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Accounting for employee health: The productivity cost of leading health risks

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Abstract

Background: "Workplace health promotion and protection" broadly refers to an integrated approach to workplace health and safety initiatives. There are substantial benefits to adopting such an approach, including the potential for: improvements to individual employees' health and well-being; increased productivity; and reduced safety risks and expenses. Yet many employers remain reluctant to shift from traditional safety initiatives and spending. This paper aims to demonstrate the value of investing in an integrated health promotion and protection approach by calculating the productivity costs associated with 11 modifiable health risks and 14 chronic conditions in an Australian mining company.

Method: Eight hundred and ninety-seven employees participated in a self-report health survey aimed at investigating employee health behaviours, health conditions and productivity.

Results: Overall, modifiable health risks and chronic health conditions were calculated to contribute to an estimated $22.15 million (AUD) and $7.95 million (AUD) in lost productivity per 1000 employees per annum, respectively. Although employee stress was identified as the third highest prevalence health risk across the employee sample (at 42%), it accounted for the highest financial burden.

Conclusion: Employee health plays a vital role in the profitability, productivity, and safety outcomes of an organisation. For modifiable health risks and chronic conditions, ailments that affected cognition resulted in the highest financial burden (ie, stress and migraine headaches).

So what? These findings make a strong financial and business case for the integration of preventative health and safety initiatives, with particular emphasis on modifiable health risk behaviours.

KEYWORDS
behaviour change, evaluation methods, evidence based practice, health behaviours, workplaces

1 | INTRODUCTION

Increasingly, employers and workplace health and safety (WH&S) professionals are shifting their focus away from the traditional silo of safety that focuses on hazard and risk reduction, and instead moving towards an integrated approach referred to as "employee health and protection."[1–6] Driving this shift is a growing body of research that suggests management of employee health positively impacts

productivity and safety behaviours.[1,3–11] Such an integrated approach makes sense for two reasons. Firstly, individual health behaviours and safety outcomes share several synergistic risk factors (eg, physical inactivity and stress-related disease; or tobacco smoking and silicosis).[5,12,13] Therefore, employers can simultaneously enhance the overall well-being of their workforce and improve safety outcomes. Secondly, an integrated approach to employee health and well-being can result in reduced costs to the employer, including those associated with absenteeism; presenteeism (or reduced productivity at work); insurance and disability claims; and elimination of redundant roles and services.[1,5,7,8,10,11,14–16]

Despite the obvious benefits of the integrated approach, many employers remain reluctant to influence individual employee health behaviours citing health, and in particular health behaviours, as the responsibility of the individual employee.[15,17] It may be argued that such a view is myopic and that the case for corporate social responsibility regarding public health has been well documented.[13,15] Integrative approaches aim to amalgamate the employees' desire for well-being with the organisation's goals of profitability, productivity, and safety.[4] However, in order to increase the uptake of integrated health and protection approaches, there is a need to demonstrate value to employers in a language that they understand: dollars!

There exists a significant relationship between employee health status and health-related costs to the employer.[2,13,16,18–25] The organisational cost associated with employees' in poor health, and those with health risk behaviours, include high workers' compensation and safety incident related expenses; elevated absenteeism and employee turnover; decreased productivity at work (referred to as presenteeism); and reduced morale.[2,7,8,16]

A study by Goetzel et al[26] investigated the relationship between 10 health risk factors and retrospective medical claims for more than 46 000 employees. The health risk factors included obesity, high cholesterol, high blood pressure, stress, depression, smoking, poor nutrition, excessive alcohol consumption, physical inactivity and high blood glucose. The results showed that these health risk factors accounted for approximately 25% of the total health care expenditure for employers.

Burton et al[27] quantified the relationship between employee health and work productivity, demonstrating that in a sample of 28 375 workers, those at high risk of a modifiable health condition (such as physical inactivity, poor nutrition, alcohol use and tobacco use) were 12.2% less productive than their counterparts, with each supplementary health risk factor further reducing work productivity by an additional 2.4%.

Conversely, investment in employee health is fruitful and has been associated with a significant reduction in employee health-related expenses and a positive return on investment (ROI).[18,28–30] A systematic review of 51 workplace health promotion studies (covering 61 interventions) by Baxter, Sanderson, Venn, Blizzard, and Palmer[31] found an overall mean ROI for employers of 138% (ie, employer saved $1.38 for every $1.00 spent on the health promotion program). However, the authors observed that the quality of the study greatly influenced observed ROI. It should be noted that these reviews represent studies from a variety of countries that operate under different health care systems. For example, in the United States of America, the ROI figures are likely to be larger as the employer typically carries a greater burden of health care costs when compared to Australia.

Accordingly, a healthy workforce should be viewed as a desirable asset to a company and the implementation of evidence-based employee health initiatives can provide a sound ROI for employers.[2,4,11,32,33] However, there is a lack of consensus among employers and WH&S professionals regarding the most effective workplace health initiative to achieve synthesis between the goals of maximising well-being with organisational profitability, productivity and safety.[4,15,18] Arguably, the best approach should be determined on an organisation specific basis, with due attention to the unique characteristics of the operational environment, job types and employee characteristics.

One approach is to address the productivity costs of health risk factors that contribute to impaired job performance and reduced safety outcomes within an organisation.[13,15,32–34] As health risk factors represent the genetic, environmental and behavioural conditions associated with poor health,[15] each health risk factor may be classified as either "modifiable" or "chronic" based on the extent to which an individual can alter the status of the risk. For example, weight is considered a modifiable health risk as changes in diet and exercise can alter one's body mass index (BMI) rating, whereas cancer is classified as a chronic health condition as it cannot be treated through environmental or behavioural change typically available to an individual. The prevalence of illnesses associated with modifiable health risks and poor health behaviours continues to rise. In Australia, where this study was conducted, modifiable health risk factors account for a significant portion of the burden of disease.[35]

In selling the concept of an integrated workplace health protection and promotion approach to employers, WH&S professionals have historically relied on analyses of the association between sick days and health care claims data.[16,33] But such analyses fail to include modifiable health risks that would enable them to develop preventative health strategies that would lead to mutual beneficial outcomes; including greater employee well-being, decreased safety incidents and increases in productivity and profitability.[33,36] To illustrate this process, this paper outlines the methodology and outcomes of calculating the productivity cost associated with 11 modifiable health risks and 14 chronic conditions in a large mining company operating in Australia. Compared to the Australian workforce, the mining industry has a considerably higher rate of fatalities from work-related injuries and a slightly higher rate of serious workers compensation claims requiring 7 or more days off work due to work-related disease or injury.[37] The mining industry has also been identified as having a high proportion of chronic health conditions as compared to other industries.[38] These elevated rates make the mining industry an appropriate setting for researching the application of health risk calculations to inform workplace health protection and promotion strategies.

2 | METHODS

2.1 | Ethics approval

This study received ethical approval from the Uniting Health Care Human Research Ethics Committee (#2013.03.74).

2.2 | Sample

A sample of 897 employees was recruited from a mining company located in rural Australia. Given the organisational environment in which the study was conducted, it was not possible to randomly select employees throughout the company. Instead, the organisation nominated working units with the goal of obtaining a representative sample of employees. In these work units, research participant information sheets were displayed in common gathering areas and announcements were made by mangers at daily work group meetings. All employees of the selected work units who were sighted by the researchers during the data collection period were invited by the researchers to participate in the health survey. Due to the recruitment process, it was not possible to calculate a response rate, however, the mining organisation confirmed that the demographic characteristics of the sample were representative of the workforce characteristics. For example, employee reported engagement in moderate or vigorous physical activity during the last 7 days ranged from 0 to 900 minutes with a mean of 39 minutes. Any person who was not a direct employee of the mining company was ineligible to participate in the study.

2.3 | Survey and measures

A 69 item self-report health survey was developed by the authors. The survey measured demographic, work productivity and health risk factors. Measures of age, gender and health risks replicated items from government surveys.[39–41] Established government survey measures were selected to facilitate transparent comparisons of participant responses to national health guidelines. For example, nutrition was measured by asking participants "How many serves of fruit, including fresh, dried and frozen (not including juice) do you usually eat each day?" and "How many serves of vegetables, including fresh, frozen and tinned vegetables do you usually eat each day?" Hydration was measured by asking "On average, during your normal working day, how many glasses (250 mL) of plain drinking water do you consume?" Sleep condition was measured using the Epworth Sleepiness Scale (ESS). Participants used a 4-point scale to report their chance of falling asleep in different situations, for example, when sitting and reading. Research indicates that the ESS has high internal consistency with a Cronbach's alpha of 0.88.[42,43] The researchers developed a concise measure of stress for this study using the validated question format and response options in the SF-12.[44] Participants were asked "How much of the time in the past 4 weeks did you feel stressed while at work? Response options included none of the time; a little of the time; some of the time; a good bit of the time; most of the time; and all of the time."

Measures of work variables including hours worked, absenteeism (ie, work time missed due to health) and presenteeism (ie, impairment while working due to health) replicated items from the Worker Productivity and Activity Impairment—General Health (WPAI:GH) questionnaire.[45] The WPAI:GH scale was selected for inclusion due to its reliability, brevity and ability to be transposed into productivity impairment cost. Although the original scale assessed impairment only within the 7 days prior to the assessment, such items were modified to include a 4-week period in order to minimise the impact of acute illnesses and shift work rosters. For example, the item "During the past seven days, how many hours did you miss from work because of your health problems?" was altered to read, "During the past four weeks, how many hours did you miss from work because of your health problems?" Although it is possible that extending the recall duration from 7 days to 4 weeks may increase error associated with recall bias, this recall duration is considered more appropriate for the mining industry that includes shift work and fly-in-fly out rosters. It is also consistent with the recall duration in the SF-12 and past research on productivity time lost in the mining industry.[44,46] The WPAI:GH measure of absenteeism and presenteeism for nonwork conditions (ie, "the degree to which health conditions affected regular activities") was omitted as nonwork activities were considered outside the scope of the research.

2.4 | Classification of risk

Figure 1 presents the classification criterion for "high-risk" cases of modifiable risks. Participants were classified as either "high risk" or "low risk" based on national guidelines for modifiable health

Health Risk	High Risk Qualification
Poor nutrition	Did not consume either 5 vegetables and/or 2 fruit per day
Physical inactivity	≤ 150 min of moderate intensity exercise per week
Weight	Body Mass Index (BMI) ≤ 18.5 or ≥ 30.0
Stress	Stressed at work 'all of the time' or "most of the time"
Tobacco use	Current or previous smoker (based on 100 cigarettes in lifetime)
Short term alcohol use	Consumed four or more standard drinks on a single occasion
Poor sun safety	Sun safety behaviour score ≥ 3/5 (eg wearing a hat)
Dehydration	≤ 8 glasses of water consumed per day
Sleep condition	Score ≥ 15 on the Epworth Sleepiness Scale
Anxiety	Anxiety diagnosed by Doctor or Nurse
Depression	Depression diagnosed by Doctor or Nurse

FIGURE 1 Modifiable health risk classification criterion for "high-risk" cases

behaviours,[39,47–51] with the exception of weight, stress, anxiety and depression. The national guideline for weight recommends a BMI in the "healthy range" (BMI 18.50-24.99).[52] However, the limitations of the BMI scale are well documented, including its propensity to (a) overestimate body fat in individuals with lean body mass (such as athletes); and (b) predict similar mortality rates for individuals categorised as "healthy" and "overweight." Therefore, for the purpose of assessing health risk status, only BMI classifications of either "underweight" (≤18.5) or "obese" (≥30.0) were classified as "high risk." Stress responses including "none of the time; and a little of the time" were classified as low risk. Responses including "some of the time; a good bit of the time; most of the time; and all of the time" were classified as high risk. For anxiety, depression and all chronic conditions, participants who reported an existing diagnosis were classified as "high risk."

2.5 | Analysis

Analyses were conducted using IBM SPSS version 21 (IBM Corp., Armonk, NY, USA) by applying the protocol outlined by Lenneman et al.[2] Productivity impairment was calculated as participant's score on the WPAI:GH. Scoring was adjusted to accommodate modifications to survey items (ie, items measured over 4 weeks were divided by four to equal the 7-day item in the original scoring metric). Each participant's productivity impairment represented the sum of days absent from work and rate of presenteeism expressed as an overall impairment percentage. "Excess" (or increased) impairment on productivity for modifiable health risks and chronic conditions was calculated as the difference in productivity impairment of "high-risk" cases minus "low-risk" cases. Calculations of costs associated with health risks are based on an average mean annual earning for full-time mining employees of $130 706.[53]

3 | RESULTS

Data consisted of participating employees' demographic information, WPAI:GH score[45] and health risk status for modifiable and chronic health risks. Consistent with the organisation's workforce demographics and the Australian mining industry full time employee demographic characteristics,[54] the majority of participants were male (73%). The mean age of participants was 36.9 years (SD = 11.5). Table 1 illustrates the demographic breakdown of the workforce sampled. A small number of participants chose not to identify some of their demographic information. For example, although 896 participants reported their gender, only 807 participants reported their age. Reported percentages exclude missing data and are therefore calculated from different sample sizes.

During the 4 weeks prior to the survey, 27% experienced moderate to high reduced work productivity rates due to poor health.

TABLE 1 Participant demographic information

Category	n	Percent
Gender		
Male	660	73.7
Female	236	26.3
Age		
Under 18 years	9	1.1
18-24 years	99	12.3
25-34 years	289	35.8
35-44 years	187	23.2
45-54 years	164	20.3
Over 55 years	59	7.3
Marital status		
Married	408	45.6
De facto	152	17.0
Separated	163	18.2
Never married	143	16.0
Prefer not to say	29	3.2
Work roster		
Permanent day roster	454	50.7
Rotating day/night shift roster	442	49.3
Tenure at company		
Less than 5 years	513	60.2
5-9 years	184	21.6
10-19 years	59	6.9
20 years or more	96	11.3
Days absent over past 4 wk		
0 days	680	81.3
1 day	85	10.2
2-4 days	53	6.3
5 or more days	18	2.2
Presenteesim over past 4 wk		
All of the time	9	1.0
Most of the time	22	2.5
A good bit of the time	44	4.9
Some of the time	165	18.5
A little of the time	343	38.4
None of the time	311	34.8

Percentages were calculated from different sample sizes as some sections of the survey may not have been completed fully.

3.1 | Proportion of respondents reporting modifiable and chronic health risks

The overall prevalence within the sample of the modifiable and chronic health risks assessed is presented in Table 2. Of the modifiable health risks, poor sun safety behaviours, dehydration, tobacco

[Correction added on 12 October 2018 after first online publication: In lines 9-13 of this page, the description of stress responses has been amended to give an accurate report of the data and analyses.]

use, physical inactivity, short term alcohol use, poor nutrition and stress were the most commonly reported conditions, with each reported to affect over 40% of respondents. The proportion of respondents reporting an individual chronic conditions was lower, with back, neck or spinal injury being the most commonly reported condition followed by high blood pressure and knee or leg injury.

3.2 | Productivity impairment and modifiable health risks

Productivity impairment was identified for high-risk individuals in seven of the 11 modifiable health risks assessed, including dehydration; alcohol use; nutrition; stress; sleep conditions; depression; and anxiety. The productivity impairment cost for health risk factors (as shown in Table 3) was determined by multiplying the excess impairment by the average Australian mining industry salary of $130 706.[53] For example, the excess impairment for poor nutrition of 2.99% was multiplied by $130 706 to determine the additional impairment cost of $3908. On average, the excess impairment for modifiable health risks that negatively impacted worker productivity represented an additional cost of $12 572, ranging from $182 for short term alcohol use to $24 899 for depression. Health risks that did not negatively impact productivity have been excluded from Table 4.

TABLE 2 Health statistics from study sample (N = 897)

Health factor	n	Percent
Modifiable health risks		
Poor sun safety	468	52.4
Dehydration	433	48.3
Tobacco use	419	46.7
Physical inactivity	387	46.2
Short term alcohol use	407	45.4
Poor nutrition	399	44.5
Stress	375	42.0
Weight	245	28.5
Sleep condition	52	27.4
Depression	73	8.1
Anxiety	50	5.6
Chronic conditions		
Back, neck or spinal injury	162	18.1
High blood pressure	131	14.6
Knee or leg injury	118	13.2
Migraine	116	12.9
Heartburn or acid reflux	110	12.3
Asthma	109	12.2
Hayfever, rhinitis or sinusitis	99	11.0
High cholesterol	84	9.4
Eczema or other skin condition	58	6.5
Other chronic conditions	39	4.4
Arthritis	35	3.9
Diabetes	30	3.3
Heart disease	13	1.5
Cancer	8	0.9

Percentages were calculated from different sample sizes as some sections of the survey may not have been completed fully.

3.3 | Productivity impairment and chronic health risks

Productivity impairment was identified for high-risk individuals in 11 of the 14 chronic health conditions assessed (refer Table 4). Replicating the method previously outlined, productivity impairment cost

TABLE 3 Productivity impairment for modifiable health risks and annual cost per person

	Percent of impairment			
	Low risk	High risk	Excess	Cost ($) per annum
Modifiable health risk				
Stress	14.51	33.57	19.05	24 899
Depression	21.11	37.41	16.30	21 305
Anxiety	21.64	35.92	14.28	18 664
Sleep condition	16.25	23.94	7.69	10 051
Dehydration	19.85	23.34	6.88	8992
Poor nutrition	21.11	24.10	2.99	3908
Short term alcohol use	22.37	22.52	0.14	182

$ = AUD.

TABLE 4 Productivity impairment for chronic health conditions and annual cost per person

	Percent of impairment			
	Low risk	High risk	Excess	Cost ($) per annum
Chronic health condition				
Migraine	20.78	33.55	12.77	16 691
Other chronic condition	21.98	32.46	10.48	13 697
Back, neck or spinal injury	21.15	28.27	7.12	9306
Heartburn or acid reflux	21.83	26.81	4.98	6509
Knee or leg injury	21.80	26.64	4.85	6339
Eczema or other skin condition	22.14	26.78	4.64	6064
Hayfever, rhinitis or sinusitis	22.11	25.07	2.96	3868
High blood pressure	22.05	24.71	2.66	3476
High cholesterol	22.19	24.80	2.60	3398
Heart disease	22.40	24.92	2.52	3293
Asthma	22.30	23.42	1.21	1581

$ = AUD.

was determined by multiplying the excess impairment by a mean Australian mining industry salary of $130 706.[53] On average, the excess impairment for chronic health conditions that negatively impacted productivity represented an additional cost of $6748, and was calculated to range from $1581 for asthma to $16 691 for migraine headaches.

3.4 | Productivity impairment cost

Table 5 presents the results of the financial impact of productivity impairment for modifiable health risks and chronic conditions to the employer, reported as a projected cost per 1000 employees. Based on the proportion of the sample with a health risk and related levels of absenteeism and presenteeism, productivity impairment for modifiable health risks ranged from $83 076 for short-term alcohol use to $10 457 787 for stress. The range of financial impact for chronic conditions was substantially lower, ranging from $29 644 for heart disease to $2 153 159 for migraine headaches. Notably within the sample, although the prevalence of dehydration was the highest reported modifiable health risk, at a rate of 48.3%, the productivity impact was moderate (with an excess impairment of 6.88%) and thus only resulted in the condition being considered a moderately high financial burden of $4 343 412.

TABLE 5 Annual loss in productivity by significant health risks factors per 1000 employees

Health risk	Excess impairment (%)	Prevalence within sample (%)	Lost productivity ($) per 1000 employees
Modifiable health risk			
Stress	19.05	42.0	10 457 787
Dehydration	6.88	48.3	4 343 412
Sleep condition	7.69	27.4	2 754 053
Poor nutrition	2.99	44.5	1 739 108
Depression	16.30	8.1	1 725 711
Anxiety	14.28	5.6	1 045 229
Short-term alcohol use	0.14	45.4	83 076
Chronic health condition			
Migraine headaches	12.77	12.9	2 153 159
Back, neck or spinal problems	7.12	18.1	1 684 434
Knee or leg problems	4.85	13.2	836 779
Heartburn or acid reflux	4.98	12.3	800 626
Other chronic condition	10.48	4.4	602 711
High blood pressure	2.66	14.6	507 609
Hayfever, rhinitis or sinusitis	2.96	11.0	425 578
Eczema or other skin condition	4.64	6.5	394 209
High cholesterol	2.60	9.4	319 445
Asthma	1.21	12.2	192 948
Heart disease	2.52	0.9	29 644

$ = AUD.

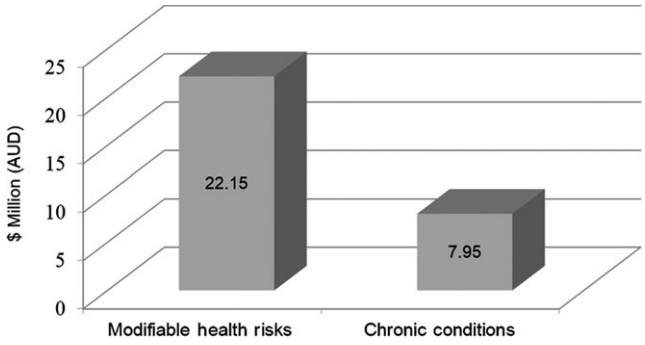

FIGURE 2 Annual cost of productivity impairment attributable to health risks and chronic conditions per 1000 employees

A comparison of the overall financial burden of modifiable health risks and chronic conditions is presented in Figure 2. The seven modifiable health risks that negatively impacted productivity accounted for a financial burden of in excess of $22 million in lost productivity, per 1000 employees per year. Conversely, the 11 chronic conditions identified attributed to a financial burden of approximately $8 million in lost productivity per 1000 employees.

4 | DISCUSSION

This paper illustrated the process of quantifying, in monetary terms, the impact of 11 modifiable health risks and 14 chronic conditions on worker productivity in an Australian mining company.

Within the mining organisation assessed, overall self-reported absenteeism was low (2.2%) and overall self-reported presenteeism was high (27%). Low absenteeism may reflect the organisational cultural value of team work. Although culture was not measured in the health survey, the shift workers were observed to typically operate in teams known as "crews" and anecdotal reports by employees suggested that inter-crew camaraderie was high. This may have resulted in some team members being reluctant to abstain from work due to minor ailments or injuries. The moderate rates of presenteeism further support this hypothesis by suggesting that employees preferred to continue to attend the workplace even when they were aware that they were operating at a suboptimal level due to health conditions.

The prevalence of modifiable health risks within the sample reflected the workforce characteristics and working conditions in the organisation. For example, poor sun safety behaviours (52.4%) and

dehydration (48.3%) were the most frequently reported conditions, which reflects the culture of a male dominated mining organisation.[55] The physical nature of the job roles, shift work roster and survey item wording may have contributed to the relatively high proportion of respondents who reported physical inactivity. For example, the survey items that assessed physical activity asked employees the number of times and duration of exercise that resulted in a moderate or large increase to their heart rate and provided examples of jogging, aerobics and competitive tennis. The wording of such items centred on planned rather than incidental exercise and may have resulted in an underestimation of the physical activity levels of employees in physically active and demanding jobs. Furthermore, anecdotal reports by employees revealed that many employees cease regular physical activity and sporting team commitments when they commence shift work due difficulties working around the roster. These comments are consistent with literature that reported that shift workers experienced difficulty with participation in team sports and organised events that typically have inflexible schedules that conflict with work and contribute to shift workers not participating in physical activity.[56] Interestingly, stress was prevalent in 42% of the surveyed population whereas diagnosed anxiety and depression were reported in 8.1% and 5.6%, respectively. Underreporting of mental illness conditions such as anxiety and depression is common in males.[57]

Prevalence within the sample of chronic conditions was substantially lower than those of modifiable conditions which may reflect the physical nature of the work. The highest reported condition of back, neck or spinal injury (18.1%) may be associated with physically laborious job roles or one that places strain on the spine—such as mining truck operators who are often subjected to spinal vibration and compression while seated in a heavy vehicle. High blood pressure (hypertension) was the second most commonly reported chronic condition at 14.6% and reflects the known association between hypertension and shift work.[58] It is possible that the data may underestimate the prevalence within the workforce of some chronic conditions, as physical disability may have affected employees' attendance during the period of data collection.

Productivity impairment for modifiable health risks was greatest for conditions that affect cognition including stress, depression and anxiety. Individuals who reported experiencing stress at work were 19.05% less productive than those who did not report experiencing stress. Similarly, individuals who reported a medical diagnosis of depression or anxiety were 16.30% and 14.28%, respectively, less productive than those who did not report a diagnosis. Such conditions are strongly associated with high rates of presenteeism.[8] This finding is particularly noteworthy as presenteeism is a substantial contributor to productivity cost; and human error-related safety outcomes (although these were not measured in this study).[59] Previous research has also estimated a high annual economic cost of $153.8 million to the Australian coal mining industry as a result of psychological distress.[46]

A similar finding was observed for chronic conditions whereby productivity impairment was greatest for migraine headaches—another condition that affects cognition. Specifically, employees who suffered migraine headaches were 12.77% less productive than those who did not. This was followed by "other chronic condition," which regrettably could not be dissected into specific aliments, accounting for 10.48% reduced productivity when compared to individuals who did not select this option. It is likely that this figure also includes, to some extent, conditions that affect cognition either through the nature of the condition itself or through the treatment (eg, medication that affects cognition such as codeine). Back, neck or spinal injuries were also a large contributor to productivity impairment resulting in 7.12% reduced productivity for those who reported the condition. However, it was observed that within the surveyed organisation, physical injuries such as back, neck or spinal injuries were typically managed by reallocating the employee to lighter duties that facilitated their continual presence at the workplace. While this practice may reduce rates of absenteeism, it will likely have a negative effect on productivity through increased presenteeism at work while the employee remains unfit for normal duties.

Finally, a productivity cost was quantified that represented the projected annual financial loss to the employer as a function of absenteeism and presenteeism per 1000 employees. For the modifiable health risks considered, stress resulted in the highest financial burden to the mining organisation, due to both its high impairment (19.05%) and prevalence within the sample (42.0%). Stress accounted for a reduction in productivity that amounted to a cost in excess of $10.4 million per 1000 employees per annum. Although anxiety and depression also produced high levels of impairment, their relatively low prevalence within the sample resulted in an estimated annual financial burden of approximately $1.0 million and $1.7 million, respectively. However, as previously noted, these figures may be substantially underestimated due to the known trend of underreporting mental illness among men.[57]

The productivity cost to the employer due to chronic health conditions present within the workforce was found to be lower than modifiable health conditions, with the highest financial burden being attributed to migraine headaches at a cost exceeding $2.1 million per annum. This is consistent with the hypothesis that conditions that affect cognition account for the greatest productivity loss when compared with other physical conditions. Back, neck or spinal injuries accounted for the second highest productivity cost, exceeding $1.6 million per annum. The finding that musculoskeletal conditions were the most commonly reported chronic condition by respondents is understandable in the light of research that reports the ageing workforce in the Australian Coal mining industry is associated with higher incidence of musculoskeletal injury, more severe injuries and longer return to work durations than their younger colleagues.[60] As previously noted, a moderate productivity cost associated with musculoskeletal conditions may reflect a tendency to reallocate employees with physical injuries to light duties in order to reduce absenteeism. However, such a practice may result in high levels of presenteeism for employees who are present at work but suffering from injury and pain that may affect their cognition.

Overall, seven of the 11 modifiable health risks and 11 of the 14 chronic conditions were found to contribute substantially to reduced productivity cost. Despite the disparity in number of conditions

assessed, it is estimated that modifiable health risks cost the mining organisation in excess of $22.1 million per 1000 employees per annum, whereas chronic health conditions cost approximately $7.9 million, per 1000 employees per annum (refer Figure 2). As modifiable health risks represented 73% of the financial burden associated with lost production of employees, there is a strong financial argument for the development of an integrated workplace health promotion and protection program that employs a preventative health strategy and targets modifiable health behaviours, particularly those that affect cognition such as stress. Such a program would likely result in substantial improvements to employee health, productivity, safety outcomes and organisational profits.

Limitations of the current study include the reliance on self-report data, cross-sectional analysis and unique characteristics of the organisation. Firstly, health measures and absenteeism data ideally require objective measures (eg, physical assessment by a medical professional and payroll or timesheet reporting). Self-reported absenteeism may be an underestimate of absenteeism as employees, who were absent during the data collection period, were not invited to participate in the survey. Regrettably, organisational constraints and the large workforce sample meant that objective measures were not considered feasible by the client organisation in this instance. Secondly, it is well-established that cross-sectional analysis is subject to common method bias (systematic variance because of the use of a single measurement at only one point in time) and a lack of ability to explain within-individual differences over time. It is possible that prevalence rates for some health risks and chronic conditions were over- or underreported due to employee absenteeism during the brief phase of data collection. Finally, the unique attributes of the mining organisation examined in this study, including the workforce characteristics and combination of day time and shift workers, may limit the ability to generalise the findings. However, this study clearly outlines the process by which organisations can assess and quantify the productivity cost of modifiable health risks and chronic conditions in order to inform the development of an integrated workplace health promotion and protection strategy.

Based on the findings in this study, future research should work to integrate the measurement and reporting of safety outcomes into the process of productivity cost analysis detailed herein. It is recommended that WH&S professionals conduct a productivity cost and safety analysis at regular intervals before, during and after the implementation of any workplace health and protection strategy in order to evaluate its effectiveness in improving employee health, reducing health related productivity cost, improving safety outcomes and increasing the overall profitability for the organisation.

5 | CONCLUSIONS

Employee health plays a vital role in the profitability, productivity and safety outcomes of an organisation. As such, there is a strong case for taking an integrated approach to workplace health protection and promotion. This study outlined the process of calculating the productivity cost associated with 11 modifiable health risks and 14 chronic conditions in an Australian mining company. Overall, seven of the 11 modifiable health risks and 11 of the 14 chronic conditions were found to contribute to decreased worker productivity as a function of absenteeism and presenteeism. Collectively, a total of $30.1 million in lost productivity costs were estimated to be due to health issues of the surveyed workforce (per 1000 employees per annum), with modifiable health risks and chronic conditions accounting for $22.15 million (73%) and $7.95 million (27%) in lost productivity, respectively. Within both modifiable health risks and chronic conditions, ailments that affected cognition resulted in the highest financial burden (ie, stress and migraine headaches). Notably, anxiety and depression were high contributors to reduced productivity, however, resulted in a comparatively small financial burden due to their limited prevalence within the sample (which may reflect an issue of underreporting in the predominantly male sample used for this study). Although safety outcomes were not included in this study, it has been widely acknowledged that there is a positive association between worker health and safety practices. Accordingly, there is a strong fiscal argument for WH&S professionals to invest in an integrated workplace health promotion and protection strategies that specifically target health behaviours and modifiable health risks, and in particular strategies to reduce employee stress. Such an integrated health, wellness and safety investment strategy may have both short- and long-term benefits for the organisation and its employees.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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