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A work-life perspective on sleep and fatigue—looking beyond shift workers

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Abstract: This study examines sleep and fatigue through a work-life lens. Whilst most often thought of as an issue for shift workers, this study observed that self-reported insufficient sleep and fatigue were prevalent for workers on standard daytime schedules. Using a representative sample of 573 daytime workers (51.3% men; 70.7% aged 25−54 yr) from one Australian state, it was observed that 26.4% of daytime workers never or rarely get the seven hours of sleep a night that is recommended for good health. Those with parenting responsibilites (29.4%) or working long (45+) hours (37.4%) were most likely to report insufficient sleep. Whereas mothers in full-time work were most likely to report frequent fatigue (42.5%). This study highlights the common experience of insufficient sleep and fatigue in a daytime workforce, with significant implications for health and safety at work and outside of work. Stronger and more effective legislation addressing safe and 'decent' working time is clearly needed, along with greater awareness and acceptance within workplace cultures of the need to support reasonable workloads and working hours.

Key words: Work-life, Sleep, Fatigue, Work hours, Parents

Introduction

There have been profound workforce changes in industrialised countries such as Australia, particularly with regard to increased employment participation of women, sole and dual-earner parents and older people[1–3]. Work-life conflict is a key challenge for such diverse workforces, exacerbated by the continuation of traditional gendered patterns of engagement in care and domestic work[4]. It is well established in the work-life research literature that the two central dimensions of work-life conflict are time pressure and emotional strain related to difficulties managing work and family commitments[5]. Indeed, there is a well established link between work-life conflict and a range of health outcomes including mental and physical health and reduced family and general life satisfaction[6–9].

This study considers two health outcomes closely related to time pressure, fatigue and a lack of sleep. As recent reviews have observed, the research literatures in these two areas—fatigue/sleep and work-life conflict—are both substantive but largely unconnected[9, 10]. Yet, in both research domains working time is central. Sleep and fatigue research in the work context mostly focuses on the scheduling of work shifts[11, 12]. Research on work-life conflict tends to focus on length of working hours[9]. Here we bridge these two research literatures by investigating the prevalance of insufficient sleep and fatigue for Australian workers on daytime schedules (i.e., work between 8 am and 6 pm). Whilst much is known about the prevalance of sleep and fatigue in shiftworkers, fewer studies have focused on daytime workers[12]. The aims of this study were

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to investigate (1) the prevalance of fatigue and sleep issues for daytime workers, (2) explore how gender and parenting responsibilities affect the prevalence of these issues, and (3) investigate workers' perceptions of how fatigue affects their work and family life, including differences by gender and parental status.

There are compelling reasons to investigate the prevalence of sleep loss and fatigue in the workforce. Laboratory research has shown that sleep loss and disruptions of circadian rhythms result in impaired performance and increased incident and accident risk at workplaces and on roads[13–18]. Regularly experiencing insufficient sleep (less than seven hours) has been linked with serious health issues such as cardiovascular disease, cancer and weight gain[19, 20], and impairments to mental functions such as diminished memory and decision making, and increased risk of anxiety and depression[21, 22]. A lack of adequate sleep also increases the risk of road accidents and injuries[23]. Furthermore, fatigue and human error have been linked to major operational catastrophes such as the grounding of the oil tanker Exxon Valdez[24] and the Challenger Space Shuttle disaster[25]. There is also a large financial cost to employers of fatigued employers, estimated at between US$2,319 to US$3,156 per sleep deprived employee annually, depending on the extent of sleep deprivation[26].

Previous research indicates how sleep and fatigue for daytime workers are likely to vary with work and personal contexts. The 'work-life lens' applied in this study considers work, gender and care as interconnected aspects of individuals' lives that influence how paid work affects wellbeing[27]. For example, in their recent review Di Milia *et al.*[12] identified care responsibilities as an unexamined demographic factor that may have implications for sleep and fatigue. Parenting has been argued to be one of the most physically and mentally demanding activities of life[28], and is consistently associated with higher work-life conflict and time pressure, particularly for women[9, 27]. Therefore, we expected that parents would be more likely to experience fatigue and insufficient sleep (*Prediction 1*). We also expected sleep and fatigue problems to worse for working mothers than fathers, due to their greater contribution to unpaid care and domestic work and common experience of chronic time pressure especially in full-time work[4, 27, 29–32]. Studies that control for women's shorter work hours observe higher work-life conflict for women than men[27, 33–37]. Similarly, we predicted that for employees working similar hours women would be more likely to report fatigue and insufficient sleep than men (*Prediction 2*). Further, we expected that working mothers would report the worst sleep and fatigue outcomes in the whole sample, including the perceived effect of fatigue on work and home life (*Prediction 3*).

There is some research on sleep and fatigue that supports the connection between work-life conflict and problems with sleep and fatigue, especially for women. Work-life conflict has been linked with lower sleep quality[38, 39], increased use of sleep medication (only women)[40] and increased fatigue, exhaustion and sleep disorders[41–44]. There is also evidence that parenting and long working hours increase the risk of fatigue for women to a greater extent than men[12, 45, 46]. Time pressure, a particular risk for working women, has also been shown to predict fatigue[47]. Finally, there is evidence that women are more likely to experience interrupted sleep as they more often attend to child-care needs during the night[48].

In addition to gender and parenting, work-life research also emphasises the importance of the length of work hours. In this study we compared part-time and full-time workers (the latter defined in Australia as 35 or more hours per week), and also compared full-time employees working 35−44 h or long full-time hours (45+ h). There is no agreed definition of long full-time hours; a great deal of variation exists in research and policy. In reality, the work and home contexts of an individual influence both willingness and capacity to work long hours[27]. In this study we used a cut-off of 45 h as this translates to a nine hour work day (assuming a two day weekend break), a benchmark suggested in work-life research as a reasonable cut-off for long hours spent in paid work, especially in the context of time spent commuting and in unpaid (care, domestic) work[27].

There are clear links between long work hours and reduced sleep quality and quantity and increased fatigue[10, 12, 49–52]. This study applied a work-life lens by examining how these patterns vary by gender and parenting status. We also investigated workers' perceptions of the impact of fatigue on their work and personal lives, to gain further insight into the potential implications for wellbeing and optimal functioning. As work-life pressures are likely to be greater for women and parents, we expected the perceived effects of fatigue on functioning would be greater for these groups.

Method

Data collection

This report uses data collected from a 2010 telephone survey conducted in a single Australian state. The sample

Table 1. Sample overview (%)

	Study sample	ABS
Age		
18–24 yr	12.0	16.6
25–44 yr	45.7	44.4
45–54 yr	25.0	22.5
55–64 yr	14.7	15.4
65+	2.6	3.0
Highest level of education		
University degree	34.9	31.8
Vocational college	35.4	19.0
Secondary school	29.7	48.0
Occupation		
Manager	9.6	13.7
Professional	26.8	20.4
Technician/trade	10.2	14.3
Community/personal service	13.5	9.2
Clerical and administrative	22.1	14.0
Sales	8.4	10.0
Machinery operators	1.8	6.5
Labourers	7.5	12.2
Work hours		
Part-time (<35 h per wk)	35.1	32.8
Full-time (35+ h per wk)	64.9	67.2

*% of full time (35+ h) workers. ABS data sources: ABS Cat. No. 6227.0 Education and Work Australia, May 2009; ABS Cat. No. 6202.0 − Labour Force, Australia, March 2010, Time series spreadsheet Table 7, labour force status by sex − South Australia; ABS Cat. No. 6291.0.55.001 − Labour Force, Australia, Detailed − Electronic Delivery, Mar 2010 (LM8); ABS Cat. No. 6291.0.55.003 − Labour Force, Australia, Detailed, Quarterly, Feb 2010, E08_aug96 − Employed Persons by Sex, Occupation, State, Status in Employment.

was collected by a randomly selected cross-section of the adult employed population in that state, with data collected by computer-assisted telephone interviews (CATI). Data was collected over four weekends in March 2010, as part of a larger survey on working time and work-life interference. Respondents were selected by means of a random sample process, and were eligible to participate in the study if they were 18 yr of age or older and were currently employed in paid work (employees on paid or unpaid leave were included in the study). In addition to these inclusion criteria, quotas were set for gender, age and geographic location (metropolitan and rural/regional areas). Household telephone numbers were selected using random digit dialling and there was a random selection of an individual in each household by means of a 'last birthday' screening question.

Sample

The sample comprised 573 employees on standard daytime schedules (work between 8 am−6 pm) (Table 1), with an even distribution of men and women (51.3% men). Nearly half (47.3) of participants had at least one child aged under 18 yr. Most participants were aged from 30 to 64 yr, and just under half had children aged under 18 yr. The majority of participants had a University or vocational college qualification. The most common occupational group was professionals, followed by clerical and administrative workers, community/personal service workers and technicians/trade workers. Comparison with Australian Bureau of Statistics (ABS) estimates (Table 1) indicates that the sample provides provides an accurate representation of the labour market at the time of the survey with respect to gender, age, type of employment and part-time/full-time work hours. The sample slightly over-represented individuals with vocational college qualifications and community/personal service workers, and slightly under-represented managers (population sample Z test <0.05).

Measures

Insufficient sleep and fatigue

Insufficient sleep was measured by a single question addressing the frequency with which participants 'get more than 7 h of sleep each night'. Seven hours of sleep a night is a commonly accepted minimum recommended time for healthy functioning; regularly having less than seven hours of sleep has been associated with a range of adverse outcomes including reduced cognitive functioning and increased risk of various detriments to physical health[53]. Responses of 'never' or 'rarely' on this scale were used to define insufficient sleep. The second question addressed fatigue, and was adapted from the widely used Samn-Perelli Fatigue Scale[54]. Respondents indicated the frequency with which they felt 'extremely tired or completely exhausted'. These two descriptors represent the highest two levels of fatigue on the Samn-Perelli scale, combined into a single item. Responses of 'often' or 'almost always' on this scale were used to define fatigue.

Work hours

Participants were asked how many hours they normally work in a week, taking into account paid and unpaid overtime. In this study long full-time hours were defined as 45 or more weekly hours.

Statistical analyses

Using SPSS software, binary logistic regression analyses

Table 2. Frequency of sleep and fatigue problems, by gender, %

	Never/Rarely	Sometimes	Often/almost always
Feel extremely tired/completely exhausted (fatigue)			
All	29.6	42.8	27.6
Men	37.6	45.5	16.9
Women	23.5	40.8	35.7
With children*	28.0	44.9	27.2
No children*	31.0	41.5	27.5
Get more than 7 h of sleep a night (never/rarely)			
All	26.4	23.9	49.7
Men	30.6	19.4	50.0
Women	23.2	27.3	49.5
With children*	29.4	22.4	48.2
No children*	24.1	25.0	50.9

* All participants

Table 3. Frequency of fatigue by work hours and parental status, %

	Never/Rarely	Sometimes	Often/almost always
Full-time (35+ h)	32.2	44.1	23.7
With children	36.5	40.5	23.0
No children	29.3	46.5	24.2
Part-time	25.1	40.7	34.2
With children	14.6	52.1	33.3
No children	35.3	30.4	34.3

Full-timers versus part-timers: all employees $\chi^2(2)=7.68$, $p<0.05$; with children $\chi^2(2)=14.06$, $p<0.01$; without children $\chi^2(2)=7.73$, $p<0.05$

Table 4. Frequency of insufficient sleep (never/rarely get more than 7 h of sleep a night) by work hours and parental status, %

	Never/Rarely	Sometimes	Often/almost always
Full-time (35+ h)	29.8	24.0	46.1
With children	38.1	21.8	40.1
No children	24.5	25.5	50.0
Part-time	20.2	23.2	56.6
With children	16.7	22.9	60.4
No children	23.5	23.5	52.9

Full-timers versus part-timers: all employees $\chi^2(2)=7.32$, $p<0.05$; parents $\chi^2(2)=14.00$, $p<0.01$

were conducted in which gender, parenting status and work hours were entered on the first step, and all possible combinations of two-way interactions on the second step. The aim of this analysis was to test for differences in reported fatigue and getting less than seven hours of sleep between (1) men and women, (2) those with and without parenting responsibilities (for children under 18 yr of age), (3) part-time and full-time workers, and (4) those working 35–44 versus 45+ full-time hours. Where possible, taking into account sample size restrictions, we also examined whether the relationship between work hours and the two outcome measures differed by gender and parenting status by entering two-way interaction terms into each regression analysis. Descriptive data is presented in Tables 2 to 4, and summaries of logistic regression analyses (B values, odds ratio (OR), 95% confidence interval (95% CI) and p values) in Tables 5 and 6 with further detail on statistically significant observations ($p<0.05$) provided in text and Table notes. Regression analyses were conducted separately for all workers (full-time/part-time) and full-time workers (35−44 / 45+ h). There were no significant covariates (age, education, occupational status) in any of the regression analyses.

Results

Gender differences

Frequent fatigue and never/rarely having more than seven hours of sleep were reasonably common experiences for workers on daytime schedules (Table 2). Just over one quarter of workers reported frequent fatigue (extremely tired or completely exhausted), with an additional 42.8% sometimes feeling fatigued. Similarly, around one quarter also reported never or rarely having more than seven hours of sleep, with a further 23.9% only sometimes getting seven more hours of sleep. There were clear gender patterns. As expected, women were more likely to report frequent fatigue (Table 5, OR=2.35). Contrary to predictions, there were no gender differences in reported frequency of getting more than seven hours of sleep ($p=0.216$).

Parenting

The expectation that parents would be more likely to report sleep and fatigue issues was partially supported in the logistic regression analyses. For the whole sample there was no relationship between parental status and reports of fatigue ($p=0.571$) or frequency of sleeping more than seven hours a night ($p=0.065$) (Table 2). There was an association between self-reported sleep and parental status when the sample was restricted to full-time workers; parents working full-time (35+ h) were more likely to report never/rarely getting more than seven hours sleep than full-timers without children (Tables 4 and 6). The majority of full-time workers are men (55.6%). Separate analyses on men and women in full-time work revealed that never/rarely getting more than seven hours sleep was more likely for fathers (43.4%) than men without children (20.6%) (OR=2.87 (CI=1.52, 5.43), $R^2=0.06$ (Cox & Snell), 0.08

Table 5. Summary of fatigue logistic regression analyses, all workers (full-time/part-time)

	95% CI for Odds Ratio		
	Lower	Odds Ratio	Upper
		Fatigue	
Constant			
Gender (female = 1)	1.53	2.35***	3.62
Part-time (0)/full-time (1) h	0.62	0.93	1.41
Parenting (parent = 1)	0.76	1.12	1.65

R^2=0.03 (Cox & Snell), 0.05 (Nagelkerke). Model $\chi^2(3)=19.64$, $p<0.001$. ***$p<0.001$. Insufficient sleep analyses not reported (see text).

(Nagelkerke). Model $\chi^2(2) = 12.39$, $p<0.01$). Contrary to predictions, mothers in full-time work were not likely to report never/rarely having more than seven hours of sleep compared to their counterparts without parenting responsibilities (p=0.809). Also contrary to predictions, fatigue was not predicted by parental status in separate analyses of men and women, p=0.547 and p=0.532, respectively). It is noteworthy that fathers working full-time were more likely to report never/rarely getting more than seven hours of sleep (43.4%) than mothers working full-time (24.4%) ($\chi^2(1)=4.36$, $p<0.05$). Therefore the prediction that women combining work and care would report the worst sleep and fatigue was not supported.

Work hours—full-time and part-time work

Analyses of part-time work must be interpreted with care given that the majority of part-time workers were women (81.6%), most of whom had children (59.1%). As noted previously, the majority of full-time workers were men, very few women reported longer full-time hours (34.7% of long hours workers were women). The logistic regression analyses of work hours, gender and parenting were exploratory; no specific predictions were developed. There were no significant differences in reported fatigue for part-time and full-time workers (p=0.749), nor were there significant interaction effects between work hours (part-time/full-time) and gender (p=0.09) or parenting status (p=0.463). The high prevalance of frequent fatigue reported by mothers working full time—42.5%—was noteworthy (compared to 16.0% of similar fathers) ($\chi^2(1)=10.96$, $p<0.01$).

Considering only full-time workers, there were no differences in fatigue by length of work hours (35−44 h compared to 45+ h) (p=0.370), nor were there interaction effects between length of full-time hours and either gender (p=0.372) or parenting status (p=0.493). Those working 45+ h were more likely to report never/rarely having more than seven hours sleep (37.4%) than those working 35–44 h (26.5%) (Table 6). Furthermore, it is noteworthy that almost half of parents working long full-time hours reported never/rarely having more than seven hours of sleep (49.0%; 28.1%t of long hours workers without children) ($\chi^2(1)=4.90$, $p<0.05$).

Perceived consequences of fatigue

Fatigue was perceived to have negative consequences on a wide range of life domains (Table 7). Between 50 to 60% of workers reported negative effects of fatigue on their life outside of work with respect to mood at home, physical health, family life, hobbies and interests and social life. Just over 40% reported a negative impact on mental health.

A substantial proportion, over 40%, of fatigued employees also identify negative impacts on work, including their productivity, job satisfaction and quality of work. One quarter of employees reported that fatigue affects their safety travelling to or from work, and 15% were concerned for their safety at work. The only significant gender difference was the perceived effect on physical health, with women were more likely to report a negative effect of fatigue on physical health (59.3%; 48.7% of men; $\chi^2(1)=4.21$, $p<0.05$).

When considering the effects of parental status it is not surprising that workers with children would report more negative effects on home and family life. This most likely reflects the increased demands associated with managing both paid work and a household with children. Specifically, employees with children were more likely to identify fatigue as affecting their family life in general (65.9% of parents; 47.7% of those without children), mood at home (71.0% of parents; 61.5% of those without children) and personal hobbies and interests (62.9% of parents; 50.9% of those without children). There were no significant gender differences in these patterns, or between mothers and fathers in the perceived effects of fatigue.

Discussion

Our findings indicate that a substantial proportion of the daytime workforce experiences insufficient sleep (less than seven hours a night) or fatigue on a regular basis, and this is particularly the case for working women and parents. A key conclusion of this paper is that insufficient sleep and fatigue are important occupational health and safety issues that are not restricted to those working non-

Table 6. Summary of fatigue and insufficient sleep (never/rarely get more than seven hours of sleep a night) logistic regression analyses, full-time workers

	95% CI for Odds Ratio		
	Lower	Odds Ratio	Upper
	Fatigue		
Constant		0.14	
Gender (female=1)	1.86	3.16	5.36
35–44 (0) / 45+ (1) h	0.75	1.27	2.14
Parenting (parent=1)	0.82	1.40	2.36
	Get more than 7 h of sleep a night (never/rarely)		
Constant		0.25	
Gender (female=1)	0.54	0.89	1.46
35–44 (0) / 45+ (1) h	1.01	1.63	2.63
Parenting (parent=1)	1.23	1.99	3.21

Fatigue: R^2=0.05. (Cox & Snell), 0.08 (Nagelkerke). Model $\chi^2(3)$=19.27, p<0.01. Insufficient sleep R^2=0.04. (Cox & Snell, 0.06 (Nagelkerke). Model $\chi^2(3)$=14.50, p<0.01. ***p<0.001, ** p<0.01, * p<0.01

Table 7. Aspects of life perceived to be affected by fatigue, by work hours and gender, %

Personal domain	All
Mood at home	65.7
Physical health	55.3
Family life	55.8
Social life	55.6
Hobbies/interests	56.3
Mental health	45.7
Work domain	
Productivity	45.7
Job satisfaction	45.7
Quality of work	40.1
Safety travelling to/from work	25.1
Safety at work	15.0

standard hours or shift-work. Just over one quarter of daytime workers in our study reported never or rarely having the seven hours of sleep a night that is recommended for good health, and this proportion increased to around half of parents working long hours (45+). Around 40% of mothers in full-time work reported frequent fatigue. Part-time work did not protect women from fatigue—around one third reported frequently feeling extremely tired or completely exhausted. In general, nearly 30% of workers reported frequent fatigue. Contrary to expectations, long hours (45+) were not associated with more frequent fatigue compared to shorter full-time hours. This may reflect the high proportion of men in this long hours cohort, who are less likely to report fatigue. There was a clear link between long full-time (45+) hours and insufficient sleep, with some indication that this pattern is likely to be strongest for parents. Nearly half of parents working long hours reported never or rarely having 7+ h of sleep.

Comparing our results to previous research, studies of the general population observe a lower prevalance of insufficient sleep than was reported in this study, although estimates do show substantial variation. For example a study of the UK adult population observed that only 5% of adults slept for less than five hours[55]. An American time use study found 32.6% of respondents slept less than 7.5 h on a weekday[56]. Estimates in the current study may be higher as we focused on the employed population and parents (both groups sleep fewer hours on average than those not employed or those without children)[55–57]. Gender differences in reported sleep quality and duration have not been consistently observed in previous research, which may in part be due to gendered patterns of bodily awareness and willingness to report health issues[55] and/or gender differences in work hours and educational attainment[57]. There is some evidence that, in general, men sleep less than women[55, 56], although this gender difference was not observed in the current study. There is some evidence that fathers have a lower sleep quality than mothers (although for full-time adults, mothers and fathers slept least well with no gender difference)[55]. In this study we found that for full-time workers fathers were more likely to report insufficient sleep than both mothers and men without parenting responsibilities. With regard to work hours, a study of the American Time Use Survey observed that working time was the strongest predict of sleep time; with longer work hours strongly associated with fewer sleep hours[56]. This is consistent with the finding in this study that insufficient sleep was most likely to be reported by those working long (45+) full-time hours.

These common experiences of insufficient sleep and frequent fatigue are likely to place significant strain on workers' capacity to be effective and engaged workers, parents, partners, friends and community members. As discussed previously, there is also clear evidence that sleep deprivation and fatigue increases the risk of workplace accidents, transport accidents and serious decrements to work performance[58]. The workers in this study concurred, identifying many personal and work outcomes that were compromised as a result of their fatigue. It is interesting to observe that parents were not more likely to report detrimental effects of fatigue on their work productivity, quality or safety. Rather, it is their family and personal life that bears the negative impact of their fatigue. This

suggests that the strains of the "double-shift" of paid work and parenting responsibilities is likely to exert the greatest impact on their family and home life.

That these issues of insufficient sleep and fatigue are relatively common for workers on standard daytime schedules indicates that government and organisational policies need to substantially strengthened to secure the health and safety of daytime workers in Australia and other industrialized countries. We turn now to the implications of this study for policy and practice.

Implications for policy and practice

As observed in the Introduction, the focus of much of the research and policy related to work-life balance, sleep and fatigue is on working time (hours and scheduling). Here we consider two central aspects of working time policy, access to flexible work arrangements and the length of working hours, with respect to strategies to reduce the risk of sleep and fatigue issues for wokers on daytime schedules.

Starting with work hours, our findings suggest that working 45+ h significantly increases the risk of insufficient sleep. Other studies have also observed clear links between long work hours and reduced sleep quality and quantity and increased fatigue[10, 12, 49–52, 56]. Therefore, our first recommendation is that an upper limit be set for 'reasonable' hours, similar to the European Working Time Directive. One approach would be to strengthen workers' right to reasonable working hours by setting a legal limit of no more than 45 h per wk on average, with a clear and specific set of exceptions to take into account occasional exceptions such as emergency situations. The key principle being that long working hours are the exception rather than the norm.

In addition to the length of a working day or week per se, a second crucial dimension of working time is the extent to which the length and scheduling fit with an individuals' needs, preferences and circumstances[59]. Employee-centered flexibility, in which workers have some input and control over the scheduling and length of their work hours and location of work is an important resource for employee wellbeing. A number of studies have shown that flexible working practices are associated with reduced fatigue and better sleep quality[60–63]. In this study substantial proportions of workers who did not have children aged under 18 yr also reported insufficient sleep and frequent fatigue. It is clear that access to flexible work practice would benefit the health and safety of all workers, whether they have care responsibilities or not.

Similar to many other industrialised countries, supporting and enabling women to increase their employment participation has been identified as a significant public policy issue in Australia, given the ageing of the population and the need to maintain productivity and economic growth[64, 65]. Our findings that just over a third of working women were persistently fatigued, a rate that varied little by parental status or part-time/full-time work hours. These findings suggest that supports and resources that support women's employment participation should be considered a priority. It is most likely that women's larger contribution to unpaid care and domestic work is a major factor in these high rates of fatigue[27, 66], along with the consistent observation that women are much more likely to experience chronic daily time pressure than men[27, 30–32]. Indeed, a population study of Swedish women observed that factors such as a poor home/family/social situation were significant predictors of sleeping problems[67]. For working women, high levels of time pressure and work-life conflict are key predictors of work-life conflict, family/social strain and dissatisfaction[27]. Cross national studies have shown that men's participation in unpaid care and domestic work, which also substantially reduces womens' work-life strain, is substantially by enhanced by government policies that encourage men to take parental leave, combined with paid leave that is to some extent mandated (e.g 'use it or lose it' paid leave for fathers)[68, 69].

Study limitations

Whilst this study took a unique work-life perspective on sleep and fatigue, there is clearly a need for further research. The study relied on cross-sectional data from a single Australian state, with a limited set of questions on sleep and fatigue. For example, length of sleep may be shorter on work days than non-work days[56], hence a more sensitive measure of duration of sleep may provide further insight into the relationship between gender, parenting, work hours and sleep[55]. In addition, limited work and social demographic data was available, such as children's health status (e.g., special needs), commuting times and geographic area (e.g., urban, regional) were not available. Future studies should utilise longitudinal methodology, and preferably collect more detailed and nationally representative data. With respect to investigating the impact of parenting, the current study defined parenting responsibilities by the presence of a child under the age of 18 yr. Further insight into the impact of parenting may be gained in future studies by broadening this definition to include parents of young adults (e.g. parents of young adults living

in the family home).

Conclusion

Insufficient sleep and fatigue are important health and safety issues, which the findings of this study indicate are experienced by a substantial proportion of the daytime working population. Work-life strains clearly play a key role—women, those working long hours and parents were at greatest risk of sleep and fatigue issues, and these groups are also most often identified as at risk of work-life pressures and strains. Stronger and more effective legislation addressing safe and 'decent' working time is clearly needed. Legislative reform alone is necessary but not sufficient to secure the health and wellbeing of daytime and shift workers. Initiatives to address working time and flexibility also require a holistic approach that examines the factors that encourage or require long hours such as workloads, performance expectations, implicit and explicit rewards for long hours within organisational cultures and work practices[70–72].

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