

A CONCEPTUAL EVALUATION OF HEALTHY EATING AND PHYSICAL ACTIVITY FOR OFFICE WORKERS APPLYING THE SOCIO-ECOLOGICAL MODEL

Prasadie Rashmini Manawaduge Silva, Indrapriya Kularatne, Edwin Rajah and Olufemi Muibi Omisakin

ABSTRACT

Healthy eating and regular physical activities are considered important factors to control obesity as well as non-communicable diseases such as type 2 diabetes, coronary heart disease, and several cancers. The obesity rate in New Zealand was 34.3% in 2021 and a sharp increase has been observed in 1977 (Ministry of Health, 2021). This literature review is based on secondary sources to evaluate the existing facilitators and barriers of healthy eating and physical activity for office-based workers in the workplace in New Zealand. The Socio-ecological model is used as the conceptual framework to examine the implications. The outcomes of this study can be used to develop suggestions and recommendations for health and wellness improvements for office-based workers. As an outcome, the work environment and culture have a significant influence on the healthy eating and physical activity of office-based workers in the workplace.

Keywords: office-based workers, healthy eating, physical activity, occupational wellbeing

INTRODUCTION

The World Health Organization (WHO) (2011) states that healthy eating and regular physical activities are important in preventing obesity, and major non-communicable diseases such as type 2 diabetes, coronary heart disease, and several cancers. The Food and Agricultural Organisation (FAO) and WHO (2019) reported that in 2016, approximately 1.9 billion adults in the world population were overweight and of that 650 million were obese. Obesity is estimated to cost countries around 0.8% to 2.4% of their gross domestic product (GDP) every year. This economic cost is estimated to increase to 3.7% of GDPs in 2060 (Okunogbe et al., 2021). Obesity also imposes indirect costs on the economy in the form of absenteeism (lost workdays due to illnesses), presenteeism (reduced productivity at work), disabilities, and unemployment (Peñalvo et al., 2021).

The Ministry of Health (MOH) (2021) reported the adult obesity rate in New Zealand was 34.3% in 2020 and 2021, and it has been gradually increasing since 1977. The underlying factors for obesity are the consumption of nutrient-poor foods and lack of physical activity (MOH, 2015). Obesity and related cardiovascular diseases are now key risk factors contributing to morbidity, and premature death in New Zealand (MOH, 2015). Of the total public healthcare costs in New Zealand, 2.5% are attributable to obesity, costing New Zealand approximately \$135 million per year (Swinburn et al., 1997). According to Burniston et al. (2012) more than 80% to 90% of these obesity and related cardiovascular diseases, and their associated burdens on the global healthcare system, could be avoided or minimised by promoting healthy eating and physical activity among the population.

Many previous studies have identified that the workplace is an ideal setting for promoting healthy eating and physical activity as a substantial proportion of adults spend a significant amount of their waking time every day in the workplace (Allan et al., 2017; WHO, 2011). Workplaces can encourage and support their workers to follow healthy lifestyle behaviours by providing a supportive physical and social environment (Pridgeon & Whitehead, 2013). Besides improved health and well-being, workplace health promotion interventions benefit organisations through increased productivity, increased employee satisfaction and loyalty, improved performance, and reduced absenteeism and healthcare costs (Baicker et al., 2010; Okunogbe et al., 2021). To develop a successful workplace health and well-being programme, managers should first identify the barriers/facilitators that their workers face in terms of healthy eating and physical activity in the workplace (Leung et al., 2018). Even though many workplace health programmes have shown a significant positive impact on the healthy eating and physical activity of workers, some health promotion programmes show a moderate to low impact. (Steyn et al., 2009; Torquati, 2016). This demonstrates the significance of understanding the workers' perception of healthy eating and physical activity, their perceived barriers or facilitators of healthy eating and physical activity in the workplace, and their preferences for future health promotion initiatives when planning and implementing health promotion programmes in the workplace.

This literature review is an evaluation adopting secondary sources of information. The aim is to evaluate the existing facilitators and barriers to healthy eating and physical activity for office-based workers in the workplace in New Zealand. The findings from the literature review provide the platform to develop suggestions on health and wellness initiatives for office-based workers in New Zealand.

LITERATURE REVIEW

The literature review discusses the current research relating to healthy eating and physical activity in the workplace, with a specific focus on office-based workers.

Healthy Eating

While there are different nuances to the concept of healthy eating, there is agreement that it is aimed at improving people's overall health and well-being (Reddy & Anitha, 2015). A healthy diet is comprised of vegetables and fruit, whole grains, lean meats, dairy products, nuts, and minimal consumption of salt, trans-fat, red meat, refined carbohydrates, and sugar (Pallazola et al., 2019). Unhealthy eating is the main contributing factor to many non-communicable diseases such as diabetes, dyslipidaemia, cancers, and hypertension (Li et al., 2015).

Healthy Eating in New Zealand

An estimated 34.3% of adults aged 15 years and over in New Zealand are obese, and a further 39.2% of adults are overweight (MOH, 2021). Additionally, the obesity rate of adults in New Zealand living in the most disadvantaged areas is two times higher than the obesity rate of adults living in less disadvantaged areas (MOH, 2021). New Zealand adults' dietary fibre intake is lower than the recommended intake of 20grams (g) per day, and this is one of the major risk factors in the development of non-communicable diseases among the New Zealand population (MOH, 2020). The MOH (2020) recommends two servings of legumes, poultry, seafood, nuts, or fat removed from red meat per day for a healthy adult. According to Wild et al. (2020), the main barriers to healthy eating for New Zealand families are the cost of healthy foods, time constraints, and a negative food environment. The average cost of a healthy diet was NZ\$27 more expensive than the cost of a current unhealthy diet in New Zealand (Vandevijvere et al., 2018). It was also suggested that reduced taxes on fruit and vegetables could reduce the average cost of healthy diets and make it easier and more affordable for people to consume a healthy diet in New Zealand (Vandevijvere et al., 2018).

Healthy Eating in the Workplace

The workplace has been recognised as an ideal place to promote healthy eating by creating a positive

physical and social environment and conditions that support healthy eating among the workers (Lassen et al., 2010). Many workplaces facilitate unhealthy eating by offering an abundance of sweet, low-nutritional foods and unhealthy snacks through vending machines (Grant, 2018; Wansink et al., 2006). Many studies found that work-related stress and job exhaustion/burnout are positively correlated with unhealthy, fast-food consumption by workers (Alexandrova-Karamanova et al., 2016; Chui et al., 2020; Leung et al., 2018).

Physical Activity

Lack of physical activity is estimated to cause approximately 5.3 million deaths annually worldwide and is equivalent to smoking and obesity in terms of health risks (O'Brien, 2018). Physical activity can be defined as any bodily movement produced by skeletal muscles which requires energy expenditure (WHO, 2018). Walking, cycling and different recreational activities are also considered physical activities (Knox et al., 2015). Office-based workers spend most of their time sitting and the lack of physical activity is correlated with obesity, and several cardiovascular diseases (Arundell et al., 2018; Gelius et al., 2020). It is widely agreed that regular movement throughout the day and breaking up sedentary time support improved health outcomes (Hartshorn, 2009; Holzgreve et al., 2021).

Physical Activity in New Zealand

Lack of physical activity is the fourth leading risk factor for noncommunicable diseases in New Zealand (MOH, 2020). According to recent survey data, the level of physical activity of New Zealanders has been declining at a rate of around 1% per year since 1990, and currently, more than a third of New Zealanders can be categorised as physically inactive (MOH, 2021). One measure of physical activity comes from the New Zealand Health Surveys 2018/19, which showed that 51% of New Zealand adults were involved in a minimum of 30 minutes of moderate-intensity activity over the week (MOH, 2021).

Physical Activity in the Workplace

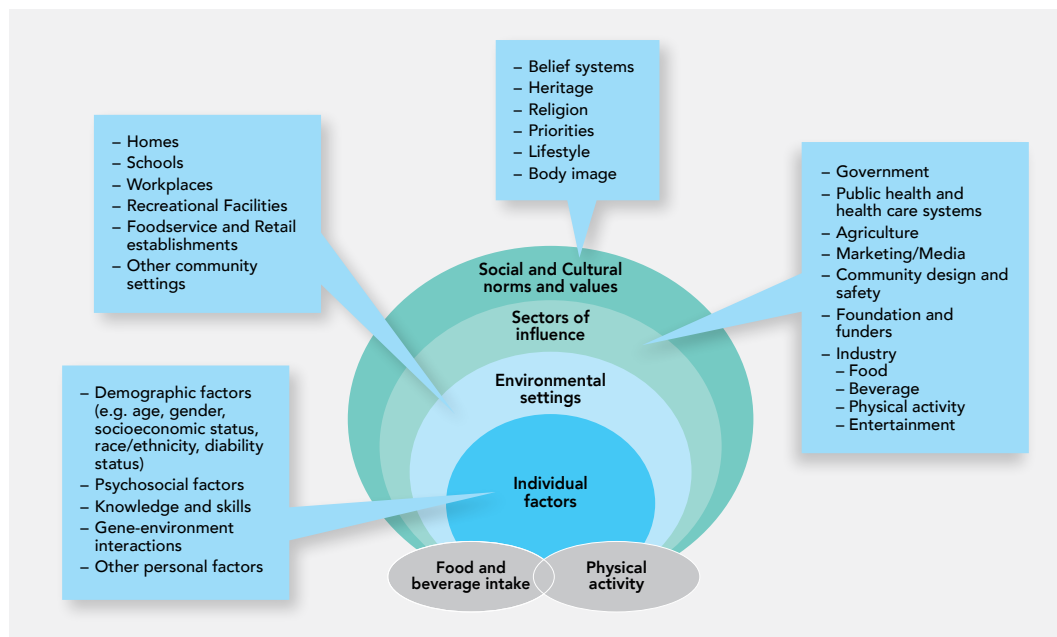
Due to the changes in technology and economic development, physical activity of many occupations has decreased significantly over the years and a high proportion of the workforce is now engaged in inactive and sedentary jobs (Hadgraft et al., 2016). In New Zealand, 57% of adult workers were categorised as being low-active in the workplace (Schofield et al., 2005). While in Australia, 75% of workers' days were categorised as sedentary (Thorp et al., 2012). For office-based workers, the majority (71% of working hours) of their workday is sedentary with minimal time (28% of working hours) is spent on light-intensity activities (Clemes et al., 2014). Workplace activity varies depending on the occupation; office-based occupations are not as active as other occupations and involve more sedentary work (Osilla et al., 2012).

The sedentary work environment has negative impact on health such as; increasing obesity, hypertension, and impaired blood lipids that are associated with cardiovascular diseases (Grundy et al., 1999; Ojo et al., 2019). In New Zealand alone, approximately NZ\$160 million of health-related costs could be saved annually if the recommended physical activity guidelines were followed by the adult population (O'Brien, 2018). Not only the economy, but workplaces also experience the impact from a lack of physical activity and sedentary behaviour of workers which impacts the workplace through decreased productivity, increase medical claims, higher worker turnover rates, and increased absenteeism, all of which contribute significantly to increasing the finance cost of the workplace (Styles, 2011).

Barriers and Facilitators to Healthy Eating and Physical Activity in the Workplace

This literature review applied the socio-ecological model (McLeroy et al., 1988) as the conceptual framework to examine the barriers and facilitators to healthy eating and physical activity in the workplace (Figure 1). It incorporates multiple factors (individual, organisational, social, and policy) into different levels of influence over human behaviour (Kasteren et al., 2020; Stern et al., 2021).

Figure 1 – Socio-ecological Model for Healthy Eating and Physical Activity



Note: The socio-ecological Model shows the individual, social, organisational, and policy level influences on healthy eating and physical activity of an individual. Source: United States Department of Agriculture and United States Department of Health and Human Services (2010).

The existing literature agrees that the organisational structures, systems, and culture of a workplace have a significant influence on the healthy eating of workers (Almeida et al., 2015; Brambila-Macias et al., 2011; Lima et al., 2021; Stern et al., 2021). Many previous studies found several organisational facilitators that facilitate healthy eating in the workplace such as the availability of healthy food options in the workplace or nearby, the availability of kitchen appliances to prepare food and store it properly, workplace cafeteria with appealing and cost-effective healthy food options, lower numbers of vending machines and nutritional education (Backman, 2011; Tamrakar et al., 2020).

The social and cultural context of Healthy Eating in the Workplace

Healthy eating is highly correlated with the social environment since eating is a social activity (Lassen et al., 2010). In the workplace, workers' healthy eating is highly influenced by their co-workers and their managers (Alqahtani, 2020; Reddy & Anitha, 2015). Additionally, family structure, support from their partner, and the presence of children also influence workers' healthy eating in the workplace (Power et al., 2017). Interestingly, Alqahtani (2020) discovered that group eating was more popular among women, and they had a higher chance of being influenced by their co-workers. Moreover, Tabak et al. (2015) showed that the fruit and vegetable consumption of co-workers was identified as a facilitator for eating more fruit and vegetables by most workers.

Culture also has a significant influence on eating practices as for most people food is the main part of their culture (Geaney et al., 2015; Verra et al., 2019). Culture consists of different values, customs, and habits of individuals acquired throughout their life (Geaney et al., 2015; Reddy & Anitha, 2015). According to Lima et al. (2021) highly educated and professional workers' food choices were mainly determined by their cultures

such as their religious beliefs and political ideologies, while among the lower-qualified workers, their culture and beliefs had a reduced impact on their healthy eating.

Individual Perspectives on Healthy Eating in the Workplace

At an individual level, healthy eating is determined by the personal characteristics of the individual including their age, gender, education level, health status, culture, income status, nutritional knowledge, cooking skills, and personal preference (Blackford et al., 2013). According to Mumme et al. (2020), education level and individual income are frequently associated with healthy eating. A recent study conducted in New Zealand showed a significant correlation between the healthy eating of individuals and their socio-demographic factors (Beck, et al., 2018).

Taste is another important determinant of eating since humans show an inherited taste preference for sweet and salty foods, while some people assume that healthy diets are not palatable (Lappalainen et al., 1997). A recent study in Mexico showed that most workers did not consume healthy food in the workplace due to the unappealing and unpleasant taste of the healthy food options available in the cafeteria (Stern et al., 2021). Also, the unhealthy foods available in the cafeteria, such as fast/fried food tasted and looked better than the healthy foods (Stern et al., 2021).

Impact of Government Policies on Healthy Eating in the Workplace

Government policies and regulations play a major role in facilitating physical activity among workers (Gelius et al., 2020). National physical activity guidelines as well as advocacy documents and different international agreements such as the Ottawa Charter also highlight the importance of government interventions for facilitating physical activity in the workplace (Gelius et al., 2020; WHO, 1986; Williden et al., 2012). Governments can introduce physical activity policies, agendas, structures, and funding to develop, implement and finance projects to increase the physical activity of the population (Gelius et al., 2020). Government policies like transport policies, urban design, and transport taxes can have a great influence on the physical activity of the working population (Ablah et al., 2019). Barton (2009) confirmed that the quality of public transportation, town planning, accessibility to local facilities, and housing patterns strongly facilitate the walking, cycling, and outdoor recreational activity of the population. Additionally, sidewalk quality, improving lighting, connectivity, street design, separate cycling lanes from other traffic, presence of dedicated walking and cycle routes, and closeness of cycle paths to workplaces have a strong correlation connection with the physical activity profile of the working population (Fraser & Lock, 2011; Gelius et al., 2020).

At the population level, policies created by the government can impact on healthy eating in the workplace (Almeida et al., 2015). Policy interventions fall into two categories: the first is, policies to support informed choices of the population and the second is policies to support changing the market environment (Brambila-Macias et al., 2011). Restrictions on unhealthy food marketing/advertisements, increasing education, and awareness of unhealthy eating and its' consequences, nutritional labelling, and information on food packaging and menus are some of the policies used to support informed healthy eating choices in the working population (Brambila-Macias et al., 2011; Mozaffarian, 2018). On the other hand, fiscal policies can be used to promote healthy eating among the population such as increasing the tax on unhealthy foods, decreasing the tax on healthy foods, providing incentives to healthy food manufacturers, and introducing quality standards (Mozaffarian, 2018).

Workplace Environment and Physical Activity in the Workplace

The workplace's physical environment and organisational structure have a significant impact on the physical activity of workers (Aittasalo et al., 2017). Many studies have identified factors associated with office-based workers' physical activity and sedentary behaviour in the workplace (Aittasalo et al., 2017; Grimani et al., 2019; Hadgraft et al., 2016; Nooijen et al., 2018). The major barriers that have been identified are workload, lack of time, work pressure, lack of exercise facilities on-site or near the workplace, lack of cycle parking

facilities, lack of lockers and showers, and lack of management support (Aittasalo et al., 2017; Nooijen et al., 2018). The main facilitators for being physically active in the workplace were the availability of on-site fitness facilities, group exercise classes, physical activity education, recreational activities, organisation-sponsored sports events, corporate challenges and work flexibility (Grimani et al., 2019; Hadgraft et al., 2016; Nooijen et al., 2018). Additionally, some of the recent workplace physical activity initiatives such as walking meetings, height-adjustable desks, treadmill desks, activity-based working, and open-plan offices have shown promising results in increasing the physical activity of workers while reducing workplace sitting time (Hadgraft et al., 2016).

Social Environment and Physical Activity in the Workplace

The social environment is an important determinant of the physical activity of office-based workers. The main social factors facilitating the physical activity level of workers are co-workers, family, and friends, and the management in the workplace (Blackford et al., 2013; Houle et al., 2017). A study of 671 male adults in Canada showed that friends and co-workers play a significant role in promoting the physical activities of men (Houle et al., 2017). They suggested that peer encouragement, being a good role model and, practical support from co-workers could help men to increase their physical activity in the workplace (Houle et al., 2017). Similarly, a study by Rowland et al. (2018) discovered that peer modelling intervention is an effective and feasible method of changing the physical activity of inactive women in the workplace. Additionally, it was found that the adults who had positive social connections and networks within their organisations were more physically active than the other workers (Pringle et al., 2013; Rowland et al., 2018).

Family responsibilities and parenthood were recognised as major barriers to physical activity in the workplace (McIntyre & Rhodes, 2009). Lack of time, lack of energy, feeling guilty and busyness due to family commitments were identified by many workers as the main reasons for being inactive in the workplace (Mailey et al., 2014). Whereas workplace physical activity initiatives were significantly beneficial to working mothers due to their limited time and family commitments (Mailey et al., 2014).

Individual Factors and Physical Activity in the Workplace

A few individual factors have been identified as barriers to being physically active in the workplace such as lack of time, lack of energy, lack of self-motivation, low self-efficacy, inconvenience of being physically active, and lack of knowledge (Blackford et al., 2013; Hadgraft et al., 2016; Ojo et al., 2019; Quintiliani et al., 2007).

A quantitative study of 992 working adults in England found that knowledge of moderate to vigorous physical activity recommendations was significantly low in the workplace (Knox et al., 2015). Knowledge and awareness of physical activity have been identified as a prerequisite to engaging in more physical activity in the workplace (Hadgraft et al., 2016; Knox et al., 2015; Ojo et al., 2019). Workers' motivation to increase physical activity in the workplace could be increased through emails, frequent messages on their computer screens, frequent reminders to interrupt prolonged sitting time, health seminars, and counselling sessions (Hadgraft et al., 2016; Parry & Straker, 2013).

The literature review covered both the importance of healthy eating and physical activity, plus barriers and facilitators for healthy eating and physical activity in the workplace in office-based workers. However, the evidence regarding studies of healthy eating and physical activity of office-based workers in New Zealand was very limited. Even though there is a clear correlation between poor nutrition and an inactive lifestyle with mortality and increased chronic disease risk, little is known about the healthy eating and physical activity of office-based workers in New Zealand. Additionally, office-based workers' perspectives about healthy eating and physical activity and their preference for future health promotion initiatives have not been assessed in New Zealand workplaces. Therefore, this literature review aimed to explore the barriers and facilitators to healthy eating and physical activity of office-based workers in New Zealand and to use the findings to recommend a range of health promotion initiatives to improve healthy eating and physical activity in the workplace.

LIMITATIONS AND GAPS

The level of workplace obesity worldwide is on the rise due to unhealthy eating and lack of physical activity among the working population (Almeida et al., 2015). Therefore, this literature review primarily aims to identify the barriers and facilitators that office-based workers face in terms of healthy eating and physical activity in the workplace. The socio-ecological model was used to describe the contributing factors of these behaviours at the individual, organisational, social, and policy levels (Kasteren et al., 2020).

There has been very limited research carried out regarding the barriers and facilitators of healthy eating and physical activity in the workplace (Lima et al., 2021; Mestral et al., 2016; Nooijen et al., 2018; Tamrakar et al., 2020). In New Zealand, most of this research was based on different community samples such as older single men, male adolescent rugby players, primary school children, and university students (Bowden, 2008; Quintiliani et al., 2010; Stokes, 2017). Also, using the socio-ecological model to analyse barriers and facilitators of healthy eating and physical activity in a workplace setting is an under-researched area in New Zealand (Edwards, 2012). The socio-ecological framework is a highly adaptable theoretical model which is used to analyse distinct human behaviours using interrelated (individual, organisational, social, and policy) factors (Kasteren et al., 2020). Apart from this, literature exploring workers' perception of healthy eating and physical activity in the workplace is limited (Commissaris et al., 2016; Hipp et al., 2015). Moreover, fewer studies have been carried out in terms of both healthy eating and physical activity components together when evaluating the health and well-being of workers (Almeida et al., 2015; Grimani et al., 2019). According to Conn et al. (2009), Steyn et al. (2009) and Torquati (2016) workplace initiatives focussing on both the nutrition and physical activity components together had a significant positive impact on workers' body weight, Body Mass Index (BMI), work attendance, and productivity in the workplace. Therefore, there appears to be a knowledge gap in this area of research as previously identified the combination of these lifestyle components; healthy eating and physical activity, have the potential to improve quality of life and prevent chronic disease in the population (Nooijen et al., 2018; Tamrakar et al., 2020).

Some occupations, especially desk-based jobs require workers to spend long periods seated such as professional services, senior management roles, artistic work, and administration jobs (Lima et al., 2021; Mestral et al., 2016). These workers spend more time sitting than average workers and have double the risk of developing cardiovascular disease compared with those workers who have physically active jobs (Retamal, 2013). However, very little is known about how to improve the health and well-being of office-based workers (Bowden, 2008; Quintiliani et al., 2010). In addition to that, literature exploring workplace healthy eating and physical activity level is limited, with much of the research carried out exploring these taking place over the whole day (inside and outside of the workplace) (Commissaris et al., 2016; Hipp et al., 2015). Thus, it would appear to be significant to undertake research in the New Zealand office-based workplace context to understand healthy eating and physical activity of office-based workers in the workplace to improve their health and health outcomes.

CONCLUSION

Eating a healthy diet and regular physical activity are considered key elements for the prevention of obesity and several chronic diseases (Li et al., 2015). Since working adults spend more than half of their waking hours in the workplace (Peñalvo et al., 2021), understanding workplace barriers and facilitators to healthy eating and physical activity is essential for the control and prevention of non-communicable diseases among office-based workers. The primary aim of this literature review was to understand the facilitators and barriers that New Zealand office-based workers face in terms of healthy eating and physical activity in the workplace. Understanding the factors associated with healthy eating and physical activity of office-based workers could help to tailor workplace health initiatives and strategies and promote healthy lifestyle behaviours among office-based workers both in and out of the workplace. Also, workplace health promotion initiatives can benefit the organisation through improved productivity, employee satisfaction, and reduced health-related costs (Arundell et al., 2018; Aittasalo et al., 2017; Knox et al., 2015; Styles, 2011).

Overall, the findings of this literature review suggest that the organisational environment and culture have a significant influence on the healthy eating and physical activity of office-based workers in the workplace. To promote healthy eating and physical activity in the workplace, it is recommended that managers should streamline the physical environment in the workplace, by cultivating a positive organisational health climate including; reducing workload, increasing the availability of healthy food options in workplace cafeterias and vending machines, introducing healthy food options at meetings and social events, increasing awareness through emails, screensavers and notice-boards, introducing compulsory breaks for stretching and exercise, longer lunch breaks for walking groups or fitness classes, signs to use the stairs instead of the elevator, organising health challenges and introducing incentive schemes to reward healthy eating and physical activity in the workplace.

However, no matter of nudging can control the choices made by individual office-based workers, the responsibility for healthy eating and physical activities in the workplace always remains with the individual.

Future research is required to determine the barriers and facilitators of healthy eating and physical activity in a wider range of workplaces. To add validity to future research, including a more diverse working population would strengthen the findings.

Finally, methods should be identified to overcome the barriers and support the implementation of successful health initiatives and strategies to improve healthy eating and physical activity of New Zealand office-based workers in the workplace.

Prasadie Silva is a Chartered Management Accountant by profession and currently working at Beca, New Zealand. She has obtained her Master of Applied Management from Otago Polytechnic Auckland International Campus, Auckland, New Zealand, and Bachelor of Accountancy from the University of Sri-Jayawardenepura, Sri Lanka. Her research interests include occupational health and wellbeing, workplace health management, nutrition, and physical activity education.

Indrapriya Kularatne is a Principal Lecturer at Otago Polytechnic Auckland International Campus, New Zealand. He has obtained his Ph.D. from the University of Auckland, New Zealand, Master of Management from Massey University, New Zealand, and Master of Science from the University of Sri Jayawardenepura, Sri Lanka. His research focuses on sustainability, environmental management, employability skills, project management, and corporate social responsibility. He is a Member of the Environment Institute of Australia and New Zealand and a Senior Fellow of Higher Advance Education (SFHEA). ORCID:0000-0001-5699-0638

Edwin Rajah is a Principal Lecturer at Otago Polytechnic Auckland International Campus, Auckland where he teaches Digital Marketing and Innovation and Entrepreneurship. His research interests are in the areas of marketing strategy, digital marketing, innovation, branding, customer relations management (CRM), business analytics, and corporate social responsibility (CSR). More recently, he has developed research interests in experiential/authentic learning and quality enhancement in learning and teaching in higher education. ORCID 0000-0002-6336-5045

Olufemi Muibi Omisakin, is a Senior Lecturer and teaches Applied Management and Business at Otago Polytechnic Auckland International Campus, Auckland, New Zealand. He obtained a Ph.D. in social sciences and public policy from Auckland University of Technology (AACSB accredited), Auckland, New Zealand. His doctoral research was in immigrants and entrepreneurship management. His main research interests are migration and migrants' entrepreneurship, small and medium enterprises, sustainable practice, international business, and organisational management. A member of the Research Association of New Zealand and an Associate Institute of Management Consultant, New Zealand. He is also a FHEA. ORCID: 0000-0003-2008-0426

REFERENCES

- 01 Ablah, E., Lemon, S. C., Pronk, N. P., Wojcik, J. R., Mukhtar, Q., Grossmeier, J., Pollack, M. K., & Whitsel, L. P. (2019). Opportunities for Employers to Support Physical Activity Through Policy. *Preventing Chronic Disease*, 16. <https://doi.org/10.5888/pcd16.190075>
- 02 Aittasalo, M., Livson, M., Lusa, S., Romo, A., Vähä-Ypyä, H., Tokola, K., Sievanen, H., Manttari, A., & Vasankar, T. (2017). Moving to business – changes in physical activity and sedentary behavior after multilevel intervention in small and medium-size workplaces. *BMC Public Health*, 317-319. <https://doi.org/10.1186/s12889-017-4229-4>
- 03 Alexandrova-Karamanova, A., Todorova, I., Montgomery, A., Panagopoulou, E., Costa, P., Baban, A., Davas, a., Milosevic, M., & Mijakoski, D. (2016). Burnout and health behaviors in health professionals from seven European countries. *International Archives of Occupational and Environmental Health*, 89(7), 1059-75. <https://doi.org/10.1007/s00420-016-1143-5>
- 04 Allan, J., Querstret, D., Banas, K., & Bruin, M. d. (2017). Environmental interventions for altering eating behaviours of employees in the workplace: a systematic review. *an official journal of the International Association for the Study of Obesity*, 18(2), 214-226. <https://doi.org/10.1111/obr.12470>
- 05 Almeida, F. A., Wall, S. S., You, W., Harden, S. M., Hill, J. L., Krippendorf, B. E., & Estabrooks, P. A. (2015). The association between worksite physical environment and employee nutrition, and physical activity behavior and weight status. *J Occup Environ Med*, 56(7), 779–784. <https://doi.org/10.1097/JOM.0000000000000180>
- 06 Alqahtani, N. (2020). The Effects of Peer Pressure on Nutrition Attitudes and Food Selection. *International Journal of Medical Research & Health Sciences*, 9(11), 23-30.
- 07 Arundell, L., Sudholz, B., Teychenne, M., Salmon, J., Hayward, B., Healy, G. N., & Timperio, A. (2018). The Impact of Activity Based Working (ABW) on Workplace Activity, Eating Behaviours, Productivity, and Satisfaction. *International Journal of Environmental Research and Public Health*, 15(5). <https://doi.org/10.3390/ijerph15051005>
- 08 Backman, D., Gonzaga, G., Sugerman, S., Francis, D., & Cook, S. (2011). Effect of Fresh Fruit Availability at Worksites on the Fruit and Vegetable Consumption of Low-Wage Employees. *Journal of nutrition education and behavior*, 43(4), S113-S121. <https://doi.org/10.1016/j.jneb.2011.04.003>
- 09 Baicker, K., Cutler, D., & Song, Z. (2010). Workplace Wellness Programs Can Generate Savings. *E-health in the developing world*, 29(2). <https://doi.org/10.1377/hlthaff.2009.0626>
- 10 Barton, H. (2009). Land use planning and health and well-being. *Land Use Policy*, 26(1), 115-123. <https://doi.org/10.1016/j.landusepol.2009.09.008>
- 11 Beck, K. L., Jones, B., Ullah, I., McNaughton, S. A., Haslett, S. J., & Stonehouse, W. (2018). Associations between dietary patterns, socio-demographic factors and anthropometric measurements in adult New Zealanders: an analysis of data from the 2008/09 New Zealand Adult Nutrition Survey. *Eur J Nutr*, 57(4), 1421-1433. doi:10.1007/s00394-017-1421-3
- 12 Blackford, K., Jancey, J., Howat, P., Ledger, M., & Lee, A. H. (2013). Office-Based Physical Activity and Nutrition Intervention: Barriers, Enablers, and Preferred Strategies for Workplace Obesity Prevention, Perth, Western Australia, 2012. *Prev Chronic Dis*, 10. <http://dx.doi.org/10.5888/pcd10.130029>
- 13 Bowden, J. A. (2008). *Adding Life to Years: Understanding Barriers to Healthy Eating in a Group of Older Single-Living New Zealand Men* (Master's thesis, Massey University), Albany. [https://Adding Life to Years \(massey.ac.nz\)](https://Adding Life to Years (massey.ac.nz))
- 14 Brambila-Macias, J., Shankar, B., Capacci, S., & Mazzocchi, M. (2011). Policy interventions to promote healthy eating: A review of what works, what does not, and what is promising. *Food and Nutrition Bulletin*, 32(4), 365-375. <https://doi.org/10.1177/156482651103200408>
- 15 Burniston, J., Eftekhari, F., Hrabí, S., Worsley, R., & Dean, E. (2012). Health behaviour change and lifestyle-related condition prevalence: Comparison of two epochs based on systematic review of the physical therapy literature. *Hong Kong Physiotherapy Journal*, 30(2), 44-56. <https://doi.org/10.1016/j.hknpj.2012.07.001>
- 16 Chui, H., Bryant, E., Sarabia, C., Maskeen, S., & Stewart-Knox, B. (2020). Burnout, eating behaviour traits, and dietary patterns. *British Food Journal*, 122(2), 404-413. <https://doi.org/10.1108/BFJ-04-2019-0300>
- 17 Cledes, S. A., O'Connell, S. E., & Edwardson, C. L. (2014). Office workers objectively measured sedentary behavior and physical activity during and outside working hours. *Journal of Occupational and Environmental Medicine*, 56(3), 298-303. <https://doi.org/10.1097/JOM.0000000000000101>

- 18 Commissaris, D. A., Huysmans, M. A., Mathiassen, S. E., Srinivasan, D., & Koppes, L. (2016). Interventions to reduce sedentary behavior and increase physical activity during productive work: a systematic review. *Scand J Work Environ Health*, 42(3), 181–91. <https://doi.org/10.5271/sjweh.3544>
- 19 Conn, V., Hafdahl, A., Cooper, P., Brown, L., & Lusk, S. (2009). Meta-Analysis of Workplace Physical Activity Interventions. *Am J Prev Med*, 37(4), 330-339. <https://doi.org/10.1016/j.amepre.2009.06.008>
- 20 Edwards, J. (2012). *Understanding the predictors of participation and the barriers to employee involvement in workplace health promotion programmes* (Doctoral thesis, Massey University). Albany. <http://hdl.handle.net/10179/4078>
- 21 Food and Agricultural Organisation (FAO) and World Health Organization (WHO) (2019). *Sustainable healthy diets – Guiding principles*. FAO & WHO. <https://www.who.int/publications/i/item/9789241516648>
- 22 Fraser, S. D., & Lock, K. (2011). Cycling for transport and public health: a systematic review of the effect of the environment on cycling. *European Journal of Public Health*, 21(6), 738–743. <https://doi.org/10.1093/eurpub/ckq145>
- 23 Geaney, F., Fitzgerald, S., Harrington, J. M., Kelly, C., Greiner, B. A., & Perry, I. J. (2015). Nutrition knowledge, diet quality, and hypertension in a working population. *Prev Med Rep*, 30(2), 105-113. <https://doi.org/10.1016/j.pmedr.2014.11.008>
- 24 Gelius, P., S. M., Goodwin, L., Schow, D., & Abu-Omar, K. (2020). What are effective policies for promoting physical activity? A systematic review of reviews. *Preventive Medicine Reports*, 2211-3355. <https://doi.org/10.1016/j.pmedr.2020.101095>
- 25 Grant, J. (2018). *Eating behaviours and the workplace: The role of socioeconomic and sociodemographic characteristics*. (Doctoral thesis, University of Nottingham). <http://eprints.nottingham.ac.uk/id/eprint/51895>
- 26 Grimani, A., Aboagye, E., & Kwak, L. (2019). The effectiveness of workplace nutrition and physical activity interventions in improving productivity, work performance and workability: a systematic review. *BMC Public Health*, 19:1676. <https://doi.org/10.1186/s12889-019-80331>
- 27 Grundy, S. M., Pasternak, R., Greenland, P., Smith, S., & Fuster, V. (1999). Assessment of cardiovascular risk by use of multiple-risk-factor assessment equations: a statement for healthcare professionals from the American Heart Association and the American College of Cardiology. *Circulation*, 100(13), 1481–1492. <https://doi.org/10.1161/01.cir.100.13.1481>
- 28 Hadgraft, N. T., Brakenridge, C. L., LaMontagne, A. D., Fjeldsoe, B. S., Lynch, B. M., Dunstan, D. W., & Lawler, S. P. (2016). Feasibility and acceptability of reducing workplace sitting time: a qualitative study with an Australian office worker. *BMC Public Health*, 16:933. <https://doi.org/10.1186/s12889-016-3611>
- 29 Hartshorn, N. (2009). *The Impact Of Participating In An Activity Programme (10,000 Steps @ Work Lite Programme) On Dietary Change* (Master's thesis, Massey University). Palmerston North. [Measuring the Impact of participating in an activity program \(10,000 Steps @ Work Lite Program\) on diet and other health behaviours as measured through stages of change \(massey.ac.nz\)](http://hdl.handle.net/10179/4078)
- 30 Hipp, J. A., Reeds, D. N., Bakergem, M. A., Marx, C. M., Brownson, R. C., Pamulapati, S. C., & Hoehner, C. M. (2015). Review of Measures of Worksite Environmental and Policy Supports for Physical Activity and Healthy Eating. *Preventing chronic disease*, 140410, 5-12. <http://dx.doi.org/10.5888/pcd12.140410>
- 31 Holzgreve, F., Fraeulin, L., Haenel, J., Schmidt, H., Bader, A., Frei, M., Groneberg, A. D., Ohlendorf, D., & Mark, A. V. (2021). Office work and stretch training (OST) study: effects on the prevalence of musculoskeletal diseases and gender differences: a non-randomised control study. *Occupational and environmental medicine*, 11(5). <https://doi.org/10.1136/bmjopen-2020-044453>
- 32 Houle, J., Meunier, S., Coulombe, S., Mercerat, C., Gaboury, I., Tremblay, G., Montigny, F., Cloutier, L., Roy, B., Auger, N., Lavoie, B. (2017). Peer Positive Social Control and Men's Health-Promoting Behaviors. *American Journal of Men's Health*, 11(5), 1569–1579. <https://doi.org/10.1177/1557988317711605>
- 33 Kasteren, Y. F., Lewis, L. K., & Maeder, A. (2020). Office-based physical activity: mapping a social-ecological model approach against COM-B. *BMC Public Health*, 163. <https://doi.org/10.1186/s12889-020-8280-1>
- 34 Knox, E. C., Musson, H., & Adams, E. J. (2015). Knowledge of physical activity recommendations in adults employed in England: associations with individual and workplace-related predictors. *International Journal of Behavioral Nutrition and Physical Activity*, 12:69. <https://doi.org/10.1186/s12966-015-0231-3>
- 35 Lappalainen, R., Saba, A., & Holm, L. (1997). Difficulties in trying to eat healthier: Descriptive analysis of perceived barriers for healthy eating. *European Journal of Clinical Nutrition*, 51 Suppl 2, S36–S40

- 36 Lassen, A. D., Andersen, K. K., Biloft-Jensen, A. P., & Tetens, I. (2010). Effectiveness of a Canteen Take Away concept in promoting healthy eating among employees. *Public Health Nutrition*, 15(3), 452-458. <https://doi.org/10.1017/S1368980011001431>
- 37 Leung, S. L., Barber, J. A., Burger, A., & Barnes, R. D. (2018). Factors associated with healthy and unhealthy workplace eating behaviours in individuals with overweight/obesity with and without binge eating disorder. *Obes Sci Pract.*, 4(2), 109-118. <https://doi.org/10.1002/osp4.151>
- 38 Li, Y., Hruba, A., Bernstein, A. M., Ley, S. H., Wang, D. D., Chiuve, S. E., Sampson, L., Rexrode, K. M., Rimm, E. B., Willett, W. C., & Hu, F. B. (2015). Saturated Fats Compared With Unsaturated Fats and Sources of Carbohydrates in Relation to Risk of Coronary Heart Disease: A Prospective Cohort Study. *Journal of the American College of Cardiology*, 6(66), 1538-1548. <https://doi.org/10.1016/j.jacc.2015.07.055>
- 39 Lima, J. P., Costa, S. A., Brandão, T. R., & Rocha, A. (2021). Food Consumption Determinants and Barriers for Healthy Eating at the Workplace—A University Setting. *Foods*, 10(4), 695. <https://doi.org/10.3390/foods10040695>
- 40 Mailey, E. L., & McAuley, E. (2014). Impact of a brief intervention on physical activity and social cognitive determinants among working mothers: a randomized trial. *J Behav Med*, 37(2), 43-55. <https://doi.org/10.1007/s10865-013-9492-y>
- 41 McIntyre, C. A., & Rhodes, R. E. (2009). Correlates of leisure-time physical activity during transitions to motherhood. *Women Health*, 49(1), 66-83. <https://doi.org/10.1080/03630240802690853>
- 42 McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health education quarterly*, 15(4), 351–377. <https://doi.org/10.1177/109019818801500401>
- 43 Mestral, C. d., Stringhini, S., & Marques-Vidal, P. (2016). Barriers to healthy eating in Switzerland: A nationwide study. *Clinical Nutrition*, 35(6), 1490–1498. <https://doi.org/10.1016/j.clnu.2016.04.004>
- 44 Ministry of Health (MOH). (2015). *Understanding Excess Body Weight: New Zealand. Ministry of Health. Understanding Excess Body Weight: New Zealand Health Survey | Ministry of Health NZ*
- 45 MOH. (2020). *Eating and Activity Guidelines for New Zealand Adults. Eating and Activity Guidelines for New Zealand Adults | Ministry of Health NZ*
- 46 MOH. (2021, December 22). *Tier 1 statistics 2020/2021: New Zealand Health Survey*. Retrieved from Ministry of Health New Zealand: <https://www.health.govt.nz/nz-health-statistics/health-statistics-and-data-sets/obesity-statistics>
- 47 Mozaffarian, D. (2018). Role of government policy in nutrition—barriers to and opportunities for healthier eating. *Science and politics of nutrition*, 361:k2426. <https://doi.org/10.1136/bmj.k2426>
- 48 Mumme, K., Conlon, C., Hurst, P. v., Jones, B., Stonehouse, W., Heath, A.-L. M., Coad, J., Haskell-Ramsay, C., Seymour, D., & Beck, K. (2020). Dietary Patterns, Their Nutrients, and Associations with Socio-Demographic and Lifestyle Factors in Older New Zealand Adults. *Nutrients*, 12. <https://doi.org/10.3390/nu12113425>
- 49 Nooijen, C. F., Kallings, L. V., Blom, V., Ekblom, Ö., Forsell, Y., & Ekblom, M. M. (2018). Common Perceived Barriers and Facilitators for Reducing Sedentary Behaviour among Office Workers. *International Journal of Environmental Research and Public Health*, 15(4), 792. <https://doi.org/10.3390/ijerph15040792>
- 50 O'Brien, W. J. (2018). Exploring physical activity profiles of Māori, Pacific and European women from Aotearoa New Zealand: Implications for body composition and metabolic health (Doctoral thesis; Massey University). Auckland. [Exploring physical activity profiles of Māori, Pacific and European women from Aotearoa New Zealand \(massey.ac.nz\)](https://www.massey.ac.nz/exploring-physical-activity-profiles-of-maori-pacific-and-european-women-from-aotearoa-new-zealand/)
- 51 Ojo, S. O., Bailey, D. P., Hewson, D. J., & Chater, A. M. (2019). Perceived Barriers and Facilitators to Breaking Up Sitting Time among Desk-Based Office Workers: A Qualitative Investigation Using the TDF and COM-B. *International Journal of Environmental Research and Public Health*, 16, 2903. <https://doi.org/10.3390/ijerph16162903>
- 52 Okunogbe, A., Nugent, R., Spencer, G., Ralston, J., & Wilding, J. (2021). Economic impacts of overweight and obesity: current and future estimates for eight countries. *BMJ Global Health*, 6(10). <https://doi.org/10.1136/bmjgh-2021-006351>
- 53 Osilla, K. C., Busum, K. V., Schnyer, C., Larkin, J. W., Eibner, C., & Mattke, S. (2012). Systematic review of the impact of worksite wellness programs. *American Journal of Managed Care*, 18(2). 68-81.
- 54 Pallazola, V. A., Davis, D. M., Whelton, S. P., Cardoso, R., Latina, J. M., Michos, E. D., Sarkar, S., Blumenthal S. R., Arnett, K. D., Stone, J. N., & Welty, F. K. (2019). A Clinician's Guide to Healthy Eating for Cardiovascular Disease Prevention. *Mayo Clinic Proceedings: Innovations, Quality & Outcomes*, 3(3), 251-267. <https://doi.org/10.1016/j.mayocpiqo.2019.05.001>

- 55 Parry, S., & Straker, L. (2013). The contribution of office work to sedentary behaviour associated risk. *BMC Public Health*, 13, 296. <https://doi.org/10.1186/1471-2458-13-296>
- 56 Peñalvo, J. L., Sagastume, D., Mertens, E., Uzhova, I., Smith, J., Wu, J. H., Bishop, E., Onopa, J., Shi, P., & Micha, R. (2021). Effectiveness of workplace wellness programmes for dietary habits overweight, and cardiometabolic health: a systematic review and meta-analysis. *Lancet Public Health*, e648–60. [https://doi.org/10.1016/S2468-2667\(21\)00140-7](https://doi.org/10.1016/S2468-2667(21)00140-7)
- 57 Power, B. T., Kiezebrink, K., Allan, J. L., & Campbell, M. K. (2017). Understanding perceived determinants of nurses' eating and physical activity behaviour: a theory-informed qualitative interview study. *BMC Obesity*, 4(18). <https://doi.org/10.1186/s40608-017-0154-4>
- 58 Pridgeon, A., & Whitehead, K. (2013). A qualitative study to investigate the drivers and barriers to healthy eating in two public sector workplaces. *Journal of Human Nutrition and Dietetics*, 85–95. <https://doi.org/10.1111/j.1365-277X.2012.01281.x>
- 59 Pringle, A., Zwolinsky, S., McKenna, J., Daly-Smith, A., Robertson, S., & White, A. (2013). Delivering men's health interventions in English Premier League football clubs: key design characteristics. *Public Health*, 127(8), 716-726. <https://doi.org/10.1016/j.puhe.2013.04.011>
- 60 Quintiliani, L., Poulsen, S., & Sorensen, G. (2010). Healthy Eating Strategies in the Workplace. *International Journal of Workplace Health Management*, 3(1), 182–196. <https://doi.org/10.1108/17538351011078929>
- 61 Quintiliani, L., Sattelmair, J., & Sorensen, G. (2007). *The workplace as a setting for interventions to improve diet and promote physical activity*. Dalian: World Health Organization. Microsoft Word - Lquintiliani_WHO_final-R2.doc (fx1234.com)
- 62 Reddy, S., & Anitha, M. (2015). Culture and its Influence on Nutrition and Oral Health. *Biomed Pharmacol J*, 8. <http://biomedpharmajournal.org/?p=3340>
- 63 Retamal, M. E. (2013). *Teacher's Workplace: Physical Activity And Sedentary Behaviour* (Master's Thesis, Auckland University of Technology). <RetamalC.pdf> (aut.ac.nz)
- 64 Rowland, S. A., Berg, K. E., Kupzyk, K. A., Pullen, C. H., Cohen, M. Z., Schulz, P. S., & Yates, B. C. (2018). Feasibility and Effect of a Peer Modeling Workplace Physical Activity Intervention for Women. *Workplace Health & Safety*, 66(9), 428-436. <https://doi.org/10.1177/2165079917753690>
- 65 Schofield, G., Badlands, H., & Oliver, M. (2005). Objectively-measured physical activity in New Zealand workers. 8(2), 143-151. [https://doi.org/10.1016/S1440-2440\(05\)80005-2](https://doi.org/10.1016/S1440-2440(05)80005-2)
- 66 Stern, D., Blanco, I., Olmos, L. A., Valdivia, J. J., Shrestha, A., Mattei, J., & Spiegelman, D. (2021). Facilitators and barriers to healthy eating in a worksite cafeteria: a qualitative study. *BMC Public Health*, 21, 973. <https://doi.org/10.1186/s12889-021-11004-3>
- 67 Steyn, N., Parker, W., Lambert, E., & Mchiza, Z. (2009). Nutrition interventions in the workplace: Evidence of best practice. *Knowledge System; Human Science Research*, 22(3), 111-117. <https://www.ncbi.nlm.nih.gov/books/NBK78544/>
- 68 Stokes, E. G. (2017). *Perceptions and Determinants of Healthy Eating in High Performing Male Adolescent Rugby Players* (Master's Thesis, Massey University). Albany. <Perceptions and determinants of healthy eating in high performing male adolescent rugby players> (massey.ac.nz)
- 69 Styles, L. J. (2011). *An investigation into the effect of providing employees with a pedometer on overall exercise levels, barriers to physical activity, stress, and satisfaction with work and life* (Master's Thesis, University of Canterbury). <http://hdl.handle.net/10092/5326> <http://dx.doi.org/10.26021/6656>
- 70 Swinburn, B., Ashton, T., Gillespie, J., Cox, B., Menon, A., Simmons, D., & Birkbeck, J. (1997) Health care costs of obesity in New Zealand. *Int J Obes Relat Metab Disord*, 21(10), 891-896. <https://doi.org/10.1038/sj.ijo.0800486>
- 71 Tabak, R. G., Hipp, A., Marx, C. M., & Brownson, R. C. (2015). Workplace Social and Organizational Environments and Healthy-Weight Behaviors. *Plos One*, 10(4), e0125424. <https://doi.org/10.1371/journal.pone.0125424>
- 72 Tamrakar, D., Shrestha, A., Rai, A., Karmacharya, B. M., & Malik, V. (2020). Drivers of healthy eating in a workplace in Nepal: a qualitative study. *BMJ Open*, 10(2), e031404. <https://doi.org/10.1136/bmjopen-2019-031404>
- 73 Thorp, A. A., Healy, G. N., Winkler, E., Clark, B. K., Gardiner, P. A., Owen, N., & Dunstan, D. W. (2012). Prolonged sedentary time and physical activity in the workplace and non-work contexts: a cross-sectional study of office, customer service and call centre employees. *International Journal of Behavioral Nutrition and Physical Activity*, 9. <https://doi.org/10.1186/1479-5868-9-128>

- 74 Torquati, L. (2016). *Health promotion in the workplace: changing the diet and physical activity behaviour of nurses* (Doctoral Thesis, University of Queensland).
- 75 United States Department of Agriculture and United States Department of Health and Human Services (2010). *Dietary Guidelines for Americans, 2010*. 7th Edition, Washington, DC: U.S. [DietaryGuidelines2010 \(health.gov\)](https://www.health.gov/DietaryGuidelines2010)
- 76 Vandevijvere, S., Young, N., Mackay, S., Swinburn, B., & Gahegan, M. (2018). Modelling the cost differential between healthy and current diets: the New Zealand case study. *International Journal of Behavioral Nutrition and Physical Activity*, 15-16. <https://doi.org/10.1186/s12966-018-0648-6>
- 77 Verra, S. E., Benzerger, A., Jiao, B., & Ruggeri, K. (2019). Health Promotion at Work: A Comparison of Policy and Practice Across Europe. *Safety and Health at Work*, 10(1), 21-29. <https://doi.org/10.1016/j.shaw.2018.07.003>
- 78 Wansink, B., van Ittersum, K., & Painter, J. E. (2006). Ice cream illusions bowls, spoons, and self-served portion sizes. *American journal of preventive medicine*, 31(3), 240–243. <https://doi.org/10.1016/j.amepre.2006.04.003>
- 79 Wild, C. E., Rawiri, N. T., Willing, E. J., Hofman, P. L., & Anderson, Y. C. (2020). Challenges of making healthy lifestyle changes for families in Aotearoa/New Zealand. *Public Health Nutrition*, 24(7), 1906–1915. <https://doi.org/10.1017/S1368980020003699>
- 80 Williden, M. (2012). *Health and productivity management in New Zealand: an exploratory study* (Doctoral Thesis, Auckland University of Technology). [WillidenM.pdf \(aut.ac.nz\)](https://aut.ac.nz/theses/123456789)
- 81 World Health Organisation (WHO). (1986). *Ottawa Charter for Health Promotion*. Geneva. Retrieved from <https://www.who.int/teams/health-promotion/enhanced-wellbeing/first-global-conference>
- 82 WHO. (2011). *The workplace: A priority setting for health promotion*. Geneva: World Health Organization. [Workplace health toolkit \(rph.org.nz\)](https://www.who.int/publications/i/item/9789241514187-eng)
- 83 WHO. (2018). *Global action plan on physical activity 2018–2030: more active people for a healthier world*. Geneva: World Health Organization. Licence: CC BY-NC-SA 3.0 IGO. [9789241514187-eng.pdf \(who.int\)](https://www.who.int/publications/i/item/9789241514187-eng)