Obesity and Coal Mining: Pilot Intervention

Project 20650

FINAL REPORT

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The Centre for Resources Health and Safety
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This research in the NSW coal mining sector builds upon the development of the Blueprint for the Management of Overweight and Obesity in the NSW Mining Industry, as well as prior CHRS research into existing obesity management programs in NSW mining. The results of this research can inform future policy and program implementation for the management of overweight and obesity at a site level and more broadly within NSW coal mines using an organisational framework designed to improve the health and wellbeing of employees.

This research demonstrates the benefits of linking scientific research with industry partnerships. Adopting a collaborative approach; where both sides share in the creation of research questions, methods, and interventions, helps to promote interdisciplinary activities within resources health and safety. This allows for the development of tailored research programs that offer strategies and innovation solutions that are sector focused.

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I Contents

II Key Terms

Terms	Meaning
Body Mass Index (BMI)	Body mass index (BMI) is the international index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by height in metres squared (kg/m^2).
Overweight	Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. A person with a BMI equal to or more than 25 is considered overweight
Obesity	Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. A person with a BMI of 30 or more is generally considered obese.(1)
Workplace wellness initiatives	Workplace wellness initiatives are employer instigated programs to help and support employees in either overall wellness or targeted health behaviours important to the workforce. Overall wellness programs may be developed to tackle a number of disease risk factors and combine elements of physical activity, healthy eating, and mental wellbeing.
Australian Dietary Guidelines	Evidence based advice on the quantity and type of foods that we need to eat for health and wellbeing.

III List of Abbreviations

AUDIT	Alcohol Use Disorder Identification Test
BMI	Body Mass Index
CRHS	Centre for Resources Health and Safety
CS HST	Coal Services Health and Safety Trust
GAD-2	Generalised Anxiety Disorder - 2
H&S	Health and Safety
NHMRC	National Health and Medical Research Council
PHQ-2	Patient Health Questionnaire -2
UON	University of Newcastle
WHO	World Health Organisation
WHS	Work Health and Safety

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VI EXECUTIVE SUMMARY

VI.I PROJECT SCOPE

The Centre for Resources Health and Safety (CRHS) at the University of Newcastle, provides leadership in the growth of interdisciplinary activities in resources, health, and safety. In 2016, alongside NSW Mining and Ethos Health, CRHS developed the Blueprint for the Management of Overweight and Obesity in the NSW Mining Industry.(2) The Blueprint aims to identify key directions for the industry to promote effective weight management. Underpinning the framework is an emphasis on research, evaluation and monitoring of workplace strategies that consider the impacts on not only individuals and workplaces, but the broader community. The Blueprint identifies the roles and expected contributions of various stakeholders (including industry, mine sites, employees, service providers, research institutions, regulatory bodies, health care organisations, unions, and communities); outlines a framework for action (identifying leadership, policy and systems, culture, education and training, partnerships, and communication and engagement); and models an action and implementation plan.

The Blueprint highlighted the need for a coordinated plan of action for mining operations to prevent and manage obesity across the industry. In response, in 2018, the research team at CRHS examined the prevalence of obesity and overweight in NSW coal mine employees. We found that overweight and obesity problems were significant among NSW coal mine employees with rates of overweight and obesity at least equivalent, and in some instances higher, than comparable populations. We also noted that the prevalence of the impact of this problem also extends to increased blood pressure, increased cardiac risk and significant rates of alcohol use and psychological distress. Continuing our research, we examined what workplace wellness initiatives targeting overweight and obesity had been trialled in NSW coal mines, and the outcomes of these at a site level. It was identified that numerous wellness initiatives had been trialled across NSW mine sites and several factors emerged as barriers or enablers to their success. Our findings highlighted that the existing initiatives had not been evaluated and measured after implementation, and so results and return on investment had not been assessed.

The aim of this study was to evaluate the implementation of a workplace wellness initiative at an organisational level and determine the implications to both industry and individuals. Working in direct collaboration with mine sites, we adopted the RESHAPE framework - a workplace wellness initiative, to identify site-specific areas of need and implement the most effective and sustainable, healthy weight initiatives. Through the process of RESHAPE, it is hoped mine sites will be able to reflect, prioritise and put into action initiatives that address overweight and obesity in their workplace.

This research serves to strengthen our understanding of the challenges and benefits of workplace initiatives on overweight and obesity within the NSW coal mining industry. We aim to provide our partners quality research that enables an industry response that is targeted and evidenced based.

VI.II SUMMARY OF FINDINGS

This project included three mine sites across NSW, one underground and two opencut mines, with all sites participating in a baseline nutrition-based and physical activity-based paper survey completed at pre-start or during training days. One site completed the intervention and follow up data collection, however, unfortunately due to constraints imposed by the COVID pandemic, one site withdrew from the research prior to the intervention, and follow up data collection has been unable to be completed at another site. As such, the findings report on baseline data collected for all sites and follow up data following the intervention for one site, with the summary findings below.

VI.II.I DEMOGRAPHICS

Baseline: A total of 949 participants completed baseline data across the 3 sites. Of these, 90.4% were male and the majority (59.2%) were aged 25–44 years.

Most participants had a trade/apprenticeship (37.8%) followed by year 10 equivalent (22.1%) and then certificate/diploma (17.6%).

Participants were predominantly widowed/divorced/separated/or in a relationship but not living together (77.8%), were permanent full-time workers (78.0%), worked 39–45 hours a week (48.3%), were shift workers (80.1%), and were either working in production (60.2%) or as a trade/engineer (31.3%).

Follow-up: A total of 420 employees from Site 3 completed a follow-up survey following the intervention. This was predominantly a male sample (88%) with the majority being permanent full-time shift workers (82%). Over half worked 39-45 hours a week, a quarter worked 46-56 hours and 4% worked more than 56 hours. Similar to the pre-intervention group, most were either production operators (56%) or trade/engineer (36%).

VI.II.II BMI

Baseline: Body Mass Index was self-reported with 18.9% of participants in a healthy BMI range, while there were effectively equal numbers of overweight (40.9%) and obese (39.1%) participants, which is higher than the Australian population data (74.5% overweight and obese).

Follow-up: Following the intervention at Site 3, there were a lower percentage of participants classified as obese when compared to baseline (44% and 47% respectively). There was an increase in participants classified as overweight between the two time points which might be attributable to a shift from those previously classified as obese (39 % and 40% respectively). In spite of this, these changes were non-significant (-0.27 (-0.89, 0.35) p=0.389)

VI.II.III DIET

Baseline: Diet considered recommended fruit and vegetable intake. Only 42.2% of participants met the requirement of at least two serves of fruit a day compared to 51.4% of adult Australians. When considering vegetable intake only 3.5% of participants met the recommendation of a minimum of five serves of vegetables daily.

Our findings also found a statistically significant relationship with BMI and the increased daily consumption of fried potato products (hot chips).

Follow-up: There was little change to diet outcomes across the board. Fruit serves per day (Odds Ratio 1.13, (0.72, 1.78) p=0.580), Vegetable serves per day (Odds Ratio 0.93, (0.63, 1.39) p= 0.727), Sugar sweetened beverages consumption (Odds Ratio, 1.29 (0.82, 2.01) p= 0.263) and fast-food consumption (Odds Ratio 1.03, (0.71, 1.51), p=0.864) were all non-significant when comparing baseline to follow-up.

VI.II.IV ALCOHOL

Baseline: Amount and frequency of alcohol consumption was reported with 30% of participants adhering to the recommended Australian guidelines regarding alcohol consumption. However, of concern were the high number of respondents (18%) who had higher alcohol consumption drinking five or more drinks on a typical day.

Follow-up: Alcohol consumption remained high and almost unchanged at follow up. Differences between AUDIT scores were not significant (Odds Ratio 1.00 (0.61, 1.62) p=0.992)

VI.II.V SMOKING

Baseline: Participants reported on smoking status with 14.9% of respondents identifying as smokers. It was encouraging to note that 26.3% had previously tried to quit smoking within the past year.

Follow-up: At Site 3, there was a reduction in those who reported smoking at follow up with 11.9% of participants identifying as smokers down from 14.9% at baseline.
Half reported smoking less than 10 cigarettes daily and 12% smoked 21 to 30 cigarettes a day. Most smokers (66.7%) had tried to quit smoking in the past year. This was a significant increase compared to the pre-intervention data, where it was revealed just one quarter (26.3%) had tried to quit smoking.

VI.II.VI PHYSICAL ACTIVITY

Baseline: The amount of physical activity, moderate and vigorous was reported by participants. The guidelines for physical activity recommend being active on most, and preferably all, days every week and that individuals perform 300 minutes of physical activity per week. At baseline we found 50% were meeting the recommended Australian guidelines for physical activity.

Follow-up: Overall, there was a mean difference of 48 minutes of increase in moderate physical activity. This represents 81% lower odds of participants doing no moderate physical exercise compared to people at baseline, and this was statistically significant (OR = 0.09, $p < 0.001$).
Regarding the Australian physical activity guidelines there was an increase in respondents who met the recommended guidelines for physical activity following the intervention. This represents people at follow-up having 111% higher odds of meeting the exercise guideline compared to people at baseline, but this was not statistically significant (OR = 2.11, $p = 0.057$).

VI.II.VII EMOTIONAL HEALTH AND WELLBEING

Baseline: When asked about feelings and experiences in the past month around half (48%) of all respondents felt calm and peaceful most of the time and around 40% reported feeling downhearted or low a little of the time.

The majority of participants in the study had not been limited in their social activities by their health and over one-third (38%) of respondents reported having a lot of energy most of the time.

The health goals of participants related mostly to staying healthy and active for their family and improving their fitness. Some also identified a health goal related to lowering their lifestyle risks.

Follow-up: Similar to the pre intervention data at Site 3, the follow up data demonstrated that half of respondents felt calm and peaceful most of the time and just over three quarters reported their health had not limited their social activity. Increased levels of energy and motivation were reported post intervention and there was a decrease in feelings of downheartedness, depression, and hopelessness. In addition, only 8% of participants reported having accomplished less than they would have liked in the past four weeks due to emotional problems (less than the 12% at baseline). Following the intervention respondents demonstrated improvements in health goals. A greater proportion of participants were motivated to maintain a healthy body weight (BMI), improve their diet, and nutrition fitness levels in order to stay health and activity for their family and to lower their stress.

VI.II.VIII WORKING ENVIRONMENT

Baseline: Participants were asked about their team attitude and relationships in terms of support for their physical and mental wellbeing. Across the 3 sites, the majority (42%) felt they could trust their supervisor and that their crew had a team attitude. Over half of respondents felt their crew worked together to achieve the best possible outcome.

Follow-up: Similar to pre-intervention rates most (70.5%) agreed they can trust their supervisor. Importantly, whereas 12.1% of participants either disagreed or strongly disagreed that they could trust their supervisor at baseline, this decreased to 7.9% at follow-up, indicating there was more trust in supervisors. Most of the respondents (70.5%) agreed that crew members work together to achieve the best outcomes possible and over half of respondents agreed (62.2%) that there was a ‘team’ attitude in their crew.

VI.II.IX INTERVIEWS: MINE STAFF EXPERIENCES OF THE WORKPLACE WELLNESS INITIATIVES

Semi structured interviews were conducted with seven participants from Site 3 in October and November of 2020 to gain an understanding of their experiences of implementing RESHAPE. All participants were members of the H&S committee, were part of the working party involved in this project and were from a range of employment areas that included management, production, operations, maintenance, and health and safety staff. The interview questions were designed to understand the process of implementing RESHAPE and the site intervention; including what

strategies were used to engage employees, how the health and wellness interventions were facilitated, and any perceived barriers in the process. Four key themes emerged from the interview data, i). Communication; ii). Work factors; iii). Health behaviours and iv).Work supports:

i) Communication

Factors such as how RESHAPE was first introduced at the site, what communication strategies were used to engage and motivate employees, and how program outcomes were relayed to staff, were identified as key influencers on the program's success. All participants were unanimous that implementing RESHAPE requires a degree of employer facilitation. The health and safety committee were identified as a good resource to communicate health initiatives. It was suggested future initiatives should include more interactive face to face sessions with health experts versus email communication and there was a strong sense that more frequent awareness on health topics is needed in the workplace. Getting crew members together to exercise outside of work was seen as a challenge and maintaining a regular meal pattern alongside shift changes (e.g., night shift) also presented barriers to healthy eating.

ii) Work factors

Several interview participants discussed characteristics of work, including shift length, rosters, work travel commute, job role and access to healthy food options as affecting both their ability and willingness to engage in RESHAPE. The sedentary nature of some job roles was also raised as an issue. As were more active roles, where staff are exposed to prolonged walking with limited breaks or the opportunity to stretch. Additional work factors, such as differences in the attitudes of inter-departmental groups, peer on peer relations, enterprise agreement (EA) negotiations and recruitment processes, were also identified as influencing employee engagement. Group mentality was seen as both a positive and negative influence.

iii) Health behaviours

A common thread in the interviews was recognising that individual choice and motivation can impact the success of programs such as RESHAPE. Several participants acknowledged staff need to prioritise their own health. The male-dominated mining-environment was seen as a limiting factor to healthy behaviour, along with an entrenched drinking culture. Group mentality was considered a driver of both good and bad health behaviours. It was advised that certain crews typically better engage in health programs and that consideration for subgroups of employees is needed when rolling out initiatives. The impact of COVID-19 on health behaviours was also discussed.

iv) Work supports

Several participants recommended changes be made to the mines existing health incentives and subsidies. Existing supports mentioned included a gym membership, a skin check program, and a quit smoking program. Some criticized the existing gym membership as it applies to only a small selection of gyms and the memberships offer little flexibility. Participants suggested extending the gym membership to include all forms of recreation. A further suggestion was to offer staff a family gym pass, recognising the motivational factor of exercising with others. Additional proactive measures recommended included a return to stretching onsite, inclusions to the hospital gap cover, more quit smoking resources, access to healthy meals at work and more education seminars around diet, exercise, and the risks of excessive alcohol consumption.

VI.II.X CONCLUSIONS

The levels of overweight and obesity in the NSW coal mining industry continues to be an ongoing concern. The interaction between overweight and obesity with other health related problems including increased BP, high cardiac risk factors, increased alcohol use and psychological distress, is significant and supports the need for overweight and obesity to be considered alongside other workplace strategies to support a healthy and productive workforce.

Building a culture of health means integrating health into organisation processes and requires sustained effort on a number of fronts. As part of this process, it is essential that management develop an environment where employees are actively included in decisions that shape health promotion efforts and ensure sufficient resources are invested in this important area of health and safety.

The existing risk identification, mitigation, response and recovery models for health and safety in the industry, as described in the NSW Mining Blueprint for Management of Overweight and Obesity, provides a framework for the industry and company response. This study demonstrates that the RESHAPE framework is a useful resource for targeting both organisational factors and individual factors and cultivating a workplace culture which is conducive to positive change and investment in workplace health. The RESHAPE philosophy aligns with the current evidence around workplace wellness interventions as it values purpose, belonging, ownership, ongoing action and continuous improvement and recognises the dynamic and variable environment of workplaces. By ensuring a sustained approach to overweight and obesity, as part of an overall approach to occupational health and safety, NSW coal mines can foster a healthier and happier workforce, aiming for improved productivity and a return on investment. It is important to note however, that for success, this process needs a champion at the workplace who can foster engagement, sustain support and commitment with both management and with employees to implement change. Despite this systematic health promotion approach, obesity rates within the coal industry remain high and a continued emphasis on maintaining a healthy weight is required at both the individual, the site, the organisation, and the industry level for successful impact on this challenging issue.

1 INTRODUCTION AND BACKGROUND

This report presents the results of the Obesity and New South Wales (NSW) Coal Mining research project (No. 20650). The report describes the implementation and evaluation of RESHAPE, a workplace framework and healthy weight initiative. It also outlines the implications of RESHAPE to industry and the benefits to individuals.

1.1 CONTEXT

Overweight and obesity is a major health, safety, and societal issue. An estimated 1.9 billion adults worldwide are classified as overweight, and 650 million are in the obese category.(1) These figures are steadily rising with almost half of the world's adult population expected to be overweight or obese by 2030.(3) The prevalence of overweight and obesity in Australia has steadily increased over the past thirty years. Australia currently ranks within the top 10 of all Organisation for Economic Co-operation and Development (OECD) countries in terms of obesity rates as a percentage of total adult population (4). Over two thirds (67%) of the Australian adult population are now classified as either overweight or obese; having risen by 3.6% over the past three years.(5) Currently 31.3% of our adult population (aged 18 and over) are classified as obese and 36% are classified as overweight, a total of approximately 12.5 million adults.(5)

Obesity is a complex disease condition that implicates many aspects of health. It has a demonstrated role in the development of a range of non-communicable diseases including type 2 diabetes, fatty liver disease, cardiovascular disease, and certain cancers.(6) Individuals who are overweight or obese are also at risk of non-life-threatening co-morbidities such as musculoskeletal pain, osteoarthritis, dementia, gout, gallbladder disease, sleep apnoea and fatigue.(7) Overweight and obesity are associated with other health risk factors such as increased alcohol use and psychological distress. There is a known bidirectional association between obesity and depression,(8-11) with obesity predicting the later development of depression.(10)

The multifactorial nature of overweight and obesity makes treatment complicated.(6) The World Health Organization defines overweight and obesity as excessive body fat accumulation that is associated with clear risks to health. Body mass index (BMI) is an internationally recognised standard for classifying overweight and obesity in adults.(1) BMI is calculated as weight in kilogram (kg) divided by height in meters squared. A BMI of 25 or greater is generally classified as overweight, with levels above 30 considered obese. The fundamental cause of overweight and obesity is an energy imbalance between energy consumed and energy expended and where this imbalance occurs, excess energy is stored as body fat.(12) An individual's dietary intake and physical activity are directly and indirectly influenced by a complex interplay of social, environmental, behavioural, genetic, and physiological factors, of which the workplace is one modifiable factor. Of significance, is that the two most significant behavioural risk factors for overweight and obesity, diet and exercise, are modifiable.(13) This creates an opportunity for treatment through health promotion initiatives in the workplace based on behaviour modification.(14)

In addition, the COVID-19 global pandemic has had a detrimental effect on obesity management. Worldwide interventions to stop the spread of coronavirus 2 (SARS-CoV-2) such as social distancing and lockdowns in the public and private sectors, have exacerbated the rates of obesity and obesity-

linked metabolic comorbidities.(15) In addition, reports out of Australia indicate changes in food behaviours, including increased consumption of discretionary and fast foods, possibly associated with these forced lifestyle changes and increased life pressures resulting from the pandemic.(16) Also of concern, are studies out of the United States and England that have shown that a diagnosis of obesity significantly increases the risk of death from COVID-19.(17)

Governments around the world have development regulatory policies, such as nutrient tax policies, aimed at reducing the prevalence of overweight and obesity. Despite this, the economic cost obesity imposes on society remains large creating an urgent need for public health measures to prevent obesity in order to save societal resources. Nationally, the price tag of obesity has been calculated at $60 billion a year and is expected to balloon with Australians spending an extra $87.7 billion before 2025.(18)

Overweight and obese working populations have higher rates of absenteeism and presenteeism, reduced productivity, increased injury and illness, slower recovery rates and increased workers' compensation costs.(19) Employees who are obese take more sick leave and are typically off work for longer than their colleagues in the overweight and healthy weight categories.(20, 21) Consideration of the factors contributing to obesity in the workplace will assist with developing suitable approaches for improving diet and physical activity amongst the worker population, ensure workplace safety, prevent productivity and financial losses, and improve employee overall quality of life.

1.2 OVERWEIGHT AND OBESITY IN NSW COAL MINES

As one of Australia's largest industries, with 247,300 employees,(22) the mining sector contributed significant export earnings of $290 billion in 2019–2020, which is approximately 9% of Australia's Gross Domestic Product.(23) The prevalence of overweight and obesity in NSW coal mine employees is significant. Rates of overweight and obesity in New South Wales (NSW) male coal miners' are noticeably worse than national figures, with 84.9% of males overweight or obese compared to 74.5% nationally (females tracking evenly at 58.0% and 59.7% respectively).(5, 24) This aligns with men accounting for more than 90% of the NSW mining workforce,(24) and the population prevalence of overweight and obesity being greater in men.(5)

In the NSW mining industry, measurements of body weight, and indicators of physical fitness and physiological health, are required at recruitment and periodically through employment at medical assessments, to monitor the potential development of occupational illnesses and injuries.(25) However, despite regular medical assessments, the rates of overweight and obesity amongst coal miners continues to grow. The mining industry faces many unique occupational factors which may impact on the higher BMI values compared to other labour industries. The sector is heavily male dominated with higher than average rates of obesity found in men (5); mining utilises shift work which has been identified as a risk factor for excessive weight (26); finally, mining is found in regional and remote areas which experience greater obesity rates compared to metropolitan areas. Knowledge gaps remain alongside concerns regarding the success of diet and physical activity programs within blue-collar workers, particularly miners.

The workplace is often viewed as a barrier to healthy eating and physical activity; however, studies show workers support the concept of workplace health promotion to address obesity.(27) Most working adults spend half of their waking hours at work with the workplace environment having a significant impact. Workplaces that provide the necessary infrastructure to support large scale health promotion,(28) the types of foods available in the workplace, the facilities that support physical activity as well as workplace culture can strongly influence people's food and exercise choices.

Improved workforce health results in improved workplace health and safety, retention of the workforce, higher productivity and reductions in absenteeism and presentism. It is hoped, that by assisting miners to improve lifestyle habits and maintain or achieve a healthy weight, we can reduce not only obesity, but also improve their overall health. This in turn may lead to fewer injuries and illnesses, and a healthier and more productive workplace.

1.3 EVIDENCED-BASED WORKPLACE WELLNESS INITIATIVES

Workplace wellness initiatives are employer instigated programs to help and support employees in either overall wellness or targeted health behaviours important to the workforce.(29) Employers increasingly offer workplace wellness programs to reduce health care costs and improve employee health. Health initiatives in the workplace have demonstrated the capacity to change employee beliefs about their own health.(30) Recent research into the value of workplace wellness initiatives suggests employees exposed to a workplace wellness program report significantly greater rates of positive health behaviours compared with those who are not exposed.(31) Furthermore, workplace health promotion programs, particularly amongst men, who utilized both diet and exercise components have shown success.(32)

However, there remains much to be understood about what is most effective in the workplace as well as identifying the approaches that simply do not work. We know that there is no one-size-fits-all approach to a successful workplace wellness program. Within NSW mining, programs need to support varying employee health needs and diversity across mine site workplace culture. Evidence suggests that a strategic and long term approach to workplace wellness is much better at yielding population health improvements and cost saving benefits when compared with programs that are composed of random and often unrelated activities.(33) More importantly, supporting health includes not only a physical environment that helps employees make healthy choices, but a full integration of health into the way an organisation operates. Reviews of successful health promotion programs point to the paramount importance of sustained support from management, as well as worker involvement in the design and execution of such programs.(34, 35)

1.4 RESHAPE

RESHAPE is based on the WHO *'Health Workplace Framework and Model'* and developed by Dr Trent Watson and Dr Jane Watson of Ethos Health, with contribution from the New South Wales Minerals Council (NSWMC) Obesity Committee.(36) RESHAPE is an 8-step framework that aims to develop an ongoing and consistent approach to the design, implementation and evaluation of initiatives to prevent and manage obesity in NSW mining operations. Each of the eight-steps is accomplished by actioning several key activities to achieve the outcome of the step. The framework is championed by

a working party and planning is pivotal, with 1, 3- and 5-year milestones driving future thinking. Table 1 below summarises the eight-steps, specific actions, and resources. Table 2 outlines our research methods as they aligned with the eight-steps.

RESHAPE was designed to create a sense of purpose and belonging to the workplace, and for individuals to develop ownership to achieve a healthy weight. Coal mining, and mining more generally, provides an incredibly dynamic and variable environment. Suitably, RESHAPE is not a prescriptive program or a one-off intervention, rather an overarching framework for ongoing action and continuous improvement within the workplace. The framework gives mine sites autonomy to determine the obesity initiatives most suitable for their operation and implement these using the RESHAPE principles. Ownership is developed through facilitating initiatives that target both organisational factors (leadership style, policy and processes, organisational culture) and individual factors (diet, physical activity, and social).

Whilst this study is focusing on the issue of overweight and obesity within the workplace, the RESHAPE process is designed to be used for any modifiable health risk factor including smoking, nutrition, alcohol, physical activity, sleep, or mental health. The objective of RESHAPE is to provide a sustained approach to fostering healthy, happy, safe, and productive workplaces through sharing responsibility to create an environment and culture where healthy choices are valued and an easy choice. This produces organizational change through ongoing investment into workplace health, and ultimately cultivates a workplace culture which is conducive to positive change. The framework has been implemented at sites across Australia and anecdotally demonstrated success, however, has yet to be executed and evaluated within an empirical setting which this study aimed to address.

The 8-step RESHAPE Process

STEP 1: Mobilise	Action 1: Identify key stakeholders Action 2: Develop and adopt a RESHAPE Charter Action 3: Align RESHAPE with organisational practices	STEP 1
STEP 2: Assemble	Action 4: Form a RESHAPE Working Party and develop the Terms of Reference	STEP 2
STEP 3: Assess	Action 5: Identifying organisational return on investment Action 6: Assessing baseline individual health measures	STEP 3
STEP 4: Prioritise	Action 7: Set priorities using the survey results and a ranking system	STEP 4
STEP 5: Plan	Action 8: Develop a 3-5 year plan Action 9: Develop a 1 year plan	STEP 5
STEP 6: Do	Action 10: Implement the 1 year plan	STEP 6
STEP 7: **Evaluate and Refine**	Action 11: Evaluate periodically* to identify progress and determine areas for further improvement using the RESHAPE Health and Evaluation Questionnaires Action 12: Summarise the RESHAPE activities and outcomes	STEP 7
STEP 8: Improve	Action 13: Make improvements based on evaluation or workplace changes	STEP 8

Table 1 The eight-step RESHAPE process

RESHAPE Framework		Research Methods	
Step	**Aim**	**Task**	**Method**
1. Mobilise	Aim #1: Identify key stakeholders Aim #2: RESHAPE commitment Aim #3: Align RESHAPE with organisational practices	Engage stakeholders (management, employees, local service providers,) for each site, collecting background relevant site level health information.	Consultation group with researchers and management at each mine site to Mobilise.
2. Assemble	Aim #4: Form a RESHAPE Working Party	Assist in the formation of a working party to coordinate, communicate, and promote RESHAPE including provision of an introductory workshop.	The research team will facilitate a workshop with relevant staff and identified stakeholders.
3. Assess	Aim #5: Review the present situation and desired future	Working Party to review relevant site-specific data, policies, and characteristics (injury stats, absenteeism, workplace healthy weight characteristics).	The research team will guide the workplace to assess the current workplace landscape in relation to obesity – to include policy review/ injury stats/ workplace healthy weight characteristics
4. Prioritise	Aim #6: Set priorities using the survey results and reflective practice	Working Party will prioritise appropriate actions in achieving healthy weight and behaviours at a site level and provide this to researchers.	Researchers will facilitate prioritisation of future strategies. For example, researchers can assist in providing options for intervention.
5. Plan	Aim #7: Develop a 3–5-year plan Aim #8: Develop a 1-year plan	Baseline data will be collected from individual miners. This will be a paper-based survey which incorporates a range of standardised measures including anthropometric and demographic data, health, smoking, nutrition, alcohol, physical activity, fatigue, depression, anxiety, productivity, erectile dysfunction, openness to health at work, and social capital. Data will be collected onsite and collection procedures will be designed to minimise disruption to workplace productivity and to accommodate the unique and specific logistical considerations of each site.	Researchers will collect and analyse baseline data. Group descriptive results provided back to the individual mine site.
6. Do	Aim #9: Implement the intervention	Implement the worksite customized plan for achieving healthy weight and lifestyle behaviours. Employees will be encouraged to adopt these behaviours in a way that is acceptable and maintainable to each of the individual worksites.	At each mine site an intervention will be implemented
7. Evaluate	Aim #10: Evaluate RESHAPE Demographic Questionnaire RESHAPE Health Questionnaire RESHAPE Evaluation Questionnaire	Post-intervention data will be collected at 12-months by a paper-based survey, re-measuring Baseline data and individual outcomes (see point 5 above for measures). Focus groups will take place with Managers, and the RESHAPE evaluation questionnaire will be administered to the working party members to evaluate the acceptability and feasibility of the intervention.	Researchers will collect follow up data via survey. Researchers will conduct focus groups with Managers. RESHAPE evaluation questionnaire will be administered to the working party.
8. Improve	Aim #11: Make improvements based on the evaluation results	Make changes based on the evaluation results. This may mean making improvements to the initiatives implemented or building on what is implemented to include new components.	Researchers will analyse data and report back to each site on the results of data analysis to assist sites to make improvements in RESHAPE at their site.

Table 2 Research methods aligned to eight-step framework

2 AIMS

This study aimed to examine the implementation of the RESHAPE workplace framework, along with a healthy weight intervention, to reduce obesity and improve healthy lifestyles within the coal mining industry. The approach was to use the RESHAPE framework collaboratively with mine sites to identify priorities and areas of need in order to implement the most effective and sustainable, site-specific healthy weight initiatives. It was hypothesised that the RESHAPE framework will lead to greater wellness outcomes for the individual (weight loss) compared to standard, once off wellness initiatives which are current practice in the NSW coal mining industry. By assisting miners to improve lifestyle habits, maintain or achieve a healthy weight and optimise health and wellbeing, it is hoped we can reduce the personal and workplace impacts associated with overweight and obesity.

This project had two primary research questions:

(i) Can RESHAPE be implemented successfully at an organisational level?

(ii) What is the effectiveness of a site-specific healthy weight intervention at an individual level?

3 METHODS

3.1 ETHICS

This research project was approved by the University of Newcastle Human Research Ethics Committee (Approval Number H-2019-0087).

3.2 STUDY DESIGN

At the time of study inception, research members were engaged in an obesity subcommittee with key stake holders (NSW Minerals Council and various mine sites across NSW) which had been formed in response to recommendations from the 'Blueprint for the management of overweight and obesity in the NSW mining industry' report. From this subcommittee, sites were recruited to participate in the study via a convenience sample of mine sites that expressed interest. The study was capped at three sites for funding reasons and a combination of underground and open cut was selected to capture different workplace characteristics. Sites 1 and 2 had similar numbers of employees, whereas Site 3 was larger.

A pre- and post-intervention study design with a cross sectional survey component was conducted. In addition, a qualitative component using semi-structured interviews with members of the working party to capture their experiences of the RESHAPE framework and gain further insights into the barriers and enablers of a successful workplace wellness initiative was completed.

Due to the ongoing nature of the COVID-19 pandemic, limiting access to sites, unfortunately, follow-up data collection was only able to be captured at one site. Follow up survey data collection subsequent to the intervention was designed to assist in evaluating and measuring what outcomes were achieved.

3.3 RECRUITMENT & BASELINE DATA COLLECTION

For those mines that expressed interest with the study, researchers attended the mine site H&S meetings to discuss the study and provide an introductory workshop. The RESHAPE manual was provided which outlined the process of selecting working party members. Each site was supported by the research team as they worked through the process to establish a working party to champion and action the RESHAPE philosophy. The H&S committee members decided who they wanted to recruit to their parties, how often they would meet, and other key considerations outlined in the RESHAPE manual. H&S representatives were commonly on the working party.

All three sites participated in a nutrition-based and physical activity-based paper survey as part of the initial data collection. Designed to take 15-20 minutes, the survey aimed to recruit participants to the study and collect baseline data. It included demographic information such as work characteristics, health, smoking, alcohol, nutrition, and exercise. An information statement attached to the survey explained the aims of the project, the voluntary nature of the research and the confidentiality of data collected. To be able to link responses from baseline to follow-up, participants were asked to enter their surname and year of birth to generate a unique study code, however most participants chose not to complete this, resulting in no specific individual comparisons between baseline and follow-up data. Results are therefore presented as group differences. Completion of the survey was deemed consent which was also noted with a tick box.

At two sites participants were provided a brief introductory talk as part of staff training days and were then provided the paper-based survey, which was completed in session. At the third site, the survey was distributed to participants during their regular pre-start shift session and they were asked to complete and return to a sealed box (to maintain confidentiality) in the muster area. This resulted in a lower response rate when compared to the other sites. The COVID-19 pandemic affected data collection (see Figure 1). Progress was interrupted as sites were necessarily required to focus all attention on measures to protect staff from contracting and spreading the virus. Further delays to data collection resulted from restrictions with onsite access due to COVID-19. In June 2020 we arranged for six-month suspension of the project because of the delays associated with COVID-19. During the suspension, our research team-maintained contact with all sites, however understandably the RESHAPE project was not a top priority for sites during this time. Continuity of contact with the sites as is part of the REHAPE process was achieved via email and telephone.

Covid had a large impact on this research study. Site 1 withdrew from the research project in January 2021 due to various barriers, including a lack of management support which coincided with significant changes in staffing. The project recommenced with Sites 2 and 3 in February 2021. As COVID-19 restrictions eased, all efforts were made by the research team and the sites to progress the project and maintain momentum. Site 3 completed the interventions and follow up data was obtained. At site 2, the intervention commenced however, the rise of the delta variant of COVID impacted the completion of this and prevented researchers gaining access to the site to collect follow up data. Follow-up data collection was tentatively agreed to take place during the first quarter of 2022, however, with ongoing challenges presented by COVID, and a change in organisational logistics, data collection has not been able to be completed. After deliberation with Coal Services, it was agreed to end the study, and finalise reporting outcomes with available data (June 2022).

3.4 PROJECT TIMELINE AND FLOW CHART

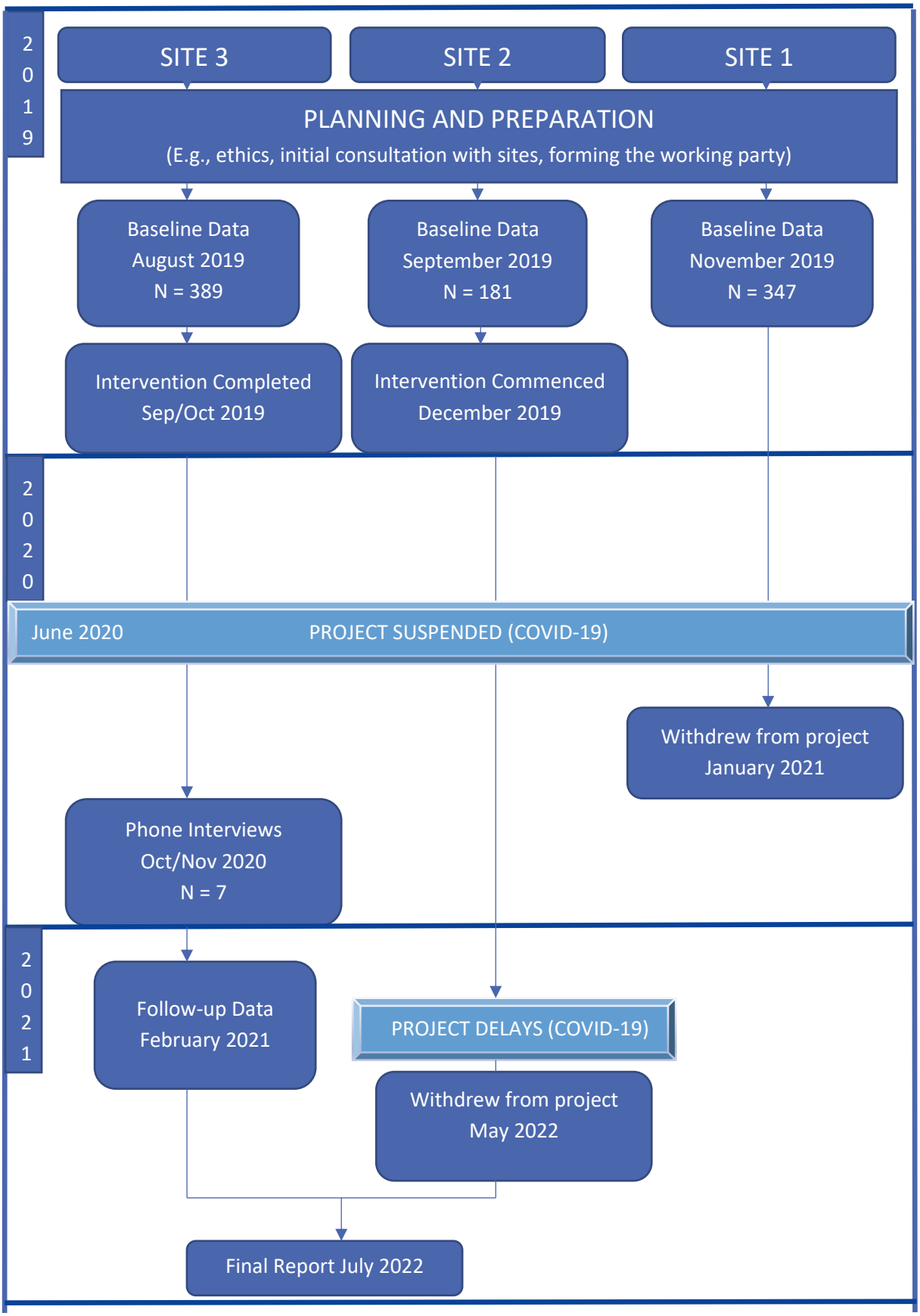

Figure 1 Project timeline and flow chart

3.5 INTERVENTIONS

The working party were provided with information of diet and physical activity education, healthy weight health promotion materials and campaign suggestions. Sites received ongoing phone and email support from the researchers and relevant stakeholders as they worked through the RESHAPE framework to determine the most appropriate healthy weight intervention for the site. The intervention component was intended to be diet/exercise and challenge-based for individuals and work teams in order to achieve a weight loss goal. The two interventions that formed part of this research project included a '12-week healthy weight challenge' and the 'out of the box' campaign which are outlined below.

3.5.1 SITE 3

A 12 WEEK HEALTHY WEIGHT CHALLENGE

Site 3 chose engaged external health provider to implement a 12-week healthy weight challenge (see Figure 2 below). The program included:

- An 'engaging' launch presentation to the workforce
- Management support
- Written resources and face-to-face sessions on physical activity and nutrition
- Objective and meaningful outcome measures using an Inbody Body Composition machine
- Meaning and targeted prizes to engage works of all ages, weight ranges and fitness levels (including mini challenges, a major prize winner and 'crew on crew results')
- Weekly health focus resources (PowerPoint presentation and handouts)
- Reinforcement of the voluntary and confidential nature of participation
- A strategic engagement and communications plan to maximise participant compliance over the full length of the program

Figure 2 12-week healthy weight challenge

3.5.2 SITE 2

'OUT OF THE BOX' campaign

Site 2 chose the nutrition campaign 'Out of the Box'. The program included a variety of education modalities including take home resources (e.g., fridge magnets, stubby holder, and drink bottles), posters, videos, and verbal messaging. This campaign had a long arm approach developed in response to the COVID restrictions, whereby the campaign was implemented within-house, without the need for external consultants to attend sites to deliver materials and messages. Rather, key personnel within the organisation, in this instance members of the working party, were provided messages and resources to deliver to the participants. This included instructional videos to show around the site (muster areas etc); posters and take-home resources that focussed on a different key nutritional message each week.

'Out of the Box' is underpinned by the principles of the health belief model, the theory of planned behaviour and the stages of change model. Participants are guided into positive health changes via increased health literacy and understanding of the core fundamentals of health diet. The content uses demographic specific language and themes, was well as Flesch-Kincaid readability level of 70% (year 8 reading level), whereby content is relatable and easily understood by all health literacy levels. For example, a like for like picture of a person holding an apple and cricket ball is utilised to demonstrate a serve of fruit. See Table 3 below for an example of the campaign's content.

	Focus	**Resource**
Focus 1	1) How to read a food label 2) How to pack a balanced lunch for work	Label reading wallet card
Focus 2	1) Portion control 2) Fruit and vegetables	Fruit and vegetable portion guide fridge magnet
Focus 3	1) Alcohol guidelines 2) What is a standard alcoholic drink	Alcohol awareness stubby holder
Focus 4	1) Sugary drink awareness 2) Water / hydration promotion	Hydration promoting drink bottle

Table 3 Out of the box' campaign content

In addition to the 'Out of the Box' intervention, as part of RESHAPE, Site 2 implemented:

- Provision of fruit boxes
- Changes to vending machines
- Access to existing health services; podiatrist, dietitian, physiotherapists.

Due to the ongoing challenges presented by the COVID-19 global pandemic, site 2 was unable to complete all of the 4 weeks roll out of the 'Out of the Box' program. This meant follow-up data collection could not be captured.

3.6 FOLLOW UP DATA ANALYSIS

Survey data was analyzed descriptively for the baseline survey for the 3 sites; 12-week follow up survey and post-intervention survey for Site 3. The datasets were cleaned and analysed using statistical package SPSS [Version 27].(37)

General descriptive statistics of the sample were completed to provide information on the profile of the participants: including their sex, workplace characteristics (i.e., role, employment status), physical health (including BMI), emotional health, lifestyle behaviours (including diet, exercise, fatigue), as well as perceptions on the workplace environment including productivity and workplace relationships. All three sites received a snapshot report of baseline findings. The research team presented the baseline findings at working party meetings where possible. Inferential statistics were completed on the comparison of baseline and follow up data for Site 3 to identify statistically significant differences.

The qualitative interview data was transcribed verbatim, with transcripts analysed thematically to identify, analyse, and report emerging themes and structure an understanding of the data, following Braun and Clarke's (2006) guidelines. Through manual coding, emergent themes were added or removed as the analysis progressed. This allowed for an inductive, data-driven approach. Two researchers coded the data over a series of meeting. Codes and categories were collapsed and synthesised to identify underlying concepts (or sub-themes) and major themes (Braun & Clarke, 2006).

Data was entered, stored, and analysed on firewall and password-protected University server, with access restricted to approved project investigators.

4 RESULTS

The findings are reported as: 1). Baseline data from the pre- intervention paper-based surveys across the three sites; 2). 12-week Challenge data (snapshot); 3). Comparison between baseline and follow up data for Site 3; and 4). Qualitative findings from the interviews.

4.1 BASELINE DATA

The baseline findings across the three sites are reported on in the journal article *Bezzina A, Austin EK, Watson T, Ashton L, James CL. Health and wellness in the Australian coal mining industry: A cross sectional analysis of baseline findings from the RESHAPE workplace wellness program. PLOS ONE. 2021;16(6):e0252802.* The results are summarised below. The baseline results were compared to the general Australian population, taken from the 2017–18 National Health Survey.(5)

4.1.1 DEMOGRAPHICS

This study provides empirical evidence on 949 NSW coal miners who participated in a cross-sectional study investigating a range of workplace, wellness, health, diet, and exercise factors. The sample was predominantly male (90%) with the majority (59%) of participants aged 25-44 years (Figure 3). Most Participants were permanent full-time workers (79%), shift workers (80%) and were either working in production (60%) or as a trade/engineer (31%) (Figure 4).

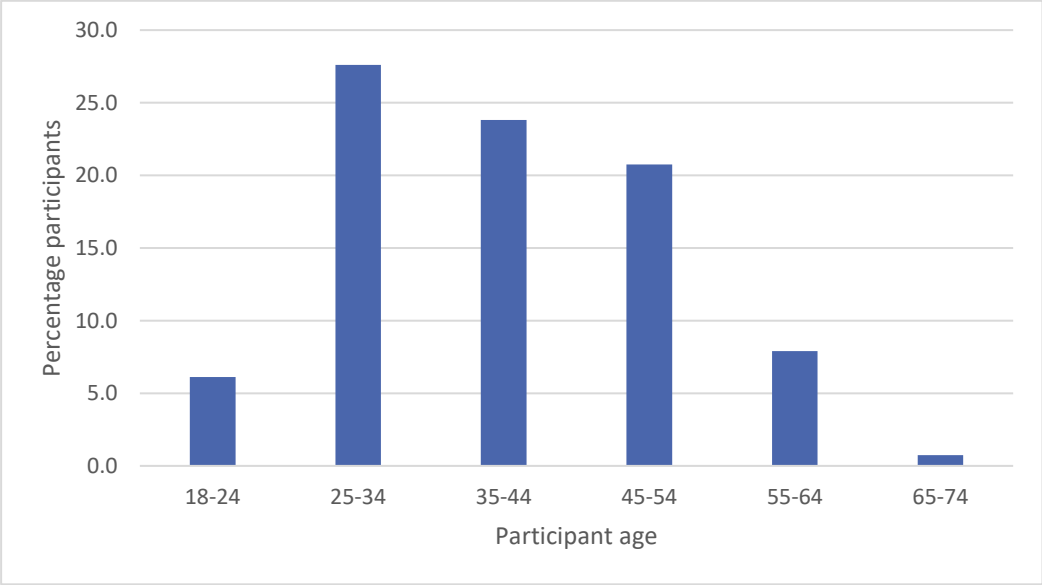

Figure 3 Age group of participants across all sites baseline

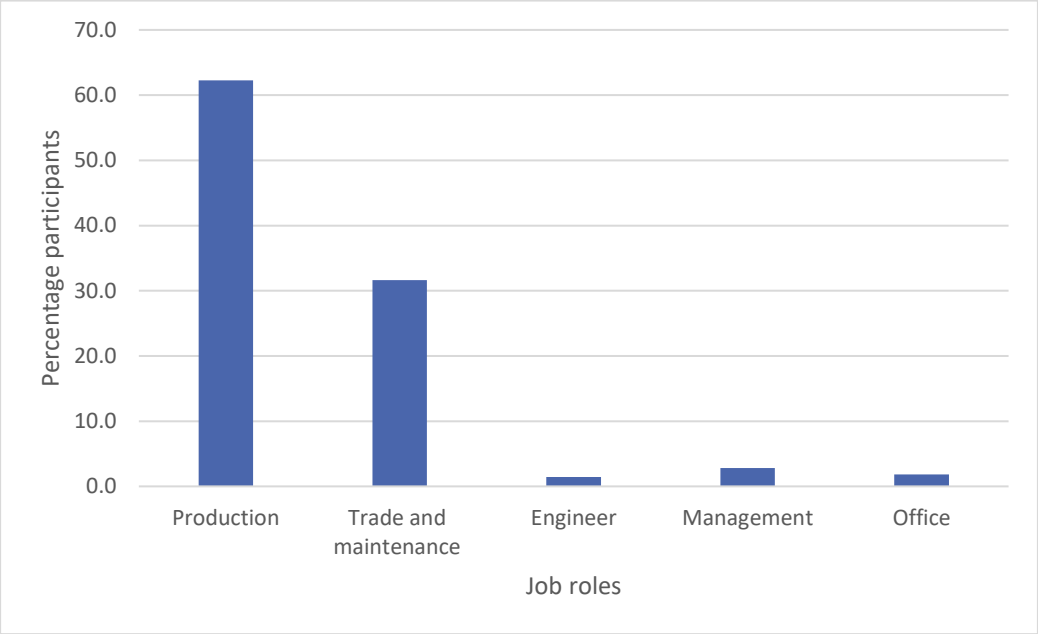

Figure 4 Job roles of participants across all sites baseline

4.1.2 BMI

Self-reported Body Mass Index (BMI) and waist circumference, both recognised measures of overweight and obesity, were used to determine the prevalence of overweight and obesity. Our findings show that at baseline, 19% of participants reported they were in a healthy BMI range (Figure 5). There were almost equal numbers of overweight (41%) and obese (39%), which is higher than Australian national population data at 36% overweight and 31% obese,(5) and similar to previous findings from NSW coal miners of 48% overweight and 27% obese.(38)

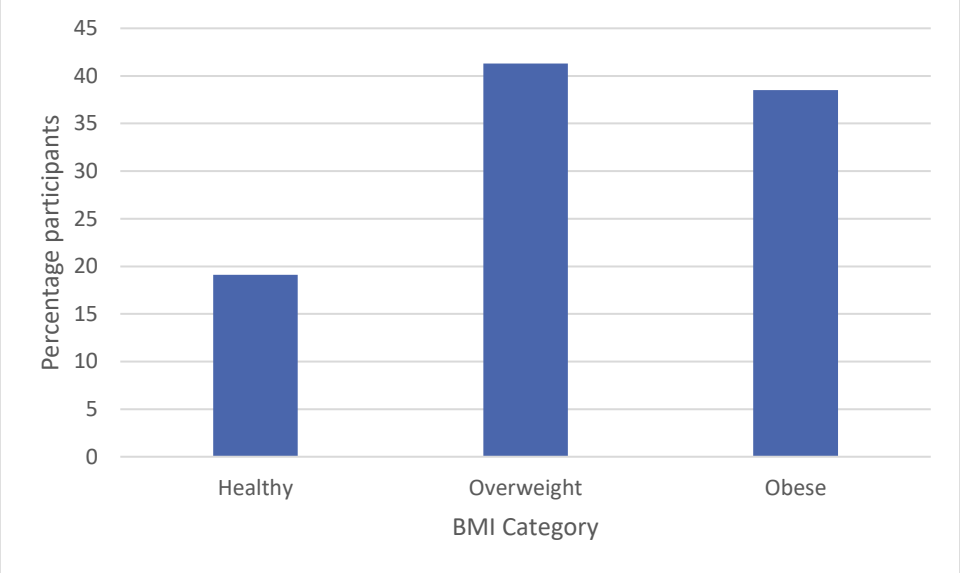

Figure 5 BMI classifications across all sites baseline

4.1.3 DIET

Dietary intake patterns varied across the sites, with fruit and vegetable consumption low. The Australian dietary guidelines recommend adult Australians consume two serves of fruit, and at least five serves of vegetables per day. Across the three sites, 42.2% of participants reported consuming at least two serves of fruit per day. Additionally, 3.5% of participants consumed the minimum of five serves of vegetables daily. This is in contrast to general Australian population data that reports 51.4% and 9.6% of adult Australians meet fruit and vegetable intake guidelines, respectively. Figure 6 outlines serve of fruits and vegetables across different intake cut offs (never eat to greater than 5 serves per day). Discretionary potato products such as hot chips had a negative effect with BMI, indicating that greater consumption levels (more than 7 times per week) were associated with increasing BMI (*b*= -6.11, p=0.05).

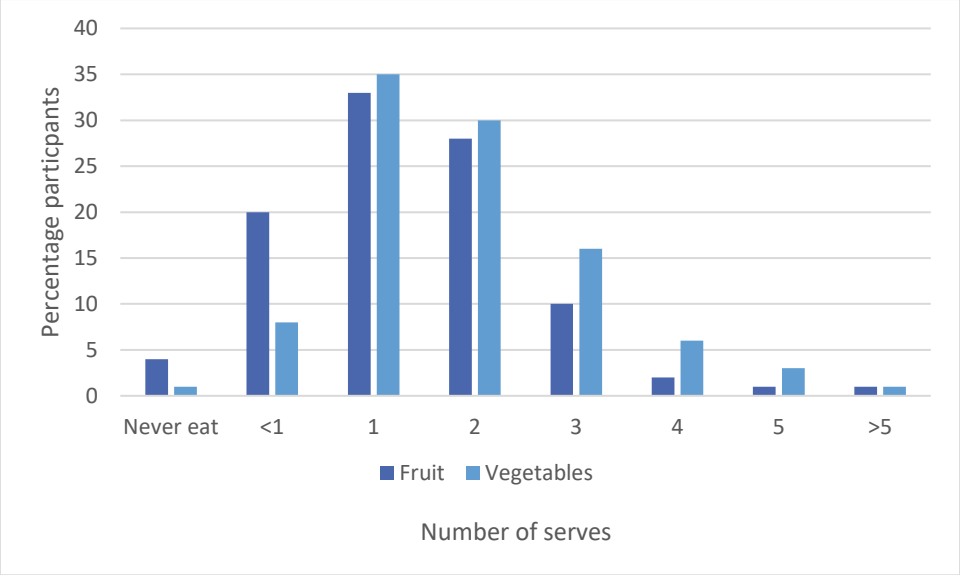

Figure 6 Fruit and vegetable consumption across all sites in serves per day baseline

4.1.4 ALCOHOL

Our results indicated that excessive episodic drinking behaviours were widespread. 33% of respondents reported drinking 2-3 times per week, with 3-4 standard drinks consumed per drinking session the most frequently reported (31%, Figure 7). According to the National Health and Medical Research Council, to reduce the risk of harm from alcohol, adult Australians should drink no more than 4 standard drinks in one session and no more than 10 standard drinks per week.

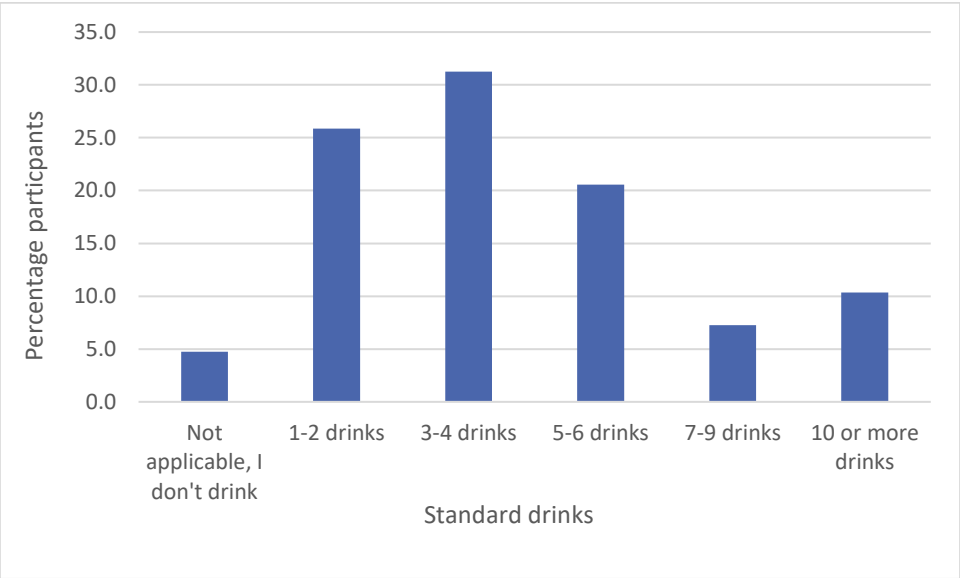

Figure 7 Quantity of alcohol consumption on a typical day when drinking across all sites baseline

Binge drinking tendencies were widely reported. Binge drinking is defined by the AUDIT tool as a drinking episode whereby six or more standard drinks are consumed. In this sample the frequency of

binge drinking episodes was evenly distributed between the monthly, 2-4 times per month and the 2-3 times a week category (Figure 8).

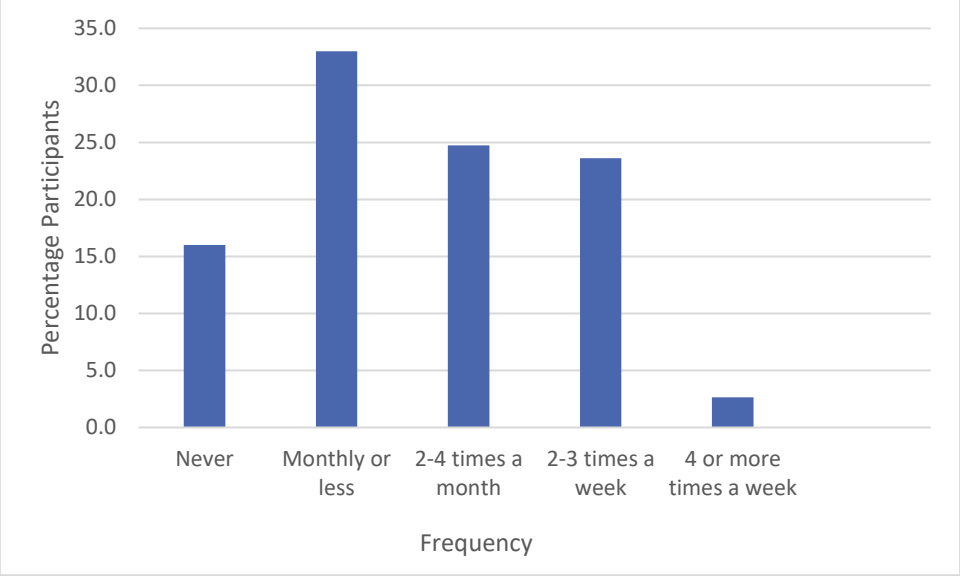

Figure 8 Frequency of binge drinking episodes across all sites baseline

4.1.5 SMOKING

At baseline, 14% or all participants indicated that they were smokers. However, on a positive note, across the three sites an average of 26.3% of all respondents noted they had tried to quit smoking in the past year.

4.1.6 PHYSICAL ACTIVITY

The Australian guidelines recommend that adult Australians participate in 2.5 hours of moderate and or vigorous physical activity (or an equivalent combination of both) per week. Across sites, there was an even distribution of participants who were meeting the Australian guidelines for physical activity (50%, Figure 9).

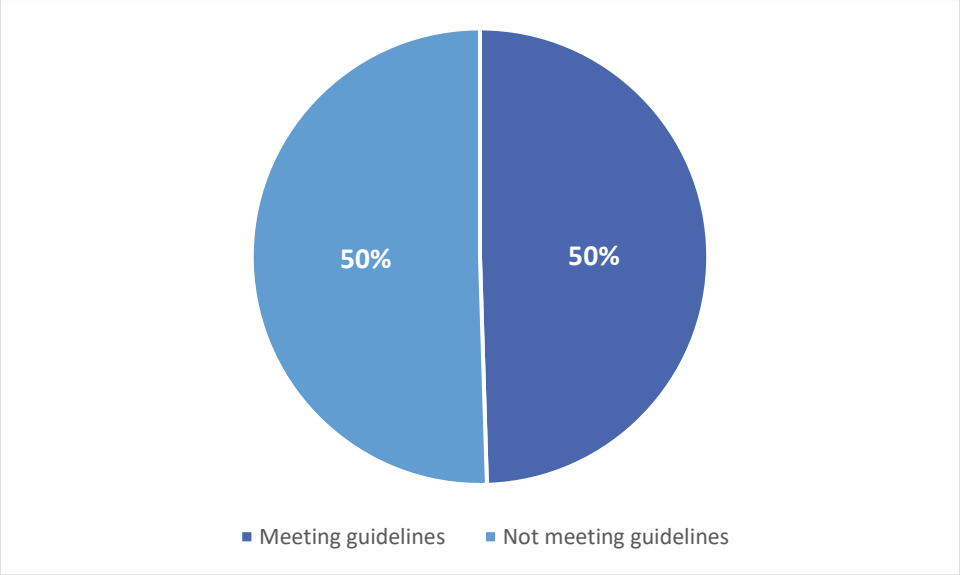

Figure 9 Percentage participants meeting physical activity guidelines across sites 1 & 3 baseline

This data represents Sites 1 and 3, with physical activity data not collected for Site 2 as they chose to focus on diet habits.

Participants in this study self-reported the amount of exercise as either moderate or vigorous with 56% indicating they do less than 2.5 hours of moderate exercise and 44% as more than 2.5 hours of moderate exercise per week. In contrast 54% indicated they complete less than 1.25 hours of vigorous exercise, with 46% indicating they complete more than 1.25 hours of vigorous exercise each week.

4.1.7 EMOTIONAL HEALTH AND WELLBEING

Depression and general anxiety were assessed using the PHQ-2 and GAD-2 tools, respectively. The PHQ-2 is from the Patient Health Questionnaire and is a self-administered tool to assess depression. The GAD-2 is the Generalized Anxiety Disorder 2-item which is a very brief initial screening tool for generalized anxiety disorder. Overall, 91% of participants ranked low on the PHQ-2 tool (Figure 10), indicating that further diagnostic analysis for depression is not warranted. Similarly, 92% of participants scored low on the GAD-2 tool (Figure 11), indicating that further diagnostic analysis for general anxiety is not warranted.

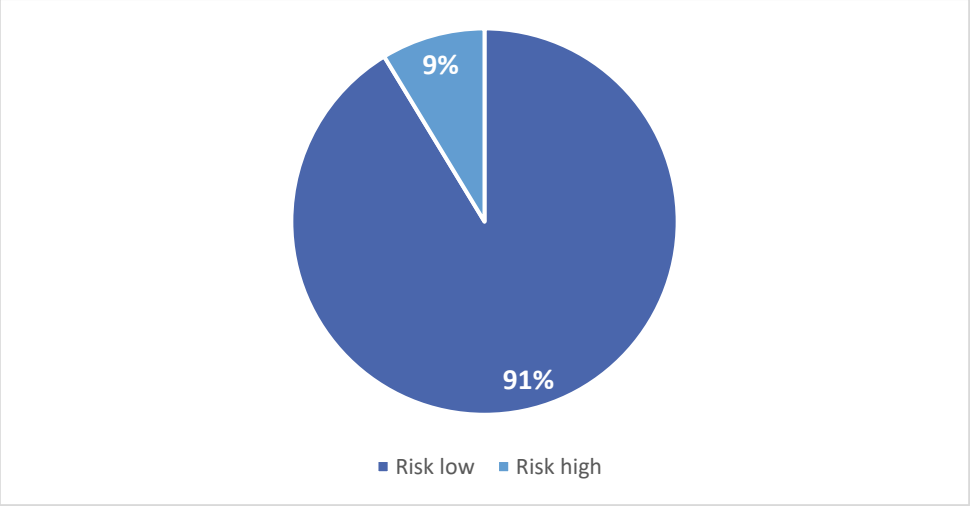

Figure 10 PHQ-2 (depression risk) scores across all sites baseline

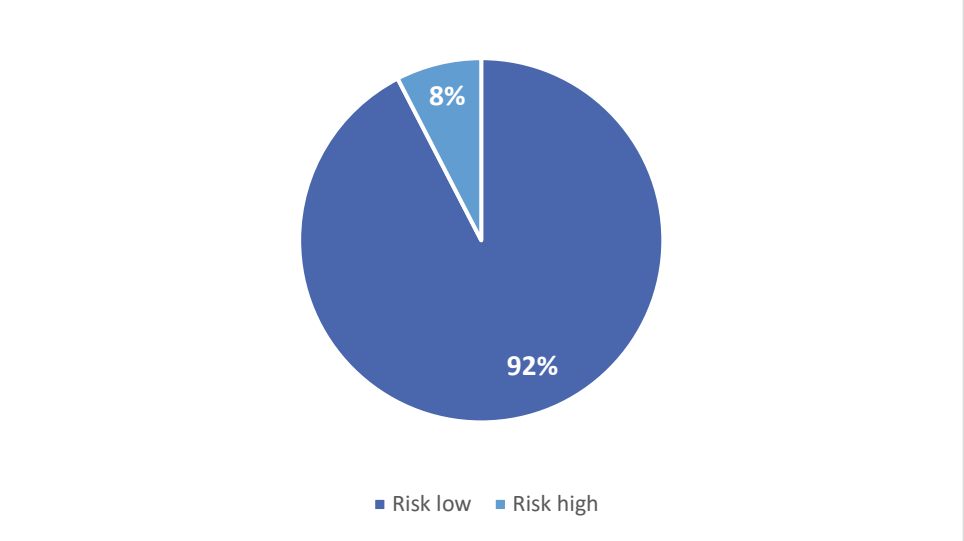

Figure 11 GAD-2 (anxiety risk) scores across all sites baseline

4.1.8 WORKING ENVIRONMENT

Participants were asked about their team attitude and relationships in terms of support for their physical and mental wellbeing. The majority (42%) felt they could trust their supervisor and that their crew had a team attitude Over half of respondents felt their crew worked together to achieve the best possible outcome.

4.1.9 FATIGUE

Daytime sleepiness, a measure of fatigue was completed at baseline across all three sites. The Epworth sleepiness scale reports daytime sleepiness across five different categories as pictured below. Majority of participants fell within the ranges which is considered 'normal daytime sleepiness' (90.5%, Figure 12). The remaining 9.5% of participants scored in levels of daytime sleepiness considered 'excessive'. The percentage of people with excessive daytime sleepiness varies widely between different groups, from about 10 to 40% or more.(39, 40)

Additionally, participants were asked on average how many hours of sleep they get each day. The average amount across all participants was 6.49 hours, which is 30 minutes less than the recommended minimum of seven hours of sleep per night.(41)

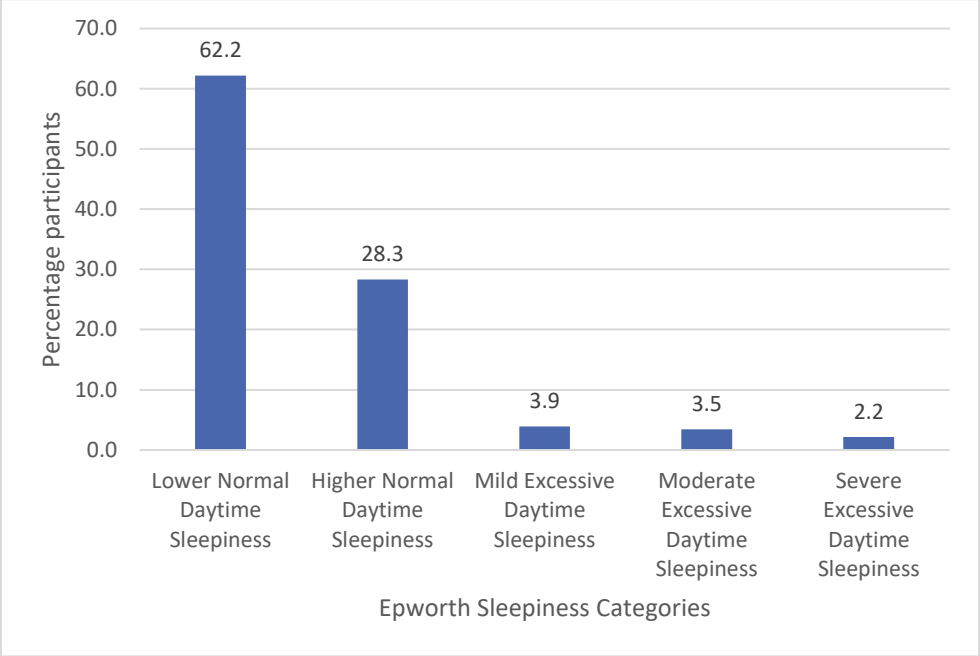

Figure 12 Daytime sleepiness (Epworth sleep scores) categories across all sites baseline

4.1.10 ORANISATIONAL POLICIES

Baseline data was collected from Site 3 on participant awareness of organisational policies. Results showed (Figure 13) that the majority of participants (75.4% - 89.5%) were aware of organisational policies related to mental health, wellbeing, smoking and alcohol, while just over 40% were aware of policies related to physical activity and nutrition.

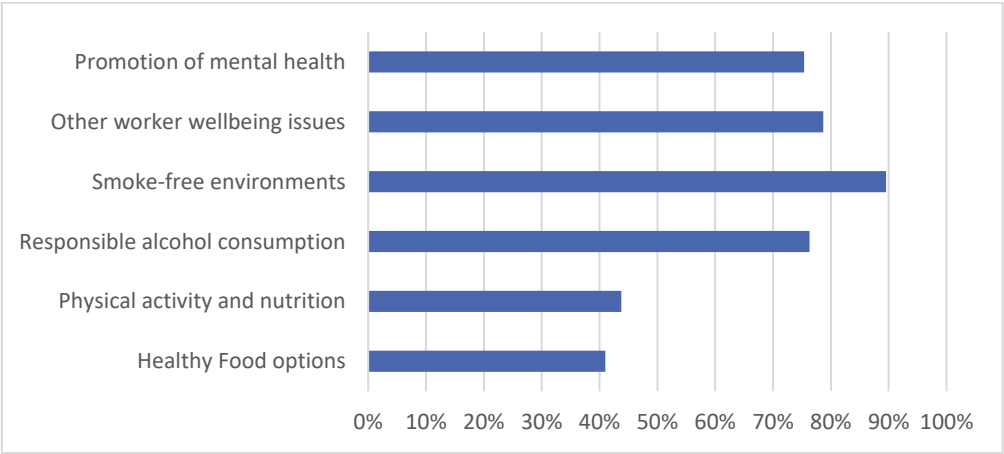

Figure 13 Awareness of organisational policies relating to health and wellbeing across all sites baseline

4.2 FOLLOW UP RESULTS: 12-WEEK CHALLENGE (SNAPSHOT)

Employees from Site 3 were surveyed immediately following the intervention: a 12-week health challenge. There was however only a small sample of 62, who responded to this survey, hence results should be interpreted with caution. Similar to the baseline data, the majority (95.2%) were male and aged 25-34 years. Most (64.5%) were employed on a permanent full-time basis, 1.6% casually, 24.2% on a contractor basis, and 6.5% as an apprentice/trainee. The majority (38.7%) worked 39-45 hours per week, 30.6% worked 46-56 hours per week, and 11.3% worked more than 56 hours per week. Shift work was reported by 83.9% of participants. Of the 52 participants who worked shift work, most worked 12-hour shifts (59.7%), with 1.6% each working 8 hours and 10 hours per shift. The majority of participants at baseline and 12 week follow up were production operators followed by maintenance workers (Figure 14).

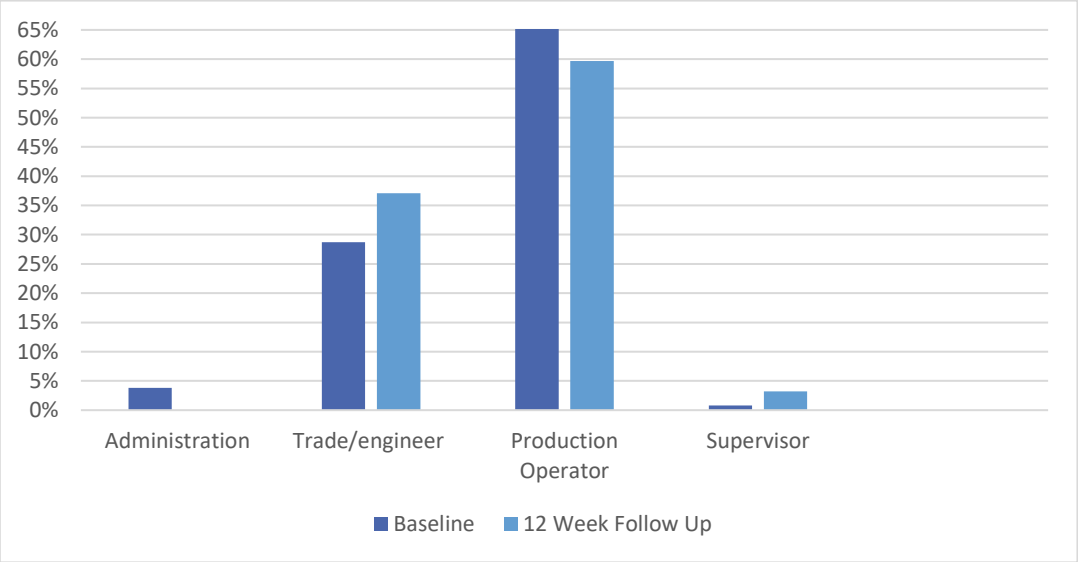

Figure 14 Occupation category of participants at baseline compared to 12 week follow up site 3

Just under half of the respondents in this follow up survey, (48.4%) participated in the 12-week health challenge. Of the 30 participants who participated in the health challenge, 93.3% got a body scan in August 2019, with 76.7% agreeing that this influenced their decision to participate. In addition, 23.3% identified that the prizes on offer to participants of the health challenge, influenced their decision.

The competitive crew versus crew aspect of the challenge was enjoyed by 76.7% of participants and most agreed that getting regular body scans would help them achieve and maintain a healthy weight.

Participants' average weight following the challenge was (SD = 16.04kg) 93.69kg, with 46.7% considering themselves to be an acceptable weight, 3.3% underweight, and 50% overweight. This is compared to participants' actual BMI reflecting that they were in an acceptable (20%), overweight (53.3%), or obese weight range (26.7%) following the challenge.

Of those who completed the 12-week challenge, most stated their weight had decreased (76.7%), with the remaining reporting that it had increased (13.3%) or stayed the same (10%). In

comparison, among those who did not participate in the challenge, only 17.9% reported that their weight had decreased, with 39.3% reporting it had increased (39.3%) or stayed the same (39.3%).

All participants who participated in the 12-week challenge agreed that it was appropriate for their employer to facilitate the program.

4.3 COMPARISON BETWEEN BASELINE AND FOLLOW UP DATA

A comparison between baseline and follow up data was completed for Site 3. Although there were increased participants in the healthy weight range following the intervention, there were rising numbers of overweight and obesity. The results demonstrated that the rates of overweight and obesity remained higher than Australian population data. Interestingly, a significant number of participants did not identify with being overweight, which may be a barrier to engaging miners in behaviours to reduce their weight. A detailed summary of the comparison of baseline and follow up data for Site 3 is outlined below.

4.3.1 PROFILE OF EMPLOYEES

A total of 420 employees completed the follow-up survey (72.4% response rate). This is an increase of 31 employees compared to the 389 participants who completed the baseline survey. Most participants were male (86.4%), with 9.5% identifying as female.

Most of the participants (75.2%) were permanent full-time employees. Permanent part-time and fix-term employees both made up 0.5% of participants. Casual employees accounted for 5.2% of respondents; apprentices/trainees made up 3.3% and contractors made up 15.2%.

Over half of the participants (55%) worked 39-45 hours a week, a quarter (25.2%) worked 46-56 hours, and 3.8% worked more than 56 hours a week. Most participants were shift workers (81.7%). The majority of participants were production operators (56%) followed by maintenance (36%).

4.3.2 BODY MASS INDEX

Body Mass Index (BMI) was calculated using participants' self-reported height and weight. Following the intervention, BMI rates were relatively unchanged with 15% within a normal BMI range post intervention compared with 14% at pre-intervention. The biggest change was the number of adults classified as obese which reduced from 47% to 44% between the two time points. Despite the proportion of adults in the obese category shifting, the overall BMI change was not statistically significant (-0.27 (-0.89, 0.35) p=0.389). Similar results were observed regarding overall weight (kg) whereby mean differences between timepoints were not significant (-0.88 (-2.65, 0.90) p= 0.327)

Australian national population data indicates rates of 35.6% overweight and 31.3% obese while previous findings from NSW coal miners reports 47.5% overweight and 27% obese.(5, 38) In the follow-up data the percentage of overweight participants was higher than the Australian national population data but lower than previous findings from NSW coal miners. In the obese category, the follow up data rates (40.2%) were higher than both the Australian population data and the previous findings from NSW coal miners.

Although 78.3% of participants had BMIs in the overweight and obese categories, only 49% considered themselves to be overweight. In addition, 48.3% considered themselves to be an acceptable weight, however only 15% had a normal range for BMI. A significant number of participants do not identify with being overweight which may be a barrier to engaging participants in behaviours to reduce their weight.

4.3.3 DIET

Analysis of diet reveals that some respondents changed their dietary habits throughout the intervention period. Overall, there was little change to fruit consumption behaviours with Figure 15 highlighting various ebbs and flows amongst consumption patterns. Consumption increased at the lower end of the serving sizes, with 37.4% of participants reporting consumption of one serve of fruit per day (an increase of 4% from baseline). However, intake of the recommended two serves and higher decreased. Just under a quarter (22.9%) participants consumed the recommended two serves of fruit a day, compared to 48.7% of adult Australians.(5)

Vegetable intake showed a positive swing towards increasing consumption levels. Overall, more respondents reported consuming two or three serves of vegetables as opposed to the previous one serve. Despite this, only 3.3% (Figure 16) reported consuming the recommended five or more serves of vegetables daily (compared to 9% of the adult Australians).(5) These results highlight an area of potential improvement and future initiatives should look to educate workers on fruit and vegetable guidelines and quantifying serving sizes.

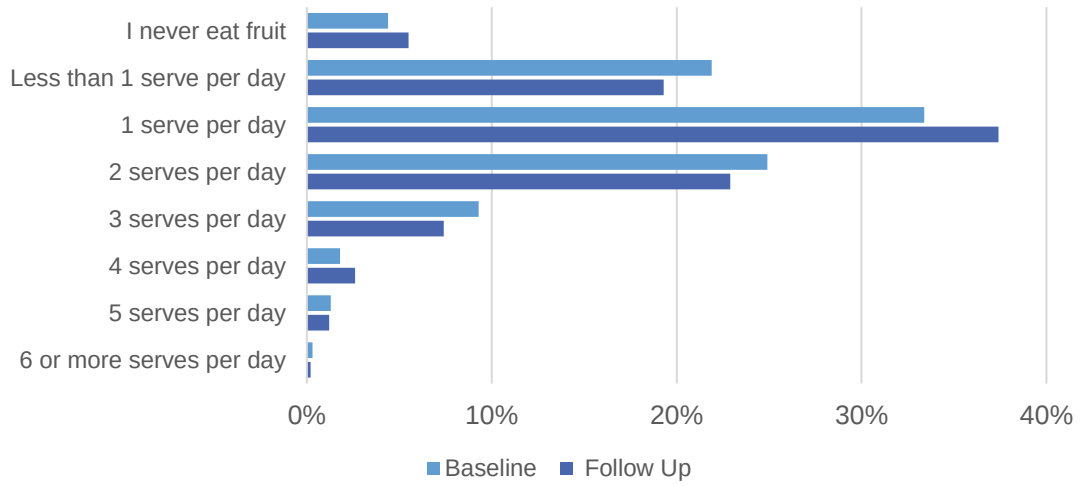

Figure 15 Fruit consumption in serves per day baseline compared to follow up site 3

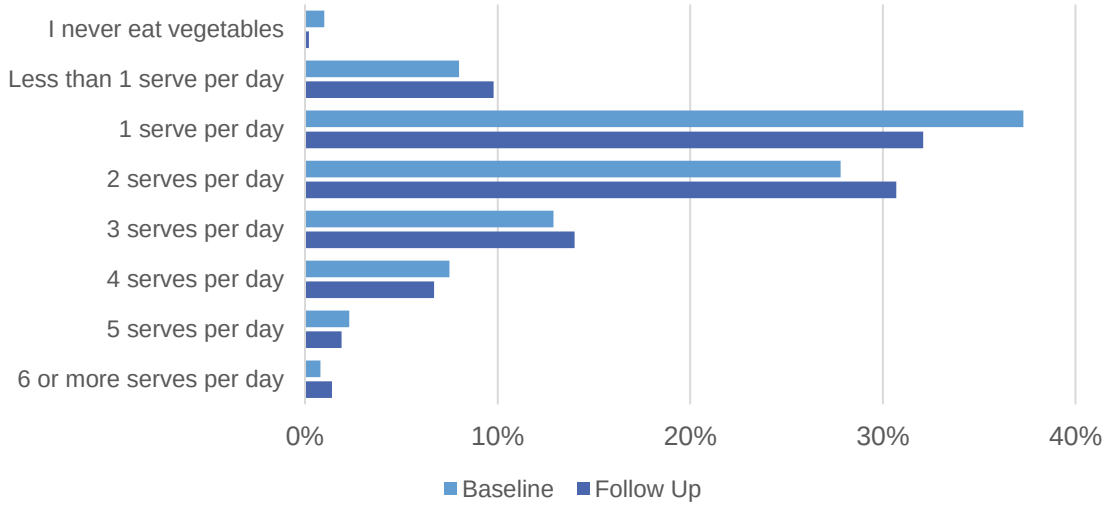

Figure 16 Vegetable consumption in serves per day baseline compared to follow up site 3

Overall, consumption of fast food and takeaways, as well as discretionary food items (hot chips, potato chips, muffins) increased from baseline to post intervention. Fast food consumption of more than once a week increased from 15.2% to 28.8%. Consumption of discretionary foods once per week increased from 18.3% to 23.1%. Whilst these results may seem discouraging, the impacts of the COVID-19 global pandemic on food behaviours have seen a rise in snacking on discretionary foods, as well as increasing fast food consumption. Primarily reports coming out of Australia substantiate this notion and may be the result of increased life pressures resulting from the pandemic.(16)

4.3.4 ALCOHOL

Findings about alcohol consumption reveal that the respondents continued to drink heavily and regularly. Over a third of respondents (35.7%) reported drinking alcohol two to four times a week while 18.8% drink alcohol four or more times a week (Figure 17). Over one third (33.8%) reported having three to four drinks on a typical day when they were drinking. Of concern is the high number of respondents (18.1%) who continued to drink five or more drinks on a typical day (Figure 18). Ten or more drinks were reported in 7.4% of respondents and 7.9% reported having seven to nine drinks on a typical day. The NHMRC Australian guidelines state in order to reduce the risk of harm from alcohol-related disease or injury, healthy men and women should drink no more than 10 standard drinks a week and no more than 4 standard drinks on any one day. The less you drink, the lower your risk of harm from alcohol.(42)

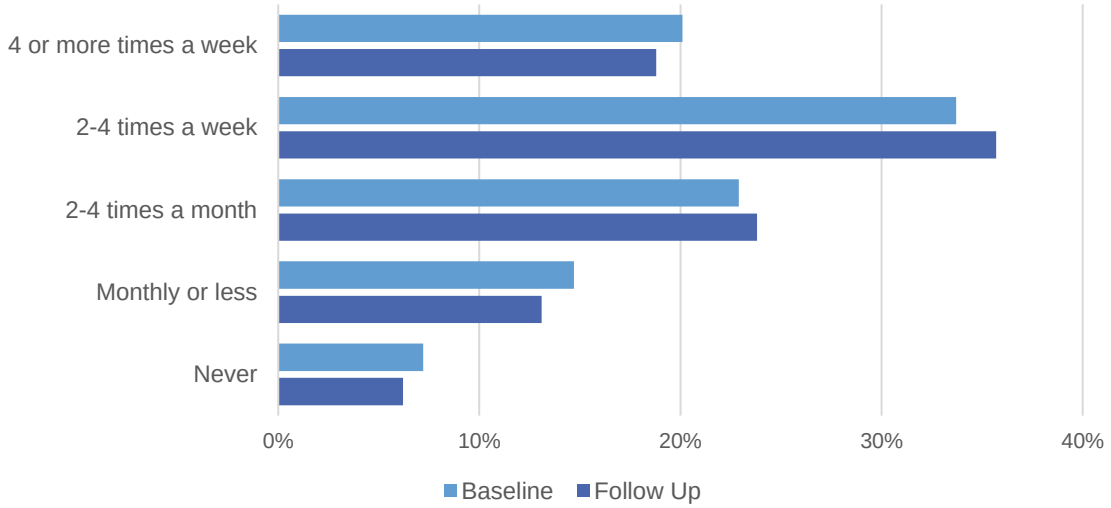

Figure 17 Frequency of alcohol consumption baseline compared to follow up site 3

The following figure outlines the number of drinks consumed on a typical day.

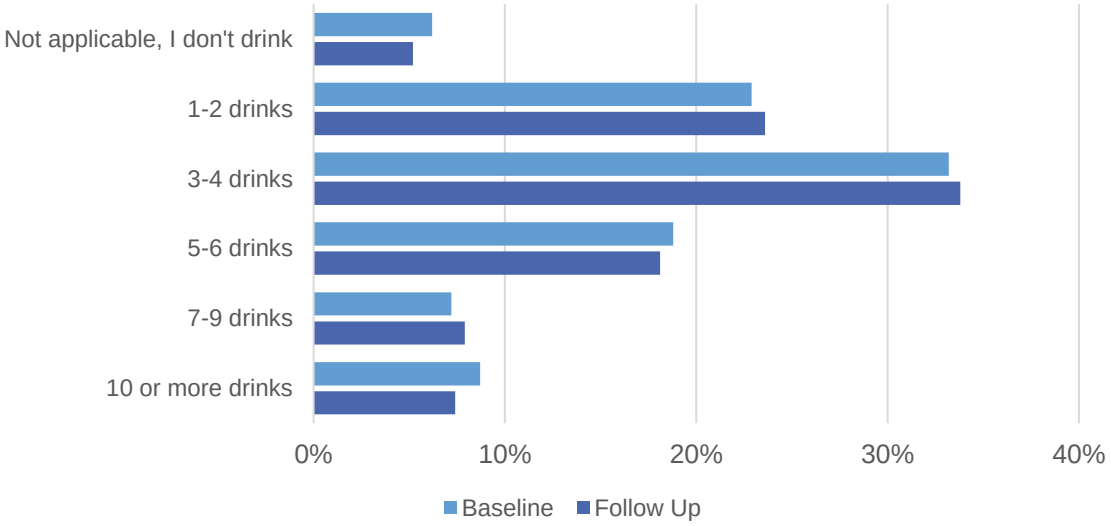

Figure 18 Quantity of alcohol consumption on a typical day when drinking baseline compared to follow up site 3

Overall, there was no statistically significant changes amongst AUDIT scores (Figure 19) from baseline to follow-up (OR 0.98 (0.65, 1.47), p=0.907).

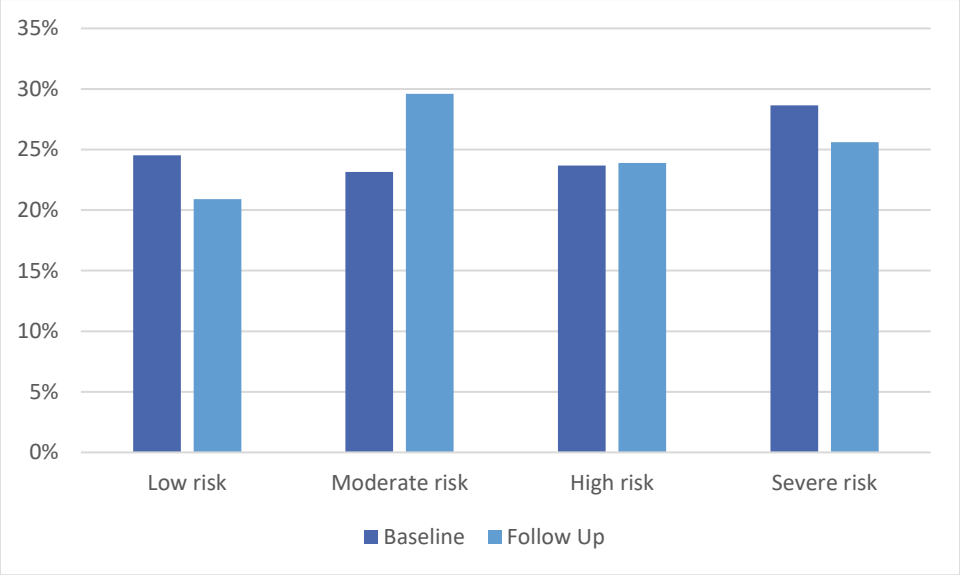

Figure 19 Alcohol Use Disorders Identification Test Risk Categories baseline compared to follow up site 3

4.3.5 SMOKING

Of those participants who were smokers (11.9% of all respondents versus 14.9% at pre intervention) half reported smoking less than 10 cigarettes and 12% smoked 21 to 30 cigarettes a day. Most smokers (66.7%) had tried to quit smoking in the past year. This was a significant increase compared to the pre-intervention data, where it was revealed just one quarter (25.3%) had tried to quit smoking.

4.3.6 PHYSICAL ACTIVITY

Between baseline and follow-up, rates of physical activity and percentage respondents meeting physical activity guidelines has increased. Overall, there was a mean difference of 48 minutes of increase in moderate physical activity. This represents 81% lower odds of participants doing no moderate physical exercise compared to people at baseline, and this was statistically significant (OR = 0.09, $p < 0.001$).

The Australian guidelines recommend that adult Australians participate in 2.5 hours of moderate and or vigorous physical activity (or an equivalent combination of both) per week. As can be seen in Figure 20 there was an increase in respondents who met the recommended guidelines for physical activity following the intervention with numbers increasing from 39% to 48%, with a corresponding decrease in the number of participants not meeting these guidelines for exercise. This represents for people at follow-up having 111% higher odds of meeting the exercise guideline compared to people at baseline, but this was not statistically significant (OR = 2.11, $p = 0.057$).

There was an increase in respondents who reported doing less than 2.5 hours or moderate exercise per week (27.2% pre to 29.8% post intervention), but an increase in those who reported doing more than 5 hours of moderate exercise per week (8.5% pre to 12.9% post intervention). Vigorous exercise rates remained similar pre and post intervention for those reporting they do less than 1 hour 25 mins and between 1.25 and 2 hours of vigorous exercise per week, however there was an

increase from 16.5% (pre intervention) to 17.6% of participants who reported doing more than 2 hours of vigorous exercise per week post intervention.

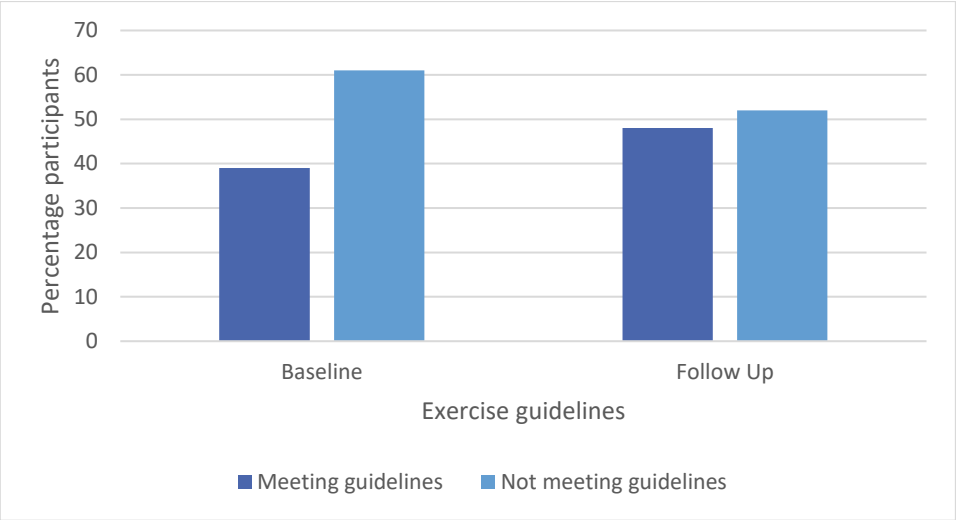

Figure 20 Participants meeting exercise guidelines baseline compared to follow up site 3

4.3.7 EMOTIONAL HEALTH AND WELLBEING

Depression and general anxiety were assessed using the PHQ-2 (Figure 21) and GAD-2 (Figure 22) tools, respectively. Between baseline and follow-up there was little change. Overall, differences between PHQ-2 (OR 1.24 (0.87, 1.76), p= 0.245) and GAD-2 scores (OR 0.70 (0.44, 1.10), p= 0.119) were not statistically significant.

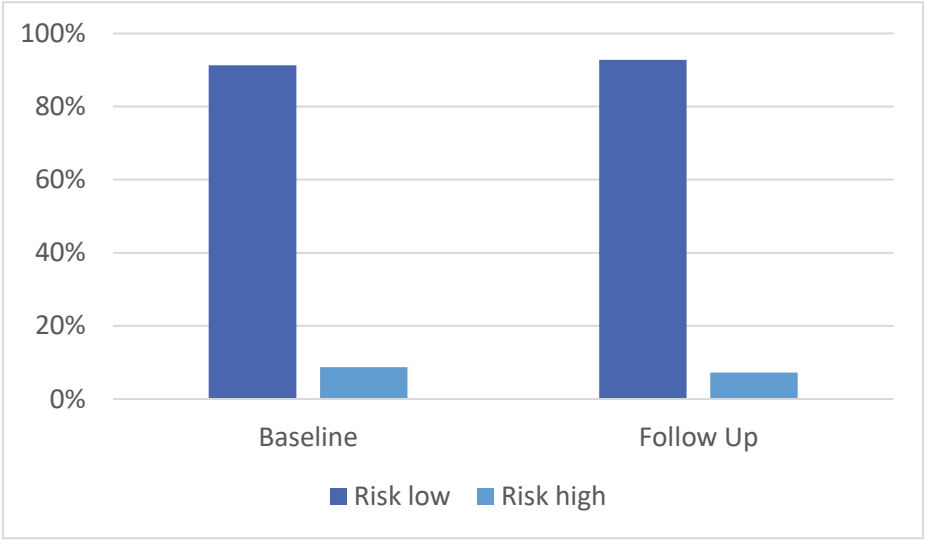

Figure 21 PHQ-2 (depression risk) scores baseline compared to follow up site 3

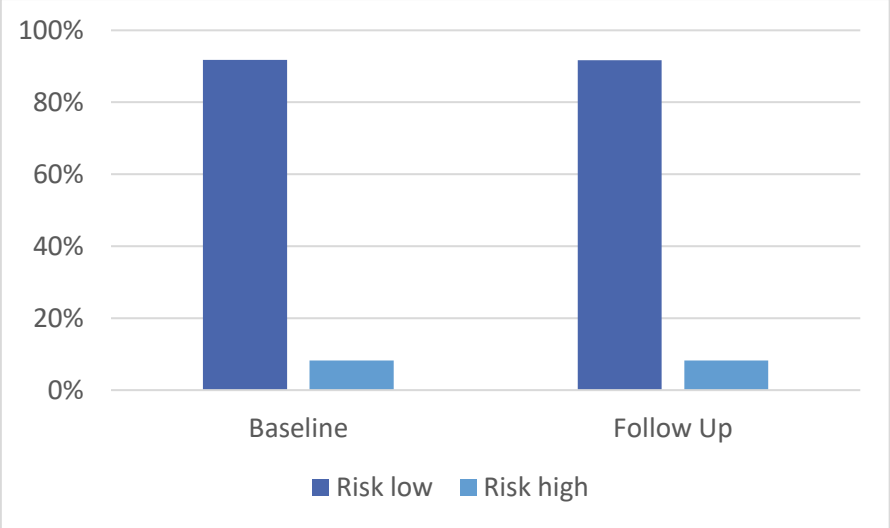

Figure 22 GAD-2 (anxiety risk) scores baseline compared to follow up site 3

4.3.8 PHYSICAL HEALTH

The health goals of participants are shown in Figure 23. Half the participants (49.3%) believed their health to be good, 7.4% believed their health to be excellent and 1.2% poor. Following the intervention respondents demonstrated improvements in health goals. A greater proportion of participants were motivated to maintain a healthy body weight BMI, improve their, improve their diet, nutrition fitness levels in order to stay health and activity for their family and lower their stress.

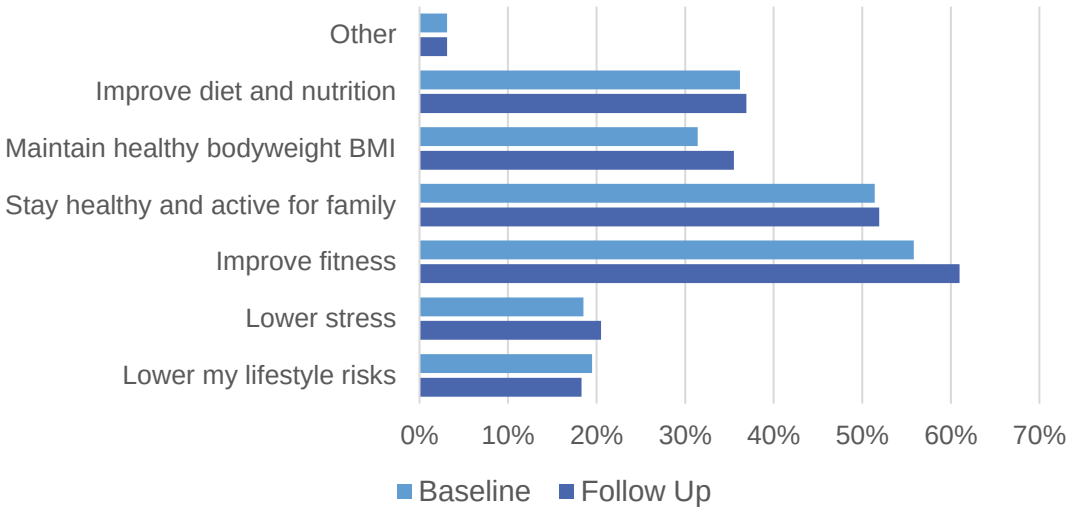

Figure 23 Health goals of participants baseline compared to follow up site 3

Most participants (89.3%) did not feel that they were limited by their health when doing moderate activities. However, 16.9% indicated they were limited by their health during heavier physical activities such as housework and climbing stairs. Similar to pre intervention rates, two thirds of participants (63.8%) reported that pain did not interfere at all with their normal work (inside and outside the home) during the past four weeks. However, 9% reported pain interfered moderately

with their normal work. This represents an increase of 3.9% or 18 participants, compared with pre intervention rates.

4.3.9 WORKING ENVIRONMENT

Post-intervention findings revealed that most respondents (76.9%) continued to report that they had no difficulties working their required number of hours, in the past four weeks. Just over one fifth (21%) struggled some of the time to concentrate on their work, which represents a decrease of 3.2%, compared to pre intervention rates. The follow up data demonstrated little change in the respondents reported capacity to work at the best of their ability, with 67.4% reporting difficulty none of the time and 4.3% all of the time.

In relation to team attitude and relationships, similar to pre-intervention rates most (70.5%) agreed they can trust their supervisor. Importantly, whereas 12.1% of participants either disagreed or strongly disagreed that they could trust their supervisor at baseline, this decreased to 7.9% at follow-up, indicating there was more trust in supervisors. Similar to pre-intervention rates, most of the respondents (70.5%) agreed that crew members work together to achieve the best outcomes possible and over half of respondents agreed (62.2%) that there was a 'team' attitude in their crew.

4.3.10 FATIGUE

Figure 24 reports daytime sleepiness (Epworth Sleepiness Scale) at both timepoints (baseline and follow-up). Between the two timepoints, there was little change between the categories. Majority of participants fell within the ranges which is considered 'normal daytime sleepiness' (90.5%). The remaining 9.5% of participants scored in levels of daytime sleepiness considered 'excessive'. The percentage of people with excessive daytime sleepiness varies widely between different groups, from about 10 to 40% or more.(39, 40) When asked how many hours of sleep participants got each day, at baseline the average was reported to be 6.4 hours. At follow-up, the average increased to 6.73 hours. This change represents an increase in 20 minutes additional sleep per day, which was statistically significant ($p<0.001$).

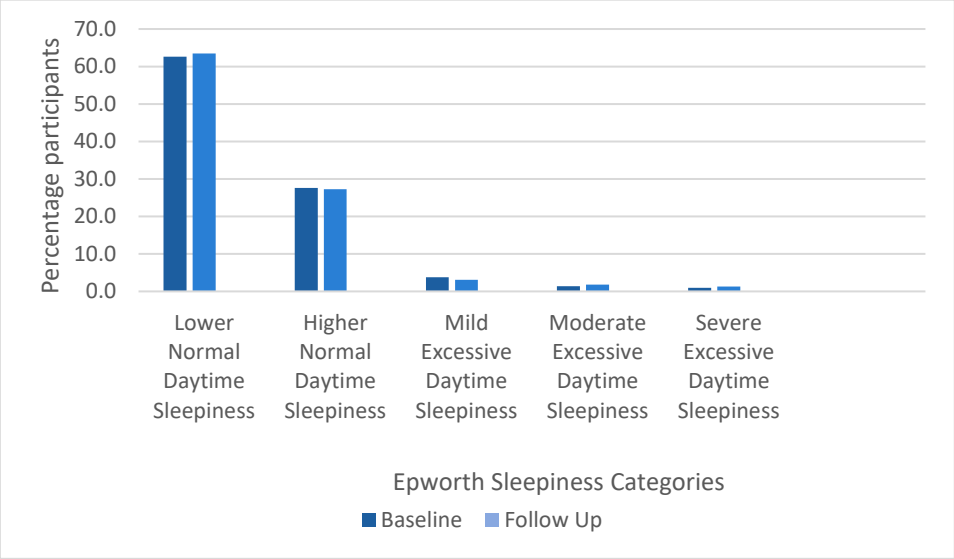

Figure 24 Daytime sleepiness (Epworth sleep scores) categories baseline compared to follow up site 3

4.4 INTERVIEWS AND FOCUS GROUPS

Interviews were conducted with seven participants from the working party at one mine site to gain an understanding of their experiences of RESHAPE. Interviews were conducted in place of proposed focus groups due to COVID-19 restrictions. All participants were members of the H&S committee and were from a range of employment areas, including management, production, operations, maintenance, and health and safety staff.

Semi structured interviews with questions designed to understand the process of implementing RESHAPE and the site intervention, including strategies used to engage employees, how the health and wellness interventions were facilitated and any perceived barriers, were completed. Four key themes emerged from the data. These were: (i) Communication (ii) Work factors; (iii); Health behaviours (iv); and Work supports.

4.4.1 COMMUNICATION

How RESHAPE was communicated to the mine site weighed on the program's success. Factors such as how RESHAPE was first introduced at the site, what communication strategies were used to engage and motivate employees, and how program outcomes were relayed to staff, were identified as key influencers. RESHAPE was branded as a health challenge with a focus on weight loss and exercise, with different health challenges provided. The site chose four health challenges facilitated by an external health provider. These included a 12-week weight loss challenge, a step challenge, a plank challenge, and a recipe challenge. The interview participants advised RESHAPE was introduced at the mines quarterly training days and was intentionally rolled out during the warmer months of the year. At the training days, employees were broken down into small groups and given the opportunity to ask questions about RESHAPE with the program stakeholders, including the program facilitators, health experts, researchers, and members of the working party.

Face to face sessions were considered a successful way to engage employees in the initiative:

> *"We had experts [the external health provider]; dieticians and physiotherapists, to present that process, which again helps, you know having the experts talking ... neutral parties having that discussion." (Participant 1)*

As part of the intervention, staff were given the opportunity to have a body composition scan with their results discussed one-on-one with a physiotherapist. During the twelve-week challenge, facilitated education sessions on diet and exercise were provided by experts. Employees used Strava, a GPS tracking app, to track their exercise habits, and a weight-loss leader board was used to drive participation. One participant noted that the mine manager partook in the 12-week challenge and suggested this helped to engage employees in the process:

> *"He [the mine manager] actually came in second place in the exercise challenge. I think that's very important. It just shows that even the top-level people are getting involved and see the value in it. That sends a powerful message." (Participant 2)*

Conversely, some participants felt there was a limited understanding of who participated in the challenge. This, along with the fact that not all members of the working party participated in the

health challenge, led some participants to suggest a greater emphasis on promotion and staff participation was needed:

> *"We need to drive it better from this. We need to participate a little more ourselves, to try and get people involved." (Participant 5)*

Across the interview data, quarterly training days and staff meetings were described as the main opportunity to promote and facilitate RESHAPE. In response to COVID-19, the frequency and duration of staff meetings were reduced, and the quarterly training days were cancelled. Several participants highlighted how this significantly impacted the site's capacity to promote RESHAPE and engage employees in the health challenges. It was also suggested this led to a limited understanding of what the program was about. Without access to the quarterly training days, it was identified that there was little opportunity to reach a captive audience. This, along with fewer and shorter team meetings, was mentioned as having had the largest impact on the program's sustainability.

Additional measures used to promote RESHAPE included using the company newsletter and PowerPoint slides at pre-start meetings. Participating staff received weekly emails and handouts regarding diet and exercise to keep them motivated. However, several participants indicated the impact of these measures on the continuity of the program was limited.

> *"I know there was a few that got involved with the challenge. I don't know how long it continued. Some got very interested early but then it started to fade during the 12 weeks." (Participant 4)*

> *"I think we could be more proactive about it ... There was no ongoing motivation. It was just this is what it is and then here is the end result … there was no ongoing promotion." (Participant 6)*

Program outcomes were communicated to the mine via a half an hour presentation to staff before shift. The external health provider also provided a report. The challenge winners were announced along with the 'crew on crew' results. There was a major prize winner who received two nights' holiday accommodation. However, the interview participants advised other organisational measures such as review of injury claims and absenteeism were not formally assessed, and several participants felt a great emphasis on program outcomes was needed.

> *"I think it's good to know results. Especially when you guys come out and present something to us at a training day. Because nothing gets said or it gets left … But I think there could be a lot more done ... The company could make more emphasis on it, I know it's not a business-related activity but if they want people engaged in it and actively do better well then promote it." (Participant 6)*

Most participants indicated they would be interested in sustaining RESHAPE at the mine. The HS committee was identified as a good resource to communicate health initiatives across the site. It was suggested future initiatives should include more interactive face to face sessions with health experts versus email communication. There was a strong sense that more frequent awareness on health topics is needed in the workplace. One participant explained:

> *"I think if you can keep on reminding people you know, regularly. It seems to go off the radar when you're not frequently told about it." (Participant 4)*

Identified ways to better sustain RESHAPE at the site included greater use of material onsite, including displays in the crib huts, and regular PowerPoint slides during pre-start meetings:

> *"Maybe if you can have a few more flyers and pamphlets to have it more in your face … so it gets more cemented in people's minds … bigger, glossier, colourful, eye-catching posters." (Participant 3)*

All participants were unanimous that implementing RESHAPE requires a degree of employer facilitation. One participant felt the best approach would be to have a dedicated staff member who can invest considerable time into the program:

> *"You really need to have someone you can dedicate time to it on site, so it's not just a program for three months, but something that is continuing every day, every week, every month, every year. But to do that it would cost a lot of money to drive that and it takes up a lot of time on site." (Participant 1)*

4.4.2 WORK FACTORS

Several interview participants discussed characteristics of work, including shift length, rosters, work travel commute, job role and access to healthy food options as affecting both their ability and willingness to engage in RESHAPE:

> *"I don't like the roster here. Even though we come off night shift on Monday morning … half of Monday is gone because you are resting up. You only have Tuesday to do normal household things … like mow the lawns and then we're back in on the Wednesday. I don't think that's enough time off. You work hard and do long hours and do the things you enjoy and then you think 'I forgot to do exercise again'. My exercise was to mow the lawn … but that's not enough … I know I need to be doing a lot more." (Participant 3)*

The sedentary nature of some job roles was also raised as an issue. As were more active roles, where staff are exposed to prolonged walking with limited breaks or the opportunity to stretch:

> *"We work a four-day week and its 6:00am until say 5:00pm. So, by the time you've done an 11-hour shift; and like I said, on the shots some days we do a lot of walking and that, and it is a bit hard to get motivated after that to actually to go to the gym." (Participant 4)*

Additional work factors, such as differences in the attitudes of inter-departmental groups, peer on peer relations, enterprise agreement (EA) negotiations and recruitment processes, were also identified as influencing employee engagement. Group mentality was seen as both a positive and negative influence:

> *"If someone who is seen as a bit of a leader in that group signs up, then everyone else tends to follow." (Participant 2)*

> *"Have a touch football challenge or a golf challenge. Even if it was just a cross country hike and something like that, to get the competition going. They do get pretty competitive; if its crew against crew." (Participant 7)*

However, getting crew members together to exercise outside of work was considered a challenge for employees:

> *"The logistics of it today is very hard because of where people live … they are all spread out … the only time they are really together is at work." (Participant 7)*

Maintaining a regular meal pattern alongside shift changes (e.g., night shift) also presented barriers to healthy eating.

> *"People are time poor. Especially after doing 12- or 12.5-hour shifts. You know the easiest thing to do is call in McDonalds or Kentucky Fried instead of going home and cooking something healthy." (Participant 4)*

It was noted vending machines at work provided some meal options. However, that these were mostly unhealthy options.

4.4.3 HEALTH BEHAVIOURS

A common thread in the interviews was recognising that individual choice and motivation can impact the success of programs such as RESHAPE.

Several participants acknowledged staff need to prioritise their own health. The male-dominated mining-environment was seen as a limiting factor to healthy behaviour, along with an entrenched drinking culture. Notably, it was explained that the site conducted an initial health surveillance review, prior to implementing RESHAPE that noted alcohol as a key issue.

> *"I think there's definitely a cultural problem as far as alcohol. I seem to have noticed it more recently … blokes take great enjoyment out of boasting how many beers they drank … I think it's mainly because of COVID not being able to go to the pub … you know, how many cartons did you go through this week or what you getting next week or how much did you drink last night? It's amazing how enthusiastically they talk about it … there's such a thing as getting a pat on the back for drinking two cartons of beer a week." (Participant 4)*

> *"We work in male dominated industry. It[alcohol] is a sensitive topic. We do regular drug and alcohol education sessions and bring people in ... At the end of the day, it's also pretty much seen as an individual, personal choice." (Participant 2)*

Group mentality was considered a driver of both good and bad health behaviours. It was advised that certain crews typically better engage in health programs and that consideration for subgroups of employees is needed when rolling out initiatives.

> *"Even just the inter-departmental groups you know, between the maintenance group and production group. We always find that the maintenance employees are always willing and a lot more open and less cynical. But the production crew … they tend to be the ones that drag the chain a bit more." (Participant 2)*

> *"Look I imagine there'd be a bit of 'head in the fan'; those who don't want to know if they are unhealthy, so they sit there with their head in the fan and pretend it's not happening. That sort of work group and demographics of people." (Participant 1)*

The impact of COVID-19 on health behaviours was discussed. Participants highlighted how the closure of gyms and other sporting venues, along with the introduction of social distancing measures, limited the choices available to staff and encouraged sedentary lifestyles. However, some saw this as an opportunity:

> *"I did hear that bike sales have gone through the roof because … because it was so restricted in other ways. We can probably enjoy our backyard a bit which probably isn't a bad thing in that regard." (Participant 3).*

4.4.4 WORK SUPPORTS

To support programs like RESHAPE, several participants recommended changes be made to the mines existing health incentives and subsidies. Existing supports mentioned included a gym membership, a skin check program, and a quit smoking program.

Some criticized the existing gym membership as it applies to only a small selection of gyms. It was felt this creates a barrier as many staff would need to travel to access the participating gyms. It was also mentioned that the gym membership does not include access to the gym's exercises classes, again limiting its appeal.

> *"At the end of the day, if we are going to the gym and you are reimbursing us, does it really matter what gym we are going to? Does it matter whether we are going there to lift weights or do classes? And I think going to classes would be a lot more beneficial for some people here … Because sitting in a truck for 12 hours a day, if you're not flexible or in some sort of shape, you aren't doing anyone any favours … particularly the older guys on the floor ... That's where I think these classes would be really beneficial." (Participant 5).*

Participants suggested extending the gym membership to include all forms of recreation to enable more staff to be more active:

> *"I know a lot of people in our group play golf and if they're going to subsidise people to go to the gym why not subsidise people to sign up and actively become a golf member … Or people who are a little bit older to do their lawn bowls. There's plenty of programs that people could do, which people could do to get active on the weekend with … In regard to actually staying healthy, the health and fitness side of it, I think they need to broaden their range with what the companies is willing to subsidise it for." (Participant 6).*

A further suggestion was to offer staff a family gym pass, recognising the motivational factor of exercising with others.

More proactive and preventative approach to work supports was suggested. Participants noted the site responds appropriately once an injury occurs, however that little is done beforehand to prevent. One suggestion was to include a return to stretching onsite:

> *"We have a lot of soft tissue injuries. … but we have no preventative measures. We used to stretch. We don't anymore because it takes time away from production." (Participant 6)*

> *"It would probably be beneficial if there was a five-minute routine especially for the operators, even if it was just regular stretching that they could do, to get mobility in their lower back, they do freeze up a bit sitting the vehicles for so long." (Participant 7)*

One participant noted the smoking program was cancelled once the 'no smoking policy' was introduced onsite. It was noted staff eager to quit are now directed to a helpline; however, that this was not enough.

> *"If you started to approach smoking, I can guarantee there would be a lot of people willing to participate … I've seen enough people here that have tried to quit or want to quit, that are probably a little bit lost at this moment in time." (Participant 5)*

Other suggestions included access to healthy meals at work and more education seminars around diet, exercise, and the risks of excessive alcohol consumption.

> *"People are time poor… an easier option of healthy meals, something you get at work on your way out … or someone that could just explain how easy it is to have a meal which might only take 15 minutes, when you get home, but one that's healthy for you." (Participant 4)*

> *"If you had more information or videos on how alcohol can affect your family, whether it be domestic violence or you know, neglecting your kids or family, you might get through to some people definitely." (Participant 4)*

4.5 POLICY

Policy changes are increasingly recognized as essential components of worksite health promotion,(43) and are considered more sustainable than individual-level behaviour interventions, (44) such as providing a healthcare plan or service to staff and allowing for flexible working hours. Acknowledging the impact policy changes can have on the culture and environment of a workplace helps to effect positive behaviour change and support reducing obesity in the workplace.
As part of the study, and in line with Step-3 of the RESHAPE framework, the researchers offered each of the mine sites support in completing an initial policy review. Sites 2 and 3 participated in this process. Findings from the policy reviews are summarised below.

<u>Existing Workplace Policies:</u>
Existing workplace policies that were identified included policies relating to: Work health and safety; Work/life balance; Return to work; Smoke free workplace; Bullying and conflict resolution; Recruitment; Grievance handling; Code of conduct and Support systems (e.g., Employee Assistant Programs).

<u>Accessibly and infrastructure:</u>
There were a range of accessibility and infrastructure provided to employees to assist with health and wellness and these included: Physical activity classes, workshops, or teams at or near the workplace e.g. team challenges, subsidised fitness membership, walking groups; Bicycle racks and

lockers; clean kitchen facilities available for meal preparation and eating areas; Drinking water freely available onsite and clean, accessible shower or change facilities; Healthy eating options e.g., healthy food options available for purchase in canteen or vending machines.

Leadership, communication, and engagement:
Communication and engagement were emphasised with a range of strategies incorporated into the work environment including a commitment to health and wellbeing being evidenced in business plans, company values and strategic documents and management participation in health and wellbeing activities. In addition, champions or ambassadors serve as role models or spokespeople for health and wellness activities with strategies available to upskill key workers on workplace health and wellness e.g., through training (E-learning packages).
Financial resources (in addition to staff time) are dedicated to workplace health and wellness, specifically the management of overweight and obesity which was noted as being outlined in their current budget.
Employees have an opportunity to raise health and wellness issues via the H&S Committee and or Health Team and messages promoting good health are displayed on noticeboards around the worksite with health-related information is regularly communicated to all workers via meetings and on noticeboards.

Culture:
It was identified that workplace culture supports employee participation in health and wellness programs, with the workplace determining the health and wellness needs and interests of workers through consultation with employees usually via the H&S committee.
Qualified health professionals are used when running health related programs/events/training or information sessions – such as physiotherapists and medical professionals, with health programs and activities being reviewed annually. Additionally, health and wellness program activities were noted to be offered to all workers i.e., contractors and employees.

Health assessment:
A variety of health assessments were identified as part of the policy review including those relating to hazardous and/or ergonomic workspace assessments. Additionally personal risk factors for overweight and obesity were regularly assessed via Order 43 Periodic medicals and as part of RTW programs via Health Management Plans. It was noted that active monitoring and support of people experiencing obesity to stay at work or return to work occurred and that preventative health screening is available to employees with referral to external providers to assist with health needs.

Research and development:
Data was routinely collected on absenteeism/leave, and utilisation of EAP or other health professional services. In addition, employee survey data via a culture survey and accident, workplace injury and incident reports provide data for the workplace to review and evaluate progress on aspects of health and wellness.

Existing and ongoing health initiatives:
At one site, it was outlined that dietician, podiatrist and physio services are available to all staff members. Initially employees have three sessions available (with each service). They are assessed

and following the third appointment a report is given to employer. If there has been evidence of success and change, they are able to access additional visits at no cost, with an emphasis on prevention and early intervention. It was noted there is a particularly high uptake of the physiotherapy service. It was also recognised that occupational health services available to staff were not limited to the mine site, with external services available through Coal Services.

5 DISCUSSION

5.1 BASELINE FINDINGS

A review of baseline survey results showed that nearly four out of five surveyed employees were either overweight or obese (41% and 39% respectively). Comparably, to NSW mining industry health data from 2014, this is a rise of over 5% in terms of cumulative population exceeding a healthy BMI. Whilst the problem of overweight and obesity is more pronounced in this industry,(24) the progressive increase in BMI also mirrors that of national figures. From the period of 2014–15 to 2017–18, within Australia, overweight and obesity increased from 63.4% to 67%, which was mainly driven by a rise of adults classified as obese (27.9% to 31.3% respectively).(6) This emphasises that overweight and obesity continues to be an issue of concern for employees within the coal industry.

Alcohol consumption at baseline was high across all three sites, in terms of both quantity (standard drinks) and frequency (drinking occasions) of alcohol per week. Thirty three percent of respondents reported drinking 2-3 times per week, with 31% reporting 3-4 standard drinks consumed per drinking session. According to the National Health and Medical Research Council, to reduce the risk of harm from alcohol, adult Australians should drink no more than 4 standard drinks in one session and no more than 10 standard drinks per week.(42)

Furthermore, binge drinking tendencies were widely reported in this study. Binge drinking as defined by the AUDIT tool is a drinking episode whereby six or more standard drinks are consumed in a single occasion.(45) This is a concerning finding when considering employers have a zero tolerance to alcohol and drugs in the workplace with mandatory pre-shift and random testing,(46) which prevents miners working under the influence of alcohol. In spite of this, this policy does not mitigate the high levels of alcohol use outside of these shift times as has also been found in other studies in mining.(47, 48) The negative health effects of harmful alcohol use cannot be underestimated and highlight the need to include health promotion and health awareness of alcohol use in this industry. In addition, alcohol consumption is not only a work, health, and safety issue, as excessive alcohol consumption has been shown to contribute to weight gain and obesity.(49)

The findings from our baseline survey showed that intake of fruit and vegetables was poor with only 42.2% of participants meeting the dietary guidelines of two serves of fruit compared to 51.4% of adult Australians. Furthermore, only 3.5% were meeting the dietary guidelines of five serves of vegetables per day compared to 9% of the adult Australian population. In addition, discretionary potato products such as hot chips had a negative effect with BMI, indicating that greater consumption levels (more than 7 times per week) are associated with increasing BMI (b= -6.11, p=0.05).

Physical activity levels at baseline showed that only 50% of participants were meeting the recommended Australian guidelines of 300 minutes of moderate and or vigorous exercise (or a combination of both) per week.(50)

The combination of high alcohol consumption, low intake of fruit and vegetables and low physical activity levels all influence the weight of individuals.(51) This supports the need to implement interventions and programs that aim to address overweight and obesity within the industry as part of a broader health, safety and wellness approach.

5.2 RESHAPE

Implementation of the RESHAPE 8-step framework aimed to provide a platform for wellness in the workplace. Through the provision of a systematic framework, the prevention and management of obesity could be achieved by designing, implementing, and evaluating health initiatives in a consistent manner. Each of the eight-steps is actioned with key activities and includes planning for 1 year, 3 year and 5 years to drive future thinking and sustainability. This overarching framework is designed to be championed by a working party and aims to create a sense of purpose and belonging to the workplace. In addition, individuals are spurred to develop self-ownership to achieve a healthy weight with ongoing action and continuous improvement. Ownership is developed through facilitation of initiatives that target both organisational factors and individual factors.

The framework was implemented at sites engaged in this research, however there were some associated challenges that unfortunately were exacerbated by the COVID-19 global pandemic. The framework was a new process for sites, not part of business as usual and as such, sites required much on-the-ground support to instigate movement through the various steps, and to maintain momentum. Interestingly, this supports a recommendation from the interviews that the site needed to work with a support organisation who could facilitate the process and provide continuing advice, support, and guidance throughout the RESHAPE implementation.

Fundamentally, the RESHAPE process conceptualises that the working party exists as a cohesive, organised group of individuals, who are assembled, and work together regularly throughout duration of the RESHAPE process. Working as a team to champion and reduce the necessity of one person being predominantly responsible was identified in the qualitative findings. In contrast, as researchers it was noted how important it is to have one contact at the workplace as ‘champion’ to facilitate, promote and execute workplace wellness initiatives. The loss of a site during this project, highlighted the essential need for managerial support, with motivation and engagement needing to be initiated and maintained both in management, those responsible for implementation and in workers.(52)

Other suggestions on improvements for the RESHAPE process included: Allowing sufficient time for the working party to develop initiatives and discuss options; Support the working party to develop recruitment materials; Additional information on the ‘how to’ of communications to engage staff in the process including a step-by-step guide; A more structured manual to be easier to follow with increased use of checklists to assist the working party to manage and identify completion of each step.

Communication is key to the successful implementation of a framework such as RESHAPE and with implementation of any health and wellness initiatives. Workplace wellness programs should also use effective communication strategies appropriate to the specific audience, to engage workers from diverse work groups and backgrounds.(53)

The COVID-19 pandemic has also highlighted the need to consider the modality of interventions to include technology and multimodal interventions which can be delivered and monitored remotely with a 'long-arm (remote) approach'. Furthermore, it is imperative all workplace wellness initiatives are designed with flexibility in response to government legislated and individual workplace COVID-19 safety procedures and policies. However, it is noted in this research that face-to-face contact with the sites involved was requested and most appropriate to encourage engagement with the framework and with the development of appropriate interventions. There is evidence to suggest that face-to-face health promotion and wellness initiatives have better outcomes than initiatives in the online environment.(54) However, the COVID-19 pandemic has demonstrated the ability for many individuals to utilise online resources in a variety of situations including with health services and therefore is something to consider into the future. Innovative online interventions are needed that are tailored to the specific population to enable impact with this population without the need for face-to-face site interventions.

Unfortunately, this research did not provide outcomes related to sustainability and longevity of using the RESHAPE framework. The COVID-19 pandemic impacted the follow through in relation to the 1-, 3- and 5-year plans however it is noted that for success, a sustained focus on health and wellness is essential. In order to review program effectiveness, ensure interventions are both sustainable, and reflect the diversity of the population as well as changing social, cultural and workplace factors, formal and ongoing evaluation is required. It is vital to embed health and wellness into usual organisational policy and procedures at both the macro-organisational level but also at the meso and micro levels where implementation at the coal face takes place. It is noted from the policy review that this needs to be explicit rather than implied and at the forefront of action plans to ensure interventions at the workplace are appropriately tailored and implemented for the specific population.(55, 56)

5.3 INTERVENTIONS

Workplace wellness interventions can take different formats and have different focuses. The RESHAPE framework encourages each workplace to consider the specific focus for an intervention. In relation to weight management the focus was either on diet and/or physical activity. Site 3 took a whole of site approach using a commercially available 12-week multicomponent wellness program, with an emphasis on nutrition and physical activity to drive changes to obesity outcomes, tailored for the male dominated population, and using health behaviour change techniques including goal setting, challenges, and knowledge and education components.(57)

The results indicate the potential that workplace health programs in the mining industry can have in improving employee's modifiable health behaviours that can contribute to chronic disease. In summary these included increased levels of physical activity; increased daily serves of vegetables; alongside non-significant increases in frequency of fast food, takeaway, discretionary food, and alcohol consumption, as well as lower fruit consumption.

This study found with regards to physical activity outcomes, people at follow-up compared to baseline had 111% (p=0.057) higher odds of meeting the exercise guideline, and 81% lower odds of doing no moderate physical exercise (OR = 0.09, p < 0.001). This is a promising finding when we consider that physical inactivity is linked with non-communicable disease and pre-mature mortality.(58) In addition, 1 in 4 adults do not meet the physical activity guidelines with a rising prevalence of physical inactivity globally.(59) Other studies in male dominated environments have also seen success with increasing physical activity levels including the Preventing Obesity Without Eating like a Rabbit (POWER) study by Morgan, Collins (60) and the PowerPlay step up challenge in Canada.(61)

The intensity of the intervention in this study; a 12-week program, may have had an impact on these results. This program included active interdepartmental challenges to promote regular exercise thereby tailoring the intervention to the specific population and included the use of a body scanner to provide specific individual feedback to the worker. This may have also encouraged engagement and interest in the study and assisted in gaining these positive physical activity results.

Fruit and vegetable intake is also linked to overweight and obesity with consumption in the general Australian population low.(62) The results of this study demonstrate that following the intervention, participants consumed more vegetables per day, which is a positive finding, however, the reported consumption of takeaways and discretionary foods increased, and less fruit was consumed. With both fruit and vegetable consumption considerably below national recommendations, these results highlight an area for potential future health and wellness initiatives. The relationship between BMI and consumption of sugar sweetened beverages and fast food is well understood and our findings matched that of earlier studies.(63, 64)

It is noted that individuals can be more resistant to dietary changes compared to physical activity,(56) especially amongst male populations who tend to distance themselves from the feminized realm of dieting.(65) The need to tailor interventions and engage with the specific population is an important factor to ensure appropriate, realistic and relevant workplace wellness interventions are deployed.(36) Workplace characteristics such as shiftwork, job role and access to food at the workplace also need consideration when implementing workplace wellness programs to ensure these are appropriate and tailored for the specific population as has been found in similar studies.(60, 66)

Interestingly, similar to the general Australian population, a significant number of the participants in this study do not identify with being overweight.(67) Inaccurate perceptions around weight status may be a barrier to engaging participants in behaviours to reduce their weight. This suggests the need for further interventions,(68) and is to be considered when implementing workplace wellness programs. Workplace health programs have however, shown effectiveness in statistically reducing overall body weight. In a recent systematic review assessing the effectiveness of workplace wellness programs for diet, overweight and cardiometabolic health, Peñalvo, Sagastume (69) found workplace wellness programs significantly reduced BMI, bodyweight and waist circumference. It should be noted that the differences found in this study of -0.88kg body weight (p=0.32) draws attention to the potential of these programs in improving health outcomes.(69)

Within our sample, a significant proportion of participants at follow up (66.7%) had tried to quit smoking in the past year and the interview data suggested there was a need for improved employer supports around smoking cessation. These results show smoking remains an issue for this population. As a framework RESHAPE has been designed to be used for any modifiable health risk factor, including smoking, and so serves as a potential resource for future initiatives that target the reduction of smoking.

Alcohol was an area of concern with our findings demonstrating that respondents drink heavily and regularly as has previously been seen in other mining populations.(47, 48) Although the results around alcohol consumption demonstrated some improvements, they remain above the recommended Australian guidelines, (42) and need to be considered in future workplace wellness interventions.

It cannot be ignored that the COVID-19 has had significant influence on a range of weight-related behaviours, including diet and exercise, and there is emerging evidence linking COVID-19 to population level weight gain.(15) Social lockdown measures brought in during the course of this research, are likely to have wide ranging effects that made weight gain protective behaviours more difficult for the study participants. Despite this, our findings support the notion that the workplace may be effective in engaging populations at risk for obesity and related illness.

From a health and safety perspective, modest weight reductions can have substantial safety implications. Wilson (70) investigated safety incident risk of underground and opencut miners over a 5-year period and found that for every one unit increase BMI over a reference 25 (upper threshold of healthy), there was an 8% ($p < 0.05$) increase in incident risk. The link between BMI and safety risks are not in isolation, with fatigue also being linked to BMI in a sample of fly-in-fly-out mining workers, with every 1 unit increase in BMI, the odds of risk for obstructive sleep apnoea increased by 19% ($p < 0.05$).(71) Obstructive sleep apnoea was one of the most prevalent sleep disorders in this population (31%) and is significant contributor to fatigue.(71)

In heavy based industries, such as mining, whereby occupational incident risks can be critical, workplace health programs should be viewed through a holistic lens as the benefits typically extend beyond the individual behaviours they are targeting. This lends itself to workplace health programs doubling down as a safety incident risk management measure. Future initiatives targeting diet should look to educate workers on fruit and vegetable guidelines; quantifying serving sizes and the dangers of fast foods, takeaway, discretionary foods, and alcohol use. Consistent with similar studies, (27) our results show that future interventions should also address workplace policies, so embedding workplace wellness initiatives within business as usual, as well as environmental and social norms that affect health behaviour decisions.

5.4 IMPLICATIONS FOR INDUSTRY

Within Australian workplaces, obesity rates are rising, and this has significant consequences for both employers and employees. Improving the diet and physical activity of employees provides benefits including improved health and wellbeing and lowered rates of overweight and obesity, which can lead to greater workplace safety, improved productivity, reductions in absenteeism and presentism, higher retention of workers and improved employee overall quality of life.(72-74)

Modifiable workplace and employment characteristics can guide interventions to reduce the risk of overweight and obesity in the workplace. However, for success, such interventions need to be part of an organisational approach to health and safety through a process such as the RESHAPE framework. It is imperative that employees are involved in this process to ensure buy-in, interest and engagement and this results from the building of a culture that values health. Involving employees in decisions about health initiatives is critical to build staff trust which requires transparent communications about programs, the purpose and rationale for programs, and the tailoring of interventions appropriately for the specific population.(33) Supporting the working party to implement and progress through the steps of the RESHAPE framework is important for all to have input into appropriate workplace wellness initiatives and to be able to champion and encourage engagement at the 'coal face'.

Leadership support at all levels is essential, with leaders supporting initiatives at the workplace in addition to practicing healthy behaviours personally. This provides support to both the wellness initiative and to encourage employee involvement. Communicating a consistent health message, using a variety of mediums (email, posters, PowerPoints, presentations) with regular reminders to reinforce engagement in the intervention was identified as essential, and assists in showing the importance and value placed upon these interventions by the leadership teams.

There is a need for workplace wellness to coexist alongside standard business practices. This ultimately adds value, support, commitment, and sustainability to assisting workers improve their individual health. This has flow on effects in improving workplace safety through decreasing safety incident risks which have been linked to poor individual health outcomes.

6 STRENGTHS AND LIMITATIONS

This study is the first to examine the implementation of the workplace wellness framework RESHAPE, as a means to reduce obesity and improve healthy lifestyles in the NSW coal mining population. We sought expression of interest from mine sites with three sites from the Hunter and Central West regions of NSW, Australia becoming involved in the study. Inclusion of both underground and open cut enabled us to capture different workplace characteristics. Whilst it should be noted that there may be some volunteer bias, at the site and the individual level, with those most interested in the topic of the study more likely to respond, there was representation from both open cut and underground mines. In addition, similar to the industry as a whole, 90% of participants in our study were male and most within the 25-44year age range (59%). This suggests results can be generalisable to the situation in coal mines across NSW more broadly and may have similarities to other male-dominated occupations within NSW and Australia.

It is acknowledged that the survey items examining self-reported changes in diet and exercise measured perceived rather than actual change and that respondent biases can lead to under-reporting.(75) Height and weight were also self-reported and provided the measurement outcomes to calculate BMI. Notably men and women typically slightly over-report height and under-report weight [64]. Moreover, the dietary measures included do not provide an overall quantification of energy and nutrient intake, but rather a 'snapshot' of some aspects of eating behaviour. Questions

related to workload and stress, alcohol intake and mental health are potentially sensitive issues amongst study participants which may impact upon the responses provided. It should be noted that one site excluded questions on the exercise habits of employees rather their focus and intervention centred on diet, therefore caution is warranted when interpreting these results. This industry led change is a limitation of research however it should be noted meeting the needs of the industry partner is essential when conducting research in this setting and results need to be interpreted with caution.

It is recognised that interview data was collected from key informants who agreed and could be contacted for interview with a potential bias present on those with a specific interest in the research being involved. Despite using a convenience sample, those who elected to participate in the interviews were able to provide helpful insights on this topic. Future intervention planning would need to be preceded by additional input from a broader participant base.

The COVID-19 pandemic caused considerable delays to this study, interrupting data collection processes, restricting researchers' access to the sites, and limitations with no training days or additional activities able to occur. One site completed the intervention and follow up data collection, however, unfortunately due to constraints imposed by the COVID pandemic, one site withdrew from the research prior to the intervention, and follow up data collection has been unable to be completed at another site. Furthermore, in the context of usual work demands along with the rising COVID-19 pandemic, mine employees leading the project found themselves with competing demands and time pressures. These parameters impact on the research progress and subsequently the reported outcomes.

These results provide useful information to inform future directions for the coal industry in managing overweight and obesity.

7 CONCLUSION

In Australia, the rates of overweight and obesity have increased alarmingly in recent decades and across all age groups. Within the mining community, the rates of overweight and obesity are higher than the adult Australian population. A comprehensive approach is urgently required to achieve behaviour change, improve lifestyle and dietary habits, and the burden of disease in this population.

The solution is both complex and multidimensional. From a sociological perspective, we know that the environment in which people live, and work are strong influences on obesity and that exposure to workplace wellness programs can yield positive health behaviours around workers' diet and exercise habits. However, implementing health promoting policies and practices, facilitating workplace wellness programs, and creating a healthy work environment requires careful consideration and is reliant on access to resources that are sustained over long periods of time. It is also acknowledged that NSW mining operations will require a different approach in every operation; as the needs of worksites, available resources, and the capacities of individual mining operations to implement wellness initiatives varies.

Our results demonstrate how mitigating factors such as workplace characterises, individual diet and exercise habits and other lifestyle behaviours, provide employers the opportunity to address

overweight and obesity, through workplace wellness programs targeting behaviour modification. By modifying the physical and social work environment through participatory and integrated health and safety approaches, such as workplace wellness interventions, mine sites can help to improve the eating and physical activity behaviours of their staff and benefit from improved workplace health and safety, retention of the workforce, higher productivity and reductions in absenteeism and presentism. The RESHAPE framework is an effective tool in this process. Through continued assessment, prioritising, planning, evaluating, and refining, RESHAPE embeds health into organisational policy and builds a culture of workplace wellness and health built on an individual organisation's policies, procedures and infrastructure and leadership style. This enables a tailored approach to overweight and obesity, which is sustainable and driven by both managerial support and worker involvement in both the design and execution. The findings of this study provide opportunities and guidance for the implementation of workplace wellness interventions in NSW mining.

Despite this, our data demonstrated statistically significant findings on the prevalence of overweight and obesity in NSW coal mines, the modifiable lifestyle and workplace factors which influence diet and exercise habits, potential trends and factors associated with weight-related behaviours in this population group and the strengths and limitations of health and wellness initiatives targeting the issue.

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