

The Economic Impact of Psychological Distress in the Australian Coal Mining Industry

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Objective: The aim of this study was to estimate the economic impact of psychological distress among employees of the Australian Coal Mining Industry. **Methods:** Sample data were gathered from 1456 coal mining staff across eight sites in two Australian states. Two measures were taken of work time lost over four weeks due to psychological distress: (1) full-day absences; (2) presenteeism. Lost work time was valued using hourly wages. Sample data was modeled to estimate annual monetary losses for the Australian Coal Mining Industry. **Results:** For the sample, estimated annual value of time lost due to psychological distress was \$4.9 million (\$AUS2015) (\$0.61 million per mine), and for the Australian Coal Mining Industry, \$153.8 million (\$AUS2015). **Conclusion:** Psychological distress is a significant cost for the Australian Coal Mining Industry. Relevant intervention programs are potentially cost-effective.

Psychological distress is a significant health issue in Australia. The 2011 to 2012 Australian Health Survey reported that 10.8% of adults experienced psychological distress at high or very high levels.¹ Lost productivity is a major economic consequence of psychological distress in Australia. Hilton et al² estimated that psychological distress produces an annual decrease of \$5.9 billion in Australian employee productivity. Further, Milczarek et al³ found that stress is associated with 50% to 60% of all time lost from work due to illness.

Present conditions in the Australian mining sector may increase psychological distress among its workers. Mining staff currently work long shifts over consecutive days⁴ and researchers have demonstrated links between stress and long working hours.⁵⁻⁹ Also, the Australian mining sector has seen a trend toward remote access employment where workers “fly-in and fly-out” (FIFO) or “drive-in drive-out” (DIDO) from other locations to do blocks of shifts⁴ seeing workers regularly separated from families and close friends. Further, changing world export conditions for coal have economic and labor force implications in Australia including the impact of increased job insecurity among workers.^{10,11}

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There are a number of reasons for studying mental health in the coal mining industry. First, there is a lack of empirical evidence of the levels and impact of mental health problems in the Australian mining industries generally.⁴ Second, the coal mining industry is a major contributor to the Australian economy, and hence, the mental well-being of workers in this industry has broader economic ramifications. Third, understanding mental health in the coal mining industry provides insights that can be helpful for understanding and addressing workforce issues in other occupations where working conditions are similar, for example, where the workforce is predominantly male with significant proportions of staff on FIFO or DIDO arrangements.

Research examining the relationship between productivity and mental illness has tended to focus on depression^{12,13} rather than psychological distress. However, participants in our survey explicitly described time off work and/or suboptimal work performance (presenteeism) due to psychological distress. Therefore, an underlying assumption in our economic analysis is that there is a causal relationship between psychological distress and lost productivity, which is a function of time off work and presenteeism.¹²⁻¹⁴

The aim of this paper is to estimate the economic impact of psychological distress among employees of the Australian Coal Mining Industry. Currently, little research has examined the economic consequences of psychological distress.¹⁵

METHODOLOGY

Ethics Approval

Ethics approval for this project was granted by the University of Newcastle, Human Research Ethics Committee (Approval Number H-2013-0135).

Participant Recruitment

The research team approached coal mining companies inviting their participation in this research. Where companies consented, specific mines in New South Wales (NSW) and Queensland were chosen to ensure adequate coverage across both states, and to gain representation of remote access (DIDO/FIFO) and locally based workers. Ten mining companies were approached with eight agreeing to participate. The two companies that declined participation were unable to make staff available during the allocated time period. Data were collected from November 2013 to December 2014.

Site managers were telephoned and their participation was sought. Where they approved, their employees were approached at work, provided with information statements, and given opportunities to inquire about the project. Those who agreed to participate were asked to complete the survey on either paper or computer, with completion considered as implied consent. All returned surveys were anonymized.

The sample of mines in this study is considered to be representative of coal mines across Australia. These mines are located in Queensland and NSW where the majority of Australian coal mining staff were working at the time of the last Australian Census (2011) (Queensland: 54.7%, NSW: 40.3%).¹⁶ The sample represents open cut and underground mines, and mines with local workers as well as those reliant on FIFO/DIDO employees.

The sample contained five underground and three open cut mines. Three of the eight sites operated primarily through a FIFO/DIDO arrangement.

The Survey

The survey contained a range of questions on demographics, working conditions, work satisfactions, employment prospects, and domestic circumstances. Pertinently, the survey also contained the Kessler 10 Distress Scale (K-10) that asks respondents how often in the previous four weeks they had 10 states of distress, or feeling: “tired out for no good reason”; “nervous”; “so nervous that nothing could calm you down”; “restless or fidgety”; “so restless you could not sit still”; “that everything was an effort”; “so sad that nothing could cheer you up”; “hopeless”; “depressed”; and “worthless.”^{17–19}

The mine sites providing consent to participate in the study may have generated a sample bias toward work sites with less psychological distress. This would be the case if refusing sites had more stressful work environments, through for example, recent involuntary retrenchments. However, the two refusing sites indicated that the reason for nonparticipation was related to staff availability rather than site-specific conditions. Therefore, we have no reason to consider that the participating sites were places of relatively lower work psychological stress.

Productive Time Lost

The survey contained two questions relevant to working hours lost due to psychological distress. These appeared immediately after the K-10 and made reference to its list of psychological distress “feelings.” The first question was on full-day absences (referred to as absenteeism):

“In the last four weeks, how many days were you totally unable to work, study or manage your day-to-day activities because of these feelings?”

The second question was on reduced productivity due to psychological distress while at work (referred to as, presenteeism):

“How many days were you able to work, study or manage your day-to-day activities, but had to cut down on what you did because of these feelings?”

Responses to the above questions, which were received in units of days, were converted to units of hours using information on participants’ usual hourly shift lengths (one shift length being equal to one day). This allowed a valuation of this lost time with hourly wage rates. For each day a participant reported presenteeism, it was estimated that on average, psychological distress was associated with a 30% loss of productive working time. The validation of this estimate is described in the Discussion section.

The authors note that the data on absenteeism and presenteeism were collected directly from employees and are therefore vulnerable to lapses in memory, misjudgments, misinterpretations of questions, and possible intentional misrepresentation. Arguably, data from staff records may have been more reliable. However, ethics approval did not extend to directly or indirectly accessing participants’ work records. We also note that the survey allowed participants to identify absenteeism and presenteeism as specifically related to psychological distress. Participants’ work records do not necessarily contain this information. Finally, the questionnaire focused on the last four weeks, thereby minimizing recall bias.

Productive Time Lost: Sample

For each participant in the sample, total annual productive time lost through absenteeism and presenteeism was estimated. This

was achieved by multiplying absenteeism and presenteeism hours for the previous four weeks by 12 (ie, annual working weeks were calculated as: 52 weeks less 4 weeks annual leave, equaling 48 working weeks, or 4 weeks * 12). The dollar value of lost productive time was calculated by multiplying lost hours by the relevant occupational hourly pay rate. Data on hourly wages for relevant occupations (managers, professionals, clerical and administrative, machinery operators and drivers, technicians and trade workers, laborers, and other) were gathered from relevant websites.^{20–22} For the entire sample, calculations were made for aggregate annual lost productive hours and the associated value.

Productive Time Lost: Australian Coal Mining Industry

Sample data on annual hours of absenteeism and presenteeism were used in three regression models to estimate annual distress related time losses for the Australian Coal Mining Industry. Dependent variables were (Model I) hours lost through distress related absenteeism; (Model II) estimated hours lost through presenteeism; and (Model III) estimated total hours lost through both absenteeism and presenteeism. Independent variables were chosen from the survey data using stepwise regressions.

The final models are outlined by the following two equations:

- (1) Model I $A = \text{fn}(G, \text{Age}, \text{MT}, \text{EC}, \text{WALJ}, \text{RS}, \text{YM})$
- (2) Model II $P = \text{fn}(G, \text{Age}, \text{MT}, \text{EC}, \text{WALJ}, \text{RS}, \text{YM})$
- (3) Model III $T = \text{fn}(G, \text{Age}, \text{MT}, \text{EC}, \text{WALJ}, \text{RS}, \text{YM})$

Where:

- (1) A = Hours lost due to Absenteeism
- (2) P = Hours lost due to Presenteeism
- (3) T = Total hours lost to both Absenteeism and Presenteeism
- (4) G = Gender
- (5) A = Age
- (6) MT = Mine Type (Open Cut/Underground)
- (7) EC = Employment Category (Manager/Professional/Tech Trades/Clerical Admin/Machine Operators Drivers/Labourers/Other)
- (8) WALJ = Worried about Losing Job
- (9) RS = Relationship Status
- (10) YM = Years in Mining

Model III allowed estimation of confidence intervals for total productive time lost due to psychological distress and its value.

Data for Model I are based on count data, which usually requires a Poisson regression, while data used in Model II are continuous (hours in presenteeism-affected days divided by 30%), and appropriate for Ordinary Least Squares regression. The large sample size underpinning the regressions implies the applicability of the central limit theorem and that “the least squares estimators have a distribution that approximates the normal distribution.”^{23,24} Under these circumstances, OLS is an appropriate technique for both absenteeism and presenteeism models. The general use of OLS was appropriate given (1) the large size of the regression population ($n = 1315$) and (2) the need for consistency in approach to estimating average annual hours of absenteeism, presenteeism, and total lost hours.

Analysis was conducted with STATA 14 software (StataCorp, College Station, TX). In Models I and II, estimates of average annual hours lost, per occupation were generated with the STATA postestimation command, “Margins.” These estimates were then multiplied with population data by occupation and state for the Australian Coal Mining Industry from the 2011 Australian Bureau of Statistics (ABS) Census.¹⁶ Lost productive hours were then valued by applying occupational hourly wage rates. For the

modeling, sample data were population weighted to the 2011 ABS Census data by occupation category.

RESULTS

Productive Time Lost: Sample

A total of 1456 coal mining employees participated in the study across eight mines. Among these, 53.0% worked in open cut mines and 47.0% worked at underground sites. Survey participants were primarily male (87.5%).

Most participants (61.8%) were aged between 25 and 45 years. The largest occupational categories were machinery operators and drivers (36.9%) and technicians and trades (34.0%) (Table 1). Over 57% of all employees worked in shifts that were either 12 hours (23.0%) or longer (34.5%). Approximately half (48.7%) worked rosters of five consecutive days, with 40.0% working between three to four consecutive days.

About a quarter (28.5%) of respondents across both types of mines worked on FIDO/DIDO arrangements. About 85% of workers were employed on a “permanent basis.” A majority of participants had some concern about employment security with 59.4% “mildly” or “moderately” worried about losing their jobs, while 17.1% were “very” or “extremely” worried.

In the four weeks before the survey, 9.6% of participants had at least one day of absenteeism due to psychological distress. Percentages were highest among professionals (10.8%), machine operators and drivers (9.7%), and technicians and trades (9.5%). Also, for the same period, 19.6% of all participants reported at least one day of presenteeism due to psychological distress. The levels of self-reported presenteeism (affected on at least one day) were highest among professionals (23.8%) and managers (26.5%).

Seventy-one respondents not only reported “high” or “very high” K-10 scores but also reported no time off with respect to psychological distress issues. This group were significantly more likely than other participants to have been “extremely worried” about losing their jobs and to report alcohol consumption at harmful levels.

Among the eight sample mines, there was an annual loss due to psychological distress of 109,311 working hours [95% confidence interval (95% CI) 89,380 to 129,242 hr], made up of 60,144 hours (54.9%) due to absenteeism and 49,167 hours (45.1%) due to presenteeism. Contributions to total time lost were greatest from the two largest occupation groups: machinery operators and drivers (42,645 hr) and technicians and trades workers (34,082 hr). Together, the two groups contributed to 74.6% of estimated hours lost through absenteeism; 68.9% of hours lost through presenteeism, and 72.0% of total hours lost (Table 2).

Across the sample, the total annual cost of distress-related lost work time was \$4.9 million (95% CI: \$4.1 million to \$5.8 million), representing an average annual cost of \$0.61 million among the eight mines. Costs of full day absences and presenteeism were \$2.7 million (\$0.34 million per mine) (53.8%) and \$2.3 million

(\$0.29 million per mine) (46.2%), respectively. Occupations incurring the highest costs were those with for which respondent numbers were highest (Table 1): machinery operators and drivers (\$1.9 million or \$0.24 million per mine) and technicians and trades workers (\$1.5 million or \$0.19 million per mine). The cost of psychological distress for professionals was estimated at \$0.6 million (\$0.08 million per mine) (Table 2).

For average annual costs for all lost productive time, Table 2 summarizes that managers (\$4754) had higher average costs than machinery operators and drivers (\$3609) or technicians and trade workers (\$3148). Professionals also had relatively high average annual costs (\$3385). (Laborers and other occupation had the highest averages, but their sample numbers were very small). Technicians and trade workers and machinery operators’ respective average annual costs for absenteeism were \$1716 and \$2131. For presenteeism, managers had a higher average annual cost (\$3998), than technicians and trade workers (\$1454) and machinery operators (\$1490) (Table 2).

Productive Time Lost: Australian Coal Mining Industry

For Model I (dependent variable = absenteeism hr), significant independent variables ($P < 0.05$ level) were employment category [technicians and tradespeople (+ve); machinery drivers and operators (+ve)]; worried about losing job (+ve), age [aged 55 yrs or over (-ve)], relationship status [in a relationship (-ve)]; and number of years in mining [over 20 yrs (+ve)]. For Model II, (dependent variable = presenteeism hrs), significant independent variables were ($P < 0.05$ level) mine type [underground (+ve)], worried about losing job (+ve), age [aged 55 yrs or over (-ve)]; and number of years working in mining [5 to 9 yrs (+ve), over 20 yrs (+ve)].

Table 3 summarizes estimated average annual hours lost due to absenteeism and presenteeism by occupation with associated value in terms of wages, for the Australian Coal Mining Industry. For absenteeism, machine operators and drivers lost on average 51.6 annual hours, and technicians and trades, an annual average of 38.2 hours. For presenteeism, average annual hours lost are higher for managers at 42.8, valued at \$3545. Professionals also had higher average annual presenteeism hours 35.1 hours, costing on average \$1805. Annual average presenteeism costs were still relatively high for machine operators and drivers and technicians and trades, respectively, at \$1551 and \$1379.

Table 4 summarizes estimated total value of time lost across the Australian Coal Mining Industry by state and occupation. The value of this lost time is estimated at \$153.8 million (95% CI: \$122.9 to \$184.7 million). Machine operators and drivers contributed \$81.8 million (53.2%), and technicians and trades workers, \$33.5 million (21.8%). Over all occupations, the total value of annual time lost due to presenteeism (\$73.5 million) was almost half (47.8%) of the total (Table 4). Queensland (\$83.5 million) and NSW (\$63.5 million) have the biggest mining populations¹⁶ and had the

TABLE 1. Sample by Gender and Occupation

	Male		Female		Total	
Managers	62	4.9%	6	3.3%	68	4.7%
Professionals	143	11.3%	55	30.4%	198	13.7%
Technicians and Trades	478	37.8%	13	7.2%	491	34.0%
Clerical and Administrative	6	0.5%	29	16.0%	35	2.4%
Machinery Operators and Drivers	467	36.9%	67	37.0%	534	36.9%
Laborers	65	5.1%	3	1.7%	68	4.7%
Other	44	3.5%	8	4.4%	52	3.6%
Total	1265	100.0%	181	100.0%	1446	100.0%

TABLE 2. Sample Mines: Estimated Annual Lost Hours and Costs due to Psychological Distress (AU \$2015)

	Hourly Wage	Total Hrs Lost	Ave Hrs Lost	Value of Total Hrs Lost	Ave Value
Absenteeism					
Manager	\$82.75	624.0	10.1	\$51,636	\$833
Professional	\$51.42	5472.0	29.6	\$281,370	\$1521
Technicians and Trades Worker	\$41.36	19,668.0	41.5	\$813,469	\$1716
Clerical and Administrative	\$43.71	924.0	27.2	\$40,388	\$1188
Machinery Operator and Driver	\$43.50	25,176.0	49.0	\$1,095,156	\$2131
Laborer	\$36.65	5220.0	84.2	\$191,313	\$3086
Other	\$59.64	3060.0	60.0	\$182,498	\$3578
Total		60,144.0	43.5	\$2,655,830	\$1922
Presenteeism					
Manager	\$82.75	2995.2	48.3	\$247,853	\$3998
Professional	\$51.42	6706.8	36.3	\$344,864	\$1864
Technicians and Trades Worker	\$41.36	16,414.2	35.1	\$678,891	\$1454
Clerical and Administrative	\$43.71	1605.6	47.2	\$70,181	\$2064
Machinery Operator and Driver	\$43.50	17,469.0	34.3	\$759,902	\$1490
Laborer	\$36.65	2408.4	38.8	\$88,268	\$1424
Other	\$59.64	1567.8	32.0	\$93,504	\$1908
Total		49,167.0	35.9	\$2,283,461	\$1668
Total					
Manager	\$82.75	3619.2	57.4	\$299,489	\$4754
Professional	\$51.42	12,178.8	65.8	\$626,234	\$3385
Technicians and Trades Worker	\$41.36	36,082.2	76.1	\$1,492,360	\$3148
Clerical and Administrative	\$43.71	2529.6	74.4	\$110,569	\$3252
Machinery Operator and Driver	\$43.50	42,645.0	83.0	\$1,855,058	\$3609
Laborer	\$36.65	7628.4	121.1	\$279,581	\$4438
Other	\$59.64	4627.8	90.7	\$276,002	\$5412
Total		109,311.0	79.0	\$4,939,292	\$3569

highest total losses. The estimated total annual lost hours for the Industry was 3.4 million (95% CI: 2.7 million to 4.1 million).

DISCUSSION

The aim of this paper is to estimate the economic impact of psychological distress among employees of the Australian Coal Mining Industry. The study has analyzed survey data drawn from eight coal mines in NSW and Queensland, and also estimated the cost of psychological distress the entire Australian Coal Mining Industry with regression.

In conducting this study, it is important to note several limitations. First, the survey used self-reports of psychological states and distress-related time lost, making the validity of the data dependent on participants' memories. Second, the sample was not based on purely random selection across Australia. Rather, it used a purposive sampling approach to obtain participants working in conditions considered likely to support psychological distress.

Third, the average daily burden of presenteeism was assumed to be 30% reduction in productivity. This assumption was validated in another section of the survey, where participants rated their job performances for the previous month, and their performances of the previous year, on a scale of 1 to 10. Among those who reported presenteeism, the mean percentage reduction in their performance from the previous month was 27.9%, being very close to our estimate of 30%. There were also respective lower (25%) and upper (75%) quantiles of -14.3% and -37.5%. Applying these upper and lower point estimates to total presenteeism cost in the Australian Coal Mining Industry costs provides a range for the cost of lost productivity, due to presenteeism between \$35.0 million (-14.3%) and (\$91.9 million (-37.5%). These variations are as compared with the total cost of the 30% level of presenteeism at \$73.5 million.

Third, the analysis does not consider the value of lost profits due to absenteeism/presenteeism. Finally, as the survey asked questions on the previous 4 weeks, it is possible that some

TABLE 3. Australian Coal Mining Industry: Estimated Losses due to Psychological Distress by Occupation (AUS \$2015)

	Hourly Wage	Absenteeism		Presenteeism	
		Ave Annual Hrs Lost	Average Cost per Worker	Ave Annual Hrs Lost	Average Cost per Worker
Managers	\$82.75	2.2	\$185	42.8	\$3545
Professionals	\$51.42	27.5	\$1413	35.1	\$1805
Technicians and Trades	\$41.36	38.2	\$1578	33.3	\$1379
Clerical/Admin	\$43.71	21.6	\$945	37.8	\$1651
Machine Operators and Drivers	\$43.50	51.6	\$2246	35.7	\$1551
Laborers	\$36.65	57.5	\$2106	25.1	\$921
Other	\$59.64	56.6	\$3373	16.6	\$989
Total		41.0	\$1797	35.1	\$1646

Note that Absenteeism and Presenteeism figures are rounded.

TABLE 4. Australian Coal Mining Industry Estimated Value of Annual Productive Time Lost due to Psychological Distress (AUS \$2015)

	New South Wales	Qld	Victoria	South Australia	Western Australia	Tasmania	Northern Territory	ACT	Total
Absenteeism									
Managers	\$195,015	\$308,804	\$7586	\$2405	\$14,062	\$1850	\$0	\$0	\$529,722
Professionals	\$2,560,569	\$4,088,150	\$80,548	\$31,089	\$138,486	\$0	\$0	\$8479	\$6,907,320
Technicians and Trades Workers	\$7,724,743	\$9,465,730	\$110,489	\$142,057	\$388,289	\$42,617	\$0	\$0	\$17,873,925
Clerical and Administrative Workers	\$722,354	\$1,440,926	\$21,746	\$17,964	\$65,239	\$6618	\$0	\$0	\$2,274,848
Machinery Operators and Drivers	\$20,887,298	\$25,341,968	\$707,625	\$352,689	\$977,197	\$125,800	\$15,725	\$0	\$48,408,302
Laborers	\$701,290	\$1,242,526	\$54,755	\$40,014	\$58,967	\$6318	\$0	\$0	\$2,103,870
Other	\$735,292	\$1,339,041	\$33,729	\$10,119	\$26,983	\$0	\$0	\$0	\$2,145,164
Total	\$33,526,562	\$43,227,145	\$1,016,478	\$596,337	\$1,669,222	\$183,204	\$15,725	\$8479	\$80,243,151
Presenteeism									
Managers	\$3,736,450	\$5,916,637	\$145,346	\$46,085	\$269,421	\$35,450	\$0	\$0	\$10,149,390
Professionals	\$3,269,754	\$5,220,419	\$102,857	\$39,699	\$176,841	\$0	\$0	\$10,827	\$8,820,396
Technicians and Trades Workers	\$6,747,354	\$8,268,059	\$96,509	\$124,083	\$339,160	\$37,225	\$0	\$0	\$15,612,390
Clerical and Administrative Workers	\$1,261,707	\$2,516,808	\$37,983	\$31,378	\$113,950	\$11,560	\$0	\$0	\$3,973,386
Machinery Operators and Drivers	\$14,420,768	\$17,496,310	\$488,550	\$243,500	\$674,665	\$86,853	\$10,857	\$0	\$33,421,503
Laborers	\$306,574	\$543,179	\$23,937	\$17,492	\$25,778	\$2762	\$0	\$0	\$919,722
Other	\$215,610	\$392,648	\$9,890	\$2967	\$7912	\$0	\$0	\$0	\$629,028
Total	\$29,958,218	\$40,354,060	\$905,072	\$505,204	\$1,607,728	\$173,851	\$10,857	\$10,827	\$73,525,815
Totals									
Managers	\$3,931,465	\$6,225,441	\$152,932	\$48,491	\$283,483	\$37,300	\$0	\$0	\$10,679,111
Professionals	\$5,830,323	\$9,308,568	\$183,404	\$70,788	\$315,327	\$0	\$0	\$19,306	\$15,727,716
Technicians and Trades Workers	\$14,472,097	\$17,733,789	\$206,998	\$266,140	\$727,449	\$79,842	\$0	\$0	\$33,486,315
Clerical and Administrative Workers	\$1,984,061	\$3,957,735	\$59,730	\$49,342	\$179,189	\$18,179	\$0	\$0	\$6,248,235
Machinery Operators and Drivers	\$35,308,067	\$42,838,277	\$1,196,176	\$596,189	\$1,651,862	\$212,653	\$26,582	\$0	\$81,829,805
Laborers	\$1,007,864	\$1,785,705	\$78,692	\$57,506	\$84,745	\$9080	\$0	\$0	\$3,023,592
Other	\$950,902	\$1,731,689	\$43,619	\$13,086	\$34,895	\$0	\$0	\$0	\$2,774,192
Total	\$63,484,780	\$83,581,205	\$1,921,550	\$1,101,541	\$3,276,950	\$357,054	\$26,582	\$19,306	\$153,768,967

participants had been on annual vacation at some time in the month before and understated their levels of absenteeism and presenteeism.

The results suggest that the estimated annual economic impact of lost productivity due to psychological distress in the Australian coal mining industry is \$153.8 million, resulting from the loss of 3.4 million hours. Given that pre-tax operating profits for the Coal Mining Industry for 2012 to 2013 were estimated at \$1.7 billion (2014 to 2015 AU\$),^{25,26} this lost time represents close to 9.0% of pre-tax operating profit.

At this time, there is no other research specifically on costs of psychological distress in the Australian Coal Mining Industry. Kelly et al⁴ estimated that annual costs attributable to mental illness across all minerals industries in NSW are \$320 million to \$450 million per annum. The authors estimated annual productivity losses for NSW Minerals Industry workers with high psychological distress, at \$8800 per annum for managers and senior administrators; and higher for manual workers at \$11,067 for affected machine operators and laborers, and \$16,500 for precision production and crafts employees. Notably, this analysis found, that in the sample data, managers had highest average losses due to psychological distress, in monetary terms. The average value of lost time among professionals was comparable to technicians and trades workers and machinery operators and drivers. These results suggest that psychological distress in the Australian Coal Mining industry is expensive across occupations.

CONCLUSION

The annual economic impact of lost productivity in 2015 due to psychological distress in the Australian Coal Mining Industry was estimated at \$153.8 million. Such a loss occurs largely among machine operators and drivers and technicians and trade workers. However, smaller occupational groups such as managers and professionals have significant average costs, due to their higher wages. Hence, the Australian Coal Mining Industry has significant potential financial gains in undertaking informed preventative programs and supporting staff vulnerable to psychological distress. The results are relevant to present public discussion and government health policy concerning FIFO/DIDO work and its health and social implications. A 2013 House of Representatives inquiry on FIFO/DIDO workers in Australia recommended that the Commonwealth Government plan for better access to health services in areas receiving significant influxes of FIFO/DIDO workers.²⁷

Relevant to this research is the presence of stigma within male-dominated industries such as coal mining, about acknowledgment and help seeking for mental illness. Mining employers might assist in creating healthier attitudes with at work programs such as men's support groups and mental health libraries.²⁸ To do so has benefits for employees, the employer, and the Australian community. The Australian construction industry is currently growing a national program to prevent suicide among construction workers, Mates in Construction.²⁹ A similar program could be instituted in mining.

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