

Health initiatives to target obesity in surface transport industries: Review and implications for action

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Abstract

Lifestyle-related chronic diseases pose a considerable burden to the individual and the wider society, with correspondingly negative effects on industry. Obesity is a particular problem for the Australasian road and rail industries where it is associated with specific cardiac and fatigue-related safety risks, and levels are higher than those found in the general population. Despite this recognition, and the introduction of National Standards, very little consensus exists regarding approaches to preventative health for surface transport workers. A review of evidence regarding effective health promotion initiatives is urgently needed to inform best practice in this cohort. This review draws together research informing the scope and effectiveness of health promotion programs, initiatives and interventions targeting overweight and obesity in safety critical surface transport domains including the truck, bus and rail industries. A number of health interventions demonstrated measurable successes, including incentivising, peer mentoring, verbal counselling, development of personalised health profiles, and offer of healthier on-site food choices – some of which also resulted in sizeable return on investment over the long term.

Obesity is a problem that has significant implications for the individual. At the local level, obesity is a primary risk factor for many chronic conditions, including stroke, diabetes, heart disease, high blood pressure, and various types of cancer (Obesity Australia 2014). It also has psychological and societal effects that impact upon quality of life, such as depression, discrimination, low income, and fewer job recruitment options. Beyond the individual, obesity has an adverse and lasting impact for communities, and when viewed economically, the societal burden ranks among the highest sources of harm to collective health. In Australia alone, the annual financial cost of obesity for 2008 was approximately \$58 billion, which included costs for medical care, prescription drugs, the health system, and loss of wellbeing (Access Economics 2008). It is fair to say that obesity ranks as one of the greatest health-related threats to future generations.

Like many other industrialised countries, obesity is one of the greatest public health challenges for Australia (Obesity Australia 2014; Obesity Working Group 2009), particularly for industry, where it has been associated with absenteeism (Tucker and Friedman 1998) and decreased productivity (Access Economics 2008). Obesity is associated with lifestyle factors such as poor dietary habits, excess of energy-dense foods, physical inactivity, and sedentary behaviours (Temelkova-Kurktschiev and Stefanov 2012). Health initiatives to target obesity in the infrastructure and transport sector have been identified as a critical area of focus, largely because the nature of the work in these environments presents conditions in which obesity can thrive. Surface transport is concerned with flow and motivated by mobility, but these factors present significant constraints in the workplace of the driver. Whether it is bus, truck or rail operation, the driving task is largely sedentary

and has little to no scope for extended physical activity on the job, or opportunities for healthy food choices. Performance also equates with how well the driver is able to meet their scheduling needs, and poor or degraded operation invariably impacts upon organisational service goals as well as the rest of the system. For this reason, being substantially overweight and unable to maintain healthy body fat levels interacts with a driver's ability to maintain overall physical fitness and indirectly impacts on their ability to continuously maintain safe driving posture and practices (Krueger et al. 2007). Obesity is, however, a preventable risk, and consideration should be given to how health initiatives target obesity in the surface transport industries, relative to the demands of the various working environments.

In all the surface transport industries, driving a vehicle is a relatively complex and cyclical task that requires perception, very good judgement and situation awareness, reliable decision-making capacity, responsiveness, and reasonable physical capability. Information required to perform the task is obtained from visual and auditory systems and operates through many cognitive processes (Naweed 2013; 2014). Decisions are enacted by the musculoskeletal system, which exerts influence on control to manipulate speed and alter the velocity of the vehicle. The following section gives a brief overview of sector-specific issues as they relate to the truck, bus and rail industries.

Truck

Truck driving in Australia and New Zealand has a huge share in transport and logistics. In New Zealand for example, trucks transport 80 percent of the country's freight (TRB 2012). In Australia, road freight is an approximately \$18 billion per year industry. Demand for service is increasing, but the industry is facing driver shortages, and by 2020, the gap between supply and demand of drivers is expected to be 15,000 (Latus 2013). The mean truck driver age is 43, and by 2016 close to 20 percent of drivers are expected to be at retirement age (O'Rourke 2014). At the same time, the industry is facing recruitment issues. Low rates of young people are entering the industry, with poor perceptions of health and work-life balance implicated as barriers to recruitment (O'Rourke 2014). Truck drivers here and internationally experience increasing rates of obesity; for example, a recent study from the US reported that long-haul truck drivers are twice as likely to be obese compared to the adult working population, as well as more likely to smoke and suffer from other risk factors for chronic disease (Sieber et al 2014).

Truck driving involves light, medium or heavy rigid vehicles, but is more often than not associated with heavy combination or multi-combination articulated vehicles with trailers (NTC 2012a). The profession often requires early starts, long shifts, days away from home and, for Australia, travelling long distances to interstate or remote areas. Large trucks are equipped with sleeping berths, televisions, and refrigerators, and the task is essentially performed with a non-fixed location employment model, and is characterised by working alone.

Truck drivers are often under severe scheduling constraints and must adjust to fluctuating operating demands that have clear implications for diet and exercise. Driving behind the wheel in a road environment introduces a range of physiological changes in response to highway conditions (TRB 2012). The nature of the job results in a higher proportion of meals being eaten outside the home, and there can be few healthy food options at truck stops and service stations. It can be difficult to find time

to make and keep medical appointments, and healthy grocery shopping on the road can clearly be challenging.

In Australia and New Zealand, much of the focus on truck driver health has traditionally been concerned with fatigue risk management as a factor affecting both individual and system performance, as well as safety. General health concerns associated with obesity have gradually started to penetrate the industry, and in Australia new medical standards were introduced in 2012 to determine fitness to drive in relation to health status, cardiac condition, and alcohol and substance misuse (NTC 2012a).

Bus

Like truck and freight operators, the national fitness to drive standards and regulatory requirements for buses in Australia and New Zealand are covered by the National Transport Commission and the association of Australasian road transport and traffic agencies (NTC 2012a). Bus drivers often enter the workforce as a second career. They are therefore considerably older (over 55 years) and have an older person's ailments (TRB 2012). Similar to the other surface transport industries, urban bus operators are an occupational group with high rates of overweight and obesity, with previous studies estimating the prevalence of overweight to be as high as 63 percent (Marcinkiewicz and Szosland 2010). Contrary to truck driving, commercial bus and coach travel typically operates a fixed location employment model, though regional travel may introduce temporary stays on long-haul trips. The driver is generally accompanied by service users (i.e. paying customers and members of the public), even if they have to perform the task themselves. Like trucks, buses and coaches are large and heavy vehicles, though technical driving ability and driving style is different. Buses servicing metropolitan districts operate on a pre-defined schedule with very regular stops and starts, which requires particular attention to smooth stopping and acceleration. The passenger interface also means that the driver must remain vigilant about what is happening in the saloon of the bus as regards stopping needs, as well as what is happening ahead on the road. The task is largely sedentary and tight schedules many constrain the desire to pull over for personal needs breaks. Regional bus and coach travel occurs over greater distances, between cities and states, including work in the tourist trade. Here, the driver is more likely to usher service users to tour stops or await completion of tours before making a return trip.

Rail

The rail industry is also growing. Both the passenger and freight rail tasks are expected to double by 2020 and triple by 2050 (Asian Development Bank 2012; Australasian Railway Association Inc. 2008), but despite the rapid increase, the industry is experiencing problems retaining staff (TLISC 2012). Mitigating the problem of obesity in this population is therefore an important part of preserving the wellbeing of those already in the industry and reducing accident risk, as well as a key step in avoiding the looming skills shortages.

Unlike the road sector, however, rail has enough variance to create a unique context for driving. Much like driving in the bus and trucking industries, rail driving necessitates a large amount of sedentary behaviour, but unlike those sectors, driving vehicles on guided rails (e.g. passenger trains, freight trains, trams) places further constraints on physical activity. Throttle and braking is applied via hand levers (as opposed to foot pedals) and number of safety systems periodically monitor driver

activity, ready to intervene if the driver is incapacitated. Once in service, the driver needs to be seated at all times. In Australia, metropolitan passenger rail service providers (including passenger tram networks) typically feature a single driver, while some regional locomotive-haul services have two. Many heavy haul rail operations in Australia and New Zealand feature a driver and co-driver arrangement.

In Australia, levels of obesity and hypertension in the rail driver cohort are greater than those of the general population (Mina and Casolin 2007), and preliminary evidence suggests that drivers tend towards unhealthy diets. The problem of obesity in rail first came under scrutiny in 2003 following a high-speed train crash that killed six passengers and seriously injured 40 others. It was later discovered that the driver had suffered a heart attack. A year later, the National Transport Commission (NTC) introduced a National Health Standard for Rail Safety Workers (NTC 2012b), incorporating a health surveillance program in the form of an ongoing periodic assessment, where safety critical workers were required to meet certain criteria to be deemed fit to work.

In 2012, a revised edition of the National Health Standard was introduced that included Body Mass Index (BMI) testing as a means of assessing train drivers' fitness for work. Since 20th January 2013, BMI has been calculated routinely as part of the periodic health assessment (every 5 years to age 50; every 2 years to age 60; every 1 year 60+) for safety critical workers. Drivers with a BMI greater than 40, or greater than 35 alongside other health risk indicators such as T2DM or high blood pressure, are labelled temporarily unfit for duty and allocated alternative tasks pending further assessment. However, recent studies looking at the impact of the National Health Standard have shown that while specific cardiac indicators (i.e. self-reported smoking status, cholesterol levels) in train drivers have improved over time, the levels of obesity have actually increased (Mina and Casolin 2012; NTC 2012b).

Summary

While issues such as fatigue and work pressure are clear contributors to obesity risk, they are also baseline properties of work in all these transport sectors. Beyond radical changes in job design, these issues are likely to remain a staple of the transport environment. Factors that collectively add to the risk are that drivers are predominantly lower-educated men (on a population level, this group is more likely to be overweight than women or more highly educated groups) with irregular sleeping patterns due to long hours and shift work. However, there is considerable variation and fragmentation within and across industries, meaning that drivers in smaller operations are not always exposed to the same level of organisational support as those in large firms. From a public health perspective, lifestyle contributors to obesity risk such as diet, diet quality, eating behaviour and physical activity have been cited as leading indicators for obesity prevention and management, and evidence shows that interventions that target lifestyle risk factors through dietary counselling and physical exercise can reduce BMI, waist circumference, body weight and blood pressure (e.g. Temelkova-Kurktschiev and Stefanov 2012). Given the negative implications of obesity for the transport industry, it seems logical that specific industry-tailored interventions could have beneficial industrial and economic ramifications.

All three modes of surface transport (truck, bus and rail) share things in common, particularly with respect to the relationship between primary driving task and restricted capacity for physical activity and good diet quality. This is why evidence from one domain may readily inform another. The increasing prevalence of obesity

and health problems in drivers working in the Australasian transportation industry makes this evidence review of considerable interest and very timely. Decision makers in this area are facing policy challenges associated with obesity-related safety risk; future skills shortages associated with a rapidly growing demand for services; an ageing transport workforce; and low retention rates of new workers. This review will help decision makers understand ways to maximise health and safeguard productivity within their own workforce, and to consider innovative public policy responses to facilitate the personal wellbeing of individual workers, and greater safety to road and rail networks and the public.

Aims and method

The broad aims of this paper are to:

1. Review the evidence for factors that may influence or inform initiatives to prevent or manage obesity in the surface transport industry; and
2. Examine programs or interventions already conducted in this area to determine what works, and the barriers and facilitators impacting these outcomes.

The first aim is designed to shed light on the factors that predict or contribute to overweight or obesity-related outcomes in the workplace, which might be usefully targeted in future interventions. The second aim is designed to identify studies with measurable weight, diet or activity-related outcomes that have directly assessed the impact of programs to reduce overweight or obesity. This will provide a comprehensive comparison and overview of relevant research. Specifically, discussion will centre on:

1. The workplace and management health promotion strategies that help prevent or manage obesity, alongside factors associated with successful implementation;
2. The practical implications for industry and recommendations for best practice.

The criteria for studies included in the review are as follows:

1. The study must include quantitative measures of, or qualitative reference to: (a) factors that influence or inform health initiatives related to overweight and obesity prevention in the surface transport sector, and (b) the effectiveness of health interventions for overweight and obesity prevention in the surface transport sector.
2. The material must be grey literature (e.g. industry research, discussion or review reports) or a publication in a peer-reviewed journal, and have been released between 2000 and 2015.
3. Due to the focus on overweight and obesity prevention, the material must include discussion of body composition, dietary and/or physical activity-related topics. Our aim was to target research from Australia or New Zealand where possible, and extend our focus to the international field where literature searches yielded sparse results.

The search was conducted from February to March 2015 and comprised database searches of SCOPUS, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Wiley Online Library, Web of Science, ProQuest, ScienceDirect, The Cochrane Library, Google and Google Scholar. We used a combination of the

following search terms:

1. health initiatives for train/truck/lorry/bus driver/s;
2. obesity, diet or physical activity combined with train truck/lorry/bus driver/s or work/er;
3. driver, truck, bus, lorry, train, rail, road, rail/truck/lorry work/er; transport industry; or safety work/er combined with obesity, overweight, health, BMI, body mass index, diet, nutrition, exercise, physical activity, activity, or fitness and initiative, promotion, program, intervention, workplace/site, assessment, standard, prevention, action, or public health.

Additional manual searches were conducted on major industry-related websites, such as the National Transport Commission. A manual search of studies that cited or were cited in articles that met the inclusion criteria was also conducted.

After removing duplicates and studies that did not meet the inclusion criteria ($n = 1440$), a total of 32 studies were identified and assembled into a literature matrix (see the Appendix). These included three from Australia or New Zealand, which were supplemented by 29 international studies (US = 19; Canada = 4; Brazil = 1; Korea = 1; Taiwan = 1; UK = 1; Sweden = 1; Finland = 1). Of these, 17 were specific to the truck industry; five focused on truck and bus; nine were specific to the bus industry; and one was specific to rail. From the 32 studies, 25 were drawn from published academic literature and seven were classified as grey literature, comprising industry reports and manuals. Nineteen studies reported factors that influence or inform health initiatives related to overweight and obesity (Appendix Table 1), and 13 studies reported outcomes related to the effectiveness of health interventions related to overweight and obesity (Appendix Table 2). Data were then extracted from the literature sources to give summary information of the characteristics, aims and outcomes of each paper, as presented in the tables and discussion sections below.

What factors might influence outcomes?

Appendix Table 1 summarises the evidence on factors that may influence obesity-related outcomes, informing intervention development. Of the 19 papers, 11 focused on trucking; four on trucks and buses together, and four on buses only. No papers were identified that focused on rail. The information in Appendix Table 1 is arranged according to the health topic of interest, followed by the type of paper, method and sample, the content and findings, and recommendations arising from the work. Ten papers focused on general health and wellbeing with a diet or physical activity component, or multiple risk factors including smoking and sleep in addition to dietary and exercise behaviours (ATRI 2002; Bigelow et al. 2014; Chung and Wong 2011; French et al. 2007; Krueger et al. 2007; Mackie 2008; McDonough et al. 2014; Meuleners and Lee 2008; Ng et al. 2014; TRB 2012). Four papers looked at physical activity only (Apostolopoulos et al. 2012a; Gorczyński and Patel 2014; Turner and Reed 2011; Wong et al. 2014). Two papers looked at diet and physical activity combined (Passey et al. 2014; Whitfield-Jacobson et al. 2007); one looked at diet only (Apostolopoulos et al. 2011), one focused on weight control behaviours (Escoto and French 2012), and one investigated obesity more generally (Apostolopoulos et al. 2012b). The literature included 13 academic studies and six from the grey literature. Taken together, these included 11 research articles, three literature reviews or syntheses, and an industry discussion report, research report, instruction manual,

conference summary report, and website evaluation. The research articles included observational methodology, qualitative interviews, focus groups, and cross-sectional surveys. Given that the majority of these studies were exploratory investigations, the observational and qualitative methods applied were appropriate to gain an in-depth understanding as a precursor to intervention work. The cross-sectional study designs are also useful for inferring correlational or predictive relationships, however we note that causality cannot be assumed from these methods. More robust methodology, such as longitudinal or case comparison designs, would be useful for this purpose.

Where practicable, findings from the selected papers were categorised into three broad themes of influencing factors: (1) individual, (2) environmental, and (3) organisational. For the purpose of this review, individual-level factors are those that are designed to influence personal knowledge of health, such as education and training, those that target socio-cognitive/psychological variables such as motivation to change health behaviour, or those that identify individual differences in workers that affect obesity-related outcomes. Environmental-level factors are those that relate to the physical work settings, such as on-site exercise facilities, and canteen quality or price. Finally, organisational-level factors are defined as the structural aspects of work that are inherent in policy and practice, for example hours of work, management structure, and culture. The sections below give an overview of the findings and recommendations for change to individual, environmental and organisational-level factors from the 19 studies identified, followed by a summary and general issues arising from this work.

Individual-level factors

The first thing to note from the studies in Appendix Table 1 is that, in line with the broader literature, individuals working in the surface transport industry had a significantly higher incidence of obesity and overweight than the general population. In New Zealand, Mackie (2008) reported that 39 percent of truck drivers in their sample were obese or very obese compared with 27.7 percent in the 2008–9 general population (Fight the Obesity Epidemic Charitable Trust 2013). This trend is also reflected in Meuleners and Lee's (2008) sample of Australian truck drivers: 78 percent of drivers were classified as overweight or obese in comparison to 67.8 percent of males in the general population in 2008 (ABS 2013). This is also the case in the international literature (e.g. Whitfield-Jacobson et al. 2007 for the US).

Although this finding was consistent across industries as a whole, some studies identified individual differences between employees that influenced the likelihood of poor health, adoption of healthier lifestyle behaviours, and the perception of workplace barriers to change.

Perhaps unsurprisingly, studies reported that the level of obesity is a factor in:

1. Perceptions of lower health status when compared with peers (Chung and Wong 2011);
2. A higher frequency of unhealthy weight management behaviours (Escoto and French 2012); and
3. Lower engagement in physical activity and the highest reported barriers to change (French et al. 2007; Turner and Reed 2011).

In addition, it was found that younger drivers, those with depression (Chung and Wong 2011), female employees, and non-white drivers (Escoto and French 2012) were susceptible to poorer health behaviours and outcomes, as were those trying to

juggle family life with long hours and the demands of their job (Mackie 2008). These findings suggest that interventions and programs targeted to obesity level or risk severity (see also Bigelow et al. 2014), age, sex and ethnicity may be beneficial to meet the particular needs of these groups. In addition, the mental health status and life stage of drivers (i.e. family commitments and responsibility) should be considered.

A second individual-level factor that the majority of studies discussed was the importance of delivering health-related education to drivers in order to address prevalent knowledge gaps about healthy diet and activity found among this cohort (Meuleners and Lee 2008; Passey et al. 2014). However, some studies noted that the quality of information varied, and was not always accurate or based on guidelines (ATRI 2002; Gorczynski and Patel 2014). In their evaluation of online physical activity information for truck drivers, Gorczynski and Patel (2014) found that only 20.5% of 44 websites hosted by trucking companies were accurate about national recommendations, and the general readability and technical quality of the sites was low. Driver perceptions of information availability and quality in workplaces were also poor (Apostolopoulos et al. 2012a; Apostolopoulos et al. 2011; Bigelow et al. 2014; French et al. 2007). This shows that quality health promotion, training and education materials are lacking overall.

In addition, studies highlighted the importance of combining quality information provision with behavioural strategies based in theory, in order to promote motivation and behavioural change (Gorczynski and Patel 2014; Ng et al. 2014). This is in line with a large body of evidence from the psychological literature, which demonstrates that knowledge gained from information provision alone is rarely sufficient to prompt measurable change (Rimal 2000). The consensus is that guidance from a health professional with expertise in behavioural change is needed to best inform organisations about how to incorporate this element into their training and educational programs (Krueger et al. 2007).

The papers reviewed discuss a number of specific psychological variables and strategies that should be targeted in health behaviour change educational materials. For example, approaches that emphasised personal responsibility for health looked at ways to enhance motivation for change, such as messages to increase self-efficacy and confidence; targeting attitudes, health beliefs and fears; providing suggestions for generating social support; and offering strategies such as goal-setting, self-monitoring and personal feedback in order to track individual progress (ATRI 2002; Apostolopoulos et al. 2012b; Bigelow et al. 2014; Gorczynski and Patel 2014; Krueger et al. 2007; Ng et al. 2014; Passey et al. 2014). The literature also recommended using strategies to overcome real or perceived barriers to adopting healthier lifestyle behaviours – either individual barriers such as high stress levels, or environmental barriers such as lack of opportunity to purchase healthy food. These strategies included the use of self-talk, meditation, personal skill-building (ATRI 2002; Ng et al. 2014), and practical suggestions such as ways to improve food choices and pre-prepare healthy meals outside of the immediate work environment (Whitfield-Jacobson et al. 2007).

However, it was again noted that psychological and behavioural strategies for change should be developed within an evidence-based theoretical framework alongside expert guidance (Gorczynski and Patel 2014; Krueger et al. 2007; Ng et al. 2014; Whitfield-Jacobson et al. 2007). Such strategies must take the driver perspective into account, and ideally be developed in consultation with the driver. Researchers also recommended that any behaviour change strategies implemented

must be flexible enough to accommodate the unique settings of the workplace and job demands (McDonough et al. 2014; Ng et al. 2014; Passey et al. 2014; TRB 2012).

Environmental-level factors

The literature on environmental-level factors in Appendix Table 1 falls into two broad categories: the work environment of food and dietary choice, and the work environment of opportunities for physical activity. In their review of the characteristics of effective health programs for truck drivers, Ng et al. (2014) reported a dearth of policy development and support for environmental-level change, meaning the area was largely omitted in current intervention literature despite posing a serious barrier to change. Studies that investigated drivers' attitudes to behavioural change generally reported positive responses to suggestions to become more pro-active about their eating habits (Whitfield-Jacobson et al. 2007), exercise habits (Wong et al. 2014), and general health (Meuleners and Lee 2008). Unfortunately, working environments were perceived to make this virtually impossible. For example, in an observational assessment of 25 trucking work settings in the US, Apostolopoulos et al. (2011; 2012a) found that almost all of the sites visited by truck drivers (including trucking terminals, warehouses, truck stops and highway rest areas) were not at all supportive of either healthy eating or active living in their facilities and availability, accessibility, and pricing and purchasing options. Unsupportive work environments were also found to be the norm in work settings for bus drivers (Bigelow et al. 2014), and these findings were echoed by drivers across studies (French et al. 2007; McDonough et al. 2014; Meuleners and Lee 2008; Passey et al. 2014; Turner and Reed 2011). However, obese drivers were more likely to report environmental barriers to food choices and physical activity than their non-obese co-workers (French et al. 2007), again suggesting that targeted programs may be necessary.

The main suggestions for alterations to work environments to facilitate healthier outcomes included improvements to company cafeterias and outlets at other work sites, for example healthier menus and better food quality and pricing (Apostolopoulos et al. 2012b; Whitfield-Jacobson et al. 2007); increasing the use of discounted gym memberships, onsite fitness facilities, and encouragement to spend less time inside the vehicle when not driving; and reducing access to television viewing (French et al. 2007; Passey et al. 2014; Turner and Reed 2011). But in their investigation into physical activity in Australian bus drivers, Wong et al. (2014) noted that when workplace-supported initiatives and facilities such as walking clubs and corporate gym memberships were available, many drivers still failed to use them. When the sedentary time of these drivers was measured objectively at work and at home over a number of days, it was found to be higher on non-work days, despite the reported environmental barriers at work. This highlights the importance of a work-life approach to physical activity and health, and the need to overcome perceived barriers to existing opportunities in the workplace.

Organisational-level factors

Reports by Bigelow et al. (2014) and others in Table 1 confirm that driver health status is having increasingly negative impacts on organisational outcomes in the transport sector. It affects safety, productivity and driver shortage. While the majority of papers agreed that organisational-level support was critical for the long-term success of health-related initiatives, the literature review by Ng et al. (2014) again found a paucity of studies addressing organisational or institutional change, both in

the trucking industry and more generally. Our review suggests that organisational-level factors influence obesity and related lifestyle behaviours in a number of ways. They influence culture, corporate policy and operations, and working conditions. A number of studies reported that long working hours and shift work predicted worse outcomes. For example, drivers who work long hours (40-49 hours per week) were more likely to report poor weight management (Escoto and French 2012) and other unhealthy lifestyle behaviours (McDonough et al. 2014) than those working fewer hours, and in one New Zealand study the impact of shift work and hours of work were found to be the most significant contributor to employee illness (Mackie 2008). Time poverty due to shift work, irregular driving routines, job demands and work intensity were also associated with low engagement in physical activity (Turner and Reed 2011; Wong et al. 2014); poor eating habits (Escoto and French 2012); non-uptake of health initiatives (Wong et al. 2014); and lack of access to health care outside work (McDonough et al. 2014). These findings show that strict adherence to Hours of Service regulation and improvements to rostering are needed to affect obesity-related outcomes, in addition to management of fatigue and safety risk and work-life conflict (Escoto and French 2012; Meuleners and Lee 2008).

Management attitude, leadership and culture within the workplace were also found to influence obesity-related outcomes. Chung and Wong (2011) showed that bus drivers who anticipate more negative reactions to errors and incidents, and a more punitive attitude from management, are more likely to report personal ill health. Kreuger et al. (2007), Passey et al. (2014), and TRB (2012) discuss fear of job loss or other negative repercussions due to poor personal health, which can lead to underreporting of health issues and a subsequent failure to access necessary support. Embracing a cultural shift towards helping and empowering employees to prevent and control medical conditions, rather than penalising them for it, is needed for long-term change. Genuine management buy-in, strong leadership and a philosophy of shared responsibility is essential to realise this (Krueger et al. 2007; TRB 2012). In Wong et al.'s (2014) study of Australian bus drivers, management in their sample recognised the issue of physical inactivity in drivers and was open to addressing this issue by making changes to the working environment. However, fear of injury from the use of workplace exercise equipment and the added potential for compensation claims were cited as barriers to voluntarily committing to additional facilities.

Summary and general issues

The evidence in Appendix Table 1 offers a range of approaches for interventions to affect change in the health of drivers, covering recommendations for individual, environmental and organisational-level focus. However, a common caveat throughout was that these factors are mutually dependent: individual-level strategies cannot be sustainably implemented while environmental and organisational barriers still exist. In their summary of an international conference on health and wellness in commercial drivers, the TRB (2012) comments that employees should be recognised as the cornerstone of the company, and driver buy-in is essential to drive change. This should include recognition of the driver's home life as well as working life (ATRI 2002; Mackie 2008; TRB 2012). Apostolopoulos et al. (2012b) add that, in isolation, conventional strategies targeting individual-level change only have failed to demonstrate sustainable effectiveness in curbing the burgeoning obesity crisis in the transport sector. As such, the general consensus is that multi-level change is required for long-term success, with commitment and re-structuring at *all* levels. Researchers

recommend prioritising and coordinating workplace health promotion within an occupational health and safety framework (2012a; 2012b; Apostolopoulos et al. 2011; Bigelow et al. 2014; Krueger et al. 2007).

The use of self-report measures when assessing both driver health and health behaviours is another issue. A common theme throughout the papers is a mismatch between perceived health and actual health status (e.g. Mackie 2008). French et al.'s (2007) investigation into body weight, physical activity and food choices in 1,092 US bus drivers showed that 83% of drivers self-reported meeting the national physical activity recommendations, while objective measures demonstrated these figures to be grossly overestimated. Other studies allude to these issues, and highlight the need for objective measures of health and behaviour (Turner and Reed 2011; Wong et al. 2014). Given the fear in the surface transport industry of job loss and other repercussions due to ill health, this evidence of unrealistic self-report and social desirability reporting is perhaps unsurprising. These findings have clear methodological implications for future research – objective measurement and confidentiality and anonymity of participation are key. This observation also serves to strengthen the argument for a cultural shift from penalty to support and empowerment.

What interventions have been applied?

This section considers interventions conducted in the surface transport sector, and summarises the evidence for effective approaches. Appendix Table 2 lists the 13 intervention papers identified in the review that contained an outcome relevant to overweight, obesity or related dietary or activity lifestyle behaviours (primary health outcomes). As no Australian or New Zealand literature was identified, all 13 papers are from international studies, mainly the US ($n = 8$). Twelve papers were from published academic sources, and one was an industry research report from the US trucking industry (Mabry et al. 2013). Consistent with Table 1, Table 2 summarises the intervention or intervention strategies used in each study according to individual, environmental, or organisational-level categories. Where reported, the mean age of participants ranged from 41 years (Gill and Wijk 2004) to 56 (Hwang et al. 2012), with an average age of 48 years. The findings of secondary as well as primary outcomes are also presented where reported, such as other clinical health-related indicators, or work indicators such as rates of absenteeism or cost. Methodologically, three papers were case studies, four were randomised controlled trials, and six used repeated measures designs (five with no control group and one with a non-randomised control). The length of the follow-up times for outcome measures ranged from four months (Gill and Wijk 2004) to four years (Davis et al. 2009). Seven studies reported using one or more established theoretical framework to guide their intervention. Of the 13 studies, 6 were conducted in the trucking industry (Gill and Wijk 2004; Greene et al. 2009; Mabry et al. 2013; Olson et al. 2009; Sorensen et al. 2010; Wipfli et al. 2013); one study considered both truck and bus drivers (Puhkala et al. 2015); five looked at buses only (Davis et al. 2009; French et al. 2010a; French et al. 2010b; Hwang et al. 2012; Zavanela et al. 2012); and one covered the rail industry (MacGregor 2009).

Primary health outcomes: What works?

The issue of ‘what works’ can be organised around a few key health issues, which we will deal with in turn.

Body composition

Findings about body composition yielded mixed results (Table 2). Of the 11 papers with an outcome measure of changes to body mass index (BMI) or body weight, six reported a decrease over time (Davis et al. 2009; Mabry et al. 2013; MacGregor 2009; Olson et al. 2009; Puhkala et al. 2015; Wipfli et al. 2013), three of which reported statistical significance at the $p < .05$ level. For those that reported the degree of change, body weight decreased on an average by 4.9kg over the course of the studies. Davis et al. (2009) also reported a 3 percent decrease in fat mass, whereas Puhkala et al. (2015) reported no change in fat mass, despite a significant decrease in weight. In addition, three studies reported findings on waist circumference over time: MacGregor (2009) reported a one inch (2.54cm) reduction in waist girth in train drivers after 15 months, and Puhkala et al. (2015) a reduction of 4.7cm after 12 months. Zavanela et al. (2012) found no change in waist measurement.

When comparing the interventions that reported successful outcomes to those that were less successful, a number of themes emerge. Interventions reporting improvements in body composition of drivers over time tended to take multi-level approaches. For example, Davis et al.’s (2009) case study of US bus employees describes a wellness program consisting of education, personalised health feedback and consultations with health coaches, in addition to environmental changes such as a 24-hour gym and improved accessibility to healthy food. Similarly, MacGregor’s (2009) UK multi-level initiative to reduce obesity in train drivers consisted of driver education, environmental changes to snack machines and accessibility of onsite nurses, gym discounts, and changes to the obesity management policy of the organisation. In comparison, programs that did not report significant outcomes in body composition tended to adopt a primarily individual-level approach, focusing on tailored and targeted health messages, educational materials, and counselling approaches only (e.g. Hwang et al. 2012; Sorensen et al. 2010).

Exceptions to this are studies by Olson et al. (2009) and Puhkala et al. (2015), whose intervention components were online behavioural training, self-monitoring, individual sessions with a health coach, and team competitions (Olson et al. 2009); and individual, face-to-face and telephone lifestyle counselling sessions (Puhkala et al. 2015). Both studies reported positive changes in body composition over six and twelve months. However, long-term follow up showed that weight loss in Olson et al.’s truck driver intervention were maintained over 30 months (reported in Wipfli et al. 2013), whereas initial changes to body composition in Puhkala’s study were lost after 24 months. This suggests that for individual-level change, the use of self-led, online e-health style approaches as used by Olson et al. (2009) may be particularly beneficial. Another potentially important difference relates to the use of incentives, which Olson et al. (2009) combined with team weight loss competitions. The use of incentives in general appears to be an important factor in successful outcomes; effective programs were more likely to report the use of incentives as part of their intervention design, with Mabry et al. (2013) reporting that 67 percent of truck drivers participated in a company-wide health program due to the incentive offered.

Finally, the methodological issue of comparison groups should be addressed. Of

the successful programs, only one (Puhkala et al. 2015) compared the changes to body composition over time with another group in order to control for confounding variables. Three studies of unsuccessful programs did so (French et al. 2010b; Sorensen et al. 2010; Zavanela et al. 2012). As the use of control groups is preferred for robust evaluation of intervention effects, caution is warranted before generalising results from studies without this research design.

Dietary behaviours

Seven papers reported on a variety of dietary behaviours, including fruit and vegetable intake (French et al. 2010a; French et al. 2010b; Olson et al. 2009; Sorensen et al. 2010); dietary fat intake (French et al. 2010a; French et al. 2010b; Olson et al. 2009); dietary sugar intake (French et al., 2010a; French et al. 2010b; Olson et al. 2009; Sorensen et al. 2010; Wipfli et al. 2013); consumption of fast food (Olson et al. 2009; Wipfli 2013); and a more generalised account of changes in food choice and dietary habits over time (Gill and Wijk 2004; Hwang et al. 2012).

Again, findings were mixed, and the variation in outcome measures and the low number of studies makes comparison of common themes difficult. Only one program reported a significant change in fruit and vegetable intake. This program comprised individual and environmental-level components including behavioural diet and physical activity programs, peer mentoring, vending machine and fitness facility modifications, and promotional events (French et al. 2010b). Olson et al.'s (2009) online behavioural training, motivational interviewing and competitions model was successful in reducing dietary sugar, fat and fast food over six months, but not after 30 months (Wipfli et al. 2013). Sorensen et al.'s (2010) tailored education and counselling to motor freight workers significantly reduced sugary beverages but not sugary snacks after 10 months. Two studies reported a positive change in food choice and dietary habits. Gill & Wijk (2004) successfully trained truck stop staff to act as proxy health promoters for healthy eating in truck drivers, and Hwang et al. (2012) achieved positive change via a tailored health education initiative over six months in Korea.

Dietary behaviours were measured using self-report which, as discussed earlier, give rise to social desirability bias. However, it is interesting to note that while self-reported changes in healthy purchases and frequency of vending machine use were not significant in French et al.'s (French et al. 2010a) program, objective analysis of vending machine sales showed greater sales of these items over an 18-month period, demonstrating that in this instance self-report suggested an *under*-reporting of effects.

Physical activity behaviours

From the four interventions that reported a physical activity-related outcome, two reported an increase over six months (Hwang et al. 2012) and 15 months (MacGregor 2009). Hwang et al.'s tailored education and self-monitoring program in bus drivers showed significant per cent increases in the number of drivers moving from 'insufficient' to 'sufficient' (3-5 x per week for 35-60 mins) categories of physical activity, and MacGregor's (2009) multi-level rail program reported an increase in the number of drivers who began to exercise formally (≥ 3 x per week for 30 mins or more). Again, from a methodological perspective, these outcome are difficult to compare. Those reporting a positive change in physical activity levels used self-report measures, did not have a comparison group in their research design, and/or had small numbers in their follow-up sample.

A note on secondary outcomes

The majority of interventions also reported secondary outcomes of potential interest. These included clinical health indicators such as blood lipid panel (e.g. cholesterol and triglyceride screening), blood pressure, and glucose levels; other fitness indicators; and work indicators, such as absenteeism and economic impact. Other clinical health and fitness indicators are important to assess metabolic and cardiovascular risk both with and independently of BMI, therefore improvements reported in this area, if sustained, are likely to reap considerable health impacts. Greene et al. (2009) and Hwang et al. (2012) reported positive changes in blood pressure through tailored educational and counselling approaches. Mabry et al.'s (2013) company-wide program for truckers, which included a considerable incentive component, reported positive gains for all health outcomes including blood pressure, lipids and glucose levels. Mabry et al. (2013) also reported increases in fitness indicators, as did Zavanela et al. (2012), whose 24-week resistance training program for bus drivers had a significant impact on muscular endurance, strength, flexibility, pain incidence and blood pressure, but no measurable change in body composition.

It is also important to note that, where measured, psychosocial indicators such as driver perceptions, satisfaction, motivational level and awareness of programs or their own health were generally positive (e.g. French et al. 2010b; Gill and Wijk 2004; Mabry et al. 2013; MacGregor 2009). This is encouraging and, along with improvements to physical health, is likely to have a direct impact on salient work indicators such as employee morale and absenteeism, which was found to improve significantly in two studies following the intervention period (Davis et al. 2009; Zavanela et al. 2012). Finally, two studies reported economic returns related to the interventions. Greene et al. (2009) showed a 16.3 percent reduction in employer costs over two years, and Davis et al.'s (2009) multi-level initiative with cash incentives reported a three-year return of investment of US\$2.34 for every \$1 spent, despite an initial increase in health care costs for the early duration of the program.

Summary and general issues

The evidence for obesity reduction and prevention is varied when considering existing interventions in the surface transport industry. Only a half to a third of existing programs suggest positive initial changes in primary outcomes, despite considerable time and effort. In line with recommendations from Appendix Table 1, it appears that initiatives tackling multi-level factors demonstrate greater success. However, while numerous programs attempted changes to the workplace environment, only one study (MacGregor 2009) attempted policy change at an organisational level. As such, Table 1's recommendation of multi-level approaches with a combination of individual, environmental and organisational level change was not actually reflected in existing programs. Furthermore, due to the small number of studies, and methodological limitations such as inconsistencies in reporting and the use of comparison groups, standardised measurement, and application of established theoretical frameworks, the active ingredients of the interventions remain somewhat unclear. In line with Ng et al.'s (2014) review of the trucking industry, this review indicates that the general quality of future studies could be improved.

The intervention studies presented in Appendix Table 2 strongly suggest that the use of incentives is an important determinant of successful outcomes, although this did not emerge as a central recommendation from the Table 1 literature. Another clear lesson learned, as outlined in the economic evaluation of Davis et al. (2009), is the

importance of a *long-term* commitment and prioritisation of wellness. Despite promising short-term findings from numerous programs – in addition to Wipfli et al.'s (2013) maintenance of primary health effects up to 30 months – the evidence shows that it is unrealistic to anticipate immediate organisational results. This echoes conclusions from Krueger et al. (2007) and others in Table 1, who argue for the importance of organisations being in it 'for the long haul' to ensure genuine cultural change. As MacGregor (2009) reported in her study of a UK rail program, however, this is often difficult to achieve due to uncontrollable factors such as changes in train operating company franchise and occupational health providers. A further discrepancy between the factors outlined in Table 1 and the actual strategies applied in current intervention programs relates to the need to take into account work-life and family issues when designing health interventions in the surface transport industry. In the current review, no programs reported strategies or outcomes specifically targeting this gap.

General discussion

The discussion offers a review of current research related to obesity in the surface transportation industry. It aims to identify effective health promotion strategies for managing obesity in drivers, targeting future interventions and discussing practical implications for industry. In line with prior research, we found that current incidence of obesity for the cohort is indeed higher than the general population of Australia and New Zealand. We identified a range of approaches to affect driver health change, but one of the most important findings was the mutual dependency of these factors. For example, any positive impact from health education and training, or even the driver's own motivation for adjusting dietary behaviours, are not easy to sustain if barriers in the physical setting and structural aspects of work still exist. Generally speaking, initiatives with multi-level dimensions demonstrated greater success in the industry context, but many only attempted to initiate change in *individuals*. This was most directly reflected in the effectiveness of applied interventions. Success was decidedly mixed with approximately half of the studies suggesting positive initial changes, though many of the studies were marred by a multitude of methodological limitations, leaving the elements of effective interventions a little unclear. For example, the use of subjective self-reports was complicated by the tendency to overestimate perceived health, with the potential for social desirability bias. Whilst this may reflect gaps in knowledge, it is also in many ways a symptom of problems with the reporting culture (linked to the power differentials, fear of repercussion and job security). To reiterate, it is crucial that organisations work to overcome a fear-driven reporting culture if they are to make real and measurable gains in this area.

As well as an over-reliance on self-report, other issues of research methodology included inconsistencies in the reporting of outcomes and the use of standardised and validated measures, a lack of comparison group, and a lack of established theoretical frameworks to guide the research design. If standardised measures are not used, the findings cannot easily be compared across studies, making consensus about the most effective strategies problematic. The use of previously validated measures from published literature should be employed to increase the reliability of the findings. Related to this, a matched control group and a theoretical framework should be incorporated into the design of workplace initiatives as standard, in order to demonstrate causal relationships between the intervention and the outcome, and

provide a replicable template for other organisations to implement within their own workforce. Notwithstanding the complexities, practical and financial constraints of industry research, we suggest that a consensus is needed within industries regarding:

1. The use of objective and standardised measures of behaviour for reliability;
2. The use of a control group with an adequate sample size to demonstrate causality;
3. The use of established theory to show what works and why; and
4. Guidance from a health professional with research expertise.

Low engagement in physical activity and higher frequencies of unhealthy weight management behaviours were the more obvious examples of factors that influenced obesity-related outcomes. Cohort demographics added a further dimension, with one of the biggest considerations being disturbance to work-life balance (e.g. family commitments, responsibilities outside work). Long hours and shiftwork were both predictors for a plethora of weight management related issues (e.g. illness, physical activity, eating habits, fatigue management), and highlighted the need for driver buy-in and the relative contribution from home life. The lack of focus on hours and work-life issues in the intervention studies reviewed here demonstrates a discrepancy between the recommendations from research on influencing factors section and the approaches actually taken by health interventions. Future work should aim to close this gap and incorporate these factors into wellbeing programs.

The driving task, whether is it conducted on road or rail, is largely cognitive. The review presented a number of barriers at the individual level (e.g. job stress), and psychological strategies (e.g. self-talk, meditation) designed to help overcome them. Quality health promotion materials to support these strategies were lacking at the environment level, and knowledge gaps were prevalent. Unfortunately, materials that did exist had a tendency to be inconsistent and/or inaccurate, which influenced their effectiveness and showed underdevelopment in the systems culture across the various industries.

We argued above that the rail sector had enough variance to separate it as a unique driving mode, but the search only revealed one rail-related study (based in the UK). While findings associated with the program were largely positive and uniquely applied at an organisational level, there has been very little research about rail systems culture relative to the efficacy of targeted health improvement programs. We can make reasonable inferences from the other sectors, but this presents a clear and sizeable gap in the rail evidence-base. Further research is required in both the heavy haul (e.g. long-distance freight) and passenger service divisions (e.g. metropolitan train services, trams).

Our review stressed a need to prioritise health and wellness with long-term commitment, but also to temper expectations – it is decidedly unrealistic to anticipate immediate results from a health intervention program. However, the industry is likely to struggle with putting these sentiments into practice. Our review suggests that organisations influence obesity and related lifestyle behaviours through culture, corporate policy, operations, and working conditions, but the nature of the industry promotes variability across all of these areas. For example, pressures on health and wellbeing budgets, high staff turnover, major restructuring, refranchising, and more pressing organisational needs all impact upon long-term investment and the chance of successful uptake. But all of these are also industry norms, and reflect the dynamic complexity of the environment. While business downturn and growth is very changeable for some parts of the sector (e.g. heavy haul rail), the driving tasks in each

of the transport industries captured in this review are predicted to increase in line with future demand. This directly competes with demographic changes, such as the aging workforce – also common to the three reviewed sectors in the transport industry – which is why the need to investigate how work organisation interacts with important demographic changes is also important.

A key criterion for our review was to identify and target substantive research from Australia and New Zealand, and extend our focus to the international field if needed. Studies in this region were sparse, indicating that in addition to the general quality of future studies, the *quantity* of research applicable to the Australian and New Zealand context needs urgent attention. It is worth noting that most of the studies we reviewed were conducted in countries displaying many similarities to Australian and New Zealand road and rail (e.g. US), particularly at the environment level (e.g. long distances, interstate operations, remoteness). This increases their generalisability for our specific context. Beyond this, the nature of the workplace, the driving task, and job design suggest that this review may also be reasonably generalisable to other industries. This is particularly the case for industries that are characterised by sedentary behaviours and lifestyle factors that promote easy access to energy-rich foods and poor dietary habits (e.g. taxi industry, other private sector public transport).

Conclusion and recommendations for future initiatives

This review has considered factors that influence obesity-related outcomes in the truck, bus and rail surface transport sectors. It has also reviewed interventions that have been applied to see what has worked for primary health outcomes, covering a range of approaches at the individual, environmental and organisational levels. We identified numerous factors that influence obesity, including coordinated health promotional activities and targeted interventions in the workplace. However, barriers to maintaining good health status had a tendency to converge over multiple levels of influence, showing that consideration needs to be given to the issue from an overarching systems perspective in order to improve the chances for long-term success.

A number of health interventions did not work very well. For example, tailored education programs, targeted education materials, vending machines substituted with healthier food options, and verbal counselling all had no direct impact on obesity. In some cases, though obesity levels did not change, there were positive incidental outcomes (e.g. reduced consumption of sugary drinks). A number of health interventions did demonstrate measurable successes, including incentivising (e.g. tokens, lotteries, prizes), peer mentoring, development of personalised feedback and health profiles, and the offer of healthier on-site food choices – some of which also resulted in sizeable return on investment over the long term. However, the integrity of the findings is somewhat impacted by methodological inconsistencies and limitations across the studies. To address this, psychological and behavioural strategies for change need to be developed within an evidence-based theoretical framework. This must contend with and recognise an industry profile with many inherent complexities and challenges that make its organisations prone to instability.

While many of the recommendations may be generalisable to Australia and New Zealand, the review reveals a paucity of research for this region and a clear need to study the topic for the specific context, particularly in the rail domain. As this review has shown, the industry as a whole is facing a number of increasingly pressing and

unsustainable challenges: the growing demand for service; ageing demographics; failure to attract and recruit a younger workforce; obesity and co-morbidities leading to higher risk of fatigue, safety risk and general workplace injury; and associated increases in health costs and economic burden. Taken together, these challenges present a perfect storm for the surface transport sector, making the issue of overweight and obesity a strategic research priority, as well as a key socioeconomic objective for policy makers.

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Table 1: Factors that inform health initiatives related to overweight and obesity

Study/location / sector	Health topic of interest and aim	Method / sample	Content / findings	Recommendations
ATRI - FMCSA (2002)* USA Truck and bus	<i>General wellness, health and fitness</i> Provide instructor education on how to reach audiences and promote health in commercial drivers	<i>Instruction manual</i> Guide for a wellness, health and fitness program in commercial drivers, including supporting materials	<i>Individual</i> Education targeting smoking, obesity, hypertension, poor nutrition, alcohol and substance use and physical inactivity, centred around four health principles: <ul style="list-style-type: none"> • Refuelling: better eating practices • Rejuvenating: better exercise and fitness practices • Relating: enhancing social relationships • Relaxing: becoming calmer to manage stress 	<ul style="list-style-type: none"> • Present evidence-based health recommendations • Emphasize personal responsibility for health • Include work, home and family factors • Discuss barriers and present strategies to better overcome individual / environmental and organisational barriers to living healthily (e.g. self-talk, meditation)
Apostolopoulos et al. (2011) USA Truck	<i>Healthy eating</i> Examine how the environmental attributes of trucking work settings influence eating patterns and food choice	<i>Research article</i> Observational assessment of 25 trucking work settings and informal discussions with truck drivers	<i>Environmental</i> <ul style="list-style-type: none"> • Healthy food environment was rated ‘not at all supportive’ (< 35% on Healthy Trucking Work-Settings Audit) for all work settings, including: (1) trucking terminals, (2) warehouses, (3) truck stops, (4) highway rest areas. • Health promotion and availability of information materials also received a ‘not at all supportive’ rating for healthy eating. 	Comprehensive multistakeholder health interventions needed: <ul style="list-style-type: none"> • Target work settings for healthier work environment • Multiple levels of influence: individual, interpersonal, organisational / institutional / ecological level • Co-ordinate workplace health promotion and occupational safety and health
Apostolopoulos et al. (2012a) USA Truck	<i>Physical activity</i> Examine how the environmental attributes of trucking work settings influence physical and recreational activity behaviours	<i>Research article</i> Observational assessment of 25 trucking work settings	<i>Environmental</i> <ul style="list-style-type: none"> • Active living environment was rated ‘not at all supportive’ (< 35% on Healthy Trucking Work-Settings Audit) for three work settings, including: (1) trucking terminals, (2) warehouses and (3) truck stops; highway rest areas were rated ‘scarcely supportive’. • Social, information and community environments also received a ‘not at all supportive’ rating for active living. 	Comprehensive multistakeholder health interventions needed: <ul style="list-style-type: none"> • Target work settings for healthier work environment • Multiple levels of influence: individual, interpersonal, organisational / institutional / ecological level • Co-ordinate workplace health promotion and occupational safety and health

Apostolopoulos et al. (2012b)	<i>Obesity</i> Examine how the transportation environment can influence truckers' risks for obesity and associated morbidities	<i>Literature review</i> Review of journal articles relating to truckers' obesity risks (<i>n</i> = 120)	<i>Individual</i> Determinants include: psychosocial variables (e.g. self-efficacy, health beliefs including attitudes, motivation and expectancies, social relationships), health history, demographics and biological factors <i>Environmental</i> Spatial and temporal attributes, socially supportive environments, accessibility/availability, promotion, pricing and purchasing options, built environment <i>Organisational</i> Regulations, hours of work, culture, corporate policies and operations	Long-term solutions needed: <ul style="list-style-type: none"> • Conventional strategies (targeting individual-level change only) to curb obesity have not shown long-term effectiveness • Transportation environment shapes driver health behaviours • Change / re-structuring needed at all levels involving multistakeholders
Bigelow, Myers, Crizzle, et al. (2014)*	<i>Multiple risk factors: smoking, diet, exercise, sleep</i> Examine prevalence and impact of health issues and provide directions for future health and wellness programs	<i>Discussion report</i> Review of literature relating to health issues in commercial drivers (journal articles <i>n</i> = 37; grey literature <i>n</i> = 20)	<i>Individual</i> Measures of individual health behaviours are limited by the use of self-report and confounding variables <i>Environmental</i> Unsupportive work environments do not promote activity, good nutrition, quality sleep, access to health information or preventative health care <i>Organisational</i> Driver health impacts safety, productivity, driver shortage	Interventions should: <ul style="list-style-type: none"> • Target several risk factors in all commercial company settings with continuous evaluation and monitoring of health / economic impacts • Drivers are a diverse population: target by severity of risk factor • Target new drivers: provide educational materials beyond traditional training, which typically focuses on injury and crash prevention • Use objective measures of health behaviour
Chung and Wong (2011)	<i>General health status</i> Investigate the factors that affect the self-rated health of bus drivers	<i>Research article</i> Cross-sectional survey of bus drivers (<i>n</i> = 785), M age = 42.2, 98.1% male	Drivers who: <i>Individual</i> <ul style="list-style-type: none"> • Report more health problems • Are younger • Have a higher BMI • Have higher levels of depression <i>Organisational</i> <ul style="list-style-type: none"> • Work longer hours • Report poorer safety culture (safety attitude and focus of management and employees, culture of reporting, reactions to errors and incidents) • Are more likely to perceive their general health as lower when asked to compare with peers 	Regular health exams may not be adequate to target health problems in transport industry: <ul style="list-style-type: none"> • Recognise that health conditions are dynamic and problems may be difficult to recognise • Provide information targeting employees' self-health management, e.g. effects of shift-rotation jobs, cause and results of fatigue and burnout, importance of sleep and recovery, effects of caffeine or drug consumption, importance of regular exercise • Target depression and weight management • Ensure compliance with HoS regulation • Address safety culture in organisation

Escoto and French (2012)	<i>Weight control behaviours</i> Examine prevalence of unhealthy weight control behaviours and associations with work-related / sociodemographic variables	<i>Research article</i> Cross-sectional survey of bus operators (<i>n</i> = 796), M age = 47.4, 73.9% male	<i>Individual</i> <ul style="list-style-type: none"> • 60% of drivers reported using at least one unhealthy behaviour over the past year • Female, non-white, and obese drivers more likely to adopt unhealthy weight management behaviours (e.g. skipping meals, diet pills) <i>Organisational</i> Drivers working long hours (40-49) per week more likely to have poor weight management behaviours	<ul style="list-style-type: none"> • Worksite interventions should address unhealthy weight control behaviours among this cohort • Individuals may need targeted initiatives for gender, ethnicity and current level of obesity • Long hours predict worse outcomes, compliance with HoS regulation is needed
French et al. (2007)	<i>Multiple risk factors: body weight, physical activity, dietary intake</i> Investigate association between body weight, physical activity and food choices among metropolitan transit workers.	<i>Research article</i> Bus drivers (<i>n</i> = 1092, M age = 47.6; 78.4% male) completed a combination of self-report and objective measures of health information, health behaviours, perceptions of worksite environment and schedule	<i>Individual</i> <ul style="list-style-type: none"> • Prevalence of obesity among bus drivers was 56%, but over half reported consuming fruit (55%) and vegetables (59%) > 3 times per week, and low fast food intake was reported. • 83% reported meeting national activity recommendations; but use of fitness facilities was low and objective activity measures showed much lower levels than self-report • Drivers did not agree that there was a lot of information about health • Obese drivers most physically inactive and most likely to report environmental barriers <i>Environmental</i> Drivers reported that healthy eating, physical activity, and weight management are difficult to do at work and perceived the worksite as unsupportive	<ul style="list-style-type: none"> • Suggested evidence of social desirability in unrealistic self-report of health behaviours: improved / objective measures needed • Interventions should leverage drivers' existing awareness, especially in relation to physical activity • Worksite interventions should increase garage fitness facilities, incorporate physical activity into the bus route, change availability of vending machines and limit television viewing, combined with increased information provision
Gorczynski and Patel (2014)	<i>Physical activity</i> Evaluate online physical activity information (accessibility, accuracy, technical and theoretical quality, and readability for truck drivers)	<i>Website evaluation</i> Review of websites (<i>n</i> = 44) promoting physical activity, exercise, or sport to long-haul truck drivers	Majority of websites providing information on physical activity were hosted by trucking companies <ul style="list-style-type: none"> • Accuracy: only 20.5% offered information based on physical activity guidelines. No guidelines for resistance exercise • Technical quality was generally poor • Theoretical quality of cognitive (e.g. perceived benefits / barriers) or behavioural (e.g. goal setting) constructs was poor • Targeting for specific populations (e.g. women, age range, motivational stage) was poor • Readability of the sites was low 	Online physical activity information for truck drivers could be improved by: <ul style="list-style-type: none"> • Ensuring information is in accordance with guidelines • Using designs based in behavioural theory, such as incorporating discussions around self-confidence, goal setting strategies, social support systems, and self-monitoring • Expanding the range of PAs recommendations and tailoring to specific needs • Improving the readability of online health information

<p>Krueger et al. (2007)*</p> <p>USA</p> <p>Truck and bus</p>	<p><i>General health and wellness</i></p> <p>Describe the elements of health and wellness programs that could be modified to apply to health and wellness programs aimed at commercial drivers; documents effective components of programs</p>	<p><i>Literature synthesis</i></p> <p>Review of health and wellness programs, literature, case studies, and identifies effective elements</p>	<p><i>Individual</i></p> <ul style="list-style-type: none"> • Programs should not have a “one size fits all” approach due to the personal nature of wellness • Flexibility is important: options that are easily adaptable to the employee <p><i>Environmental</i></p> <p>Changes to company cafeterias and facilities are important but need to be available to all</p> <p><i>Organisational</i></p> <ul style="list-style-type: none"> • Adherence to company programs, well-managed locations and active management predict the greatest chance of success • Most programs do not last in the long-term 	<p>Need to address maintenance:</p> <ul style="list-style-type: none"> • Organisations need to prioritize wellness and accept there will not be immediate results • Cultural change / paradigm shift is needed: long-term view, committed coordinator and adequate resources • Strong leadership is needed to empower and drive employees • Focus on at-risk behaviour identification and correction • Health professional / expert guidance is needed • Inclusion of family/home life is important
<p>Mackie (2008)*</p> <p>New Zealand</p> <p>Truck</p>	<p><i>General health and fitness</i></p> <p>Identify the health and fitness issues related to log truck drivers and provide recommendations for interventions to address key issues</p>	<p><i>Industry research report</i></p> <p>In cab-observation; cross-sectional survey with drivers (<i>n</i> = 225; M age 43.8, sex not reported) interviews with drivers and other operator staff (<i>n</i> = 14)</p>	<p><i>Individual</i></p> <ul style="list-style-type: none"> • 39% of drivers obese or very obese • Drivers reported being in good health: showed a mismatch between their perceived health and their actual health • Time and tiredness reasons for inactivity <p><i>Organisational</i></p> <ul style="list-style-type: none"> • Working conditions (e.g. shift work and hours) found to have most significant impact on employee illness • Work-life balance was a significant problem for drivers due to long hours of work 	<p>Effective interventions need:</p> <ul style="list-style-type: none"> • Multilevel approach aimed at different levels, i.e. education to employees and employers, integration of standards within the industry, government initiatives that focus on the whole population, policy change • Important areas to target are work / life balance, obesity, injury prevention
<p>McDonough et al. (2014)</p> <p>Canada</p> <p>Truck</p>	<p><i>General health and lifestyle</i></p> <p>Investigate lifestyle issues, health, and disease risk factors experienced by truck drivers</p>	<p><i>Research article</i></p> <p>Four focus groups with truck drivers (<i>n</i> = 16, M age = 47, 93% male) and managers (<i>n</i> = 10, M age = 36, 100% male) to explore the lifestyle context of drivers in relation to health</p>	<p><i>Individual</i></p> <p>Primary health conditions, such as smoking, weight, alcohol, blood pressure, diabetes, etc. were identified as barriers to maintaining good health</p> <p><i>Environmental</i></p> <p>Drivers and managers identified issues such as accessibility, availability, affordability, time, parking issues, and lack of healthy choices as barriers to healthy dietary behaviours</p> <p><i>Organisational</i></p> <ul style="list-style-type: none"> • Job demands, long hours, financial pressure, culture, regulations, workplace communication, and sedentary nature of job exacerbated stress, health risks and unhealthy lifestyle behaviours • Lack of access to basic health care due to scheduling issues 	<p>Interventions should:</p> <ul style="list-style-type: none"> • Address workplace environmental determinants that are significant in shaping health behaviours • Take into account the unique challenges of the occupation, including lone working and culture

Meuleners and Lee (2008)* Australia Truck	<i>General health and lifestyle</i> Investigate general health of truck drivers and determine issues of health-related concern in the workplace	<i>Research article</i> Phase 1 structured interview with truck drivers ($n = 302$, M age = 44, 95% male); Phase 2 structured interview ($n = 50$, M age = 47, 100% male)	<i>Individual</i> • 78% of drivers overweight or obese with higher behavioural risk factors and health problems than general population • Drivers keen to be more pro-active re: health <i>Environmental</i> Quality of food, facilities and costs at roadhouses were of major concern <i>Organisational</i> More opportunities to relax and sleep at roadhouses are needed	Workplaces should adopt a comprehensive approach: • More education / information, better health promotion messages • Regular medical assessment • Involvement of physicians • Policies to ensure supportive work environment • Improve rostering and appropriate rest facilities
Ng et al. (2014) Canada Truck	<i>General health and lifestyle</i> Review the characteristics of effective health promotion interventions for reducing chronic illness and risk factors in truck drivers	<i>Literature review</i> Review of journal articles relating to health promotion programs for truck drivers ($n = 9$)	<i>Individual</i> • Most studies focused on behavioural / individual level strategies for change, e.g. awareness raising and educational/skill building • Counselling, health assessment, feedback, written contracts, setting goals are effective <i>Environmental</i> Environmental support and policy development largely omitted from studies <i>Organisational</i> Paucity of studies addressing organisational or institutional level change, e.g. HoS	Future work should address the following: • Methodological issues such as lack of control group, short follow up periods, small numbers, lack of morbidity outcomes, economic evaluation • Focus on perspectives of drivers • Gain company and management support • Address challenges to implementation and long-term engagement • Focus on work environment and organisation as well as individual-level factors • Base interventions on health behaviour change theory
Passey et al. (2014) USA Truck	<i>Diet, physical activity and health care access</i> Explore truck drivers' views toward diet, physical activity, and health care access to inform development of a weight loss intervention	<i>Research article</i> Four focus groups, three in person and one teleconference with truck drivers ($n = 30$, M age = 45.7, 90% male) to discuss diet, physical activity and access to health care	Drivers: • Have health aspirations but not able/willing to commit to change • Have less healthy behaviours when on the road • Fear loss of job related to poor health • Report barriers of cost, knowledge, access and time, as well as attitude and fear (of doctors / injury) • Suggest radio, CDs, or podcasts are the best way to deliver health information • Say phone calls from health coaches would make them accountable • Say inexpensive gyms and showers at truck stops would encourage them	Future work should: • Promote personal responsibility for health • Provide information to address knowledge gaps and enable positive decision making • Use strategies that are flexible and mobile • Increase facilities at truck stops

TRB (2012)* USA Truck and bus	<i>General health and wellness</i> Identify and evaluate the effectiveness of strategies and current practices in place to address health and wellness issues for commercial drivers	<i>Conference proceedings summary report</i> Synthesis of conference papers to critically review thinking, discussion, and research on employee H&W issues	<i>Individual</i> <ul style="list-style-type: none"> • Employees should be recognised as cornerstones of company • Incentivize participation <i>Organisational</i> <ul style="list-style-type: none"> • Consensus that transportation companies need to adopt a health and wellness philosophy • Long-term success will depend on a shift towards integrated models of health, safety, and productivity management 	Future interventions should: <ul style="list-style-type: none"> • Address cultural change and individual change through lifestyle interventions • Assure management buy-in, strong leadership, shared responsibility • Implement and improve corporate health and wellness training for all employees • Facilitate integration of health-conscious practices to both work and home life • Help employees control medical conditions, not penalize them
Turner and Reed (2011) USA Truck	<i>Physical activity</i> Examine exercise habits and perceived barriers to exercise in truck drivers when working away from home	<i>Research article</i> Cross-sectional survey with truck drivers and body measurements taken (<i>n</i> = 300, M age = 45.7, 86.3% male)	<i>Individual</i> <ul style="list-style-type: none"> • Reported exercise minimal; 93.3% = BMI > 25 • Obese drivers more likely to negatively rate exercise environment • Spending non-driving time in trucks associated with less exercise in partnered drives <i>Environmental</i> <ul style="list-style-type: none"> • Perceived exercise environment rated ‘never available / terrible’ or ‘usually not available / bad’ by 75% • 59% would use equipment if at truck stops • Lack of time / facilities were biggest barriers <i>Organisational</i> <ul style="list-style-type: none"> • Work intensity associated with less exercise 	Implications: <ul style="list-style-type: none"> • Organisations could require team drivers to spend more time out of the truck • Objective measures of behaviours and work environmental needed • Address education and motivation • Address availability and cost of exercise equipment at work sites
Whitfield-Jacobson et al. (2007) USA Truck	<i>Eating / exercise habits</i> Investigate truckers’ anthropometrics; assess eating/exercise habits and choices and attitudes to availability of healthful options	<i>Research article</i> Cross-sectional survey of truck drivers and body measurements taken (<i>n</i> = 92, M age = 44.3, 94.6% male)	<i>Individual</i> <ul style="list-style-type: none"> • 86.7% overweight; 57.1% obese • Healthful food choices important to all drivers • Drivers had positive attitudes to restaurants’ provision of healthful choices • Drivers who valued healthful choices more likely to say they would choose more nutritious options if offered • Taste was valued more than nutrition 	Wellness programs need: <ul style="list-style-type: none"> • Involvement of a registered dietitian to overcome general lack of dietary knowledge and ensure healthy food also tastes good • Education, support and co-operation of truck stops

Wong et al. (2014)	<i>Physical activity</i> Measure activity patterns and perceptions of workplace physical activity opportunities and preferences among bus drivers	<i>Research article</i> Objective measures of physical activity taken in bus drivers (<i>n</i> = 28 M age = 52.4, 100% male), and qualitative interviews with bus drivers (<i>n</i> = 28) and managers (<i>n</i> = 6)	<i>Individual</i> Sedentary time significantly higher on off-work days than on-work days. Light-intensity time was higher on work days than off-work days <i>Environmental</i> Workplace-supported initiatives such as walking clubs and corporate gym membership are used by some, but perceived to be accessible for all due to health issues (e.g. injuries) and time <i>Organisational</i> <ul style="list-style-type: none"> • Organisational barriers for low physical activity and non-uptake of initiatives were shift work and irregular driving routines • Fear of injury and compensation were cited by managers as a barrier to additional facilities 	Implications: <ul style="list-style-type: none"> • Some bus drivers may be more active at work than home – work-life approach needed • Organisational encouragement and support are important • Target inactive drivers who fail to take up existing opportunities: help to overcome perceived barriers
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*Grey literature

Table 2: Intervention studies related to overweight and obesity

Study / location / sector	Aim	Sample / method	Intervention/s	Primary health outcomes reported	Secondary outcomes	Findings
Davis et al. (2009) USA Bus	Evaluate the effectiveness of a wellness program to increase employee morale, combat rising health care costs, and reduce absenteeism rates in a bus company	Bus operators, mechanics, and administrative employees (<i>n</i> = 300 voluntarily enrolled, no further information given) Case study (four years, no control) No theory reported	<i>Individual</i> <ul style="list-style-type: none"> Wellness coaches / trainer consultations Education / information Personalized feedback Multiple cash incentives, subsidies and reimbursements for participation and changes in health indicators <i>Environmental</i> <ul style="list-style-type: none"> 24-hour gym Access to healthy food Health promotion events / workshops 	<ul style="list-style-type: none"> Weight Body fat 	<ul style="list-style-type: none"> Absenteeism Return on investment (ROI) 	<ul style="list-style-type: none"> 64.1% of people who had two personalized health assessments lost approx. 10lbs per person / 3% body fat (<i>ps</i> not reported) Absenteeism dropped from 10% to 7.6% between 2005 and 2007 2004-2007 total ROI of \$2.34 saved for every \$1 spent on program
French et al. (2010b) USA Bus	Investigate the effectiveness of a worksite intervention to prevent and reduce obesity among bus drivers	Bus garage employees, <i>n</i> = various for each outcome, final combined sample 1070) RCT (two year follow up, control group = measurement only) No theory reported	<i>Individual</i> <ul style="list-style-type: none"> Behavioural food and physical activity programs New driver peer mentoring <i>Environmental</i> <ul style="list-style-type: none"> Vending machines – increase healthful food and beverages Fitness facilities 1-day health and fitness expo Farmer’s markets at garage 	<ul style="list-style-type: none"> Body mass index Fruit and vegetable intake High-fat snacks Sugar-sweetened beverages Physical activity 	Perceived worksite environment and social support	<ul style="list-style-type: none"> Changes in BMI, physical activity, high-fat snacks and sugar-sweetened beverages not significant Fruit and vegetable intake and perception of worksite environment increased (<i>ps</i> <.05)

French et al. (2010a)	Evaluate the effectiveness of a vending machine intervention to prevent and reduce obesity among bus drivers	Bus garage employees, ($n = 2159$; Intervention = 1067; Control = 1092, M age = 47, 79% male) RCT (18 months follow up, control group = measurement only) No theory reported	<i>Environmental</i> Modification of vending machines – increase availability (by 50%) and affordability (price decrease by at least 10%) of healthful food and beverages	Food choices: •Fruit and vegetable intake •High-fat snacks •Sugar-sweetened beverages	•Frequency of use •Sales	• Changes in self-reported sugar-sweetened beverages, snack foods, and fruit and vegetables similar between groups • No difference between groups for self-reported frequency of use • 10-42% higher sales of healthy food and beverages in intervention group ($p < .05$)
Gill and Wijk (2004)	Examine the viability of using truck stop staff as proxy health promoters to target healthy eating in truck drivers	Drivers visiting truck stop (n differed by subsample; drivers = 60, M age = 41, majority male) Case study (time frames, between 4 months – 3 years, no control) Theory reported: preventative, self-empowerment, governmental	<i>Individual</i> • Educational program / information campaign • Personalized health profile / awareness raising / skill training for staff • Tokens, lotteries, prizes and incentives for drivers <i>Environmental</i> • Offering healthy food choice alternatives / menu changes • Encouraging a health promoting ecology in truck stop	•Food choice behaviour (balance of calories, fat, carbohydrates and protein)	•Nutritional analyses of popular dishes served in truck stop •Staff health awareness •Staff willingness to act as a proxy	• Drivers tended to choose healthier alternatives • Nutritional analysis of pre- and post- intervention food choices showed better balance of calories, fat, carbohydrates, and protein content • Staff awareness and willingness increased (no ps not reported)
Greene et al. (2009)	Evaluate the economic impact of a program to improve blood pressure in drivers with diabetes and obesity	Drivers from electrical utility company ($n = 501$, M age = 43, 100% male) Repeated measures (6 months follow-up, no control) No theory reported	<i>Individual</i> • Educational materials and resources geared towards lowering risk and maintaining certification • Verbal counselling during medical exam, or at employee health fair • Promotion materials to employer and stakeholders	Body mass index	•Blood pressure •Economic impact	• No change in overweight and obesity • Uncontrolled hypertension decreased ($p < .01$) • No. of employees with normal blood pressure increased ($p < .01$) • Reduction in employer costs (16.3% decrease over 2 years)

Hwang et al. (2012)	Evaluate the effectiveness of a tailored health promotion program on cardiovascular disease risk factors in bus drivers	Bus drivers ($n = 163$, total M age = 56.2, 100% male) Repeated measures (6 months follow-up, no control) Theory reported: Transtheoretical Model	<i>Individual</i> <ul style="list-style-type: none"> • Tailored education from health professionals x2 over 6 months • Hospital referrals where needed • Dietary, physical activity and smoking education tailored by disease and stage • Use of diaries / self-monitoring 	<ul style="list-style-type: none"> • Body mass index • Physical activity • Dietary habits (categories of bad, general and good habits base on Korean National Screening Program) 	<ul style="list-style-type: none"> • Smoking • Alcohol intake • Blood pressure • Triglycerides • Total cholesterol • High/low-density lipoprotein • Job stress 	<ul style="list-style-type: none"> • No change in BMI • Increase in physical activity and healthy eating habits ($ps < .01$) • Decrease in smoking and alcohol frequency ($ps \leq .03$). • Decrease in BP and HDL ($ps < .01$) • Health outcomes not associated with job stress
Mabry et al. (2013)*	Evaluate driver perceptions of and satisfaction with a company-wide health and wellness program for truckers	Truck drivers ($n = 94$, M age = 49, 89% male) and staff ($n = 27$), voluntarily enrolled, no further information given) Case study (preliminary results at 6 months, no control) Theory reported: Transtheoretical Model	<i>Individual</i> <ul style="list-style-type: none"> • Mailed information packs • Online health-risk assessment • Biometric screening • Tailored health behaviour recommendations • Support and coaching from health coach • Various lifestyle behaviour programs available • Health insurance incentive 	Body mass index	<ul style="list-style-type: none"> • Cholesterol • Triglycerides • Glucose • Blood pressure • Aerobic capacity • Driver and staff perceptions and satisfaction 	<ul style="list-style-type: none"> • Positive change in BMI and all secondary health outcomes (extent of change / ps not reported) • 61% of drivers reported that health has improved • 82% satisfied / very satisfied with program: 67% motivated by incentive; confidentiality concerns biggest barrier
MacGregor (2009)	Evaluate the effect of a program to reduce obesity among train drivers	Train drivers ($n = 33$ with BMI > 33, no further information given) Repeated measures (15 months follow-up, no control) Theory reported: Motivational Interviewing	<i>Individual</i> <ul style="list-style-type: none"> • Suggestions for overcoming dietary and exercise barriers • Education leaflets, posters, websites • Disease testing and referral • Discount gym membership <i>Environmental</i> <ul style="list-style-type: none"> • Reduce / alter snack machines • Access to OH nurses <i>Organisational</i> Adapt existing obesity management policy based on National Institute for Health and Clinical Excellence	<ul style="list-style-type: none"> • Body mass index • Waist measurement • Exercise level 	Participant feedback	<ul style="list-style-type: none"> • 72% of drivers lost 1 point from BMI and >1 inch from waist • 60% of drivers had begun formal exercise >3 times per week for 30 minutes or more at follow-up (ps not reported) • Participant feedback was positive • Limited follow-up numbers due to changes in TOC franchise and OH provider

Olson et al. (2009)	Evaluate the effectiveness of a pilot health promotion program for reducing weight in lone-working truck drivers	Truck drivers (n = 29, M age = 48.4, 79% male) Repeated measures (6 months follow-up, no control) Theory reported: Motivational Interviewing Transtheoretical Model	<i>Individual</i> <ul style="list-style-type: none"> • Behavioural computer-based training: risk information and self-management strategies • Behavioural self-monitoring • Motivational interviewing: up to 4 sessions with health coach • Access to website <i>Environmental</i> Team weight-loss competitions with incentives	<ul style="list-style-type: none"> • Body weight • Fruit and veg consumption • Dietary fat • High fat / sugar consumption • Exercise levels 	<ul style="list-style-type: none"> • Motivational stage of change • Secondary clinical, fitness and psychosocial indicators 	<ul style="list-style-type: none"> • Body weight reduced 3.5kg, approx. 1 unit of BMI ($p < .01$) • Reductions in sugary snacks / drinks, fast food, % calories from fat ($ps \leq .03$) • Fruit and veg <i>ns</i> • Gains seen in waist circumference and flexibility ($ps = .01$)
Puhkala et al. (2015)	Investigate the effect of lifestyle counselling on body weight and cardiometabolic risk factors in truck and bus drivers	Truck and bus drivers with waist circumference >100 cm ($n = 113$; Intervention = 55; Control = 58, M age = 47.6, 100% male) RCT (12 and 24 month follow ups, control group = measurement and 3 month counselling after 12 months) Theory reported: Health Action Process Approach	<i>Individual</i> <ul style="list-style-type: none"> • Structured monthly lifestyle counselling targeting nutrition, physical activity and sleep hygiene, 6 face-to-face, 7 telephone sessions • Use of food diary and pedometer 	<ul style="list-style-type: none"> • Body weight • Waist circumference • Fat mass 	Metabolic indicators: blood pressure, glucose, cholesterol	<ul style="list-style-type: none"> • Greater change in body weight (-3.4kg; $p < .01$) and waist circumference (-4.7) in intervention than control at 12 months • No significant difference between groups for fat mass or total metabolic risk at 12 months • No significant differences between groups for any outcome at 24 months
Sorensen et al. (2010)	Evaluate the effectiveness of a worksite-based intervention promoting tobacco use cessation and weight management to motor freight workers	Truck and dock drivers ($n = 542$; Intervention = 227; Control = 315, M age = 48.5) Repeated measures (10 months follow up, non-randomized control group = measurement only) Theory reported: Motivational Interviewing, Transtheoretical Model, Social Cognitive Theory	<i>Individual</i> <ul style="list-style-type: none"> • Up to five telephone counselling sessions to address factors in work environment • Personal health messages, tailored to behaviour, intention, self-efficacy, risk perception, social support and nicotine addiction • Targeted written education materials • Nicotine replacement therapy 	<ul style="list-style-type: none"> • Body mass index • Fruit and vegetable consumption • Sugar-sweetened beverages and snack consumption 	Tobacco use	<ul style="list-style-type: none"> • No difference in weight management between groups • Decrease in consumption of sugary drinks ($p < .01$) • No significant decrease in sugary snacks or fruit and vegetable consumption • Greater rate of smoking cessation in intervention group ($p = .02$)

Wipfli et al. (2013)	Evaluate the effectiveness of a pilot health promotion program for weight loss maintenance in lone-working truck drivers	Truck drivers ($n = 15$, M age = 48.4, 79% male) Telephone interview to follow-up 30 months after intervention Theory reported: Motivational Interviewing	<i>Individual</i> <ul style="list-style-type: none"> • Behavioural computer-based training: risk information and self-management strategies • Behavioural self-monitoring • Motivational interviewing: up to 4 sessions with health coach • Access to website <i>Environmental</i> Team weight-loss competitions with incentives	<ul style="list-style-type: none"> • Body mass index • Dietary intake (fruit and vegetables, fast food meals, sugary drinks and snacks) 	<ul style="list-style-type: none"> • Average total decrease in body weight (-18.4lbs ($p < .01$) and BMI (-2.7 units, $p < .01$) from baseline to 30 months • No change in dietary intake from baseline to 30 months
Zavanela et al. (2012)	Examine the impact of a resistance training intervention on health, fitness, and work-related measures in bus drivers	Bus drivers ($n = 96$; Intervention = 48; Control = 48, 100% male) RCT (24 week follow up, control group = measurement only) No theory reported	<i>Individual</i> Tri-weekly on-site resistance training program for weeks 0-8, 4x for weeks 9-24, run by three fitness professionals, with instructions to maintain usual diet	Body composition: <ul style="list-style-type: none"> • Body mass index • Waist measurement 	<ul style="list-style-type: none"> • Blood pressure • Muscular endurance and strength • Flexibility • Pain incidence, absenteeism <ul style="list-style-type: none"> • No body composition changes found • Improvements in blood pressure, pain incidence, muscle endurance and flexibility ($p < .05$) in intervention group • Reduction in absenteeism in intervention ($p < .05$)

*Grey literature