT-CPAN researchers but will not be shared with your employer. At the end of the project any personal information will be destroyed immediately except that, as required by the University's research policy, any raw data on which the results of the project depend will be retained in secure storage at AUT for six years, and then destroyed. Should the results of this project be published in a journal or presented at a conference, your identity will be protected at all times.

What are the costs of participating in this research?

While your participation in this research does not incur a financial cost, it does incur a time cost. You will be required to contribute a total of 45 minutes of your work time to this research.

What opportunity do I have to consider this invitation?

You have one week to consider whether or not you wish to be involved in this research.

How do I agree to participate in this research?

Should you wish to participate, you will also need to complete the attached consent form prior to the interview. You may choose to return it to us via e-mail, or bring it along to the interview. Once you have signalled your interest in the study, you will receive an e-mail that will provide dates, times and the locations with which the interviews will be taking place.

Will I receive feedback on the results of this research?

If you wish to receive feedback from the focus group results, a report will be made available at the end of the study period (March 2011) that you are able to have access to. Please email Mikki Williden (address below)

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Researcher, **Mikki Williden** (mikki.williden@aut.ac.nz (09) 921 9999 x 7633) or to the Project Supervisor **Professor Grant Schofield** (grant.schofield@aut.ac.nz (09) 921 9999 x 7307).

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTECH, Madeline Banda, madeline.banda@aut.ac.nz, 921 9999 ext 8044.

Whom do I contact for further information about this research?

Researcher Contact Details:

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Lecturer

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Project Supervisor Contact Details:

Grant Schofield

Professor of Public Health

Auckland University of Technology

Private Bag 92006, Auckland 1020

Phone: (09)921 9999, extension 9126 Email: grant.schofield@aut.ac.nz

Your contribution to this study is invaluable and we thank you in advance for your participation.

Kind regards

Mikki Williden and Grant Schofield