Shift work and health

Development of accessible information to support education and awareness of the health outcomes associated with shift work

Dr. Amy Reynolds

Dr. Sarah Jay

Professor Drew Dawson

Associate Professor Jill Dorrian

Professor Sally Ferguson

MAKE THE SHIFT TO GOOD HEALTH

MAKE THE SHIFT TO GOOD HEALTH

Published by CQUniversity's Appleton Institute
School of Health, Medical and Applied Sciences
Adelaide Campus, Australia
44 Greenhill Road, Wayville SA 5034
PO Box 42, Goodwood SA 5034

Citation
Reynolds AC, Jay SM, Dawson D, Dorrian J and Ferguson SA (2017). Shift work and Health: Development of accessible information to support education and awareness of the health outcomes associated with shift work

ISBN
13 digit: 978-1-921047-18-3
10 digit: 1-921047-18-6

Acknowledgements
This work was supported by a SafeWorkSA Commissioned Research Grant.

Contents

Executive Summary

Shift work (encompassing, night work, on-call, long work hours, irregular work hours and Fly-in Fly-out or Drive-in Drive-out work arrangements) is increasingly common across a broad range of industries and demographics. While shift working arrangements are essential for the maintenance of our global 24h society, there are known risks to shift workers which do not apply to individuals who work more 'standard' hours (Monday-Friday, 9am-5pm).

Working at night, in the evening, and early morning in combination with restricted opportunity for sleep, elevates the fatigue risk for shift workers. The increased likelihood of fatigue related accident, error or incident has been acknowledged and in some industries, formally managed for over a decade using Fatigue Risk Management Systems (FRMS).

However, the impact of these same working conditions on worker health and wellbeing has received less attention. This is problematic, as a developing body of scientific literature recognises shift work is associated with development of adverse health outcomes. Based on this literature, our research group initially proposed the development of a formal risk management framework specifically for the management of the health risks associated with shift work – termed FRMS-Health. However, key industry contacts on the project Steering Committee advised that industry was not yet ready for formal management strategies, as awareness and understanding of the health risks associated with shift work is only in its infancy. At the advice of the expert committee, we revised our original approach to development of education materials to support industry awareness about the health risks associated with shift work. We focussed on practical, positive solutions to support individual awareness and management of the health impacts associated with shift work.

Our approach to the development of the education materials is evidence-based; with consultation of both FRMS best practice literature (which demonstrates the idea that education and knowledge is key) and a theoretical rationale anchored in the Health Belief Model. The result is a flexible suite of education tools designed to translate across different industries and demographics; and to be rolled-out as a suite or in isolation. A focus was placed on accessible, easily interpreted materials to facilitate engagement across a diverse range of workers.

The long-term intention will be to develop and implement formal systems for the management of health risk associated with shift work, using FRMS as a framework. It is our hope that the materials in this project package will be widely used to promote awareness and educate industry about shift work and health. Education and awareness constitutes the first step in the future development of an FRMS-Health.

Shift Work and Health

Health Consequences of Shift Work

Shift work is a necessary function of a society with 24/7 operational demands[1]. Workers in healthcare, transport, emergency services and hospitality play an intrinsic role in delivering services outside a standard (0900 h – 1700 h) working day. 'Shift work' encompasses a variety of work schedules with a common theme of nonstandard working hours; these include fixed (morning, evening and/or night), rotating (two or more of the previous shift types in an alternating fashion), rostered and transient on-call requirements, and overtime shift patterns[2].

Shift work arrangements differ by industry, and by work role, and can encompass adhoc on-call requirements, irregular schedules and long work hours. Over 15% of Australian workers identify as shift workers, and almost 50% of these workers report working rosters that include night work. Night work is the most disruptive schedule in terms of impact on circadian rhythms and sleep, and most strongly associated with adverse health outcomes[3].

Exposure to shift work is associated with a range of adverse health outcomes; most commonly weight gain/obesity, type 2 diabetes, metabolic syndrome, cancers (specifically, breast cancer) and cardiovascular disorders (and more broadly, negative cardiometabolic outcomes)[2]. Gastrointestinal distress, poor mental health, and musculoskeletal complaints are also evident in shift workers[2,4]. Despite the growing evidence base suggesting that shift work exposure increases prevalence of adverse health outcomes and increases risk of mortality[5], it is neither practical nor feasible to dispense with shift work practices.

Industries commonly affected by shift work:


Healthcare and social assistance


Accommodation and food services


Community and personal service workers

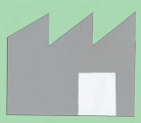

Transport, postal and warehousing


Mining


Emergency services


Construction


Retail trade

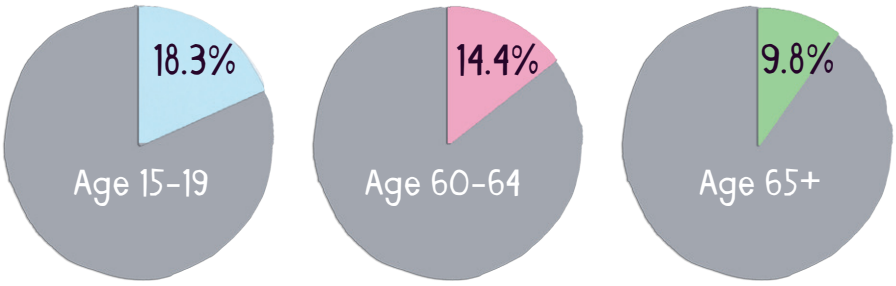

Manufacturing


Information, media and tele-communications


Art and recreation services

Shift Workers in Australia

According to Australian Bureau of Statistics Working Time Arrangements (2012), prevalence of shift work (measured as 'usually working shift work') is relatively consistent over age groups, ranging from 18.3% of workers in 15-19 year old workers to 14.4% in the 60-64 year age bracket, declining to 9.8% in the 65+ year age bracket (see below).



All industry categories in the ABS dataset contained workers who identified as shift workers[3]. The lowest prevalence of shift work was reported in the Education and Training sector (1.5%), and highest prevalence was seen in the Mining industry (42.6%). Almost a third of workers in Accommodation and food services (37.6%), Transport postal and warehousing (30.6%), and Health care and social assistance (30.4%) indicated they usually worked shift work[3].

From these data, it is clear that shift workers span generations and industries. Workers aged 19-65 are identified as shift workers, and all industry categories specified by the ABS in the 2012 Working Time Arrangements survey have shift workers (albeit in varying quantities)[3]. While shift work itself can be summarised in the context of a number of risk factors such as night work, long working hours and rotating schedules, the diversity of workers means that not all risk factors associated with shift work will be applicable to all workers and industries. For example, one risk factor associated with poor health outcomes in shift workers is exposure to rotating rosters. In Australia, almost half of our shift working population identify as being regular rotating workers. Thus, information on rotating and irregular shifts will hold greater significance to some workers than others.

Project Development

Initial Project Scope and Aim

Shift work conditions are associated with a number of poor health outcomes. It is thought that a number of risk factors which accompany shift working conditions are responsible for this. These health outcomes represent a potentially chronic health burden for the individual, and there are implications for the employer in terms of lost productivity, presenteeism and absenteeism in the long term.

Shift work practices are synonymous with elevated likelihood of fatigue due to:

- reduced opportunity for sleep,

- a requirement to be awake at biologically adverse times of the 24-hour day, and

- extended periods of wake.

The impacts of fatigue in the workplace are well known and potentially catastrophic. Fatigue risk management systems (FRMS) mitigate against risk of fatigue-related accidents and incidents in the workplace. **Using an evidence-base of international research on sleep and circadian biology, and applying safety management system theory and a risk-based approach, FRMS represent best practice for managing fatigue-related risk.**

FRMS are primarily aimed at mitigating against the occurrence of incidents and accidents using evidence about the acute impacts of fatigue and performance impairments. However, the long-term effects of fatigue are currently less well understood and therefore less well managed, particularly in the context of worker health. **There is a need to move beyond a safety focus on fatigue risk management, and consider safety and health consequences in the longer term.**

Long-term adverse impacts will have far-reaching consequences impacting individuals, workforce capacity, and healthcare burden. **An indication of the potential long-term impacts is research showing negative health outcomes for some shift working populations in relation to gastrointestinal health, cardiovascular health and mental health**[2].

Our original project scope proposed that there is a strong need for a complimentary health component to the existing FRMS framework; we proposed development of the FRMS-H: Fatigue risk management system-health. **This project was initially intended to provide a resource package for industry and workers to support management of health and safety in the workplace, both acutely and over the long term.**

Consultation with Steering Committee

To adequately inform the needs of industry, we engaged leading personnel to form our steering committee. We asked representatives from a diverse range of industries that utilise shiftwork arrangements for their workers including; emergency services, mining and energy, health, rail and heavy vehicles.

Steering Committee Members:

Antonietta Colella - Principal Strategy and Policy Consultant at SA Health

Sue McCarrey - Chief Executive Officer, Office of the National Rail Safety Regulator

Kirsty McCulloch – Principal Consultant, Human Systems Group

Andreas Blahous – Senior Specialist (Fatigue Management), National Heavy Vehicle Regulator

Rob Sandford – Assistant Chief Officer at SA Country Fire Service

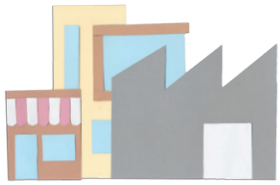
Initial discussions between the research team and steering committee were focused on how 'health' is currently represented and managed in each of the industries, what is appropriate for industry to be regulating in terms of health and the idea of prescriptive rules/guidelines. The steering committee indicated that an understanding of the link between shift work and health is limited and that knowledge and action around health in workplaces with shift work schedules is highly varied. From an industry perspective therefore, the idea of addressing the relationship between shift work and health is still in its infancy.

Based on initial discussions, it was clear that in the medium to long-term, management of health outcomes associated with shift work and extended working hours may be approached with a Risk Management System (RMS) similar to the current framework for managing the effects of fatigue on safety. However, given the current state of knowledge and understanding of shift work and health, **industry is not currently in a position to engage with, and implement, a formal FRMS-Health Framework.**

Despite this, there was consensus from industry representatives that awareness and education about shift work and health is a priority. That is, an awareness that there is risk in the first instance, followed by education and training about how to manage that risk. Experts in the field of FRMS support this education-based approach, and we refer the reader to a paper by Gander et al [6], which outlines the key organizational factors required for comprehensive Fatigue Risk Management Systems. We believe the same principles can be adopted in the future for FRMS-H development. Using an FRMS example from the Flight Safety Foundation, Gander et al state that one of the key elements to an effective FRMS is education and awareness. Further, Gander et al outline that individuals will need differing types and depths of knowledge depending on their roles within a workplace (employee, WHS personnel, management).

An important precursor to a RMS approach for shift work and health is **provision of adequate education and information for workplaces and employees to better understand the health implications of shift work and extended working hours.** Our Education Materials are solely focused on provision of information and raising awareness about the impacts of shift work for health. This will provide the foundation on which to build future FRMS-H framework(s). As guided by the Steering Committee there was an emphasis on education materials that were:

a. solution focussed,



b. applicable to a diverse range of personnel, and industries, and

c. practically implementable.

Revised Project Aims

Based on this industry consultation, it was established that a solution-focused suite of education materials would be the most beneficial platform to engage workers and employers in a more long-term conversation about the relationship between shift work, extended working hours and health. Key objectives for these materials included:

- content informed by existing evidence around shift work and health outcomes;
- easily identifiable/relatable shift work risk factors;
- materials which could be used both in isolation (single factors) or as a suite of educational materials; and
- practical, positive strategies to support the early conversation and understanding about the relationship between shift work and health.

The project overall has developed a suite of educational materials that can be used across a number of mediums (including, but not limited to, posters, flyers, PowerPoint presentations, reports). This approach is intended to facilitate individual (worker) engagement with the materials in addition to use of content in tailored education strategies for different workplaces and individuals with different roles within those workplaces.

Theoretical Rationale for Educational Material Development

Mounting cross-sectional evidence in shift work and health outcomes indicates that shift work practices can be associated with poor chronic health outcomes for these workers. However, the demands of modern society dictate a need for 24/7 operations across a diverse range of industries, and with this comes an unavoidable demand for shift work. Thus, reducing the health burden for workers is, to a degree, dependent on individual behavioural strategies and management of risk factors that are associated with the adverse health outcomes seen in shift workers.

Engagement with the steering committee highlighted diversity in awareness of adverse health outcomes associated with shift work across industries, and differences in strategies to manage these outcomes. Given this diversity in awareness of the health outcomes associated with shift work, we recognised the need to provide health information that was accessible and meaningful for workers with different working time arrangements. Further, given that changing working time arrangements is likely not a behavioural strategy available to many workers, there is a need to provide potentially modifiable behavioural and lifestyle strategies in conjunction with information about disease associations with shift work.

Preparation of the educational materials for this project was driven by constructs associated with the *Health Belief Model* developed by Hochbaum, Kegels, Rosenstock and Leventhal in the 1950s[7]. The *Health Belief Model* has been used extensively in prevention and promotion contexts for health outcomes, and is currently conceptualised around six constructs; susceptibility, severity, benefits, barriers, cues to action, and self-efficacy.

The *Health Belief Model* posits that **likelihood of taking action in regards to health outcomes is driven by both the perceived threat of illness or poor health outcomes, and by the factors which may help or hinder behaviours which could contribute to better health outcomes**[7]. Specifically, six key constructs are associated with behaviour change according to the **Health Belief Model**, including:

1. **Susceptibility:** how an individual perceives their risk of a poor health outcome
2. **Severity:** the significance of a poor health outcome from the individual's perspective
3. **Benefits:** how workers perceive positive outcomes and benefit associated with changing behaviour
4. **Barriers:** how workers perceive factors which may prevent them from changing behaviour
5. **Cues to action:** prompts to change behaviour
6. **Self efficacy:** personal perception of ability to adopt a behaviour

In the context of the education materials developed for this project, there was an emphasis from industry on providing positive, or solution-based, information in addition to education about the association between shift work and adverse health outcomes. Our interpretation in the context of the *Health Belief Model* was to provide **cues to action which** facilitate behaviour change. Alongside information about chronic health outcomes in existing literature, cues to action encourage workers to consider **susceptibility** and **severity** of adverse health outcomes which are associated with shift working conditions by, in turn increasing potential behaviour change. Finally, guided by the existing literature, we provided some examples of behaviour change to prompt workers to consider potential opportunities to reduce susceptibility and severity of disease outcomes in the long term. Examples provided were intended to be broad, accessible and achievable to promote likelihood of consideration and uptake by individual workers.

The format of these materials was intended to be linear, providing some of the behavioural consequences and risk factors of specific working conditions, the associations of these changes with adverse health outcomes, and suggested behavioural changes which could be beneficial for workers. The structure of these materials is intended to infer **benefits** to workers of making some behavioural changes to support their long-term health and wellbeing.

Development of Education Materials

Based on the scientific evidence surrounding the relationship between work, sleep and health which is concisely summarized in Appendix 3, the research team identified **five key risk factors** for workers who work non-standard hours. The design of the tool kit is based on these five key risk factors. Each risk factor can 'stand alone' as not all workers will identify with all risks; but they are consistent in presentation and information so they can also be used as a suite of education materials. The five risk factors identified in the literature are: working at night, working on call, working a FIFO/DIDO schedule, working long hours and working rotating or irregular shifts.

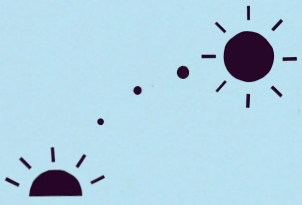
The basis of the materials is to highlight the risks, demonstrate how various work conditions contribute to these risks, identify the known adverse consequences and provide positive solutions/approaches for workers and industry. To this end, the research team developed a three-tier suite of education materials (see Figure 1) geared at providing workers, WHS personnel, and upper management with accessible information to better understand the health risks associated with shift work and extended working hours. These materials are presented in a manner that highlights the risks that may lead to poor health outcomes, and provide succinct and achievable solutions for workers to engage with.

The Five Key Risk Factors

1. Working at night [2,8-17]

2. Working on call [2,8-11,13,22,23]

3. Working a FIFO or DIDO schedule [2,9,10,13,14,18-20]



4. Working long hours [2,8-11,13-17,21]

5. Working rotating or irregular shifts [2,8-17]

Worker-oriented materials (*Education Tools*) are supported by WHS materials (*Detailed Fact Sheets*), which comprise a lay summary of key literature relevant to each risk factor contributing to health outcomes in workers. Finally, key research literature used to prepare the lay summaries for the Detailed Fact Sheets are annotated in the *Reference Material* which is targeted at WHS and other personnel wishing to access the scientific literature supporting the materials presented. This approach is intended to facilitate research utilisation and uptake for workplaces and personnel, while ensuring that worker materials are easily accessible and translate to different mediums for delivery.

Figure 1. Tool Kit Outline

Suggested Use of Materials

The **Education Tools** are presented in accessible language and format, with the intention that they can either be displayed as posters, distributed (physically or electronically) as flyers, or reframed for PowerPoint delivery (subject to workplace preference). These tools are recommended for use with employees across all roles.

The **Detailed Fact Sheets** are more comprehensive summaries of the health consequences associated with each shift work risk factor. While still intended to be accessible to a lay reader, these materials are more comprehensive and targeted at expanding understanding of current research with regards to each risk factor. The detailed fact sheets are designed to be accessible for employees either through handouts, or printed on the reverse of Education Tools as a more detailed overview of the brief Education Tool. Importantly, these documents will be useful for WHS staff and educators to support knowledge sharing within workplaces about the potential health outcomes and strategies associated with each risk factor.

The **Reference Materials** provide a detailed summary of the key resources which contributed to development of the Education Tools and Detailed Fact Sheets. This information is provided predominantly to guide further reading for WHS personnel and upper management to facilitate an evidence-based discussion around consideration of health outcomes associated with shift work. With this information, WHS personnel and managers can act as a resource when workers have queries around shift work risk factors and potential personal strategies. These materials will also provide evidence upon which to base the FRMS-H framework when industry is ready.

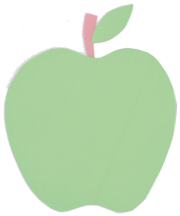
Considerations for Implementation and Uptake

These materials have been designed as the *beginning* of what is hopefully an ongoing dialogue around education for shift work and health in industry. Given that, outside the scientific community, the health consequences of shift work have received limited exposure, our materials are intentionally very simple. They have been designed so that they are easy to roll out and generalisable across industries and demographics.

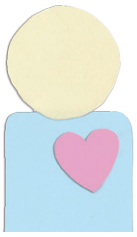
While it is not the aim of these materials to provide tailored advice or personal strategies it is important to note factors that may alter (in particular exacerbate) health risk for people engaged in shift work. That is, everyone exposed to shift work has potential to experience negative health outcomes, but there might be some individuals, who are likely at increased risk. For example individuals with pre-existing medical conditions or who have been involved in shift work for many years may have a different risk profile to those who do not have existing medical conditions or have only just started shift work. There may be gender differences and/or differences depending on the type of work that is done, the role that someone has or industry.

Future Directions

An important consideration with providing educational materials moving forward will be ensuring that they facilitate intended behaviour change. A future consideration will be pilot testing the materials developed as part of this project with different cohorts of shift workers to determine:



a. whether the materials adequately convey useful and meaningful health behaviour suggestions, and



b. whether this promotes quantifiable behaviour change which results in benefit for shift working individuals.

Following the education phase, the next step in the management of shift work related health outcomes will be work towards a framework for managing (FRMS-H) – as per the original project aims. Next steps will likely involve screening or checks to detect for vulnerabilities, or precursors to certain health outcomes (both related and unrelated to shift work) with a view that more tailored advice and personal strategies advice will follow in the future.

A focus on sleep health is at the core of education materials. As highlighted by Kecklund and Axelsson[2] in a recent state of the art review, insufficient sleep is a likely precursor to many of the adverse health outcomes we see in shift workers. In addition to targeted shift working materials to improve health (and health behaviours) our community of day and shift workers will undoubtedly benefit from positive education materials more broadly on sleep health. Recent findings from Adams and colleagues[24] suggest that inadequate sleep is experienced by up to 45% of Australian adults; and 29% of adults indicated they had made an error in the workplace as a consequence of inadequate sleep. As such, while the focus in these materials is on shift workers, whose work schedules mean they are at higher risk of insufficient sleep, it is clear that increased attention is needed on sleep health and promoting positive sleep behaviours in working adults.

References

1. Rajaratnam, S. M. W., Howard, M. E. & Grunstein, R. R. Sleep loss and circadian disruption in shift work: health burden and management. *Med J Aust* **199**, 11–15 (2013).
2. Kecklund, G. & Axelsson, J. Health consequences of shift work and insufficient sleep. *BMJ* **355**, i5210 (2016).
3. Australian Bureau of Statistics. *Working Time Arrangements, Australia; 6342.0.* (2012).
4. Knutsson, A. & Bøggild, H. Gastrointestinal disorders among shift workers. *Scand J Work Environ Health* **36**, 85–95 (2010).
5. A, K. Mortality of Shift Workers. *Scand J Work Environ Health* **43**, 97–98 (2017).
6. Gander, P. *et al.* Fatigue risk management: Organizational factors at the regulatory and industry/company level. *Accident Analysis and Prevention* **43**, 573–590 (2011).
7. Thorsteinsson, E. in *Health Psychology in Australia* (eds. Dorrian, J. et al.). Chapter 3: Common models in health psychology. Cambridge, UK: Cambridge University Press (2017).
8. Banks, S. & Dinges, D. F. Behavioral and physiological consequences of sleep restriction. *J Clin Sleep Med* **3**, 519-28 (2007).
9. Hilditch, C. J., Dorrian, J. & Banks, S. Time to wake up: reactive countermeasures to sleep inertia. *Ind Health* **54**, 528–541 (2016).
10. Boivin, D. B. & Boudreau, P. Impacts of shift work on sleep and circadian rhythms. *Pathologie Biologie* **62**, 292–301 (2014).
11. Bonham, M. P., Bonnell, E. K. & Huggins, C. E. Energy intake of shift workers compared to fixed day workers: A systematic review and meta-analysis. *Chronobiology International* **33**, 1086–1100 (2016).
12. Navara, K. J. & Nelson, R. J. The dark side of light at night: physiological, epidemiological, and ecological consequences. *Journal of Pineal Research* **43**, 215–224 (2007).
13. Nea, F. M., Kearney, J., Livingstone, M. B. E., Pourshahidi, L. K. & Corish, C. A. Dietary and lifestyle habits and the associated health risks in shift workers. *Nutrition Research Reviews* **28**, 143–166 (2015).
14. Akerstedt, T. Shift work and disturbed sleep/wakefulness. *Occupational Medicine* **53**, 89-94 (2003).

15. Knutsson, A. Health disorders of shift workers. *Occupational Medicine* **53**, 103-08 (2003).

16. Caruso, C. C. Negative Impacts of Shiftwork and Long Work Hours. *Rehabilitation Nursing* **39**, 16–25 (2014).

17. Harrington, J. M. Health effects of shift work and extended hours of work. *Occupational and Environmental Medicine* **58**, 68–72 (2001).

18. Joyce, S. J., Tomlin, S. M., Somerford, P. J. & Weeramanthri, T. S. Health behaviours and outcomes associated with fly-in fly-out and shift workers in Western Australia. *Internal Medicine Journal* **43**, 440–444 (2013).

19. Torkington, A. M., Larkins, S. & Gupta, T. S. The psychosocial impacts of fly-in fly-out and drive-in drive-out mining on mining employees: A qualitative study. *Australian Journal of Rural Health* **19**, 135–141 (2011).

20. Langdon, R. R., Biggs, H. C. & Rowland, B. Australian fly-in, fly-out operations: Impacts on communities, safety, workers and their families. *Work* **55**, 413–427 (2016).

21. Kivimäki, M. *et al.* Long working hours and risk of coronary heart disease and stroke: a systematic review and meta-analysis of published and unpublished data for 603 838 individuals. *The Lancet* **386**, 1739–1746 (2015).

22. Ferguson, S. A., Paterson, J. L., Hall, S. J., Jay, S. M. & Aisbett, B. On-call work: To sleep or not to sleep? It depends. *Chronobiology International* **33**, 678–684 (2016).

23. Nicol, A.-M. & Botterill, J. S. On-call work and health: a review. *Environ Health* **3**, 15 (2004).

24. Adams, R.J., Appleton, S.L., Taylor, A.W., et al. Sleep health of Australian adults in 2016: Results of the 2016 Sleep Health Foundation national survey. *Sleep Health* **3**, 35-42 (2017)

Appendices Industry Resources

MAKE THE SHIFT TO GOOD HEALTH

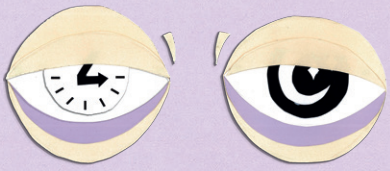
Appendix 1: Education Materials

The worker-oriented *Education Tools* are designed to be simple, and engaging with **one main message**. Their intended use is to be displayed as posters, desktop backgrounds, on PowerPoint Slides, on a webpage. Together the risk factors have a cohesive design so, can all be used together OR can be used as a stand-alone resource if a particular risk factor(s) are not relevant.

The base layout has a deliberate, flexible design in that the main message (whether it be about diet, mental health, work-life balance, sleep) can be altered depending on the audience and/or the intended focus.

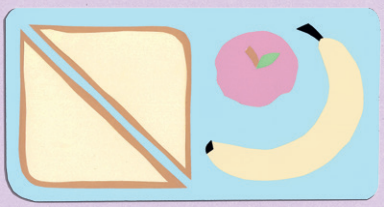
Working at night?

MAKE THE SHIFT TO GOOD HEALTH



Working at night means sometimes I need to change the timing of my meals.

Eating at night is linked to poorer food choices and can contribute to weight gain.



Pre-preparing healthy food to take to work can improve health and wellbeing.

Working at night also means sometimes:

- I try to sleep during the day
- I'm less available to family and friends
- I'm exposed to light at night

Did you know?

- Day sleep is not as 'good' as night sleep
- Working at night can be socially isolating
- Being exposed to light at night can disturb your body's natural rhythms

What can I do?

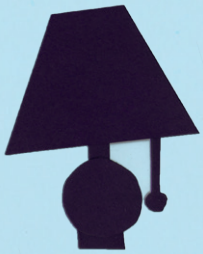
- For the best daytime sleep, make your bedroom cool, quiet and dark
- Develop a good regular relationship with your GP - they can help with health concerns before they become big problems

Working rotating or irregular shifts?

MAKE THE SHIFT TO GOOD HEALTH

Working rotating or irregular shifts sometimes means that my sleeping patterns are disturbed.

Rotating and irregular shifts are linked with poorer health, including weight gain, cardiovascular symptoms and type 2 diabetes.



Make sleep a priority – for the best sleep allow time to unwind, and make your bedroom cool, quiet and dark.

Working irregular or rotating shifts also means sometimes:

- Meal timing is disrupted
- I feel tired, stressed and run down
- It is hard to organise family and social commitments

Did you know?

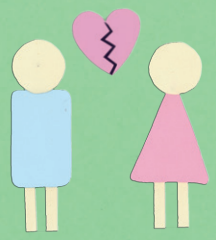
- Working rotating or irregular shifts can affect your performance at work, and your safety commuting to and from your workplace
- Eating at odd times of the day (especially night) is linked to poorer food choices
- Changing patterns of light exposure can disturb your body's natural rhythms and affect your health

What can I do?

- If you feel too tired to drive, find another way home (taxi, public transport, or a friend/family member) or rest until you feel safe to drive
- Try to maintain regular food habits – if you know you won't have access to healthy food during your shift, bring your meals/snacks to work

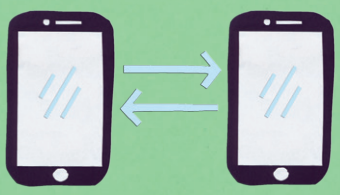
Working a FIFO or DIDO schedule?

MAKE THE SHIFT TO GOOD HEALTH



Working a FIFO/DIDO schedule can put pressure on relationships.

Many FIFO/DIDO workers report feeling isolated from everyday and important life events, even when they return home.



Set up regular contact times with your family and friends when you are away from home.

Working FIFO/DIDO also means sometimes:

- I need to work a combination of shift schedules
- I can't be as involved in important activities outside of work

Did you know?

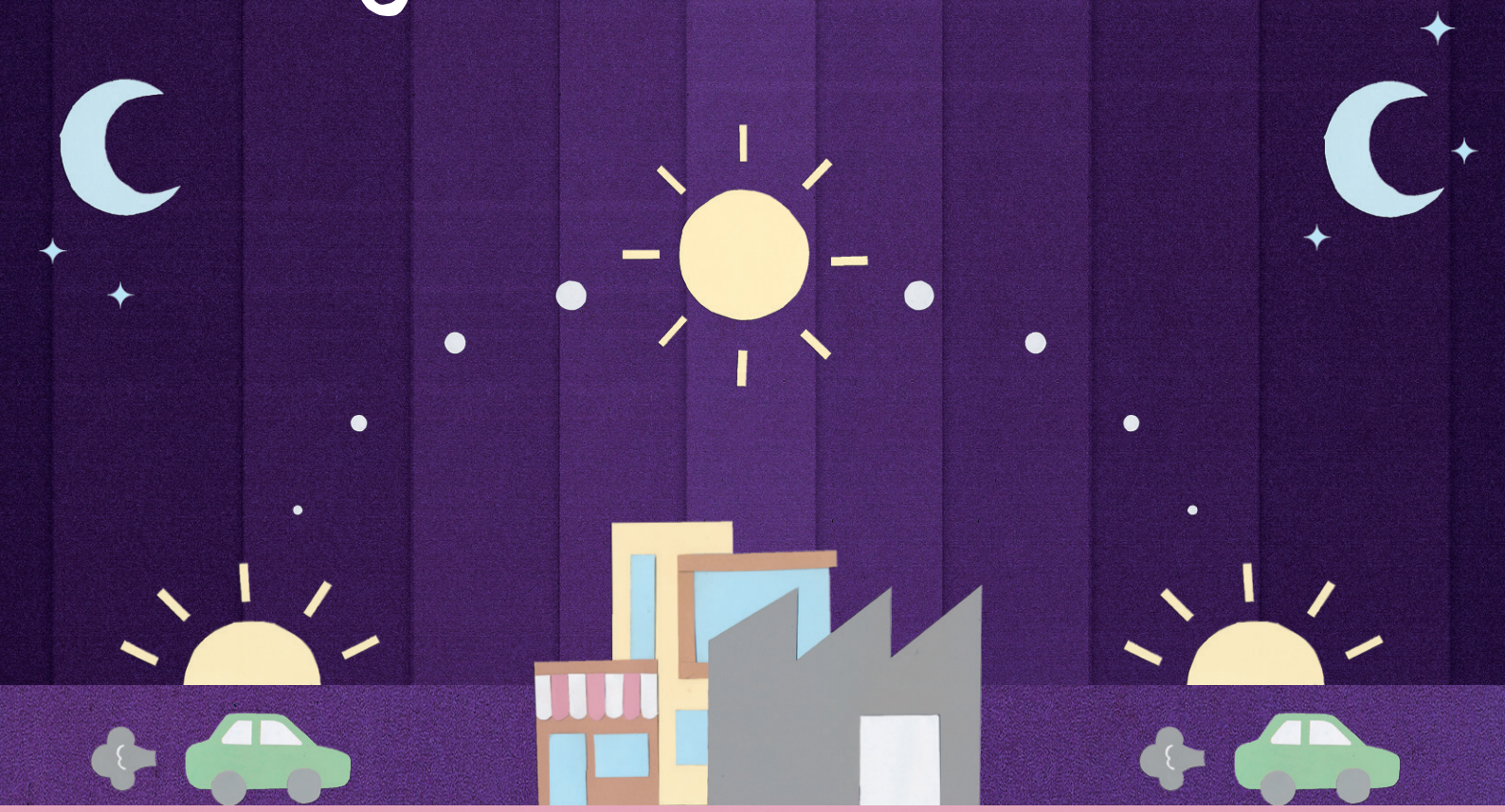
- Both night and early morning shifts are linked to less sleep, which can affect your health and safety
- Food choices when eating at night can be less healthy than choices during the day

What can I do?

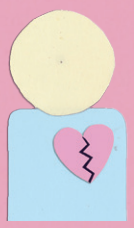
- Make sleep a priority on-site and at home, with a comfortable, quiet and cool sleep environment
- Maintaining an exercise routine on-site can be beneficial for your mental and physical health
- Where possible, try to limit unhealthy food choices - especially at night

Working long hours?

MAKE THE SHIFT TO GOOD HEALTH



Working long hours can mean there is less time for sleep, social activities and exercise.



Long work hours are linked with weight gain, greater risk of cardiovascular health problems, and poorer mental health.

Allow time for social and physical activities across your work week, while still maintaining a regular sleep routine.

Working long hours also means sometimes:

- Fatigue feels unavoidable
- I don't feel as happy and well as I would like
- I don't get the sleep I feel I need

Did you know?

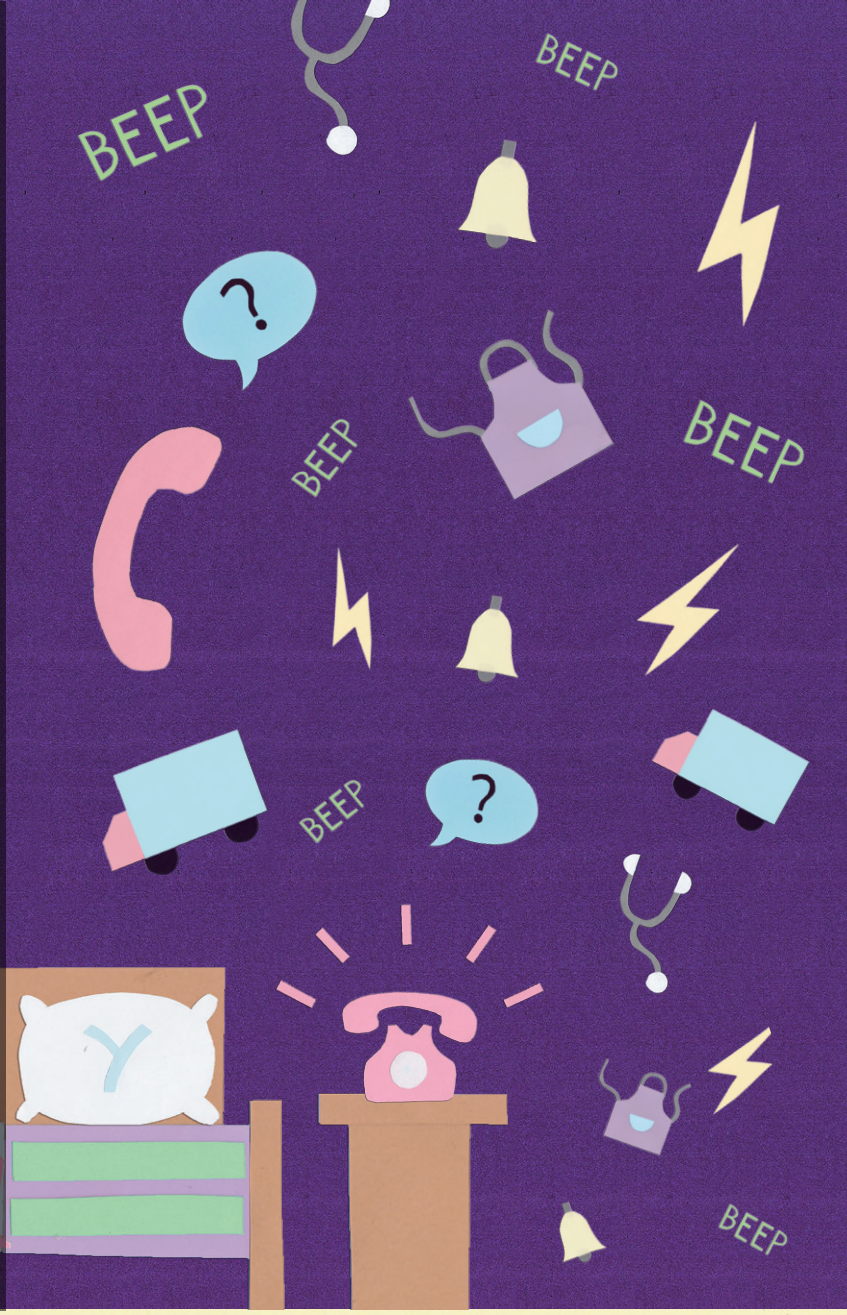
- Long work hours are associated with shorter, poorer quality sleep
- Fatigue can contribute to more errors at work, and risk of accidents both at work and on your journey home

What can I do?

- Avoid caffeine in the hours before bed
- If your work day starts early, remember to build extra time for winding down and going to bed into your evening
- If your day allows, short naps can help when you feel tired and fatigued

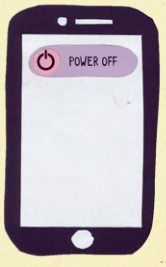
Working on call?

MAKE THE SHIFT TO GOOD HEALTH



Working on call can mean that sleep is disturbed – even when there are no calls.

Using technology at night can affect your ability to get to sleep and stay asleep.



Prioritise time to recover and rest when you're not on call (turn off the tech).

Working on call also means sometimes:

- I've always got a phone or pager nearby
- I'm waking and working at odd hours
- I'm thinking about work when trying to sleep or during family time

Did you know?

- Working at odd hours can affect your body's natural rhythms
- Performance when you wake up can be impaired – this can increase likelihood of errors or accidents
- Short and/or disturbed sleep is associated with poorer mental and physical health

What can I do?

- Be aware of reduced performance immediately upon waking
- When calls may have disrupted your sleep, try to nap
- Try to negotiate working arrangements that give you some undisturbed sleep opportunities each week

MAKE THE SHIFT TO GOOD HEALTH

Appendix 2: Detailed Facts Sheets

Detailed Fact Sheets

Audience:
Workers, WHS

Content:
Five shift work risk factors from literature
One page per risk factor including summary of:

- Industry/ies affected
- Reach/impact in Australia
- Relationship with health (what and how)

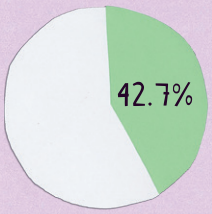
There is a Detailed Fact Sheet for each of the five risk factors. Detailed Fact Sheets will provide a lay-person's summary of the evidence relating to that risk factors. This resource is aimed at interested workers wanting information beyond the basic education tools and WHS representatives who require a more in depth understanding and background, contextual information for each risk factor.

Working at night

MAKE THE SHIFT TO GOOD HEALTH

Nearly half of Australia's shift workers report usually working on rosters with night duty. While these workers play important roles in providing services 24/7, there are some negative effects in terms of cognitive performance and health associated with working when the body is biologically primed to be sleeping.

Impact in Australia



Australian shift workers who report usually working at night (after 7pm)

Working at night and health

Of all patterns of shift work, the highest risks of chronic health outcomes associated in the scientific literature are found with night work – including:

- cardiovascular disease,
- metabolic syndrome (obesity, high blood pressure, high cholesterol, insulin resistance),
- type 2 diabetes, and
- breast cancer.

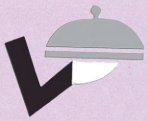
While the exact way that working at night affects health is not well understood, recent literature suggests that the most likely pathway is through insufficient sleep.

Humans are biologically suited to being awake during the day and asleep during the night. Environmental cues such as light, eating and social interaction send messages to the body's central clock, which in turn influence the release of hormones. This includes the release of melatonin, a hormone that plays a key role in many physiological functions including sleep. When working between 7pm and 7am, workers are exposed to artificial light, which influences the release of melatonin and sends a message to the body's central clock to be awake rather than asleep. Eating and engaging in social interactions during the night also sends messages to the central clock that conflict with the body's biological need to sleep at night. As a consequence, night shift workers frequently report shorter sleep durations and increased sleepiness when awake.

Working at night results in exposure to light, altered eating patterns and social and occupational interactions at night. This causes consistent disruption to the body's biological drive to be asleep at night and awake during the day. A disturbed body clock, altered patterns of food intake and regular insufficient daytime sleep contributes to poorer mental and physical health outcomes for these workers.

Industries commonly affected:

Healthcare and social assistance



Accommodation and food services

Community and personal service workers

Transport, postal and warehousing

Mining

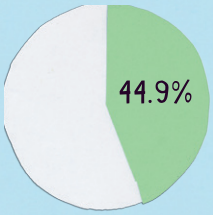
Emergency services

Rotating or irregular shifts

MAKE THE SHIFT TO GOOD HEALTH

Almost half of Australia's shift workers report being employed on a rotating shift schedule. While this reduces exposure to permanent night shifts, there is the added complexity of trying to adjust to constantly changing schedules, and the impacts this can have on personal time, mental health and physical health.

Impact in Australia



Individuals who identify as usually working shifts indicated they habitually work rotating shift work

Rotating or irregular shift work and health

Rotating and/or irregular shift workers typically report higher levels of fatigue, poorer sleep, and feel less rested when they do sleep. Rotating or irregular shift work is associated with a range of adverse health outcomes including:

- type 2 diabetes,
- cancers (particularly breast cancer), and
- metabolic disorders.

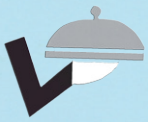
Rotating or irregular shift work invariably requires workers to be awake at night, which disrupts the body's biological drive to be asleep at night and awake during the day. This means workers are working (exposed to light) and eating at irregular times of the 24 hour day and these activities can also contribute to disruption of the body's biological drive.

By nature of the frequent change in shifts, sleep opportunities are often disrupted and not as restful as needed. This is important because regular, insufficient sleep is likely to be one mechanism by which shift work affects long term health. Insufficient sleep also contributes to worker fatigue. Rotating shift work is also associated with higher reports of fatigue than other shift types, and as such is a risk for fatigue-related errors and accidents. This means that in addition to chronic physiological health complaints associated with working during the night, and at changeable times of the day, rotating shift workers may be at increased risk of work related injuries (particularly musculoskeletal).

Health associations with rotating and irregular shift work are not limited to disrupted sleep and fatigue. Long rotating shifts are associated with binge drinking in Australian shift workers which in turn has health implications, and may worsen the consequences of disturbed sleep and fatigue these workers are often already experiencing. Other health risks can arise from the social disruption that occurs when shift times are regularly changing. The impact on traditional family and leisure time can be challenging for those with partners, family and friends who maintain different work schedules. Co-ordinating caring duties for children and/or other family members, participating in household activities and responsibilities and scheduled leisure activities are all impacted. These factors may play a role in associations between rotating and/or irregular shifts and poorer mental health in these workers.

Industries commonly affected:

Healthcare and social assistance



Accommodation and food services

Emergency services

Transport, postal and warehousing

Mining

Fly in/Fly out (FIFO) and Drive in/Drive out (DIDO) schedules

MAKE THE SHIFT TO GOOD HEALTH

While the body of knowledge regarding the effects of FIFO/DIDO schedules in Australian workers is still relatively small, the associations between shift work and health likely apply to many of these workers. There is also the added complexity of managing stretches of time (multiple weeks, in many cases) away from family and friends, and the challenge of reintegrating with home life when off-site.

FIFO/DIDO schedules and health

As a group, FIFO/DIDO workers have received limited attention in terms of the impact of their work practices on health outcomes. A recent focus on psychosocial health in FIFO/DIDO workers suggests that workers on these schedules may experience negative mental health outcomes and social stressors associated with their unique work practices.

The relationship between FIFO/DIDO schedules and health is likely affected by a number of factors which overlap with other shift workers. Some of these factors include:

- working rotating or irregular shift patterns,
- working long days, and
- working at night.

In addition to the known impact that these factors have on health, early research in FIFO/DIDO workers suggests that negative impacts on wellbeing are associated with living away from the home environment for periods of time.

As a consequence of swings associated with FIFO/DIDO schedules, workers have reported feeling that their family dynamic can be negatively impacted. These impacts are felt in partner relationships, and by children of FIFO/DIDO workers.

Workers also report feeling disengaged with their local (home) community, and may be more likely to display risky health behaviours including smoking, drinking and reduced physical activity.

While no prospective, longitudinal data is available on the impacts of FIFO/DIDO schedules on worker health, in Australia it is plausible that the social isolation and risky health behaviours reported by some FIFO/DIDO workers could contribute to poorer mental and physical health and wellbeing in the long term.

The impact of FIFO/DIDO schedules on health and wellbeing is an area requiring further research to more clearly understand the relationship between these unique work practices and long-term health and wellbeing. Anecdotal evidence points to large between-company and between-site differences in sleep environments, food options, rostering arrangements and on-site daily commutes which may all affect the relationship between FIFO/DIDO schedules and long term health and wellbeing.

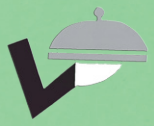
Impact in Australia

While a number of industries employ FIFO/DIDO schedules, the mining industry in particular relies heavily on these practices. Almost half of all Australian shift workers are in the mining and construction industries, meaning a large proportion of these workers may be impacted by FIFO/DIDO.

Industries commonly affected:

Mining

Construction



Accommodation and food services

Transport, postal and warehousing

Working long hours

MAKE THE SHIFT TO GOOD HEALTH

An increasing number of studies have found associations between long working hours and poor mental and physical health. This is particularly relevant for shift workers, with many shift workers reporting longer working hours. The impacts include increases in mental health symptoms and sleep disturbance, as well as increased risk for cardiovascular complaints and weight gain.

Impact in Australia

500,000

shift workers work shifts greater than nine hours. By reasonable definition, 'long working hours' is more than eight hours per day, more than 40 hours per week. Many individuals who would classify as non-shift workers are also affected by long working hours (e.g. as a consequence of overtime).

Long working hours and health

Long working hours refer to a schedule where work predominates, and there is little (or less than desired) time remaining for workers to be involved in social, domestic activities and sleep. Long working hours have been associated with depression, anxiety, sleep disturbance, short sleep and stroke. This may be a consequence of reduced recovery time between work periods, including limited time for recovery sleep. Chronically short sleep (less than 7 hours) is linked to many negative health outcomes relating to disruption of hormonal, cardiovascular and immune systems.

When workers have the combined burden of long working hours and shift work conditions, we also see a relationship with weight gain, chronic sleep problems, sleepiness, and poor overall wellbeing. Negative health outcomes associated with long working hours and shift work include:

- increased risk of cardiovascular events,
- gastrointestinal distress,
- metabolic syndrome, and
- breast cancer.

These poor health outcomes are thought to be a consequence of a combination of chronically poor or inadequate sleep (due to disrupted timing and/or duration of sleep opportunities) and circadian misalignment (potentially due to irregular or changing work hours which expose workers to bright lights and stress at times when their bodies would typically be winding down at night).

The risk of having a work-related accident or injury increases when shift length is greater than eight hours at a time, with a 27.5% increase in risk in workers on 12 hour shifts. These statistics are not limited to night shift workers. Risk of an accident or injury also increases with successive shifts, highlighting the need to consider the long work hours in terms of hours per shift as well as hours worked across the week.

Industries commonly affected:

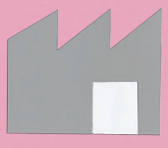
Healthcare and social assistance

Accommodation and food services

Retail trade

Transport, postal and warehousing

Mining



Manufacturing

Information, media and tele-communications

Arts and recreation services

Working on call

MAKE THE SHIFT TO GOOD HEALTH

While we are still developing an in-depth understanding of the human cost of on-call work, we know that on-call work reduces sleep. Consequently, on-call work is likely to have both short and long term implications for health via this impact on sleep. Since a large portion of on-call work is in place to provide cover at night, added risks for health and safety relate to working at night, and also from performing job tasks/making decisions/driving upon waking due to 'sleep inertia' (that groggy feeling immediately after waking that is associated with sleepiness and performance impairment).

Impact in Australia

On-call work refers to a requirement to be available to respond to a call, whether asleep, at work, or engaged in social activities. 25% of Australia's male and 19% of female workforce have on-call or stand-by as part of their working agreements.

Working on call and health

Insufficient sleep on a regular basis is likely to be one mechanism by which working on call affects long term health. Insufficient sleep also contributes to worker fatigue, which can result in increased sleepiness, errors and accidents.

On-call work can disturb sleep in two ways:

- Reduced opportunity to sleep due to disruption caused by phone calls, call-outs, deployments, etc.
- Poor quality and/or reduced sleep even when there is no measurable disturbance (e.g. calls, call-outs).

If an on-call worker has to answer or attend to a call during the night, unless they are able to sleep longer in the morning (difficult both socially and biologically), their sleep will be reduced. What is acknowledged anecdotally but not well understood scientifically is the sleep disturbance that occurs even when there are no calls or call-outs. Reasons for sleep disturbance in the absence of actual calls is thought to relate to stress and worry about:

- missing a call,
- being woken,
- the tasks required upon waking, or
- other factors.

The impact of stress/worry on sleep outside the on-call context is well established. Poor and/or inadequate sleep on a regular basis has been linked to numerous negative, physiological health outcomes relating to the hormone, immune and cardiovascular systems. This helps to explain the link that shift-work, in particular night work, has to obesity, type 2 diabetes, and other disease. Prevalence of anxiety and depressive symptoms are also linked to the amount of on-call duty. This link may be the direct result of the impact that on-call work has on sleep, with chronically short or disturbed sleep linked to depression, or some other, as yet unknown, consequences of on-call work.

On-call periods that occur overnight may require workers to be awake (or be woken) at night, which disrupt the body's natural (circadian) rhythms and means workers are awake and eating at irregular times of the day. Exposure to light at night and eating during the night are likely linked to the poorer mental and physical health outcomes seen in night workers. Also, being woken from sleep can have immediate safety implications with sleepiness and poorer performance common symptoms of 'sleep inertia', which is that feeling of grogginess immediately upon waking. The effects of sleep inertia are exacerbated when woken around 3 – 4am and if previously sleep deprived – both common scenarios with on-call work.

Industries commonly affected:

Healthcare and social assistance

Accommodation and food services

Information, media and tele-communications

Transport, postal and warehousing

Mining

Emergency services

MAKE THE SHIFT TO GOOD HEALTH

Appendix 3: Annotated Reference Material

Audience: Workers, WHS, Policy

Content:
Annotated summary of key reference articles
Three to five articles per risk factor
Where possible, open sources
Combination of reviews and original research articles

The final resource is the detailed reference material. Key publications have been identified and summarised in an annotated bibliography. Where possible, an emphasis has been put on sourcing and summarising high quality, review articles. The aim of the annotated bibliography is to highlight the key literature for each risk factor so that workers/WHS representatives and policy makers know what the relevant material is and where they can locate more references if desired.

Annotated Reference Material

Ferguson et al. (2016)
On-Call work: To sleep or not to sleep? It depends.

Type	Review article
Key words	On-call, stand-by work, sleep, performance, non-standard hours
Relevant to	Working on call
Summary	A narrative review which focuses on the impact of on-call work for sleep and systematically identifies, and discuses three arguments for the management of on-call in terms of sleep. The three foci are: 'to sleep'? 'to sleep poorly' and 'not to sleep'. This review highlights the literature to show how sleep can be impacted by calls throughout the night but also how sleep is impacted when on-call even when there are no calls. Given that the main outcome of interest is sleep, the focus in largely on overnight on-call periods. The authors conclude that it is probably always better to try and sleep than not to sleep at all given the well documented impacts of sleep deprivation for safety and performance. But that consideration needs to be given to performance impairment upon waking (sleep inertia) and how best to manage it.
Key Messages	Trying to obtain SOME sleep, even if of poor/reduced quality and quantity is preferable to no sleep at all. Performance impairment upon waking to a call needs to be considered in performance and risk management. Being on-call may impact the quality and quantity of your sleep even if no calls are actually recieved.

Nicol & Botterill (2004)
On-call work and health: a review

Type	Review article
Key words	On-call work, health, mental health, job stress, sleep disturbances and personal safety
Relevant to	Working on call
Summary	This systematic review reviews the available peer-reviewed, published literature (16 studies) investigating the impact of on-call work for the workers themselves. The focus is on the the overall health impacts of on-call work. The literature presented is largely based on questionnaire data in General Practitioners. The authors categorise the main impacts of on-call for health as; Stress, Sleep Disturbance, Mental Health and Personal Security (relating specifically to jobs where workers are called to work in a remote or isolated environment at night). The overall impact of on-call work for all these areas of health is negative.
Key Messages	While cost-effective, there is a human cost to on-call work arrangements with negative outcomes identified for workers and their families. There may be differences with the way that men and women cope with the stress of on-call work. The health impacts of on-call work concern both physical (sleep, personal safety) as well as mental health (stress, anxiety and depression).

Banks & Dinges (2007)
Behavioral and Physiological Consequences of Sleep Restriction

Type	Review article
Key words	Sleep restriction, neurobehavioral functions, physiology
Relevant to	Working on call, working at night, working rotating or irregular shifts, working long hours
Summary	This paper details the impacts of restricted sleep in both the short term and the potential impacts for longer term (chronic) sleep restriction. In the shorter term (a few days, weeks), impacts are largely related to neurobehavioural (performance) deficits which can impact job performance and safety and mood. There is also large inter-individual variability in response to acute sleep restriction. The review also highlights the potential relationships between sleep restriction and long term health outcomes. Specifically chronically restricted sleep may account for findings that associate short sleep durations with health-related outcomes such as obesity and cardiovascular morbidity.
Key Messages	Sleep restriction is commonplace and can be due to work demands, lifestyle, illness, domestic responsibilities and/or sleep disorders. Performance impairment associated with sleep restriction has

implications for workplace performance as well as safety. Physiological consequences of chronic sleep restriction may be associated with longer term health consequences relating to endocrine function, inflammatory responses and metabolism.

Hilditch et al. (2016)
Time to wake up: reactive countermeaures to sleep inertia

Type	Review article
Key words	Sleep inertia, body temperature, caffeine, light, napping, self-awakening, shift work
Relevant to	Working on call, working at night, working rotating or irregular shifts, working long hours, working a FIFO/DIDO schedule
Summary	This is a systematic review article that describes what 'sleep inertia' is, factors that influence sleep inertia and summarises the literature on countermeasures to sleep inertia. A majority of the research to date has been conducted in controlled laboratory environments and focused on factors that influence severity and duration of sleep inertia. There is very little research that specifically investigates ways to counter sleep inertia especially tools that can be used upon waking—'reactive' countermeasures. Caffeine is an accessible stimulant for shift workers and has been shown to be effective upon waking if administered prior to sleep. There is also some support for the benefits of light (via a light box or custom light emitting glasses) and temperature (specifically cooling the body temperature) upon waking. There is little evidence to support the efficacy of common 'waking' strategies such as splashing water on your face, engaging in physical activity or eating, but no research to suggest that they are ineffective either.
Key Messages	Sleep inertia is that period immediately upon waking that is associated with impaired performance. Factors that may exacerbate sleep inertia include; the time of awakening (e.g. worse in the early morning); duration of prior sleep (a short nap, longer nap, longer sleep); and prior sleep loss. In shift work settings, the aim should be to manage and/or minimise sleep inertia (as opposed to not sleeping) - research to date points toward caffeine (administered prior to sleep) as a potential sleep inertia countermeasure.

Kecklund & Axelsson (2016)
Health consequences of shift work and insufficient sleep

Type	Review article
Key words	Health, shiftwork, sleep restriction
Relevant to	Working on call, working at night, working rotating or irregular shifts, working long hours, working a FIFO/DIDO schedule
Summary	This is a systematic review based on 38 meta-analyses and 24 systematic reviews, with additional narrative reviews and articles used to outline possible mechanisms by which shift work may cause accidents and adverse health. A very common consequence of shiftwork is acute sleep loss, particularly in connection with night shifts and early morning shifts. The authors also identify links between shiftwork and accidents and chronic adverse outcomes including type 2 diabetes, weight gain, coronary heart disease, stroke and cancer. The conclusions reached were that the health and safety consequences of shift work and insufficient sleep are very similar (particularly with regard to accidents and cardiometabolic outcomes) but that the evidence to date is not strong enough to say definitively that the reason shiftwork is associated with these adverse outcomes is because of insufficient sleep.
Key Messages	Shift work is strongly associated with insufficient sleep and moderately associated with cardiovascular disease, type 2 diabetes, cancer and occupational accidents. Short sleep (4-7h) and disturbed sleep are both associated with increased risk for occupational accidents and cardiometabolic diseases. The adverse health outcomes experienced by shift workers are likely related to insufficient sleep but sleep (lack thereof) cannot be identified as the cause of these adverse health outcomes.

Boivin (2014)
Impacts of shift work on sleep and circadian rhythms

Type	Review article

Key words	Shift work; night shift work; circadian rhythms; sleep deprivation; sleep restriction; performance; accidents; countermeasures
Relevant to	Working on call, working at night, working rotating or irregular shifts, working long hours, working a FIFO/DIDO schedule
Summary	This review summarises circadian rhythms and explains the physiology behind our behaviour and why working at night, and other shiftwork schedules might have negative impact. It outlines how shiftwork can result in the misalignment between the sleep/wake cycle and the body clock and the consequences of the misalignment in terms of accidents and health risks. Countermeasures to shiftwork are also discussed and include strategies that encourage biological adaptation to schedules (e.g. minimising light exposure on the morning commute home after night shift) and/or minimising sleep loss during shift work by maximising rest opportunities.
Key Messages	The misalignment between the body's rhythms when doing night work (sleeping during the day, awake at night) is similar to that experienced by someone travelling to the other side of the world (e.g. jetlag). Night shift work is associated with the greatest sleep loss compared with day, morning and evening shifts. Health risks associated with shift work include gastrointestinal and cardiometabolic disease, some cancer, psychological disorders, menstrual and pregnancy problems.

Bonham et al. (2016)
Energy Intake of shiftworkers compared to fixed day workers: A Systematic review and meta-analysis

Type	Review article
Key words	Diet, food intake, night work, obesity, shift schedule
Relevant to	Working on call, working at night, working rotating or irregular shifts, working long hours
Summary	This review compares the literature that has investigated the 24h energy intake of shift workers as compared to day workers. Of the 12 studies included in the review, evidence showed that energy intake (amount of calories consumed) did not differ significantly between shift workers and fixed day workers. While this seems to counter the association between shift work and adverse health outcomes, It was concluded that while energy intake may not differ, the timing of food intake, the types of foods consumed, how food consumption is distributed across the 24h and snacking behaviours may all contribute to the increase risk for obesity, type 2 diabetes and cardiovascular disease observed in shift workers.
Key Messages	Shift workers are at an increased risk for developing cardiovascular disease, obesity and type 2 diabetes. Shift workers do not consume more energy (calories) across a 24h day when compared to fixed day workers. Factors including the types of food, the timing of food intake increased and snacking behaviour may contrbute to development of disease in shift workers in relation to diet.

Navara & Nelson (2007)
The dark side of light at night: physiological, epidemiological, and ecological consequences

Type	Review article
Key words	Cancer, endocrine disruptor, immune, light pollution, melatonin
Relevant to	Working on call, working at night, working rotating or irregular shifts
Summary	This short review outlines the physiological and behavioural consequences of light exposure at night as well as the 'big picture' implications for both humans and animals. Shift work is a major cause of increasing exposure to light at night but urban development and the presence of artificial light on roadways, homes, public places all contribute to what is termed 'light pollution'. Exposure to constant light and/or light at night has implications for our basic physiology including our circadian timing system. The physiological impact of circadian disruption through light exposure is thought to influence endocrine function immune response, metabolic function and has been linked to cancers. The impact of artificial light exposure and altered light/dark patterns also impact animals in terms of reproduction, predator-prey behaviours and migration patterns.
Key Messages	The mechanism by which shift work may be linked to disease such as endocrine (hormone) and metabolic dysfunction; cancer and immune response may be exposure to light at night. Exposure to constant light conditions OR light at the 'wrong' times can disturb the rhythmicity of a series of

hormones in the body. The impact of changes to our pattern of light exposure are far reaching and can/will impact animal world (migration, reproduction, predator-prey behaviour) as well as the human implications.

Nea (2015)
Dietary and lifestyle habits and the associated health risks in shift workers

Type	Review article
Key words	Shift work; dietary habits; dietary changes; lifestyle changes; nutritional issues; chronic health
Relevant to	Working on call, working at night, working rotating or irregular shifts, working long hours, working a FIFO/DIDO schedule
Summary	This narrative review covers some of the lifestyle changes which are associated with shift working conditions. Lifestyle changes reviewed included dietary changes (13 studies), physical activity changes (9 studies), smoking (7 studies), alcohol (7 studies). There is a particular emphasis in this review on barriers and lifestyle changes in shift workers which may contribute to the adverse health outcomes. The authors draw on the evidence reviewed to highlight that biological disruption (circadian misalignment/ working at biologically inappropriate times of day), in combination with psychological (stress, social isolation, family conflict) and behavioural (poor diet, reduced physical activity, increased smoking and alcohol, impaired sleep) factors likely contribute to the longer term adverse health outcomes we see in the literature.
Key Messages	Behavioural changes occur with shift work, including changes in diet, physical activity, smoking and alcohol. Addressing the impact of shift work on lifestyle is important for managing long term health. Workplace interventions are likely an important component for improving the impact of shift work on health.

Akerstedt (2003)
Shift work and disturbed sleep/wakefulness

Type	Review article
Key words	Shift work; rotation; scheduling; sleep disruption
Relevant to	Working at night, working rotating or irregular shifts, working long hours, working a FIFO/DIDO schedule
Summary	This detailed review considers the disruption of sleep/wakefulness in shift workers. This article provides a detailed overview of sleep patterns associated with different shift schedules (night work, morning work, and afternoon work), highlighting the increase in objective and subjective sleepiness and likelihood of falling asleep with night shift work. This article highlights the role of circadian misalignment in the relationship between shift work and poor health outcomes, and emphasises that adaptation to night shift is rare. Detail on the homeostatic and circadian influences on performance is provided. Importantly for rotating shift considerations, this article provides balanced consideration of speed and direction of shift rotation, time of changeover, and the impact of quick changeovers for overall sleep achieved.
Key Messages	Morning, afternoon and night shift types affect sleep differently. Disruption to circadian rhythms is a key factor in health problems for shift workers. The way shifts are structured (direction and speed of rotation, speed of changeovers) can impact sleep and alertness differently.

Knutsson (2003)
Health disorders of shift workers

Type	Review article
Key words	Shift work; night shift; cardiovascular disease; gastrointestinal distress
Relevant to	Working at night, working rotating or irregular shifts, working long hours
Summary	This article provides a concise overview of the relevant literature linking shift work with disturbed health. Gastrointestinal distress is reported frequently in shift workers, particularly in regards to disrupted bowel movements, and peptic ulcers. A clear summary of the relationship with cardiovascular disease

	is provided, with the strongest relationship between shift work and coronary heart disease. This article highlights that the relationship with cancer is not conclusive; indeed, more recent publications also highlight that this relationship is not as clear as other health conditions. Metabolic disturbance and negative pregnancy outcomes (miscarriage, pre term birth and lower birth weight) are also considered in in context of shift work. The author provides a clear picture of the physiological, behavioural and social disruptions associated with shift work, and their potential contribution to poor health outcomes in shift workers.
Key Messages	Cardiovascular, metabolic and pregnancy outcomes are impacted by shift work. Disruption of circadian rhythms, along with disturbed sleep, changes in behaviour (smoking, food intake), may contribute to this. Lifestyle and stress in shift workers should also be considered in context of poor health outcomes.

Caruso (2014)
Negative impacts of shiftwork and long work hours

Type	Review article
Key words	Shift work; work schedules; circadian rhythms; extended work hours
Relevant to	Working at night, working rotating or irregular shifts, working long hours
Summary	This narrative review provides a clear, accessible summary of the literature linking shiftwork and long working hours with a range of consequences, beginning with insufficient sleep. In particular, the review highlights that longer shifts and weekly work hours are most commonly associated with less sleep, and sleep disturbances. The impact on cognitive function is discussed, as is the cumulative impact of long, night working hours on risk of injury and errors in the workplace. In addition to briefly summarising health conditions associated with shift working conditions (including mood, gastrointestinal and cardiovascular complaints, cancer and reproductive health outcomes), this article also summarises diseases associated with longer working hours. These include disturbed mood (particularly depressive and anxiety disorders), risk for coronary disease, hypertension, diabetes, and musculoskeletal disorders.
Key Messages	Long working hours impact cognitive function and chronic health in workers. This has implications for worker health and well-being, but also for the safety and well-being of patients. There is a need for employer involvement in education and management of the impact of working hours on employees.

Kivimaki et al. (2015)
Long working hours and risk of coronary heart disease and stroke: a systematic review and meta-analysis of published and unpublished data for 603838 individuals

Type	Systematic review
Key words	Long working hours; cardiovascular; coronary heart disease; stroke
Relevant to	Working long hours
Summary	This systematic review and meta analysis draws on 25 studies conducted on 24 worker cohorts, based in Europe, USA, Australia. By combining these data, including unpublished participant data from European cohorts, the authors were able to ascertain the relationship between increasing hours of work per week and risk of incident coronary heart disease and stroke. When adjusting for age, sex and socioeconomic status (which are known to affect risk for coronary heart disease and stroke), there was significant trend for increasing risk of stroke with longer working hours, with the relative risk for workers working >55h/ week being 1.3 times higher than those working a standard week. A weaker association was found with coronary heart disease. The findings highlight the impact of longer working hours on vascular function, and the importance of monitoring and management in at-risk workers.
Key Messages	Long working hours are associated with a significantly increased risk of stroke. Long working hours are associated with coronary heart disease, but this association is weaker than seen for stroke. There is a need for monitoring and management of cardiovascular risk factors in those working long hours.

Harrington (2001)
Health effects of shift work and extended hours of work

Type	Educational article
Key words	Extended work hours; shift work; health; safety; schedules
Relevant to	Working at night, working rotating or irregular shifts, working long hours
Summary	This article is an accessible educational article which provides a brief overview of the health and safety consequences associated with extended (or long) working hours which are common in some shift working professions. The author provides an overview of the consequences of disrupted circadian rhythms (which also holds relevance to workers engaged in night shift), and the impact of sleep and circadian disruption on performance, and on family and social life. The impact of long hours and shift work on sleep, fatigue, mental health, cardiovascular and gastrointestinal disorders, and reproductive function are each summarised with reference to existing literature. In addition, performance effects of long working hours and impact on accidents is considered with references to previous major incidents which have been linked to long working hours.
Key Messages	Extended work hours, which are a common feature of shift work, are linked to performance outcomes. There are health-related consequences of extended work hours, but a number of conditions still require greater research to better understand the impact. There is a need to support workers to cope with these working conditions to facilitate improved mental and physical health in the long term.

Note: limited evidence is available relating to the impact of FIFO/DIDO schedules when compared with other shift working practices. As such, literature beyond review articles is included for completeness, to illustrate the more specific impacts of FIFO/DIDO schedules on worker wellbeing, while also recognising that FIFO/DIDO workers are commonly exposed to many of the other risk factors identified for shift workers in this review.

Joyce et al. (2012)
Health behaviours and outcomes associated with fly-in fly-out and shift workers in Western Australia

Type	Cross sectional study (questionnaire)
Key words	Public health, population surveillance, occupational health
Relevant to	Working a FIFO/DIDO schedule
Summary	This is a cross sectional study comparing health behaviours and outcomes between FIFO workers, shift workers and workers in other employment types. Self report. 380 FIFO workers responded. The data shows that FIFO and shift workers had a similar health behaviour profile and that compared to workers in other forms of employment, FIFO and shift workers were more likely to smoke, be overweight (FIFO only) and drink alcohol at 'risky' levels. In terms of health outcomes, FIFO workers were less likely to have current mental health problems compared to both shift workers and other workers.
Key Messages	FIFO workers, like shift workers were more likely to report adverse health behaviour such as smoking and drinking. This is a cross sectional study which provides a single 'snapshot' of a group of workers at the given time. In this study population, FIFO workers had a lower prevalence (self report) of current mental health problems.

Torkington et al. (2011)
The psychosocial impacts of fly-in fly-out and drive-in drive-out mining on moning employees: A qualitative study

Type	Cross sectional study - qualitative (interviews)
Key words	Long distance commuting, mental health, psychosocial support, rural, well-being
Relevant to	Working a FIFO/DIDO schedule
Summary	This is a qualitative study that used semi-structured interviews with 11 FIFO/DIDO workers to examine the impact of their work on their psychosocial well being. Interview data was collated into three topic areas; impact on family; impact on relationship and partner; and support. Results were varied and both positive and negative psychosocial impacts were identified. In terms of positive impacts, financial rewards and job satisfaction were cited. The negative impacts related mainly to family and home life with worry surrounding sick children and missing out on time with the family. Worry seemed to be related to the age of the children (worry more if children are younger). The impact for partners and on relationships was significant with loneliness and stress cited when workers are away and that return to family life often caused disruption to the regular family routine.

Key Messages	In this group, both positive and negative impacts of FIFO and DIDO work for psychosocial health were reported. Impact of FIFO/DIDO work on the family varied from 'minimal' to 'significant' with the age of children being a major determinant of family impact. The impact for worker's partners are largely negative with increased stress, and domestic burden, negative impacts not restricted to when worker was away but when at home as well.

Langdon et al. (2016)
Australian fly-in, fly-out operations: Impacts on communities, safety workers and their families

Type	Review article
Key words	Health, mining, well-being, FIFO, DIDO
Relevant to	Working a FIFO/DIDO schedule
Summary	This review provides a summary of the prevalence of FIFO and DIDO workers/workplaces in the mining sector in Australia. The impact of the FIFO/DIDO roster systems is discussed in terms of workforce concerns and social and community concerns. The FIFO specific literature is limited but concerns relate to roster design with no 'standard roster as such' and over 70 different variations. Sleep disturbance has been cited as a common consequence of FIFO/DIDO rosters, similar to other shiftwork. As a result, attention has to be given to the fatigue, performance and safety of FIFO and DIDO workers. This is particularly the case for DIDO workers who drive back home at the conclusion of roster cycles. In terms of health and wellbeing, evidence is limited however FIFO workers are at increased risk for obesity, smoking and drinking heavily. Mental health issues associated with social, relationship issues are also discussed.
Key Messages	FIFO/DIDO rosters typically encompass types of shift work and so sleep disruption and subsequent fatigue and safety concerns are as relevant to FIFO/DIDO workers as they are shift workers. Compared to non shift workers, FIFO workers are more liklely to smoke, be obese and drink excessively. Mental health impacts have not been fully explored but reports of social and relationship difficulties are not uncommon.


MAKE THE SHIFT
TO
GOOD
HEALTH