Night-work and its impact on workers and their families

THE CASE OF RMT WORKERS

A Report Commissioned by RMT

RMT

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INTRODUCTION: THE REASON FOR COMMISSIONING THIS REPORT

There is a tendency for employers to suggest that the impacts of night work on the health of workers can be explained by lifestyle habits – and thereby shift responsibility from employers and their duty of care onto individual workers.

Given this RMT's National Executive Committee agreed to obtain some qualitative academic research, and for this to be interview based using a small sample group (of Network Rail, Train Company and London Underground members). The outcomes of such research would be for the purposes of strengthening our arguments in relation to night and shift work and the impact of both mental and physical health conditions on members, their families and communities.

RMT entered into this research project with a number of other unions to save on costs. The joint research findings are presented in a combined report (see: https://bit.ly/4agOidf) – in addition, each union received a mini report specific to their own union.

HOW TO USE THE REPORT:

The report has a handy summary on page two and useful recommendations on page 48.

The research findings refer to other academic research - research which should be referred to in meetings with your employer when discussing rosters and shift work. Where applicable the research findings should also be included in fatigue risk assessments when identifying workplace hazards and considering necessary control methods.

Although the report is focused on rail members, the general principles raised in the report will apply to other transport sectors

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1. REPORT INTRODUCTION

A substantial international body of work has shown the association between night work and shift work and a wide range of both mental and physical health conditions (Torquati et al., 2019; Moreno et al., 2019; Gurubhagavatula et al., 2021), with impacts on their families and communities (Arlinghaus, et al., 2019). A range of organisational psychosocial risks such as high workloads, reduced supervisor support, workplace violence are frequently increased for night workers (Fischer et al., 2019).

However, there is also a tendency to suggest that the impacts of night work on the health of workers can also be explained by lifestyle habits which shifts responsibility from employers and their duty of care onto individual workers. This research aims to look at workers' experience of night work, including in the context of shift work, the impact on their lives and the factors that may shape worker's decision-making about night work, as well as how both organisational and labour market changes impact night work. The overall research covers five unions; CWU, RMT, TSSA, Equity and Community. An overall report will bring the findings together, but this report specifically analyses the data collected on the RMT. It is based on interviews with one RMT officer and 15 members working rotating and permanent nightshifts in Network Rail, London Underground (LU) and with one worker with the London Northeastern Railway (LNER), and with the workers in a range of job roles.

The research aimed to:

- Examine the experiences and perceptions of night working, including on-call work, and its impact on the physical and mental health of workers.
- Explore the impact of changes in work, both organisational psychosocial risks including workloads, supervisor and social support, job cuts and vacancies as well as the labour market level, for example outsourcing, on experiences of night working;
- Interrogate workers' preferences for night work and the factors that may influence workers' decisions to undertake night work;
- Develop potential union demands in relation to collective bargaining about shiftwork and night work, including in the context of longer-term demands for a shorter working week.

2. REPORT SUMMARY

LITERATURE REVIEW

- In the academic literature there is strong evidence linking shift and night work to negative health outcomes including cardiovascular, gastro-intestinal and metabolic disorders such as diabetes and metabolic disorder, with weaker links to cancer, reproductive disorders and mental health. These negative impacts may be gender-specific, with risks varying between men and women. Proposed biological pathways for these associations are related to circadian rhythm disturbance and sleep deprivation, as well as social desynchronisation. However, the relative contributions of these factors and whether they are direct or indirect mediators remains unclear. Poor diets and insufficient exercise associated with shift and night work are likely to exacerbate these impacts on health.
- The evidence linking shift work to cancer is less strong, but there appears to be relationships with shift intensity (time off between shift schedules), years spent working shifts and to types of shift system. Recent evidence suggests links between intensive night shift work and hormone-dependent breast cancer women in who commence night shifts before they reach menopause.
- Again, the evidence linking shift work to mental health and reproductive problems is inconclusive. However, evidence of the impact of shift and night work on depression indicates this is of concern, especially in the case of female night shift workers.
- The literature shows that psychosocial risks in the work environment can exacerbate the negative impacts of and night work and shift work on workers' health.
- Shift work, and night shift work in particular, results in workers lives being socially desynchronised from family, social networks and communities. There is evidence that shift work can have a negative impact on partner relationships and on pre-adolescent children's development.
- The negative impacts of social desynchronisation can be ameliorated to a degree at the workplace level when workers have genuine control of their shift schedules and are able to adjust their working hours to the demands of family and social relationships.

LABOUR RESEARCH DEPARTMENT DATA ON SHIFT PREMIA

- A survey of collective agreements show that night shift premia vary widely, but the average and median are both 30% of the equivalent day rate.
- While rates as a proportion of day rates appear to be stable over time, the interviews suggest that changes have been made for those on newer contracts, including increasing the amount of night and weekends shifts required.

INTERVIEWS WITH WORKERS

- Night work and weekend work, both rotating shifts and permanent nights, is a feature of the work of railways workers, especially for those involved in maintenance, and with the demands for night work increasing over time with some new contracts requiring 39 weeks per annum of night shifts and 39 weekends per annum. Additional night and weekend work occurs through doing overtime and on the London Underground cover weeks which can be up to three weeks per year.
- There a is a large amount of overtime done by railways workers, which can further increase the number of night shifts worked as well as contribute to fatigue.

- The heavy physical demands and challenging work environments of maintenance workers is fatiguing and adds to the fatigue associated with night work and overtime.
- The key psychosocial risks identified are excessive work demands related to work intensification (i.e. excessive workloads and time pressures) and excessive overtime; insufficient managerial support for workers; and insufficient managerial leadership on both rail safety and workers health and safety. These contribute to work-related stress and exacerbate fatigue.
- Excessive workloads and overtime are underpinned by insufficient staffing both in Network Rail and London Underground which also exacerbates managers roster inflexibility in response to workers' needs and may also impact on how they conduct and respond to fatigue assessments.
- Fatigue assessments were reported to be inadequate and with managers not always responding to support workers. Trade union H&S representatives reported that workers often lack the knowledge and confidence to request and participate fatigue assessments.
- Most workers do some overtime with younger and middle-aged workers more likely to do large amounts, mostly for financial reasons. This is even more salient with the cost-of-living crisis, inflation and below inflation pay rises. Older worker report increasing difficulties coping with night work and limit overtime worked primarily to help colleagues take leave or to support good relationships with managers by helping to fill the rosters.
- Lack of meal breaks for maintenance workers and signallers may contribute to poor eating habits and to fatigue. For signallers, inadequate meal breaks is frequently associated with insufficient staff.
- In alignment with the academic literature, most night workers suffer from sleep deprivation due to poor quality sleep which is fragmented and disturbed, split sleep and sleep of short duration (about 5hrs). This is related to circadian rhythm disturbance as well as the external environment (noise, children's school runs). Sleep deprivation is cumulative over the number of nights worked. The more night worked the longer it takes to overcome sleep deprivation and associated fatigue.
- All the workers reported excessive fatigue related to working night shifts. This could occur on the job, typically around 03:00 - 04:00, after the night shift and following run of night shifts. Workers reported taking two or more days to recover from a run of night shifts. There are issues related to safe commuting for night shift workers when they are fatigued, with several reporting accidents or near misses. This is especially a risk for those doing 12-hour shifts.
- While it is commonly believed that permanent night workers adjust to night shifts, this may not be the case for all, with the one permanent night worker in this study reporting excessive fatigue that became normalised. The literature indicates that not all workers can readjust their circadian rhythm.
- The length of blocks of night shifts worked and of recovery time in rosters were highly variable. Long blocks of night shifts such as six or seven in a row are particularly detrimental, especially where not accompanied sufficient recovery time. Given the cumulative effects of sleep deprivation there should be an assessment of the adequacy of recovery time after a block of night shifts.
- This extended need for recovery time is an added burden for night shift workers that is not shared by day workers, yet this is not paid for by companies and forms part of the workers 'free time'. During recovery time workers are unable participate in personal, family or social life. Given recovery time is essential to manage the negative impacts of night work on workers, there is an argument to be made that this should be compensated.

- A key advantage of night work for those with dependent children was that this it helped workers to manage childcare in the context of limited government support for free childcare and a market with limited childcare places and times of availability as well as with high costs. One participant preferred night work as they were a 'night owl' and there was less managerial surveillance at night.
- In alignment with the academic literature on the multiple impacts of night work on workers' health, families and social life, this research identified negative impacts on night workers' health and health-related behaviour. Workers experienced excessive fatigue during and following night work, generally engaged in limited physical exercise, generally reported poor eating habits and diets and with many reporting being overweight. Fatigue itself, as well as social desynchronisation, were significant drivers of poor eating and insufficient exercise. This is concerning since diet and exercise intersect with the negative effects circadian rhythm disturbance and sleep deprivation on workers' health. Rather than victim-blaming individual workers, workers' struggle with diet and exercise needs to be understood in the context of the organisation of work and rosters, work demands and overtime, availability of meal breaks and healthy food, and the social context of diet and exercise. Addressing this issue requires a multi-level approach.
- There is some indication that some night workers may use alcohol to cope with difficulties in getting to sleep during the day.
- Night work had significant negative impacts on families and social relationships, especially those with dependent children. While night work facilitates managing childcare by enabling school runs, it also limited both the quantity and quality of the time that night working parents have with their children and family, with some reporting negative impacts on partners and children. Night work risks partner relationships in some cases leading to relationship breakdown as well diminishing social relationships. Poor rosters and social asynchrony, fatigue and mood disturbance all contributed to negative outcomes. This can be ameliorated to some extent by workers having more control of rosters, with roster flexibility and rosters designed to minimise fatigue.
- These negative impacts on personal, family and social life are likely to have a long-term impact on physical and mental health and to potentially exacerbate existing mental health issues and diminish the quality of life outside of work. Supportive family and social relationships can ameliorate some of these issues.
- Those workers doing large amounts of night work and permanent night shift workers have difficulty in attending appointments and related matters due to social asynchrony so use a significant portion of their annual leave for this, further limiting opportunities for family life. This indicates that night workers need additional annual leave to compensate for this.

3. LITERATURE REVIEW

NIGHTWORK AND SHIFT WORK: IMPACTS ON HEALTH, PSYCHO-SOCIAL RISKS AND WORKERS' FAMILIES AND COMMUNITIES

This review examines the literature on the impact of shift work and night work on health, on psychosocial risks and on shift and night workers' families. It draws largely on the Working Time Society reviews of these issues conducted in 2019 and supplemented by more recent additional literature to further develop key aspects where relevant.

SHIFT WORK, NIGHT WORK AND HEALTH

The Working Time Society is a scientific committee on shiftwork and working time and a sub-committee of the International Commission on Occupational Health (ICOH), an NGO that works closely with the World Health Organisation and International Labour Organisation. In 2019 they produced a series of Consensus Statements on issues related to shiftwork and other forms of non-standard work based on transparent and rigorous processes of assessment of the literature (Wong, Dawson and Van Dongen, 2019). Moreno et al. (2019) conducted a robust review of the link between shiftwork (including night shift work) and health for the Working Time Society. The review provides a clear protocol for assessing the strength of the evidence of the reports in the review, as well as the strength of the evidence taken overall based on Koch's postulates. Koch's postulates are used to determine the causes of diseases and have five criteria:

- the strength of the association between the disease and putative cause;
- credible biological pathways of causality;
- consistency across various research investigations;
- the time sequence, for example the timing between exposure and onset of disease is reasonable considering the causal mechanism;
- that there is a dose dependent relationship, for example, that the degree of exposure to shiftwork increases the likelihood of the disease occurring.

As part of the criteria for assessing the robustness of the evidence, Moreno et al. (2019) investigated the proposed biological, physiological and social causal pathways between shift work and various diseases, including laboratory-based research simulating different shift patterns and patterns of sleep disturbance. Moreno et al. (2019) were attentive to gender differences in the associations between shiftwork and health, which may be based on biology, variations in shift patterns and psychosocial risks in different gendered occupations, as well as considering women's dual role in both paid and domestic work and how these interact with shift and night work. Moreno et al.'s (2019) review formed the basis for the Consensus Statement on the evidence-based effects of shift work on physical and mental health. This Consensus Statement concluded that there

'is strong evidence linking shift work and negative health outcomes such as cardiovascular diseases, gastrointestinal and metabolic disorders (type 2 diabetes; metabolic syndrome). There was less consistent evidence linking shift work to cancer, mental health problems and reproduction-related problems.'

SHIFTWORK AND CANCER

In 2007 the International Agency for Research on Cancer (IARC) classified shift and/or night work in group 2A of 'probable carcinogens' since 'they involve a circadian disorganisation.' This was re-evaluated and re-confirmed in 2019 by a working group of 16 scientists from 26 counties, 'based on limited evidence of cancer in humans, sufficient evidence of cancer in experimental animals, and strong mechanistic evidence in experimental animals.' The IARC identified three domains that may be influence these risks – the type of shift system; duration over time of participation in the

shift system, and the shift intensity (time off between the shift schedules), i.e. these are all dose dependent aspects (Ward et al., 2019).

There have been seven recent systematic literature reviews of the link between shift work or night work and cancer with three examining breast cancer and two examining prostate cancer (Dun et al., 2020; Jahn et al., 2024; Riviera-Izquierdo et al., 2020; Fagundo-Riviera et al., 2020; Manouchehri et al., 2021; Riviera et al., 2020, Hong et al., 2022). Despite methodological issues in the research on the link between shift work, night work and cancer (including heterogeneity of occupations, poor definitions of shift work and night work, insufficient attention to dose dependant relationships, etc) in the more robust meta-analyses there is accumulating evidence of a link between shift work and hormone-dependant breast cancer which is dose-dependent. This is especially for the case of night shift work. There is no strong evidence of a link to prostate cancer at this time.

SHIFT WORK AND DEPRESSION

A rapid review of the association between shiftwork and mental health focussed on high quality reviews and meta-analyses over the past five years (see appendix for details of the procedure). The link between disruptions of circadian rhythm and a range of mood disorder, including depression and anxiety is well established (de Leeuw et al., 2023) and likely to be bi-directional (meaning that circadian rhythm disturbance can lead to depression at the same time as depression can lead to circadian rhythm disturbance) (Walker et al., 2020). Walker et al.'s review, (2020) discussed underlying psychological and biological causal mechanisms. Most of the studies reviewed focussed on circadian rhythm disruption due to night shift work or to jet lag. De Leeuw et al. (2023) provides evidence of physiological and biological pathways between circadian rhythm disruptions and mood disorders, including depression.

Okechukwu et al.'s (2023) systematic review and meta-analysis of the association between night work and depression is robust and included assessment of the quality of the methodology and evidence, providing an estimate of the statistical significance of association. They report a significant association between night shift work, the circadian and sleep disruption that it causes, and the risk of depression in nurses. It concludes that nurses who work night shifts are at risk of developing depression.

Further research using longitudinal, case-controlled studies designs, more specific diagnostic criteria for specific mental health issues, and more consistent definitions of shift or night work would enable a clearer understanding of the association between shift work, night work and mental health. Nevertheless, regarding depression there are well-understood relationships between circadian rhythm disruption and mood disorders and their underlying biological pathways, so there is good reason to be concerned about the association between shiftwork especially night shift work and depression, particularly for female night shift workers in the light of Torquati et al.'s (2019) review.

CAUSAL PATHWAYS LINKING SHIFT WORK/NIGHT SHIFTS AND ILL HEALTH

Moreno et al.'s (2019) review identifies several causal pathways supported by evidence from laboratory studies underpinning the associations between shiftwork/nightshift and ill health, in particular circadian rhythm disturbances, sleep restriction (i.e. insufficient sleep) and social desynchronisation. However, from the existing evidence they conclude that the extent to which these causal mechanisms play a role and whether they mediate the association between shiftwork/nightwork and ill health either directly or indirectly, is not clear. They also identify that gender influences the response to shiftwork and nightwork and that men and women may have different risks for negative health outcomes.

SHIFT WORK, NIGHT SHIFTS AND PSYCHOSOCIAL RISKS

In addition to the direct biological effects of shiftwork and night work on workers' health, a range of psychosocial issues affect workers as a consequence of engaging in shiftwork and nightwork. These psychosocial effects are likely to form feedback loops (both positive and negative) on the impact of shiftwork and night work on the health of workers. Examples of psychosocial risks factors include high job demands such as excessive workloads, fast pace of working, long working hours,

high cognitive or emotional demands, poorly designed work schedules; job insecurity and lack of career prospects; low job autonomy or lack of control; role conflict or lack of role clarity; lack of managerial or peer support; poor communication; poor work/life balance; poorly implemented organisational change; workplace bullying and violence; work-life conflict. These vary both quantitatively and qualitatively for different shift schedules (Fischer et al., 2019) and so are relevant to understanding the relationship between psychosocial risks and shift and nightwork. The presence of psychosocial risks in the work environment is associated with work-related stress and has negative impacts on workers physical and mental health. Managers of organisations are required under UK Health and Safety Legislation to assess, prevent or control the psychosocial risks to which workers are exposed.

PSYCHOSOCIAL RISKS, WORK-RELATED STRESS AND PHYSICAL AND MENTAL HEALTH – MODELS

The concept of psychosocial risks has developed within the occupational health and safety (OHS) literature to understand the effects of the work environment and its organisation on workers' physical and mental health. Work organisation includes 'how work is planned, organised and managed within companies and the choices on a range of aspects such as work processes, job design, responsibilities, task allocation, work scheduling, work pace, rules and procedures, and decision-making processes' (Eurofound, 2022). These shape the psychosocial risks to which workers may be exposed which then affects their levels of work-related stress and subsequently their mental and physical health. The European Agency for Safety and Health at Work (EU-OSHA) describe this link:

> *'Psychosocial risks … which are linked to the way work is designed, organised and managed, as well as to the economic and social context of work, result in increased levels of stress and can lead to serious deterioration of mental and physical health' (EU-OSHA, Brun and Milczarek, 2007).*

High levels or prolonged periods of exposure to psychosocial risks increase the likelihood that workers will experience work-related stress, which then leads to physical and mental health problems, absence from work, reduced quality of outputs, increased welfare and medical spending and reduced productivity (Eurofound, 2010). There is strong evidence of a link between psychosocial risks and work-related stress, burnout, poor mental health, musculoskeletal disorders, sleeping problems (Leka, Jain, and World Health Organisation, 2010) and cardio-vascular disease (Schnall, Dobson and Landsbergis, 2017). The prevalence of psychosocial risks and work-related stress has been rising in the EU in recent years, with time pressure or work overload being the highest (19.5% of workers affected (Franklin et al., 2023).

There are several models of the relationship between the work environment and psychosocial risks and their impact on workers work-related stress, mental and physical health. Karasek's Demand-Control-Support model is one of the most widely used (Rick et al., 2002). This model proposes that when psychological and physical demands are high and/or decision latitude/skills discretion (control) and social support (peer and supervisor) are low then this will lead to high levels of job strain/ work-related stress. While common models, including Karasek's, have been critiqued for lacking the theoretical, reliability and validity robustness (Rick et al., 2002), there is evidence to support the link between high job demands, low job control, and low social support with psychological distress in workers (Madsen et al., 2017). This model is the basis for the approach taken by the HSE in the UK.

SHIFTWORK AND PSYCHOSOCIAL RISKS

Fischer et al.'s (2019) review of the literature on the relationship between psychosocial risks and shift and night work noted the limited research in this area. Nevertheless, they identified a direct relationship between job control and shift scheduling since flexible work arrangements align with employee autonomy and control over the work. Flexible roster scheduling that realistically provides workers with discretion and autonomy over their shift scheduling enables workers to adjust schedules that have become problematic for their work-life balance or health, and both increases workers sense of control of their work and reduces the risks of negative impacts of shift work and night work on them.

Psychosocial risk may also operate as mediators or moderators of the relationships between shift and night work, circadian rhythms and health outcomes (Fischer et al., 2019). For example, Fischer et al.'s. (2019) review identified studies that demonstrated that compared to permanent day shift workers, those on rotating or permanent night shifts experienced higher levels of job strain which were indirectly related to poorer quality sleep (Wong et al., 2016). Higher levels of job strain contributed to increased risk of cardiovascular disease in shift workers compared to day workers (Tenkanen et al., 1997), with Nabe-Nielsen et al. (2019) demonstrating that compared to day shift workers, non-day shift workers had lower job control, less support from managers, and higher physical demands. There is some evidence that shift and night workers may be at increased risk of workplace violence, although this is likely to vary by occupation (Fischer et al., 2019).

These studies demonstrate psychosocial risks operating as moderators and mediators of the differences in impacts on health for shift workers compared to permanent day shift workers, highlighting their importance in exacerbating or ameliorating the negative impacts of shift work and night work on workers' health. There is rather limited research on these relationships at present. Furthermore, understanding these processes requires detailed knowledge of the specific psychosocial risk factors in the particular work environment and how these shape workers exposure to the risks of negative health consequences associated with shift and night work.

SHIFTWORK AND IMPACTS ON FAMILY, SOCIAL NETWORKS AND COMMUNITIES

There is strong evidence that shiftwork, night work and weekend work patterns disrupt workers' capacity to participate in social relationships, leading to social desynchronisation that contributes to work-life conflict, health and occupational safety even after the direct effects of shift work are accounted for (Arlinghaus et al., 2019). There are several contributory work-related factors; the specific nature of the shiftwork patterns, the number of hours worked as well as job specific psycho-social aspects such as long working hours and overtime, excessive job demands, low control over work processes and skill discretion and whether work is secure or precarious, all of which affect workers' well-being. For example, workers may prefer a compressed working week of longer daily hours over fewer days as this gives them longer blocks of time off work. However, the fatigue impact of long working days may extend recovery time negating some of the social advantage of the compressed week, as well as increasing fatigue-related risks on the job (Arlinghaus et al., 2019).

Arlinghaus et al.'s (2019) review compared long (e.g. five to seven days on the same shift then rotating) and short (two to three days on the same shift then rotating) shift rotations, with some research suggesting that short shift rotations enable some short re-synchronisation with social life which improved subjective work-life balance. This review also highlights several studies on the ameliorating effect of worker control of shift flexibility in reducing the negative impact on social and family life, including in the case of those working irregular hours. Costa et al.'s (2006) study using European data from 16 countries found worker control of working hours flexibility had a strong relationship to 23 different measures of health and well-being, and worker control of shift flexibility had the second strongest impact of several variables, on work-life conflict. However, Arlinghaus et al. (2019) also attends to studies which fail to show such a relationship which may include cases where the degree of flexibility is constrained by workplace characteristics and employers, so flexibility may not be 'usable' for workers.

SHIFTWORK AND IMPACTS OF SHIFTWORK ON RELATIONSHIPS AND CHILDREN

There is significant body of research on the impact of shiftwork on families and children. Most of this research demonstrates a negative impact on children's emotional and developmental outcomes on those whose parents who work shifts, with larger effects for families on low incomes and on single parent households. There are key mediators of this relationship including parental depressive symptoms, quality of parenting, reduced parent child interaction and unsupportive home environments. The relationship between shift work and outcomes for children was strongest for night-working mothers with pre-school and middle school children (Arlinghaus et al., 2019).

There is significant research demonstrating a negative impact of shift-working on the risk of divorce or separation compared to those working day shifts (Arlinghaus et al., 2019). This effect

was worst for both male and female workers who were working nightshifts and parenting, with one study of US workers indicating a six-fold increase in risk of divorce for men and three-fold increase for women (Presser, 2000).

Arlinghaus et al (2019) warns against generalisation of these results since the specific types of shift schedules, the degree of control that workers have over them and family characteristics all play a significant role. For example, where families can reconfigure care and household duties so that fathers take on a greater role the impact on work-life conflict may be ameliorated. This would also be the case where workers have the capacity to flexibly adjust schedules including the capacity to reduce without penalty unsocial working hours, to ensure that one parent is available for child-care, which may subjectively outweigh the costs of working shiftwork.

GENDER DIFFERENCES IN IMPACT OF SHIFT WORK ON FAMILIES

More recent research has begun to consider gender differences in the impact of non-standard work schedules on work-life conflict. For example, Lambert, et al. (2023) found that non-standard work schedules increased time-bound work-life conflict more for women than it did for men, with early morning and evening work disrupting socially valuable time for women and weekend work disrupting it for both men and women. This maybe because women tend to take more responsibility for routine, daily and less flexible forms of domestic work than men. Lack of family support was a strong mediator of work life conflict which brings in the importance of extended family structures. Work schedule unpredictability is especially detrimental for women reflecting the impact of sudden shift changes on household management and the organisation of childcare.

DADASHI AND RYAN'S REVIEW OF THE RELATIONSHIP BETWEEN NIGHT WORK AND HEALTH

Dadashi and Ryan's (2022) literature review examined the literature on the links between night work and health, as well as identifying and evaluating interventions to manage these risks. While exploring direct links, it does not consider the wider issue of shift work scheduling or how psychosocial factors interact with night or shift work to mediate or moderate these risks. Neither does it consider the impact of shift work and night work on psychosocial risks, or on night-workers' family and community. While Dadashi and Ryan's review specifically refers to nightwork, many of the reviewed articles refer to shift work so it might be assumed that they focus only on shiftwork that included night-work in particular.

The literature review did not include the significant review of this literature by Moreno et al. 2019 and the associated Working Time Consensus Statement regarding the link between shiftwork (including nightwork) and health (although other Working Time Society Consensus Statements from 2019 are included Dadashi and Ryan's review).

The review does not specify the criteria for evaluating the evidence in the reviewed papers apart from summarily stating if the evidence is conclusive or not. There is no indication of the study designs which would help assess the strength of the evidence and its limitations. The report identifies cardio-vascular disease (CVD), cancer, metabolic disorders as the most frequently reported studies, based on the number of research reports about these illnesses. It is difficult to draw conclusions about the strength of association or prevalence of disease linked to nightwork, from the frequency of studies, given there are many reasons why some diseases are more researched than others, for example available data bases, costs of studies, quality of evidence or robustness of results.

CONCLUSION

There is strong evidence, including proposed causal biological and social pathways, that shift work is associated with negative health outcomes in relation to cardiovascular disease, gastro-intestinal disorders and metabolic disorders (diabetes and metabolic syndrome). These pathways include circadian rhythm misalignment; sleep restriction (i.e. insufficient sleep) and social desynchronisation. The extent to which these causal mechanisms play a role and whether they mediate the association between shiftwork/nightwork and ill health either directly or indirectly, is not clear. They also identify that gender influences the response to shiftwork and nightwork and that men and women may have different risks for negative health outcomes. These effects are independent of associated lifestyle factors including poor diet and insufficient exercise that are also associated with shiftwork, and which can exacerbate these negative impacts on health.

While the evidence linking shift work to cancer is less strong, in 2007 and again in 2019, the International Agency for Research on Cancer (IARC) classified shift and/or night work in group 2A of 'probable carcinogens' since 'they involve a circadian disorganisation.' This is 'based on limited evidence of cancer in humans, sufficient evidence of cancer in experimental animals, and strong mechanistic evidence in experimental animals' (p.1058). The impact of shift and night work on cancer is dose dependant, determined by the type of shift system; duration over time of participation in the shift system, and the shift intensity (time off between the shift schedules) (Ward et al., 2019). There is recent evidence supporting dose-dependent links between night shift work and hormone-dependent breast cancer women who commence night shifts before they reach menopause.

The evidence linking shift work to mental health problems and reproductive problems is less strong. However, evidence since 2019 on the impact of shift and night work on depression, together with emerging work on proposed causal pathways, indicates this is of concern especially in the case of female night shift workers.

Prolonged exposure to psychosocial risks in the work environment is linked to work-related stress, burnout, poor mental health, musculoskeletal disorders, sleeping problems and cardio-vascular disease. Psychosocial risks and work-related stress have been rising in the EU in recent years, with time pressure or work overload being the highest. Exposure to psychosocial risks will exacerbate the negative impact of shift work and night work on employees and there is emerging evidence that workers doing non-day shift work are at higher risk exposure to job strain, low control at work, less managerial support, higher physical demands and exposure to workplace violence. However, the profile of psychosocial risks is likely to be occupation-dependant and assessments need to take into account potential differences between workers on different shift schedules.

Shift work, and night shift work in particular, results in workers lives being socially desynchronised from family, social networks and communities. There is evidence that shift work has a negative impact on partner relationships and on pre-adolescent child development. These impacts are also affected by the personal, family and economic situations of workers and the availability of affordable child-care that is structured to fit with the working lives of shift workers. The negative impacts of social desynchronisation can be ameliorated to a degree at the workplace level when workers have genuine control of their shift schedules and are able to adjust their working hours to some extent to the demands of family and social relationships.

DATA ON SHIFT PREMIA

A review by Incomes Data Research (IDR) of night working in 44 organisations in December 2023, mostly from private services, primary sectors and manufacturing, found that around 90% of respondents schedule night working as permanent shifts with 69% of these operating permanent night shifts and 61% operating a pattern of rotating day/night shifts. Two thirds paid an annual shift premium calculated as a percentage of salary ranging from 12.5% to 35% - a median of 33%. Other employers paid shift premia as a fixed monetary amount each year – a median of just over £5,000. In the case of hourly-paid roles approaching two thirds (63%) applied a percentage uplift (typically worth 30%) rather than a monetary premium (£1.71ph at the median). The survey found a slight increase in the median premium, up from 30% in 2022 to 33% in 2023. The survey suggested that there were recruitment and retention challenges in relation to weekend and late or 'back' shifts, although in most cases employers had not taken steps to address these challenges in terms of pay incentives.

A larger analysis of night shift premia was commissioned from the Labour Research Department including indications of any changes in the levels of premia in recent years. LRD has its own categories for different shift patterns against which it records either a cash amount or a percentage premium for **early, middle and late** time periods:

- 24 hour 5 day working
- 24 hour 6 day working
- 24 hour 7 day working
- Double days 5 day working
- Double days 7 day working
- Permanent nights 5 day working
- Permanent nights 7 day working
- Premium for night working
- Other arrangements

The analysis presented here looks exclusively at shift patterns where data has been entered either for a percentage or a cash premium for the **late period** within each particular pattern. Exactly what times of day or night are involved in each case varies, from the "backshift" in a double day patten to the night-encompassing period in rotating 24-hour cover, and time periods associated with permanent night shift or the evening/nighttime hours when a premium rate is defined as being payable.

The analysis includes 3,728 rates in 571 bargaining units, the majority (60%) in the manufacturing sector, followed by transportation and storage (19%). Overall, just under half (46%) of rates were expressed as a cash amount and over half (54%) as a percentage. The median percentage premium was 33% and the average 32%. The median weekly cash premia is £95.49 and average £101.65.

In each case a corresponding non-shift rate of pay has been identified, so that a cash premium could be used to calculate a percentage premium (and vice versa). Premia range from 0.5% to 318%; both the average and median shift premia is 30%.

Table 1 – Shift premia as a % of equivalent day grades

% shift rate premia	
Under 10%	3%
10-20%	15%
20-30%	32%
30-50%	45%
50-100%	5%
Over 100%	1%

An analysis of a sample of 689 rates was undertaken to evaluate changes in shift premia over time (where data over time was available). Table 2 shows that in the vast majority of cases the percentage premium appears to be unchanged, in 12% it has increased relative to **at least one earlier year;** and in another 12% it appears to have reduced; in the remainder (5%) something appears to have changed but the direction of change is unclear or inconsistent.[1]

Table 2 – Changes in shift premia

A pattern where the % premium has gone up	84	12%
A pattern where the % premium is unchanged	491	71%
A pattern where the % premium has gone down	81	12%
A pattern where the % premium trend is unclear	33	5%
Total	689	100%

[1] Those row counts total 689 because, even though bargaining units where only one row of premium is available have been ignored because they offer no ability to show change or continuity, it includes bargaining units where trends have been picked up for more than one shift pattern.

4. PARTICIPANTS DESCRIPTION

All the workers interviewed had worked night work for many years. One of the workers was seconded to union Health and Safety duties and the rest were all currently worked night shifts, mostly within a rolling shift roster. There was one full-time permanent night shift worker and two part-time permanent night shift workers, all female and working on the London Underground (LU). There was one RMT official who had a previously worked nightwork in the railways including as a welder, who was a key informant on the issues of nightwork in the industry.

The fifteen RMT workers interviewed were predominantly white males (ten) over the age of 50yrs (seven) with three males between 35 – 45yrs and worked in maintenance, signalling and telecommunications (S&T) roles or as signallers. The maintenance roles were: Track Maintenance, Off Track (vegetation, fencing and drainage), Track Inspection, Overhead Line Maintenance and Signal and Telecommunication Maintenance (S&T) and Signallers. It included Team Leaders in maintenance roles. These roles were in Network Rail.

Of the 15 participants, there were six women, and they were generally somewhat younger (20s-50s years of age, but with one woman in her late 50s). They were doing a range of roles including a night tube train driver, asset controller, underground maintenance team leader, and two in customer support services (one manager and one assistant). All but one of the women worked for London Underground, except for one customer service assistant in London Northeastern Railway (LNER).

Eight of the workers were either union representatives or trade union Health and Safety representatives. Since they have accumulated considerable knowledge of the industry and of the work processes and issues faced by workers, they were a rich source for understanding these issues in this research as well as drawing upon their personal experiences of work. One was the full-time RMT Lead Representative for Health and Safety who had worked previously for many years as a welder on maintenance doing shift work and another had been temporarily seconded full-time as a national union Health and Safety Representative, so these were not currently doing shiftwork in general, although one still did some shifts so they could meet with workers and understand their issues.

All had had partners, or were still in relationships with partners, over the years of working night-work. Three of the six women did not have children. The three women who with children had young children and were the only participants working permanent nights - two part-time (Friday and Saturday nights only) and one full-time. All but one of the males had had, or currently had dependent children, over their time of working night shifts.

All but one of the workers worked either for Network Rail or the London Underground. One younger female worker was with London Northeastern Railway as a customer service assistant. Consequently, many of the findings, including those relating to older workers and those in other roles apply to Network Rail and London Underground and can't be generalised to London Northeastern Railway.

The description of the participants is in the following table:

Pseudonym	Role and Company	Union Role	Gender	Age	Yrs in railway industry	Yrs of night work	Partner while doing night work	Dependant children when doing night work
Peter	Full-time RMT Official; previously welder; Network Rail	Lead Union H&S Rep, Network Rail	Male	50s	35	26	Yes	Yes
Cheryl	Customer Service Manager; LU	Union H&S Rep	Female	40s	17	10	Yes	None
John	Overhead Maintainence; Network Rail	Seconded as full-time Union H&S Rep	Male	60s	17	23	Yes	Yes
Tim	Signaller; Network Rail	Union H&S Rep	Male	40s	17	13	Yes	Yes
Paul	Signaller; Network Rail	National RMT H&S Rep	Male	60s	43	37	Yes	Yes
Neil	Team Lead Signals & Telecom; Network Rail	Union Rep	Male	40s	20	20	Yes	Yes
Norma	Station Customer Sevice Assistant; LNER	None	Female	20s	8	8	Yes	None
Jack	Operative Track Inspection; Network Rail	Union Rep	Male	60s	18	18	Yes	Yes
Ian	Signaller; Network Rail	None	Male	30s	24	22	Yes	Yes
Phillip	Team Lead Signals & Telecom, Acting Supervisor; Network Rail	Union H&S Rep	Male	40s	22	22	Yes	Yes
Wayne	Team Lead Off Track; Network Rail	Union H&S Rep	Male	50s	20	20	Yes	Yes
Grant	Team Lead Signals & Telecom; Network Rail	Union Rep	Male	50s	29	27	Yes	Yes
Joan	Asset Control Center Operator; LU	None	Female	50s	30	23	Yes	None
Sally	Team Lead Maintenance & Failures; LU	None	Female	20s	9	9	Yes	Yes
Louise	Night Tube Driver; LU	None	Female	40s	10	4	Yes	Yes
Maureen	Customer Service Assistant; LU	None	Female	30s	6 (with 2 yrs maternity leave)	6	Yes	Yes
	NB: LU = London Underground							

5. KEY FINDINGS

5.1 NATURE OF THE WORK

This section describes the nature of the work and general working conditions for the main groups of workers in maintenance, signals and telecommunication maintenance (S&T), signallers, customer services, asset control and train driving.

Maintenance workers

Maintenance workers are involved in doing track maintenance, off-track maintenance (e.g. drainage, keeping the sides of the track clear, etc), Signals and Telecommunication (S&T) maintenance, fault response and overhead line maintenance.

The maintenance workers do mainly night work and are based at a depot, and then leave from there to do trackside work outside and so are exposed to the weather. This generally requires a significant amount of time spent walking on ballast (stones supporting the tracks) often four to six miles, which is tiring and in the long-term causes many workers to have physical problems with their feet and knees. The work also generally involves heavy physical work. There is additional time spent in vans driving to sites or waiting in vans at the depot. The workers are no longer permitted to have the engine running if the van is stationary so in winter this can be very cold. Electronic van monitors assess this. The depot is where workers complete paperwork, rest and eat before and after going on track and the depots are described as very uncomfortable and in one case also vermin infested.

When on track there are no toilets unless there is a nearby service station or café, and nowhere to eat or to obtain food unless they bring it with them or there is a service station or shop open near where they are working. There is no shelter on track. To have a rest break then means returning to the depot, then going back to the site job which takes significant walking and /or driving time. Most workers prefer to work through the scheduled rest break and then to be able to leave a little early if possible, however managers may or may not agree with this arrangement.

The workers then return to the depot before the end of their shift to complete paperwork etc. Some are then on-call at the depot until the end of the shift.

The majority of maintenance workers (80-90%) work night shifts because that is when most of the trains stop running and there is a window of opportunity to do the maintenance work between about 00:00 to 5:00. There is a small number of crews on during the day to fix faults. Stopping trains during the day would cause delays and have repercussions for the running of the trains.

The biggest blocks of maintenance time are over weekends, starting from approx. 22:00 on a Saturday night through until approximately 11:00 on Sunday morning. In the mid-week there might be a maintenance window of four or so hours while on the weekend this can go up to eight hours. Consequently, most of the maintenance workers work mostly night work, especially on weekends. In London Underground most maintenance can only occur when trains are not running as there is no space in the tunnels, hence this work is done primarily at nights and weekends.

Signallers

Signallers control the movement of trains on the lines. They work in multi-person or single person signal boxes. Over the past few years Network Rail has been consolidating signal boxes by merging and removing some single-person boxes. This often increases commuting time for those signallers affected. Signallers operate signals controlling the movement of trains throughout the day and night.

Customer service managers and assistants

Customer service work is station-based work that provides frontline services to service users. This includes supporting customers, staffing gates, intervening in situations with customers (including antisocial behaviour, potential suicides) dealing with service disruptions, security, doing rosters, handling money, closing and opening stations. While many station close overnight there is still one worker on duty. Other stations are open for 24hr with night trains running and staffed by several workers. Customer Service Managers can manage teams of up to 80 staff across up to five stations as well as doing frontline tasks on stations when working overnight alone.

Asset Control Centre workers

There was one older female Asset Control Centre Operator who had worked for London Underground for many years. This work involves receiving reports of faults on stations and tracks by phone, email or on apps, then prioritising jobs and passing these on to appropriate contractors. This works like a call centre, with workers monitored and with KPIs regarding the workflow. There has been a significant change to the work in relation to the introduction of new technology and software, resulting in operators having more limited autonomy, being subjected to micro-management and now having more limited relationships with contractors. On night shifts there is less managerial surveillance of workers.

London Underground Train Drivers

There was one female participant who worked part-time on Friday and Saturday nightshifts on the London Underground as a night tube driver. This involves driving trains through dark tunnels and putting them into and out of depots. The work can be quite monotonous.

5.2 PSYCHO-SOCIAL RISKS AND NIGHT WORK

While night working has its own well-documented negative impacts on workers' fatigue, mental and physical health, the nature of the work environment also impacts on, work-related stress and mental and physical health. Widely recognised psycho-social risks include excessive job demands, low levels of control over the work, low levels of supervisor and collegial support and poorly managed change programs. These are robustly linked to work-related stress and a range of negative physical and mental health outcomes including fatigue and burnout, as discussed in the literature review above. When night work is combined with psycho-social risks within the work organisation the impact on mental and physical health and on family and social relationships will be exacerbated.

Three key psychosocial risk factors identified in the research are excessive work demands (including both work intensification (high workloads) and extensification (high levels of overtime) which are largely underpinned by insufficient staff; problems with managerial support, managerial attitudes to rail and workers' health and safety, and the management of change.

Understanding how specific psychosocial risks shape the context of night work and exacerbate the impact of night work enhances understanding of the impacts of night work on workers in these sectors.

Changes to work: work intensification

The maintenance workers, signallers, asset control operator and a customer services manager, most of whom had many years of experience in their jobs, reported that their workloads had increase of recent years, for many to unmanageable levels, and were associated with significant work-related stress. This seems to be less of an issue for the customer service assistant (one participant).

Many identified that in recent years staffing numbers had been reduced while job demands and tasks had increased for front-line workers, team leaders and lower-level managers.

For example, an off-track team leader described the drastic reductions of staffing in his area and the changing workloads,

> *In my department, there's probably - we're severely undermanned. We've only got four people. We used to have 14 at one time. …. We have a large, large section. We have 26 ELRs, which is line sections. We cover a vast amount. We've done that with four people. So, I would say it's put a massive strain on the four guys, myself included. Also 'Modernising Maintenance' [program]. I'm a union rep, so I've been released for these meetings. So, that has incurred overtime over rest periods. … So, it's a kind of enforced overtime, that, because we've had to do it. (Wayne, Team Lead, Off-track Maintenance, Network Rail)*

In his section, the union has negotiated a review of the staffing and managers have agreed to increase staff with another seven workers, however, these will still need to be trained up. This is still three workers below past staffing levels and at the same time the workload has increased with extra tasks associated with drainage which has increased the work bank (the list of work tasks to be done).

> *Seven people was to replenish what we lost over the last few years. So, yeah, our work's increased, the work bank is - and the work we have is off the scale, really. (Wayne, Off-track maintenance team leader, Network Rail)*

Many of the workers reported that workloads had become unmanageable.

> *Now we've got staff that have been here for 20 years, still in their fifties, really fit and well, and just going, 'I'm not doing this anymore. This is just becoming impossible'. The workload is unmanageable, and you can't actually do anything within the timeframes that you've got to do it in, with the less staff that we have as well'. (Phillip, Team leader S&T, Network Rail).*

For S&T workers who are doing fault fixing or maintenance in line blockages during the day when trains are running, their work has also become more pressurised. Since they can only work for a few minutes at a time when the trains are not on currently on the track or are stopped for a short while, this only gives them short spurts of time to complete the work which them puts them under significant time pressure. This is a result of changes introduced to increase the safety of working on the lines, but it has led to a more pressurised work environment.

> *The workload that's required to be done now doesn't fit into the access windows. So, you just can't physically do the work. So, more staff could fix that potentially, but then you'd still need the access to get in and get the work done. So, it is a double knock-on effect. (Grant, Team Lead, S&T, Network Rail)*

On the London Underground the Customer Service Manager also report reduced staffing and increased workloads that are very stressful.

> *… my job is incredibly stressful with the workload, which is more than I can manage. So, there was a reformation of job roles in 2016 called' Fit for the Future' on London Underground. So, I was just running a station, I was a station supervisor and my role became a job called customer service manager. So, I'm now responsible for the management of staff and their performance and all of their issues at five stations in all, and all of those staff, which is over 80, and now we are going through another reform. So, my job is essentially going, so they're not replacing anyone that does my job, so there should be 10 people that do my job to manage that workload. And there's currently in reality there's six. … that responsibility is very stressful because there's not enough of us…. two people who've been off long-term sick for over six months with work-related stress as well as two vacancies. Hence why we are under. (Cheryl, Customer Services Manager, London Underground).*

In the Asset Control Centre of London Underground the work had changed to a call centre type environment with increased monitoring (including micro-management) by managers, the use of work-flow key performance indicators (KPIs), with less autonomy and more limited relationships with contractors and customers. For Joan (Asset Control Centre Operator) the job is now focussed on quantity rather than quality. The workloads had increased due to having more lines and stations to look after so there is more work coming in as well as new processes and systems encountering 'teething problems' all of which increases the workload and time pressure.

Across the job roles the increased workloads were attributed to a large degree to the various restructures done by the companies, which resulted in many of the older more experienced workers taking redundancies or retiring, or through natural attrition and recruitment freezes, leading to increasing workloads (work intensification and extensification) for those remaining. The issue of work extensification and overtime will be discussed in the next section.

Management: safety, support and change management

Rail safety and workers' health and safety. The railways are a safety critical industry. Several of the workers raised issues about management and safety in relation to both safety on the railways as well as the attitudes and behaviours of managers regarding workers' health and safety.

> *Network Rail is not a family friendly company in the slightest. It likes to portray itself as being that way, but it doesn't care, and they don't care about safety. I mean, I've just told you a couple of horror stories there (Jack, Track Inspections, Network Rail)*

Several older workers expressed concern about managers attitudes to safety on the railways, indicating that managers were keen for team leaders to sign off on jobs with minimal regard for actual safety, and prioritised speed of completion over addressing safety concerns. One worker described being pressured by managers to sign off work whether it was completed or not. This attitude can then affect workers attitudes to safety and create tensions within work teams. For example, a track inspector described how managerial attitudes towards safety created tensions between workers in track inspection teams with some workers wanting to finish the job and get back to the depot especially during in cold and wet conditions, and others who refuse to sign off unless the whole section of track had in fact been inspected since they felt a primary responsibility for passenger safety. Another track maintenance worker reported that they were aware of significant physical gaps in the rails that would sometimes be ignored with the expectation that the next team would identify and rectify the problem.

The disparity between worker and management attitudes and perceptions of rail safety could be a source of conflict and work-related stress, this is particularly likely where workers have primarily concern about their responsibility for passenger safety. The concept of 'moral distress' as a potent psycho-social risk is documented in the literature on health care workers and their responsibility for patient care and safety i.e. where workers are unable to deliver the care they were trained for, which then negatively impacts upon patients (Morley, Ives and Bradbury-Jones, 2019). There is a possibility that a form of moral distress may be occurring for some maintenance and S&T workers in relation to the rail safety of the public.

There is a common perception amongst most of the maintenance workers and signallers regarding a general attitude of managers, which one worker sums up as -

> *'nothing stops the job, … you do what you're told, when and how you're told to do it … they don't want people to challenge [on safety issues]' (John, Overhead Maintenance, Network Rail).*

This attitude towards safety by managers is also reflected in the workers' reports about managers' attitudes to workers' health and safety. Workers, including those who were health and safety officers, reported that fatigue management was very superficial, that it relied on workers initiating individual self-reports about their level of fatigue which managers were then supposed to assess in a fatigue interview, such as asking them if they felt excessive fatigue, are they eating healthy food, are they getting enough exercise, etc. Some workers found some of these questions to be quite patronising. The health and safety officers reported that few workers actually initiated fatigue management processes. Furthermore, managers may or may not act with an appropriate intervention. While there is an appeals process, this rarely happens in practice. Workers are often either not well-informed about their rights or lacked confidence to bring fatigue and other issues to the attention of managers or to challenge them.

Communication with workers about health and safety issues can also be problematic. For example, customer service assistants on stations largely don't have access to computers at work, yet managers use emails to communicate about health and safety issues. So, while these workers are unlikely to read emails, management can still report they have communicated with workers.

Some of the health and safety officers were also critical of the role of Office of Rail and Road (ORR, the safety regulator for the railways and road transport), as being very lenient with managers around issues raised concerning workers' health and rail safety.

Managerial support: Most of the workers raised concerns about limited managerial support in relation to mental health, fatigue, and roster inflexibility, with a few describing problems with micro-management.

Mental health issues are often strongly stigmatised in the broader community which can then affect managers' understanding in the workplace. In one case, a worker reported that after they revealed their mental health issues to a manager this was subsequently used to rationalise and victimise the worker in relation to other issues that the worker raised.

Several workers reported lack of managerial support for changes to rosters to accommodate family needs.

> *No empathy [from managers]. I tried myself to get a roster. They've got this thing called individual rosters. I put forward one and it just got blown out the water, but I'm still fighting that. A lot of it is just convoluted. (Jack, Track Inspections, Network Rail)*

This worker had requested a change to an individual roster, which is within the scope of managers to grant. He needed to be able to provide some support to aging parents with emerging health problems. This was refused as it 'did not fit the business operations'. In this case the worker felt that this was potentially discrimination because he was a union representative, since the same request from another worker was granted. Another worker reported that he tried to get his roster changed so that he could spend more time with his family, but the manager refused, again 'due to business needs'.

Even booking time off over weekends for family events can be difficult in some areas:

> *There's things on a Saturday night I can't go on. Trying to get time off from these managers is a nightmare, do you know what I mean? I don't know, they're Stalinist or whatever, they are! (Jack, Track Inspections, Network Rail)*

Managers also control the timing of annual leave which many workers who do night work use to facilitate rest days or to attend important family functions. Annual leave is granted only if it can be fitted around business needs. For example, customer service staff on the London Underground can only have one 3 week-long break in the summer. The rest of their leave can only be taken as a maximum of one or two-week blocks and then only when it fits business needs. Since the railways in many areas are under-staffed, this makes taking leave when workers need it sometimes quite difficult.

A signaller described managements' response to issues raised by H&S representatives about signallers not being able to take any rest breaks. Management sent in time and motion assessors who recorded all the mini- breaks and interruptions of one to five minutes across a shift then added these up to say in total they had a 20-minute break which was sufficient. The reality was they could not prepare a meal and eat it or even make and drink a cup of coffee in a 2–5 minute break.

For customer service managers working on stations alone at night, a significant safety issue is dealing with workplace violence, abuse, intervening in potential suicides and attending to medical emergencies. Stress has increased over recent years since the support services (police and ambulances) have become slower to respond. Consequently, customer service managers are dealing with vulnerable people for longer. For lone workers at night there is no personal back-up except for calling 999 or a service control number. This makes the workers more vulnerable, and being alone on the station can make it harder to mentally process difficult events, so this becomes more stressful since there is no managerial support over this time. This subsequently makes it more difficult to sleep once the shift has ended and they are at home.

Managerial neglect of workers' safety after they finish a late shift also may be somewhat problematic. One young female worker reported feeling very unsafe after finishing a late shift around midnight on Friday and Saturday nights because they had to walk past groups of inebriated men to get to the car park some distance from the station. Network Rail owns the car

park adjacent to the station but refused to make any car spaces available for workers finishing on late shifts.

Some health and safety representatives made links between these poor management practices concerning health and safety and lack of support for workers to changes in the recruitment practices for managers. Many of the new managers were coming directly into management as graduates with little experience and little knowledge of the rail industry or from the external contractor base where contractors are driven more by profits than by concern for workers and safety.

Management of change: Several workers were critical of the way that changes associated with restructuring were handled by senior managers where the union had to battle to try to get their concerns about the changes seriously considered by management.

Night work in the railways is embedded in an organisational work environment with significant psychosocial risks, specifically excessive work demands through work intensification and extensification related to insufficient staff, managerial inadequacy in relation to attitudes to rail and worker health with weak external regulation, together with limited managerial support on a range of issues including communication in some areas, fatigue, roster flexibility and mental health and the perception of inadequate change management.

These psychosocial risks are more generally linked to work-related stress and mental and physical health and are likely to exacerbate negative impacts of night work on workers. Excessive work demands are likely to increase fatigue and to exacerbate the fatigue associated with night work.

Lack of managerial flexibility in accommodating to workers' needs regarding rosters and being able to book leave when needed is likely to exacerbate both workers' stress and their ability to maintain good family and social relationships which are already impacted by night work and weekend work in particular (Arlinghaus et al., 2019). Good family and social relationships support workers' mental and physical well-being.

Managers' attitudes to health and safety influence the organisational safety culture and can affect relationships between team members regarding health and safety. In particular, managers' attitude to workers' well-being, especially in relation to fatigue in the rail industry, in turn has an impact on workers' willingness and capability to report fatigue or mental health issues and hence its effective management.

Engagement with workers and unions in change management is also critical to understanding and responding to the potential impact of proposed changes on workers' fatigue and well-being as well as on operational safety issues (Mathisen et al., 2017).

5.3 NIGHT WORK AND SHIFT ROSTERS

The rosters are developed in discussions between managers and the union, within the parameters of the contract. For maintenance workers and signallers with Network Rail there is a minimum of 39 weeks per year of night work and 39 weekend shifts on newer contracts. This has increased from previous contracts that was 28 weeks per year with 32 weekend shifts and on which some workers still remain. There is a requirement for those who are promoted to accept the new contract, which some participants reported prevents them from applying for promotion. There is no requirement to have a break after a run of nights, only a rule that says there should normally be a break of 56 hours in every week. There is a recommended maximum of working 60 hours per week. Both the HSE (2006) and ORR (2024) recommend guidelines for managing shift and night work.

The rotating rosters were quite varied from 4 to 13 weeks across different locations and job roles. The Network Rail maintenance standard roster is 13 weeks. Four- and six-week rosters may be more common for some groups of workers. Some London Underground rosters include a 'spare' or 'cover' week (of up to three weeks in some rosters) where the shifts are varied to cover staff on leave, etc and which often increases the number of nights worked beyond those formally designated in the roster. Network Rail maintenance rosters no longer include spare weeks.

The amount of night work, the length of the blocks of nightwork and the number rest days after nightwork seem very variable. For example, the number of nights in a four-week roster could be 15 nights in three blocks of five nights with two or three rest days after a block of nights; 10 nights in two blocks of five nights with two or four rest days after; seven nights in blocks of three and four nights with three rest days after each block, but also with some having seven days off after day shifts. Or in a six-week roster, nine nights in blocks of four and five nights with five days rest after each block. On London Underground customer service assistants at stations reported working seven nights in a row on rotating rosters with seven days and seven afternoon shifts. Rest days here are defined by the companies as including the day of the morning that the night shift ends and the day the night shift begins in the evening.

Including the day of the morning when the run of night shifts ends as a rest day is a contentious issue for workers since they finish night shifts exhausted and that day is generally spent just recovering or preparing for shift transitions rather than normal living. To manage shift transitions workers often will get a few hours' sleep when they get home from work, then will try to stay awake as long as they can in the hope of sleeping properly that night in an effort to try to readjust their circadian rhythms back to day shifts. This is certainly a day in which the worker cannot do much at all.

The number of weekends not spent working also varied across the different roles and departments. In this research we counted a weekend off as covering all day Saturday and Sunday, i.e. not those days when the shift ends on a Saturday morning or starts on a Sunday night. This varied from one weekend in six weeks; one weekend per month; three weekend in six weeks; and less often to five weekends in seven; or eight weekends out of twelve weeks, with a report from one depot that workers had one weekend off in twelve weeks.

Shift length also vary from seven, eight, nine and twelve hours, with twelve hour shifts common on weekends, although some departments have all shifts as 12-hour shifts. This is often decided in consultation with the union. Many workers claimed that they preferred, or would prefer to work, longer twelve hours shifts as it means they have more days off which allowed for both recovery from night work and more time to engage in personal, family and social life. When working seven or eight hour shifts on rotating rosters including weekends, they felt like they were always at work. Staying awake after 03:00 to 04:00 when they 'hit a wall', especially on twelve-hour nightshifts, was a particularly difficult period on nightshifts.

Some jobs also require being on-call and responding to emergencies, as in the case of off-track maintenance workers. This is mainly to attend emergencies such as clearing fallen trees, etc. While this is currently voluntary, the company is pushing to make if a requirement of the job. One of the problems is that managers pressure workers to then go on and do their rostered normal shifts including night shifts after the call-out. So, they may end up working four hours or more on a call-out and are then expected to go and do a normal rostered shift after that. This is despite the collective agreement requiring a twelve-hour rest period after finishing a call-out.

Commuting:

Commuting times were also very variable from a ten-minute bike ride, to travel time of up to two hours each way. Many of the participants had at least one hour commuting each way. Long commutes are significant in relation to finishing a night shift and driving home afterwards, with those working longer shifts of 12 hours especially vulnerable to the effect of fatigue on driving. There is a rule about the time from leaving work to returning home should be no longer than 14 hours, but many workers, especially in London, can't afford to live close to work or due to the consolidation of signal boxes have had changes to their place of work, so have longer commutes which can put them over the 14-hour rule.

5.4 NIGHT WORK AND OVERTIME: WORK EXTENSIFICATION

The railways are a 24/7 service. While most city-based trains will stop around 01:00, there are still a few night trains running through some stations, and a reduced intercity service after this time, as well as some freight trains. The reduced service provides opportunities for maintenance to occur, particularly on weekends, as well as requiring workers to support the trains that are moving at night. This means most maintenance-associated railway workers are required to do a significant amount of night work and weekend work, with the contractual requirements for this increasing over time. Consequently, especially for maintenance workers, the overtime available is more likely to be nightshifts and / or week-end shifts.

In more recent years there have been various restructures such as Network Rail' s 'Modernising Maintenance' and London Undergrounds 'Fit for the Future' programs which resulted in redundancies leading to increased workloads and the need for more overtime. The workers commonly stated that 'the railways run on overtime', meaning there is insufficient staff to get the required work done so that without workers doing overtime the railways couldn't run. Contract changes have also increased the amount of night and weekends shifts required.

The older workers reported having done a lot of overtime when they were younger and are aware of other workers who currently work a lot of overtime, with one reporting that he knows of others who will work up to 60 hours in a week with overtime. There is a regulation specifying an upper limit of 60 hours per week maximum which was put in place following the Clapham rail crash. This is still more than the EU working time directive of 48 hours per week. The nominal working week is 35 hours per week, but this is averaged over the year, so actual working weeks vary significantly and can be well over 48hrs.

The older workers reported that they have generally cut back on the amount of overtime they do as their fatigue has got worse as they have aged, however it is important to note that this impact on their bodies began at a relatively young age in their early 40s.

> *… when you get to 40 you feel the effects of nights really hit you. I'd say I started feeling that maybe around 38ish, and I just pulled off and didn't do as many extra shifts (Phillip, Team Lead S&T, Network Rail).*

Overtime is a form of work extensification i.e. lengthening the time of the working week. This is cheaper for employers as they don't have to pay the associated costs of employing extra workers. Shift work and night work is a way that employers can extend the length of the working day collectively. This extension is also possible at an individual level where workers do double shifts, or as is sometimes the case where they are required to work an extra half-shift while another worker works the other extra half-shift to cover the full shift of a worker on leave. On some networks managers can require workers to work an extra couple of hours past their shift end time.

There are more opportunities for overtime where there are twelve-hour shifts since this leads to having more days off work which can then be used to work overtime. Where shifts are shorter for example seven or eight hours and include longer runs such as seven nights in a row, there is less opportunity for overtime. This is the case of customer service assistants on the London Underground.

There can be pressure from managers to do overtime which older workers often resist. However, for those who want overtime they may more easily succumb to pressure from managers to do more than they want, or risk being refuse any overtime at all.

> *If you don't want it at all, they haven't got any leverage. But if you're someone who needs a bit of overtime from time to time, you'll get pressured to do more, because they'll take what overtime you've got. (Grant, Team leader S&T, Network Rail).*

This also suggest that at least some managers are putting pressure on workers to work overtime so that they can ensure the rosters are covered, which especially likely to occur in the context of insufficient staff. This means that workers' well-being, especially in relation to fatigue, may be de-prioritised by at least some managers.

Shift and overtime premiums

Overall, it was difficult to gain clarity on the shift premiums and overtime penalties and how these had changed over time as many participants were vague or contradictory about this. There were a lot of different contracts in the group interviewed, all with different terms. There needs to be further investigation of this issue. These are likely to be significant in relation to financial incentives to work extra nights and to do overtime.

The nature of the job, the structuring of rosters, lengths of working day and week and the contexts of organisational restructures largely shapes expectations and requirements concerning night work and overtime. Overtime is a form of work extensification by prolonging the working week that saves money for the employer as it can become a means of running the railways with fewer workers, especially if combined with the erosion of overtime premiums over time. Excessive overtime can exacerbate the fatigue associated with night work, which is particularly risky for maintenance workers whose work is largely nights and weekends.

5.5 PERMANENT NIGHTSHIFTS

For Network Rail workers there is increased pressure for more workers to do permanent nightshifts. This removes any need to have blocks of rest days between shift changes or following runs of night shifts. Depending on shift lengths it can also enable more overtime to be worked. For example, with longer 12 hr shifts there are fewer days worked so this frees up time for overtime.

Amongst the participants there was one full-time maintenance worker on the London Underground doing permanent night shifts. Being on permanent nights means that there is no requirement for managers to schedule extra rest days off as there is for those doing rotating shifts, as it is argued that over a period of time the workers' body clocks adjust to night work.

However, this circadian rhythm adaption is variable across individuals and the fast transition into day patterns involved in having weekends off work will disruption this and risks fatigue. 'Permanent night workers and early morning workers run the risk of chronic sleep debt, fatigue, ill health and disruption of family and social life' and the HSE recommends that permanent night shifts be avoided (Health and Safety Executive (HSE), 2006).

This worker's roster starts 23:00 on Monday and finishes at 06:30 Saturday working 7.5 hours shifts (0.5 hours nominally for meal break makes 35hrs per week). This gives the worker only one full day off (Sundays), since Saturday is wiped out in recovery, although the company counts this as a rest day, along with the Monday before commencing night work in the evening. This requires a quick change in the body clock to cope with being active during the day on Sundays to be able to have any family time at all, then readjusting back to night shifts on the Monday night. This also means that there is little opportunity for overtime except to work Sundays, which would then mean working two weeks without any break, which is very exhausting.

The only way to be able to attend night-time family events such as school plays when on night shifts or doing permanent night shifts is to try and book annual leave days, since the demanding physical nature of much of the work, especially for maintenance workers, means that one's energy needs to be preserved to be able to do the job at night, so workers can be reluctant to expend their energy by attending social events in the evening before work. This also applies to attending appointments during the day, when one needs to be sleeping. There is no extra annual leave for permanent night shift workers and unlike rotating shift workers no blocks of rests days.

Some of the workers working rotating shifts had a negative perception of permanent night shifts commenting that this means 'rarely seeing the light of day' and having very little social life and one worker remembered doing permanent night shifts as even more exhausting than rotating shifts. Certainly, the full-time permanent night shift worker on the London Underground in this research found this regime of work to be exhausting, despite her relatively young age (20s) (as discussed below).

5.6 MOTIVATIONS FOR NIGHTWORK AND OVERTIME

Workers choose to work for the railways in roles which demand significant night and weekend work. Many of the older workers participating remembered that in the past working for the railways was considered to be a good job, with good pay, opportunities for some overtime, potential career pathways and training, and job security. One participant described how he came from a railway family as his father and grandfather had been railwaymen and shiftwork is all that he and his family knew.

All the older workers in maintenance and signalling roles considered that the demands of the job and the amount of night work and weekend work required had significantly increased in the over recent years, whereas when they were younger the job was more tolerable and less demanding. They described their younger selves as getting used to shift work including some night work and being able to work significant overtime without excessive tiredness. They put this down to being younger and to the work being less demanding at that time. They described doing overtime back then to save money for holidays, to support families and children and to pay mortgages.

> *It was just, well, it's just one of the things we would, the money that I was bringing in for doing shifts, that was that was the major thing we wanted for our House and our lifestyle. … Still. Yeah, but you feel a bit lonely at times or at home sometimes. Like when driving into work, and like I said on a Friday evening and everybody's in the pub and you're like, 'oh, I'm off to work'. But yeah, you know, but then the money is better and that enables you to have a slightly better quality of home life in a way. … You don't have to worry about the bills and what you can get your kids., it not a struggle to get school uniforms, so you just adapt as best you can. (Paul, Signaller, Network Rail)*

Having a slightly better quality of home life for this worker meant reduced financial worries and not struggling for the basics such as paying bills and buying school uniforms for children. This doesn't suggest an excessive lifestyle which is sometimes attached to those working large amounts of overtime.

However, the participants reported a range of motivations for doing overtime, and with a small number expressing a preference for night work. Most of the older worker participants reported doing much less overtime than in the past primarily due to the excessive fatigue that their rostered nightwork leads to as they have aged, so they no longer have the energy to do a lot of overtime. Night work and overtime has a more pronounced negative impact on their bodies and how they feel, as they have got older. These older workers continue to do some limited amount of overtime but now the motivation is more often about either helping colleagues so they can take sick days or annual leave or to maintain a good relationship with their line managers.

For those with dependent children, especially in cases where relationship breakdown led to blended families and supporting children from previous partnerships, doing overtime was important for family support. Younger workers also work overtime so they can pay for a holiday or to save for a house deposit. They also expected that they might do more overtime once they have a mortgage and children.

By doing significant amounts of overtime some workers say they could significantly increase their wages, sometimes nearly doubling their normal pay. This is significant in the current cost-of-living crisis with high inflation and below inflation pay increases over recent years.

In terms of night work, workers identified several advantages to night work. For those with dependent children this was around managing the demands of childcare, especially being able to do school-runs, although one talked about having time off during the day for oneself without other people around. One participant preferred nightwork because they were a 'night owl' so they found early morning starts very difficult and also because there was less management surveillance at night.

Two female participants worked permanent 12-hour night shifts on Friday and Saturday nights because the only option in the London Underground to work part-time was to work weekends and the night work fitted with their need to manage childcare and their partners' work patterns.

One female maintenance/faults worker on London Underground was full-time on permanent 12-hour nightshifts, finishing at 06:30 am Saturdays and starting at 23:00 Mondays, so has some of the weekend off to spend with her family. This fitted better with childcare and taking children to and from school with a predictable and regular weekly schedule compared to working rotating shifts.

Maintenance and signalling workers in Network Rail reported that as they aged, they are finding the demands of the nightwork too high and often their financial situation is more secure, so they do less overtime as they get older, and do it to support their colleagues or managers. Younger workers are doing overtime, where they can, to support their families, to buy a house, etc, that is, financial incentives, while others refer to themselves as 'night owls' and prefer night work since it can also be a time of less managerial surveillance for some categories of worker. While there is a limited of 60 hours per week for railway workers, several of the health and safety officers amongst the participants reported that some workers are regularly working very long hours.

5.7 EXPERIENCES OF NIGHT WORK

Sleep and fatigue

The majority of night shift workers reported having fragmented, split sleep during the day which was of poor quality and of short duration. Most were getting about five or six hours of sleep per day. They would get home around 07:00 or 08:00 and go to sleep for a few hours (unless they had children to take to school first) then wake up and get up for a few hours to potter about the house, eating and picking up children if they had dependent children, then trying to sleep again in the late afternoon or evening for a few hours before going in to work the night shift.

> *When you went home, you went to sleep, and you went to sleep initially like, fine, you would be out normally for about two hours, and then you're awake. Say you went to sleep at 08:00, you'd wake at 10:00 and you're wide awake and you just end up getting up, I mean 12:00, and people are going like that, get up, back to bed before they go out and all that. It's all split sleeps it's called. Loads of people on night shifts do that. They get up early and then they go back to bed at 6:00pm, up again at 9:00pm for your work, and then you go into work … (Jack, Track Inspection, Network Rail)*

Workers described how their body rhythm is disturbed, and their body does not want to sleep during the day, so they will often get up, or just lie in bed without actually sleeping. They are careful to monitor and minimise what they do during the day to preserve as much energy as possible in preparation for the following night shift.

Apart from circadian rhythm disturbance, many found sleeping during the day very difficult also due to noise from outside, and in summer it was hotter so trying to have windows open while maintaining a dark room was difficult and creates still more noise. While one worker reported that earplugs worked, many found ear plugs were not effective. On weekends and holiday times noise can be even more of problem, especially when there are children at home.

One older H&S Representative with many decades of working for the railways reported that he coped by treating night shifts as only 'work and sleep' and did not try to arrange anything else to do when on night shifts, so he 'writes off the week' when doing nightshifts. This was particularly the case for when doing twelve-hour shifts which meant that there was no time except for 'work/sleep/work'. He found earplugs were effective for him and reported being able to sleep during the day.

On the other hand, the pattern of split sleeping was necessary for those with dependent children. Those with dependent children reported needing to stay up when they got home from a night shift to be able to drop-off children, then going to bed and waking again in time to pick them up from school when working night shifts.

There is a significant degree of individual variation in the degree of circadian rhythm disturbance, however most of the workers in this report found that sleeping during the day was difficult, with

the first couple of nights being the most difficult. Most workers reported splitting their sleep onto a morning and an afternoon/evening sleeping session, and that this was often of poor quality due to difficulties in sleeping during day due to external disturbance and to circadian rhythm disturbances. Some found sleep improved somewhat after a couple of days into doing night shifts, but then they would have to cope with another shift transition.

These findings of sleep quality and duration are in alignment with the literature on circadian rhythm and night work which identifies problems with poor quality sleep of short duration (four to six hours, and insomnia (Wyse et al., 2017; Kecklund and Axelsson, 2016; Åkerstedt and Wright, 2009; Yong, Li and Calvert, 2017; Moreno et al., 2019)

All the workers reported suffering from excessive fatigue which was much worse on night shifts. Most were aware of issues related to their body clock which they used to explain their difficulties in sleeping when doing night shifts. With the majority reporting only getting about five or six hours of poor-quality and fragmented sleep when on night shifts this leads to sleep deprivation and an accumulated sleep debt depending on the number of night shifts worked and rest periods.

Workers described the resulting fatigue as feeling 'completely wiped-out', 'shattered', 'permanent grogginess', 'like a zombie', having 'brain fog' to the extent of experiencing short-term memory loss. These metaphors express such an extreme level of exhaustion where they are unable to function in any sense of normal. This state of being 'like a zombie' after night shifts occurred not only for those doing four or five night shifts in a row but was also reported by the two younger workers doing permanent part-time night shifts of Friday and Saturday nights on the London Underground. Exhaustion seemed to be worse for those currently working, or who had previously worked, longer runs of seven nights in a row resulting in extreme exhaustion at the end of a run of seven-night shifts, likely from accumulated sleep deprivation.

It is largely when workers have finished a night shift that the fatigue and feelings associated with that would start to overwhelm them. Consequently, there was little energy left for anything else apart from work and doing the basic necessities at home (e.g. childcare) during night shift working.

All the workers found fatigue associated with night shifts to be much worse compared to doing early and afternoon shifts, however, it was when they compared themselves to how they felt when they were on annual leave that the difference in how they felt was most dramatic. They were less moody and had more energy and motivation to do things. This suggests that the problem with accumulated sleep deprivation and associated fatigue may carry over to other shifts as well, even after night shifts have finished.

One younger maintenance worker on the London Underground who was doing full-time permanent nights was permanently tired. However, she reported that she had learned to normalise her tiredness because she no longer worked rotating shifts which would provide her with a comparison in how tired she was feeling. It was only when she is on holiday and had recovered that she notices how much better she feels in terms of energy and mood. Again, this indicates an accumulated sleep debt.

Some described how their family and friends would comment on how exhausted they seemed after doing night shifts, and how different they were when not working night shifts.

> *Friends of mine used to say to me when you used to come around, I used to go around there. They used to make me a dinner before I got married, and they've said often enough, even at the, you know, by the time you got to six and seven nights, they said that you looked absolutely dreadful. (John, Team Lead, Overhead Maintenance, Network Rail).*

Yet even when taking annual leave, workers reported still required several days of doing nothing before they fully recovered their energy and mood. Consequently, a part of their annual leave is just devoted to recovery from working shiftwork and nightshifts.

Making the transition from night shifts back to day life and day shifts was also quite problematic, with workers reporting that they would stay up as long as they could after finishing a night shift in the morning, in the hope their body would be so tired that they would get good nights' sleep that

night so they could re-adjust to the daytime world rhythm. So, while the day of finishing a night shift is counted as a 'rest day' by the employers, in reality workers are too exhausted to do anything but 'staggering around', they need to stay up, yet can do very little, so that they can sleep that night. All workers report that it takes a couple of days after night shifts finish to feel some level of recovery from night shifts.

Importantly, the recovery time of at least two days (and in some cases, three days) was needed after the end of a run of nights. This was the case for those working four nights in a row as well as for the two younger women who were doing only two nights in a row on permanent part-time shifts on Friday and Saturday nights.

This findings are aligned with the literature on recovery from sleep deprivation, which may take one or two nights following one night of total sleep deprivation (Balkin et al., 2008) and longer than seven days to recover after five days of 4 hours of sleep (Axelsson et al., 2008).

While the exhaustion that workers experience while doing night work is worse than when they are doing other shifts, this exhaustion associated with night work may still carry over across the other working shifts, as described in the literature on sleep deprivation (Boivin, Boudreau and Kosmadopoulos, 2022). There may not be insufficient recovery time built in around night work in some rosters. Many workers contrasted how they felt when working to how they feel once that go on holidays. After a few days of relaxing totally by doing nothing, they become a different person - their normal sense of self returns, and they can enjoy life again. Doing nothing at all at the beginning of their holiday time was essential to recovery from the demands of nightwork and shiftwork. This difference in how they feel is very stark to them and is often also commented upon by their family and friends.

The amount of recovery time after nightshifts is crucial to addressing the effects of sleep deprivation and needs a closer assessment. This is particularly important given that one worker reported that managers are trying to minimise recovery time.

All the recovery time is on the worker's own time, not on the company's time. Workers can do very little when at home between each nightshift, and then need two or three days to recover after a run of nights. The rosters for those on rotating shifts proved a variable number of days off, from two (including the morning of the day the night shifts finishes plus the following day) up to a week. These recovery days are unpaid.

Some workers compared this situation to those who work regular day work, five days a week. These workers generally still have time and energy after work to do something in the evening and then also have the whole weekend for recreation. However, night workers are using a large part of their own time just in recover from the fatigue associated with night work during which they have generally have minimal energy for personal, family or social life. The negative impacts of night work on fatigue and family life (as well as increased risks to health from night work) are not burdens that are required of normal day-time workers.

The workers reported that once they were at work the demands of doing safety critical jobs that were busy kept them awake on the job. However, most report 'hitting a wall' about 03:00 to 04:00 when it becomes more difficult to stay awake. By the end of the night shift, they report feeling completely exhausted.

This has led to traffic incidents and near misses when driving home. Because many of the shifts finish when there is little public transport, many drive to and from work (with commutes of one hour or more each way being common) so that by the end of a shift they just want to get home as soon as possible. One participant was so shaken by a near miss that they stopped driving even though waiting for public transport meant a much longer commute. Driver fatigue following nightshift and associated potential accidents are well recognised in the academic literature and associated with both prolonged wakefulness and circadian rhythm misalignment (Lee et al., 2016; Mulhall et al., 2019) with night shift drivers are generally aware that they are fatigued at the end of a shift.

Sleepiness, impaired cognition and performance are widely reported for shift workers in a range of industries, with performance declining further with extended working hours and shorter sleep duration, with the first night shift usually the worst. Cognitive function may either improve or deteriorate depending on a range of other factors (Boivin, Boudreau and Kosmadopoulos, 2022).

The home commute following night shifts is also associated with excessive sleepiness and accidents.

Several reported that the management's solution to making the drive home safer was to suggest that they have a short nap in their cars in their own time after the end of their shift before driving home. However, this would further extend the time associated with work and further shorten the gap between getting home and having to go to work for the next shift, so most just wanted to get home as quickly as possible.

One maintenance worker used the example of the fire brigade services where if there was time during the night shift when there was no immediately important work to do the brigadiers were permitted to use work time to sleep. This was relevant to depot-based maintenance workers as they would often get back to the depot a couple of hours before finishing time. The depots were furnished with very basic and uncomfortable chairs and were often vermin-ridden so it was not possible to rest comfortably there. Consequently, the workers would sit in their vans keeping warm with the engines running. This was potentially time for some of them to have a nap in work time as there was often little else to do. However, one worker reported that their manager refused this and said they should use the time to tidy up the depot. Workers were stopped from running the van engines to keep warm by the installation of remote monitoring into the vans.

There is an argument for enabling workers to have a nap on company time before commuting home, especially in the case of maintenance workers who are already coping with fatigue from both the heavy physical demands of the job and circadian rhythm disturbances and sleep deprivation and who do also do large amounts of night work. There seems to be a potential time gap between returning to depots and finishing paperwork that could be used for workers to nap for 20 minutes (as part of a 40 minute break that includes time for the worker to refresh and overcome sleep inertia) (Health and Safety Executive (HSE), 2006) before commuting home, provided that the amenities in depots were improved to facilitate this and that it was carefully supervised to ensure that they were again wakeful before driving home.

All the older workers from their 40s onwards reported that their fatigue and poor sleep associated with night work increased as they aged and some reported that this had started as early as their late 30s to early 40s.

> *As I say, when you're younger, I found it - it's possibly not too bad, because you can cope with it all a bit physically when you're younger. I don't know. Maybe it's the cumulative effect, but I started first noticing negative effects with the nights - it must have been 2005, 2006, So, then I must have been early to mid-30s, So, after I'd been doing it about 10 years. (Grant, Team Lead, S&T, Network Rail).*

Fatigue is likely to be further exacerbated for those engage in physically demanding maintenance work, many of whom also reported coping with physical health problems with ankles, knees and feet due to walking on ballast (see below). Those aged in their 50's and 60's reported the most difficulties with fatigue and poor sleep, with some not sure they could work through to retirement while continuing to do night shifts. This was the case for those doing more demanding physical work as well as those doing more sedentary work in signal boxes. Many were contemplating ways to move away from night work, either taking early retirement or moving into different with the industry, although their options seemed rather limited.

There is some evidence that older workers have less tolerance for shift work (Folkard, 2008). Certainly there is evidence for dose effects (the more night work the greater the risk of a negative outcome) of night work on breast cancer in nurses (Wegrzyn et al., 2017), colorectal cancer (Wang et al., 2015), and with shift work and heart disease (Torquati et al., 2019) and cardiometabolic health (Sun, M., Feng, W., Wang, F., Li, Z., Tse, G., Vlaanderen, J., Vermeulen, R., and Tse, L.A., 2018; Gao et al., 2020; Wang et al., 2021).

This indicates the need for special care and considerations for older workers to ameliorate the impact of night work, to retain their knowledge and skills within the industry and enable them to work through to a healthy retirement in the industry they have trained for and to which they have been committed.

Food and eating:

Shift work disturbs the timing of eating which may have affect metabolism. Night shift workers are reported to have a greater calorie intake at night which may increase body fat and weight loss effectiveness independently of total daily consumption (Boivin, Boudreau and Kosmadopoulos, 2022).

Most of the workers, especially the older ones, reported excess weight in themselves and amongst their colleagues with some reporting that this had started after commencing night work.

The majority of interviewee reported poor eating habits associated with night shift work, despite having significant self-awareness about diet and health and often made repeated attempts to have a healthy diet. Most ended up eating 'rubbish' food when on nightshifts. Those who could sit down before the night shift and have a cooked meal with their family fared somewhat better. However, others were not hungry after getting up from sleeping a few hours as their body eating clocks was not synchronised. During the night shifts some found their body rhythms related to eating were disrupted, so they were not feeling hungry when they would normally when they were not on night shifts. One worker pointed out the impact on eating as a part of human sociability

> *so when your partner wants something to eat, and you'd normally have a nice mealtime or you'd [go for something to eat] you're completely not hungry. So, that's something that as humans you bond over a lot of the time. You lose that ability to probably do that as much as you'd like to, or you would do. (Phillip, Team Lead, S&T, Network Rail).*

The impact is not just on the workers' bodies but on their social relationships in the family as well, given the importance of shared mealtimes to family life.

A couple of interviewees chose not to eat much at work except for some fruit, and another ate some salads at work. However, most reported that they generally just grabbed some take-away 'rubbish' food to eat on the job.

The circumstances governing the capacity to have meal breaks also affect their eating. For maintenance workers coming out of a dept there was nowhere to eat when on the track, other than to go back to the depot. Most eat something before leaving the depot about 23:30 and then have some biscuits and coffee or tea upon returning about 05:00, unless there was a service station or shop near where they were working to be able to get some take-away food.

Those working in signal boxes, while they might have a microwave and coffee machine, were too busy to be able to take a break at all, so would have cold food that they could nibble between tasks. Not being able to take meal breaks was especially problematic for those in single person signal boxes with no-one to cover their work during a meal break. This is an issue of contention for the union, since not taking breaks can exacerbate fatigue. Customer service assistants working in teams on stations that are open all night were told by managers when they can take a meal break, rather than them having any choice, and the timing might not align with when they were hungry or needed to eat to be able to stay awake.

The only food supplied by employers were, in some cases, automatic dispensing machines with chocolate bars and crisps.

Fatigue itself played a significant role in unhealthy eating patterns. Workers were often too tired with little energy to prepare a proper meal to take to work. In addition, one way to cope with the increasing fatigue as a night shift went on was to eat junk food, especially sugary or fatty food (crisps, chocolate bars), which some reported as 'craving' especially in the early hours of the morning. Eating sugary food and drinking drink coffee is a way to try to push through the rising fatigue to keep awake. As a consequence, many of the workers reported being overweight.

> *If you're on a 7:00 pm start, then sometimes it's literally, she [partner] comes in from work as I'm going out, and I eat at work or eat on the way to work. Yeah, it's [eating] all over the place. To be fair, she comes home a bit earlier now. But yeah, sometimes - you try and get a meal in together. But yeah, sometimes you go in and out. But in terms of eating generally, I'd say shift work is catastrophic. A lot of us get thoroughly sick of being told by Network Rail that you've got to eat salads and you've got to eat this and you've got to eat healthily, but the realistic thing is, if you'll excuse the language, you eat shit. Because you come in on*

> *night shift, and you're looking at the factor that it's a massive physical effort coming between 12:00 and 5:00 in the morning. So, you come into the depot, and you're pouring coffee and cookies down your neck, because you're trying to get some sort of energy into your system. A salad doesn't really cut it. You can't eat anything bulky, because everything on the railway that you need to work on is on the floor. So, if you've eaten a large meal, you can't bend over. But as for anything hot - well, unless you bring food in that you reheat - which means you have to eat early in the evening - then your only option once you've gone out is whatever's open after midnight, and obviously, there's loads of really healthy options available after midnight in south London. There's fried chicken or there's burgers if you're lucky. As I say, your hot food isn't an option once you're out of the depot. And eating a cold sandwich at 2:00 am when it's minus two [degrees Celsius] isn't particularly appetising. Yeah, crisps, chocolate bars. Cookies were always my - you buy a pack of those really nice chocolate-y Sainsbury's Taste the Difference that you're not really meant to eat four of at a sitting, but you did tend to eat them. So, yeah, you'd eat massively unhealthy stuff, and you just see that pattern reflected. Everyone else does the same. I don't think I know anyone who ate particularly healthily. (Grant, Team Lead S&T, Network Rail).*

The research on circadian rhythm misalignment has identified its impact on hormones related to appetite and on glucose levels. In addition, sleep deprivation is associated with preferences for high fat food. Furthermore, night shift work has been associated with lower levels of energy expenditure (Moreno et al., 2019). These can lead to overeating and the reduce the body's capacity to process meals and when combined with insufficient exercise are likely to contribute to the propensity for obesity and metabolic disorders such as diabetes.

These metabolic affects and the associated potential impacts make maintaining a good diet and exercise especially important for shift and night workers, yet the organisation of work (meals breaks, food, fatigue associated with poor shift pattern regimes) contributes to undermining this.

Many of the workers resented managerial advice on the importance of healthy eating and the dangers of junk food as this advice failed to acknowledge the effort needed to organise and prepare food when they were very tired or exhausted, nor the way that eating patterns were shaped by the contingencies of night work, by the demands and limitations of the work processes and the organisation of work and by the reality that for many their fatigued body craved fast, high-energy food to get through the night and to cope with the physical demands of the job, in the case of maintenance workers.

These eating patterns is facilitated by the ease with which fast food can be obtained since the development of fast-food apps and its availability at any time of the day or night. This may risk exacerbating poor eating patterns especially for those who are on permanent night shifts:

> *A lot of the people who are on permanent nights live off takeaways. You just live out of them. It's constant. In a weird way you get offered all sorts of deals, because there are apps now where late supplies and things like that – and they log on and get a bag full of food for £10, but it's an absolute bag full of a million and billion calories of badness. (Phillip, Team Lead, S&T, Network Rail).*

What come through these interviews is the conflict that most workers experience between knowing that fatty high carbohydrate foods, chocolate and crisps is bad for the body in the medium and long term, yet the difficulties in permanently changing behaviour, which may leave some feeling guilty and self-critical. What needs to be appreciated is how the structure of the regime of night work, the work processes and demands, including physical and other demands associated fatigue, the organisation of work, as well as the broader food culture associated with food delivery apps is shaping these conflicts and the appearance of individual choice. Simple admonishments about needing to have healthy diets ignores this context that is shaping night workers' diets, which is then constituted as an issue about individuals' (poor) choices.

Alcohol:

There is some evidence in the academic literature that alcohol consumption can be increased in shift workers, and for night workers alcohol consumption after work can be used to self-medicate for sleeping problems, or as a response to the increased work stress and negative impacts on family and social life associated with shift and night work (Richter et al., 2021). This can be

significant for night workers since alcohol consumption before sleep can lead to poor quality sleep (Colrain, Nicholas and Baker, 2014).

In the railways most roles are safety critical so there is no tolerance for alcohol or drugs in workers' bodies when they are working and there is regular drug and alcohol testing. This requires abstinence for at least 12 hours to be non-detectable for most blood tests. All the workers emphasised the safety critical role of their jobs and the responsibility that came with that.

There were some workers who reported that they knew of other workers who would have a drink when they first got home following a night shift to try and relax after the demanding work and to help them sleep, even though this would lead to poor quality sleep. One worker reported having done this in the past.

> *It was only about three years ago that I think I stopped drinking when I came home in the morning. Because that, again, started off some years back, because you're quite keyed up after a lot of the night shifts, because there's a lot of pressure to get work done within a narrow time window. So, it was, come home - this is the unhealthy bit of having a glass of whisky in the morning to help you sleep. I realised some time back that this probably wasn't a good thing. But otherwise, you tended to lie there wide awake and not immediately sleeping. So, yeah, that probably affected quality of sleep and - yeah, had massive health and mental health implications. But I have mostly stopped drinking now, just because of that sort of behaviour. (Grant, Team Lead, S&T, Network Rail).*

The combination of workloads, deadlines, and the circadian rhythm disturbances makes it difficult for night workers to sleep, so alcohol may seem like a solution to these issues, for some. However, this worker recognised that this leads to poorer quality of sleep and that it would have health implications in the future, so he stopped drinking in the morning after work.

One worker pointed out that there is only a tiny window in the month when there was an opportunity to drink, so he would take advantage of this, particularly in the context of feeling like he was missing out when seeing other people drinking and enjoying their weekends in the summer.

Given the safety critical nature of the industry and the zero-alcohol tolerance at work, it is likely that many workers are reluctant to report excessive drinking at home. This issue needs further investigation, given the potential for alcohol to be used by night workers in response to work-related stress and difficulty sleeping. This is particularly important given that alcohol reduces the quality of sleep and may have longer term health impacts.

Exercise:

There is a relationship between reduced physical activity and shift work identified in the literature which describes several mechanisms including social desynchronisation with the availability of leisure facilities and team-mates, conflict with other responsibilities (domestic and family) and fatigue (Atkinson et al., 2008; Arlinghaus et al., 2019).

These issues were also found to play a role with railways workers in this research, with many (but not all) reporting diminished physical activity when not at work, especially during night shifts. Fatigue was the most prominent cause of diminished physical activity, and this was exacerbated as they became older.

For railway maintenance workers the demands of the job of walking on ballast and doing heavy lifting and carrying is a form of exercise but this was also frequently leading to damage of their knees, ankles and feet over time. In some cases, this prevented them from doing the forms of exercise at home that they had previously enjoyed.

> *Before I joined the railway, I was actually a personal trainer for a period of time. I love training, I love running, I've always enjoyed it, but strangely enough with the railway because of walking on uneven surfaces and ballast and sleepers I started getting plantar fasciitis and issues around my tendons. (Phillip, Team Lead, S&T, Network Rail).*

On the other hand, more sedentary roles such as for signallers sitting in signal boxes, train drivers, and some customer service workers on stations there was little opportunity for significant physical activity through their work.

Many of the older workers were aware and concerned about the negative impacts of night work on health and several reported knowing colleagues who had died soon after retiring. They were aware of the importance of having a good diet and needing to exercise regularly. However, as with the case of eating above, most workers found it difficult to do much exercise when on night shifts due to fatigue and time constraints. The irregularity of rotating shifts could also be a limit on participating in team sports, although one worker was able to make this work for him.

Some workers reported going though cycles of going to the gym or other forms of exercise, but this required significant discipline to maintain, and they often then dropped doing exercise.

> *I love going to the gym and I love training, but the shifts just make it hard. You wake up and you think, I'm going to work in a few hours. So, you just don't go. (Phillip, Team Lead, S&T, Network Rail).*

> *It is very hard exercising when you're on nights, because you just don't have the energy, but it's a case of having to force yourself, and again, that's something that's fallen away a bit as I've got older. I think, yeah, I gave up running when I was on night shifts. I still do run, but I think I was about 47. I got to the point of, I cannot run on a day when I've done a night shift (Grant, Team Lead, S&T, Network Rail).*

Those doing twelve-hour shifts and having significant commutes do not have much time to exercise during the working week, especially if they also have young children. Furthermore, it can be difficult to make regular commitments to play sport with others due to the irregular work patterns.

Nevertheless, some do try to get some exercise as it helps them to cope with work-related stress and the demands of nightwork. One had bought a dog to make himself go for a walk, while another cycled to work. One office-based worker in a call centre for assets control on the London Underground reported 'having a bit of a walk when not on night shifts' but is generally too tired to do much exercise. Her request for a walking desk at work was refused by managers.

The case of one of the maintenance workers who does engage in significant exercise outside of work and who also has a healthy diet is pertinent. He manages to play football and badminton or to swim before he goes to work on night shifts or after finishing a day shift. He also now has a healthier diet than in the past when he was overweight. He is supported in this change of diet and exercise by his partner. This routine requires discipline, and his key motivation is related to a serious health problem that left him off work for many weeks. This experience made him determined to do the best he can to look after his body. He was particularly aware that many colleagues on the railways die before or shortly after retirement:

> *But I kind of worry that if I don't get on top of things, which I have been doing the last year, if I don't get on top of things, then I've seen so many people not even make retirement, which is really sad, you know? That worries me. You work all your days for retirement, and not - I've seen some people get two or three years out of retirement. (Wayne, Team Lead Off-Track Maintenance, Network Rail).*

While many workers were concerned about the negative impact of night work on their health, they often reported that excessive fatigue and time limitations result in them giving up on doing significant exercise, especially while doing night shifts. As in the case of night workers' diets discussed above, the conditions of work and the demands and impact of night work shaped the conditions of possibility for these workers to engagement in regular exercise, yet managers tend to focus on the issue as a matter of individual choice, which can exacerbate workers' sense of guilt and powerlessness. This attitude is reiterated in fatigue assessments where managers ask workers if they have a proper diet and get exercise as ways of supposedly ameliorating the impact of night work. This ignores the interaction between high work demands, night work, fatigue and the strong discipline required to maintain a healthy diet and exercise all of which intersect to form negative feedback loops.

5.8 IMPACT ON HEALTH

Physical health

A wide range of physical illness are associated with shift work and night work, as discussed in the literare review provided, with particularly strong associations with cardiovascular diseases, metabolic disorders such as diabetes, and some forms of cancer.

Most of the workers, especially the older ones, reported they were overweight and some reported physical ailments such as high blood pressure or heart problems, which in the academic literature is associated with night work. Others reported stress-related physical illnesses, for example one worker suffered with boils and thrush attributed by his doctor to work-related stress and high levels of fatigue. Another worker consulted his doctor about his high levels of fatigue with the doctor attributing this to shiftwork, the demands of a young family and insufficient vitamins. One worker doing permanent night shifts reported severe Vitamin D deficiency due to insufficient sunlight which pre-disposed her to frequent colds and infections.

Many of the railway maintenance workers reported having knee, ankle and foot problems from years of walking on ballast in all weather. Similarly, a customer service manager who works alone on station overnight also had knee issues from doing significant amounts of stair climbing in the cold while doing two-hourly security checks, while customer service assistants tend report back and leg problems from standing all shift.

Knee, ankle and foot problems then further limit workers' capacity to engage in exercise, for example, one worker who used to play football had to give it up because of his sore feet.

However, the excessive work demands due to being required to cover shifts and to do overtime are also concerning for some maintenance workers

> *What I'm worried about is modernising maintenance, lack of staff, and the fact that they want more work done with less people means that the roster clerks may look at a roster and say, we need to cover the work. Doesn't matter how that affects the member of staff, we need to cover the work. So, I'm a bit concerned that if that does happen, then health might go south, like a lot of people, and that - I am concerned with that. (Wayne, Team Lead, Off-track Maintenance, Network Rail).*

Some of the younger women doing night work reported that their periods were heavier or more irregular on night shifts, which is likely related to circadian rhythms effects on hormonal functioning. This is supported in the academic literare with associations between shift work and menstrual disorders, dysmenorrhea and early menopause (Hu et al., 2023).

For maintenance workers and for station staff who work alone overnight it is the combination of demanding physical work and the pressures this puts on their bodies, the stress of doing safety critical work and keeping everyone safe while working to tight deadlines with time pressure and high workloads, when combined with doing nightwork, which is fatiguing in itself due to the impact on circadian rhythm, that workers find stressful and exhausting. This pushes some into what one worker called a 'survival mode', a state that can become normalised until they are away from work and recovering when on annual leave. It is this contrast between working and being on leave that makes them highly aware of the negative effects that this regime is having their bodies. Older workers in particular expressed concerns about how they can continue working to retirement age, with several recalling previous colleagues who had died soon after retiring.

> *That's why I worry because they do tell you that you're more likely to have heart problems and that, working night shift. The amount of people dying at my age is quite - I don't know if it's just a railway thing, but younger than me, dying, (Jack, Track inspections, Network Rail).*

These concerns about fatigue and ill health associated with aging began for many in their late 30s to early 40s when they first noticed that they were becoming increasingly more adversely affected by nightwork.

Most workers reported being overweight which some consider had commenced after they began night work. This could be linked to metabolic dysfunction in relation to circadian rhythm

misalignment and sleep deprivation as well as to the association between night work, poor diet and limited physical exercise as discussed above. While a few workers reported issues with cardiovascular problems, others are aware of the link between shift and night work and cardio-vascular disease which is a worry for them as they get older and start to see colleagues dying before or shortly after retiring. Significant numbers of maintenance workers and at least one customer service worker report musculoskeletal disorders linked to the physical demands of their work, which are likely to further impact upon their capacity for exercise.

Mental health

There are potential causal pathways between shift work, night work and mental health through the effects on circadian rhythm misalignment and chrono-biology, sleep deprivation and impacts on family and social life. The academic research on the association between shift work and diagnosable mental illnesses is currently inconclusive (Moreno et al., 2019). Nevertheless there is evidence that night work affects the mood of workers (Lowson et al., 2013; Chellappa, Morris and Scheer, 2020) with proposed biological pathways via circadian rhythm disturbance and via the brain-gut axis (Chellappa, 2020).

The findings in this study indicate at least short-term impacts of night work on mood disturbance and with interactions between night work, fatigue, and social desynchronisation with mood disturbance and family relationships that could have medium term consequences for mental health or exacerbate existing mental health issues.

All the workers spoke about how nightwork and fatigue caused changes in their emotional status or mood, in particular how they were more 'short-tempered', 'snappy', 'grumpy' and more emotionally reactive when doing night shifts, which then which took a day or two before they had recovered and returned a more normal way of relating.

They reported getting short-tempered with partners, children and sometime work colleagues, and then feeling guilty for reacting in that way, especially where their children were concerned. This could lead to negative feelings about themselves and the impact on their family relationships.

> *So, my ex-partner and my current partner both agree that I am very grumpy when I'm on nights. There's no shadow of a doubt. I feel it myself, I know I am. I'd say I'm less tolerant, I've got more of a short fuse when I'm working nights. So, if I'm on of a day and someone says something that I don't agree with or I think is stupid for example – I'm quite self-righteous so if someone says something that I think is a bit idiotic, of a day I think I'd turn a blind ear to it and just sort of scoff and ignore them. … Again, because I'm grumpy it can't be nice for them [the children]. It can't be nice for them when I'm very snappy. They've sort of got to tread on eggshells if I'm on nights. They know I'll get annoyed a lot easier. I do mean it's a lot easier. The difference is night and day [laughs]. Sorry for the pun, yeah, but it is. The difference between my personality and how I'm feeling, is massively different. (Neil, Team Leader S&T, Network Rail).*

> *Very short-tempered, yeah. Well, as I say, if you're getting five or six hours' sleep a day, and you're doing seven night shifts, by the end of it, you're exhausted and depressed, and just - yeah. It's not ideal in terms of family relationships (Grant, Team Leader S&T, Network Rail).*

The effects of being short-tempered puts strain on personal relationships which can leave them feeling guilty. This may be a widely shared problem amongst the workers, with work colleagues sometimes providing a source of commiseration and understanding.

> *Oh, it definitely does [have an impact on relationships]. We talk about this a lot in work, between a lot of people. Strangely, once you get into work – I think because everybody is in the same little boat and then it's usually nighttime if you're on nights at that period, you end up talking about that. You actually - [you'd say and go] you can tell you're on the edge of your seat. Something really silly that wouldn't bother you, you're just more annoyed. It's easier to be like, 'I'm not doing that. Just leave me alone, go away'. You end up, us all talking about it at work. You feel bad for it, because at the time I don't think you realise your own fatigue level when you're in it. (Phillip, Team Lead S&T, Network Rail).*

This worker also makes an important point that when they are feeling fatigued, they may not be aware of how tired they are. This is more likely with shift workers and especially permanent

nightshift workers where fatigue becomes normalised and not recognised as the source of poor mood.

A few of the workers described feeling mildly depressed at times, including toward the end of a block of nights, but did not know if this was caused by nightwork. There is equivocal evidence of a link between nightwork and depression (Moreno et al., 2019). Many of the workers reported excessive workloads and associated work-related stress and there are strong links between work-related stress and anxiety and depression in the academic literature as discussed in the literature review provided.

> *Depression was the first thing. Just the fact that you're starting to - at the end of a run of nights, you're just feeling really down, and generally feeling a lot more fatigued, perhaps, after a week of nights, than I had done when I first started it, you know? I don't know how much that is just getting older generally, but certainly when you're 25, I didn't find it too much of a problem. (Grant, Team Leader, S&T, Network Rail).*

Those in customer service roles face the additional demand of dealing with vulnerable customers late at night.

> *The station I work at has had multiple stabbings. There's all sorts of things, and you normally on a day shift or a late shift, and I've had a bad shift I can, my brain can process, has a bit of time to process before going to sleep. On night shifts you sort of you don't process or you're processing and you're sleeping. (Cheryl, Manager, Customer Services, London Underground).*

Being alone on a night shift while also being busy, including supporting vulnerable customers, means there is little opportunity for lone workers to mentally process adverse events before going home, which then exacerbates their sleeping difficulties.

Furthermore, many of the workers reported high or unmanageable workloads and time pressure on tasks accompanied by work-related stress, which can lead to increased fatigue and a vulnerability to mental health problems including burn-out. These excessive workloads and work-related stress experienced by workers that can interfere with some workers' recovery on rest days.

> *I checked my work emails all the time. I reply on my days off and outside my hours, and for staff who've been like no one got back to me about this and it's, I normally do it because it's to do with someone's personal welfare, but I definitely don't have an off switch. (Cheryl, Manager, Customer Services London Underground).*

All workers described being short-tempered and snappy with family members and sometime with work colleagues during periods of night work, which can also extend into their recovery period. This impacts on their social relations, with those workers with dependent children feeling particularly guilty. This could lead to an impact on their self-esteem in the short term and mental health in the medium term, including potentially exacerbating existing mental health issues. This issue of the impact of poor mood on children is taken up in more detail in the following section on impacts on family and social life.

Many (especially some maintenance workers and most signallers in Network Rail and a customer service manager in the London Underground) report that high or unmanageable workloads are a source of work-related stress which further exacerbates the fatigue experienced by these workers and can contribute to mental health issues.

5.9 IMPACT ON FAMILY AND SOCIAL LIFE

Sustaining social and family relationships is crucial for workers' mental health and overall well-being. Evenings and weekends are the most valued times for engaging in these relationships. However, night work and weekend work desynchronise shift workers' social lives from that of their family and social networks. Furthermore, fatigue can also negatively affect workers' mood and mental health and hence the quality of their engagement in social relationships.

There is significant literature supporting an association between night and weekend work and poor work-life balance. This can have negative impacts on the worker and their family, with a higher risk for partners to separate, and for poorer emotional and developmental outcomes for children and riskier behaviour in adolescents. These risks are also shaped by family circumstance e.g. number of young children, extent of quality childcare support outside the immediate family, work schedules of both parents, geographical proximity of extended family and social networks, aspects of the organisation of work and the work environment (Arlinghaus et al., 2019).

Some of the negative consequences of shiftwork, night and weekend work on social life can be ameliorated by roster flexibility and workers having real control over their rosters (Arlinghaus et al., 2019), so they can time their work, at least to some extent, to enable participation in important family and social events.

This section investigates the impact of night work and weekend work on workers family and social relationships for the railway workers participating in the project.

Partners and children

All workers who had (or who previously had had) dependent children and partners reported a significant impact of shift and night work on their relationships with partners and their children.

All workers had been, or were currently, in a relationship with a partner, sometime for many years. Several workers spoke about the negative impact on relationships with partners, to the extent that nightwork and its sequalae were a significant contributor to relationship break-down. Others also spoke about how common partner relationship breakdown seemed amongst their colleagues as well.

> *I've said a few times, I'd say the divorce or separation rate is absolutely through the roof. I've been a part of that myself. So, in the past I probably worked way more than I should have done. I was younger and didn't consider the effects of what it's doing on your family and everything else. … Definitely I think if I wasn't doing night shifts, I think a lot of the problems personally for me maybe wouldn't have happened. (Phillip, Team Leader S&T, Network Rail).*

> *Yeah, that definitely had a negative impact, because I don't think it was something that she was properly aware of, how impactful it is, until the little boy came along, and she was really tired as a mum. Trying to do everything as you do as a new mum and the stress that comes with that, and maybe me not being there as much as she believed I was going to be because of the impact of trying to do my job, and then me worrying, thinking I've got to do this. I've got to pay for all the bills, and I've got to pay for that. It's like that cycle. (Phillip, Team Leader S&T, Network Rail).*

Most reported that the success of their current relationships were grounded in having a partner who had some understanding and acceptance of the impact of shift and night work on the worker and their relationships. This included that their partner was accepting that they were often not physically available due to shift patterns, and when even when physically present, were not as emotionally available when on, and after, night shifts.

However, the impact on relationships is exacerbated where both partners are doing nightshifts and also have young children to care for:

> *[Time with my husband] it doesn't exist. The last time we went on a date night – don't even know. Then in the evenings when one of us is working nights, it's that hour between the kids going to bed and then having to leave the house [laughs].*

> *[Interviewer: Does it has an impact on the relationship]*

> *Yeah, definitely. We've both said it. We love each other, don't get me wrong. But sometimes it feels like the connection is just strained, and we need that time together to have a reset and then carry on, because it kind of turns into a bit of a I'm tired, the kids have been busy all day or like - so that when he's had them on the weekend, but I can't help because I've got to sleep for work. Then I get up and I'm like looking forward to seeing him, but he's tired because he's had a full day of it and he's just looking forward to going to bed, and vice versa. (Maureen, Customer Service Assistant, London Underground).*

Children

Workers' relationships with their children were particularly complex as children were often a key motivation to work night shifts in the first place, both in relation to the practicalities of childcare arrangements as well as in being able to financially and materially provide the best they could for them (as discussed above).

> *In terms of family relationships, there's also the whole thing of, when you're on nights over the weekend, your other half taking the kids out for the day so you can actually sleep, so they're not in the house at the same time. Yeah. There's no earplugs on earth that can keep out the noise of someone charging up the stairs next to your bedroom. So, yeah, it impacts that, and everyone's keenly aware of the fact you're on nights, and it doesn't exactly improve their childhoods, I don't think. (Grant, Team Lead Signals & Telecom, Network Rail).*

> *It can't be nice for them when I'm very snappy. They've sort of got to tread on eggshells if I'm on nights. (Neil, Team Lead S&T, Network Rail).*

Having children around, especially on weekends and school holiday time, can be problematic for workers on night shifts since children, especially when they are younger, tend to be noisy and so disturb the worker's attempts to sleep during the day.

Children also are drawn into the discipline of night work by having to be 'treading on eggshells' and trying to be quiet in the house, or if the weather is OK then their partner can take children away from the house. However, this means the partner is doing this childcare alone, which can be demanding, while the night shift worker misses out on this family time and can feel disconnected. The night shift worker is also aware of the potential negative impact of the night-worker's irritable mood on children.

> *Then it's things as well, like they'll want to do – go away for the weekend or like have a family day out. I can't join in that. Then my husband has got to have them all to himself which can be intense sometimes. Yeah, it just all gets a bit – I feel like we're juggling and sometimes I feel like we're passing ships in the night. It's me sailing the opposite direction to my four children and my husband. (Maureen, Customer Service Assistant, London Underground; on permanent nights, part-time).*

There is a contradiction between the positive benefits of night shift in relation to childcare arrangements and material support and its negative impact on children:

> *Doing the school runs, to a certain extent, was quite nice, because you did get a regular contact with them. But yeah, there's certainly an element of the fact that you probably sometimes shout at them when you shouldn't, just because you're absolutely exhausted. Yeah, I don't know (Grant, Team Lead, S&T, Network Rail).*

Night work enables school runs which are not just a practical matter of transport and transfer, but they also provide moments of potentially meaningful contact with children. Yet simultaneously the quality of this time with children can be easily compromised by the impact of nightwork in relation to fatigue and its effects on the parent/worker's mental and emotional state.

> *But on weekends that I'm working, it's difficult because they're just being kids but I'm trying to sleep. So then my husband has got to try and juggle keeping them quiet so that I can sleep or taking them out if the weather is decent. Then Sundays, [when she is not working] they'll ask, can we go to the park? Can we do this, that? I'll have to say no because I'm just too tired. I can't join in and things like that. Then yeah, Mondays, get them all off to school. It's a bit of a tense morning because I'm like, right, come on, we've got to get things done because I just don't have patience for them messing about. If I say they've got to get uniform on, I expect their uniform to go on. I don't expect messing about because I'm tired, so I just want things done immediately. Then they go to school, and I just feel guilty because they've not had a rested, best version of me. It's a lot of mum guilt. (Maureen, Customer Service Assistant, London Underground; permanent nights, part-time).*

> *I could really feel it then, because I was too tired to fully be engaged and give my little boy the time that I really wanted to give. That has a knock-on effect with your mental health.*

> *You're talking to yourself, thinking, am I doing the right here? You're thinking about the money, you're trying to be a parent. On both levels you're trying to provide, and you're also trying to be there emotionally and physically and everything else. It is really hard with shift work to be able to do that. Your circadian rhythm and your body clock is completely off. I remember sitting there at times and it does get to you where you think, I'm not doing a good enough job (Phillip, Team Lead S&T, Network Rail).*

There is a significant conflict for night shift workers between providing both materially and emotionally and physically for children. This conflict is tied to their fatigue and disturbed circadian rhythm which is experienced in a highly embodied way, and which can undermine the sense of being a good parent and leave them feeling guilty about the quality of their parenting.

> *I can't give that [time] to them individually then, because otherwise the night-time would just go on forever. It's got to be, like you said, half-an-hour to an hour of shared time. Then I feel, again, it's mum guilt because I feel like they're not getting that individual one-on-one time. They're just grouped together. So, it's like the kids, … It's never, 'Oh, it's my eldest and I doing something because she's getting bigger now'. Things like that. Never anything like that. (Maureen, Customer Services Assistant, London Underground).*

These conflicts can then emerge for the children as they get somewhat older and can then articulate their intense frustration with this lost family time:

> *My eldest, she's noticing. Like I said, she's eight. The oldest three, they get upset when I say that I've got work. But my eldest one, she's like, but why have you got to go? Why can't you just ask if you can have this weekend off or can we do this? Why is it you've got to go to work then? Can't we just go on holiday? Well, not holiday, but like a little weekend away or go stay with family for a night? Things like that. She's got a lot of questions why I keep having to leave when she's home. (Maureen, Customer Service Assistant, London Underground).*

For workers with young families, weekends are critical times for families to be together since during the week school-based rhythms and disciplines dominate which involve getting the children ready for school, picking them up in the afternoon, doing homework or other activities, then dinner, bathing, and bedtime. Children themselves may not spend much time together when they are at school. For both children and parents, the weekends represent opportunities to have more spontaneous, unstructured and quality time together.

Not being available to the family in meaningful ways can lead to feelings of guilt about the quality of parenting and potential regret about what is being lost:

> *Yeah. I really – I've said it to him [partner] before, a big concern of mine is that I'll look back and regret it, because the kids are only kids for a certain amount of time. I don't want to look back and be like I wasted – not wasted, but I didn't get to enjoy all those weekends. Because I sat down one day and I was like out of 52 weekends in a year, I get seven at home with my kids.*
>
> *It's so conflicting because I love the job, but I think sometimes the restraints of the hours and things like that just makes me feel stuck. Like I said, I can't choose my annual leave. It's one of those where I love the job. On paper, it's so practical with my husband's work hours, things like that. Yeah, but then, it's also so restricting that I just feel I'm torn between the family and the work. … Yeah. I'm doing it for them and then I can't enjoy it with them.*
>
> *My main thing is I feel torn between I have to work like I don't have children, but then I'm parenting like I don't have a job to go to. (Maureen, Customer Service Assistant, London Underground).*

For this worker it is the loss of weekends and the fatigue associated with night work that jeopardises not just the quantity but the quality of the time that she has with her family. Yet doing weekend nightshifts enables her to manage the logistics of child-care (made more difficult by the lack of close relatives living nearby who could potentially help or of state-funded childcare) and she also finds the work itself fulfilling. She feels torn between family and work since the working hours are not family friendly. There is here an implicit recognition here that 'the job,' meaning the

structuring of working time and how this is managed, ignores the needs of families not just to 'manage' childcare but to engage in nurturing the quality of family life.

Extended family and friends

Shift work and night work that includes weekend work negatively impacts on the capacity of workers to regularly engage in social life with extended family and friends. Unlike day workers who can socialise in the evenings after work, nightshift workers are out of sync with normal life as well as too fatigued to be able to engage with people:

> *You just strike that week [night shifts] out, you are not going to be socialising, you are not catching up with family or friends. … the more consecutive nights in a row, the less you sleep. But you have this permanent sense of grogginess. You're not as sharp and you're not able to go about your social life, or to be there for your friends or your family, really. (Cheryl, Manager, Customer Services, London Underground).*

Excessive weekend working further isolates workers from their social networks.

> *it [shiftwork] also means it's impossible to have any kind of steady, committed plans with friends, so I only get one weekend off every five weeks. Uh, and I am not the worst. (Grant, Team Leader S&T, Network Rail).*

While some workers reported that some of their friends try to plan events around their roster, most report they just miss out. Many report that friends and sometimes family don't understand the restrictions of night work regarding rosters and fatigue. This can negatively affect their sense of connection to their friends:

> *But it's like, oh, they say, do you remember such and such? I'm like, no. Yeah, you were working, probably. So, yeah, it has impacted, perhaps, some elements of my social life, because a lot of people arrange things, and can you do it? And you go through your roster, and it's like, no. …they arrange things, and it's like, I'm either there or I'm not, you know? Sometimes there is a thing of, sometimes they don't always invite me, because they just assume that I'm working. So, yeah. There has been that. (Grant, Team Leader S&T, Network Rail).*

> *So, yeah. I'd say there's definitely a detrimental effect. You're not involved in as much. There are a few best friends that I've had who I couldn't go to the kids' communions and christenings. Some of them to be honest have never forgiven me for that. (Phillip, Team Leader S&T, Network Rail).*

Night shifts could potentially enable some workers to have dinner with friends before they left for work, however, this is a small 'time window', they can't share a drink with their friends and most workers are too fatigued and are trying to preserve their energy for a demanding night shift. Where they do agree to evening or weekend events that clash with their roster, they will often try to book a day of annual leave. However, this then uses up their annual leave allowance which they need for recuperation or often may not be permitted by managers due to operational needs.

Location also played a role in maintaining social relationships, so that where workers' extended families lived near them there were more opportunities for social interactions such as having meals together.

All workers reported that shift scheduling of night work and weekend work desynchronised their lives in relation to valued social time with family and friends and that the fatigue associated with night work also negatively affected their capacity to engage meaningfully with family and friends. Together these factors limited their capacity for family and social life. This could be a significant factor in the breakdown of some relationships and contribute to strain at times in many relationships. Those older workers in long-term relationships with partners had some understanding and acceptance of the impact of night work on workers fared better.

Amongst both male and female workers there was significant conflict around parenting and work since night work enabled the practicalities of childcare as well as enabling the financial and material provision of families, yet the shift scheduling reduced the amount of quality social time available on weekends and their fatigue diminished the quality of their relationships with partners and children when on night shifts. This resulted in some workers with young families feeling guilty, remorseful, and conflicted about work and family. This conflict could then emerge in young children wanting more sustained engagement with the night working parent.

Workers' wider social network of friends and extended family was also negatively impacted by shift scheduling and fatigue when on night shifts. While some had friends who would try to schedule events around their rosters, most ended up missing out on significant gatherings unless they could book annual leave (which may or may not occur). These limitations could diminish their sense of connection to partners, extended families and friends. This could potentially affect worker mental health in the medium and long term or exacerbate any existing mental health problems.

5.10 FUTURE PLANS AND NIGHT WORK

The majority of workers in their 50s knew about the negative long-term impact of night work and shift work on health. Many describe older colleagues who retired only to die of heart diseases soon after. They were very worried about the negative impact that night shifts were having on their bodies with an increased possibility of serious diseases if they continued do night shifts. This was often expressed as 'my body just can't keep going doing night shifts'. Most felt they could not keep working nightshifts until retirement.

However, for many with specialised skill sets moving to an alternative industry seemed difficult. Some were exploring ways to move sidewise, either through union work, or to move into other areas of the industry, but options seemed to them to be quite limited. Some older workers were considering early retirement.

Furthermore, many older workers were advising their younger colleagues to get out of the industry since it was no longer a good job that you could cope with until retirement and they reported they would not encourage any young people to enter the industry. This was both because of the large amounts of night and weekend work now required, especially for maintenance workers, as well as the high workloads and work pressure. Some of the younger workers also report being given this advice to 'get out while you can' but are concerned about the significant loss of pay associated with moving to another industry and the financial impact on their families.

For both those older workers who are still too young to retire, and some younger workers with families, this could lead some to significant frustration and feeling of being trapped as they were already feeling the negative impacts of night and shift work and increasing fatigue on their physical and mental health.

6 CONCLUSION

Night work and weekend work is a requirement for most railway workers, and this has increased over time with most new contracts in Network Rail now requiring 39 weeks of night work and 39 weekends per year. Rostered 'cover' weeks on the London Underground, and overtime can significantly increase the amount of night work that workers are doing. Most RMT workers do large amounts of nightshifts and weekend work.

All workers found night work to be particularly fatiguing compared to other shifts, with those on permanent night shifts also reporting excessive fatigue. Fatigue occurred even after only working two night shifts, however excessive fatigue increased further with the number of night shifts worked in a row.

Most of those on rotating night shifts were getting about 5 hrs of poor-quality and fragmented sleep, split across two time periods in the morning after returning from work and in the afternoon before going to work. As well difficulties going to sleep and or staying asleep due to misaligned circadian rhythm, there were frequent external disturbances especially noise and, in the summer, heat. This represents significant sleep deprivation for most of these workers, with accompanying excessive fatigue, and with the sleep debt accumulating the more night shifts worked in a row.

Sleep deprivation and circadian rhythm misalignment can also affect workers' ability to be awake and alert during the latter part of a night shift, with many resorting to eating high carbohydrate and sugary food and drinking caffeine to stay awake after 03:00 to 04:00. The first couple of night shifts were often the worst for sleep and fatigue probably related to the time that circadian rhythm re-alignment takes.

Recovery from the fatigue associated with night shifts and re-adjusting their body to another change of shift generally takes at least two of days for most workers, and over this time the workers report being exhausted. The recovery time required varies with the number of night shifts worked. Rostered recovery time allocations varied across job areas and within rosters and could be 2 to 7 days. Since sleep deprivation is cumulative and can take a significant amount of time to recover from, sufficient recovery time after night shifts, as well as the number of night shifts worked in a row needs to be carefully assessed.

Circadian misalignment is an issue especially where blocks of night shifts are short, for example blocks of three, four or five nights were common amongst the workers. Circadian rhythm re-alignment generally takes longer than this, although some related biological processes (e.g. cortisol levels, etc) do not seem to re-align at all. Individual chronotypes are likely to be significant as some people re-align more quickly, while others many fail to align at all. Short blocks of night work enable workers to recover more quickly from circadian rhythm misalignment and sleep deprivation and are recommended by the HSE (2006). Longer blocks of night work of one to two weeks result, for many people, in the circadian rhythm becoming re-aligned with night work. However, this makes subsequent changes in shift patterns very disturbing as the circadian rhythm then needs to re-align each time, leading to excessive fatigue and sleeping problems. The HSE (2006) does not recommend long blocks of night shifts associated with slow rotating shift patterns.

Some workers reported working up to seven nights in a row which they found to be the most exhausting probably as a result of the accumulative effects of sleep deprivation and the process of circadian rhythm re-alignment. The demand for working long blocks of night shifts in rosters should be re-assessed, with longer blocks of recovery time rostered to try to ameliorate the negative effects on fatigue. Recovery periods following night shifts needs to be long enough to overcome the accumulated sleep debt. The HSE (2006) recommends two to three night shifts in a block followed by two to three recovery days. There are some workplaces that do not seem to be abiding by this.

The railway workers were doing 35 to 37.5 hours per week average over the year. However, night work, especially in relation to rotating shifts, demands much more recovery time compared to those workers who work a regular day work. This recovery time needed is related to biological processes connected to circadian rhythm and sleep deprivation and resulting in excessive fatigue that do not occur in day workers. Recovery time from work for night workers is much longer than that of day workers. It is also likely to be affected by demanding physical work or complex mental work that is also fatiguing. Recovery time is not available for enriching personal, family or social life. Together with the negative impact of night shift work on workers' health, this is a burden not shared by day workers, but one which night workers are not compensated for. This puts night workers at considerable disadvantage compared to day workers in relation to lost time for life outside of work and for potential negative impacts on their health.

A large amount of overtime is also being worked in the railways with workers identifying that 'the railways run on overtime'. This is largely due to reductions in staffing over recent years in many areas in both Network Rail and London Underground. The key motivation for doing overtime for younger workers was largely related to extra money for holidays, to buy houses and for supporting families, with a key advantage of working night shifts being the capacity to managed childcare.

This changed for older workers, with common reasons for doing overtime being to support colleagues in getting time off and to support their line managers who have difficulties covering shifts. However, all the older workers had either reduced or eliminated working overtime as it was too exhausting on top of their normal roster.

There is currently a maximum of 60 hours per week permitted on the railways, which gives significant scope for working overtime, with night shifts likely to be those most available. When overtime is combined with the increased demand for night work, this can further exacerbate fatigue.

Excessive fatigue has negative feedback loops on diet and exercise for most workers, with social and appetite misalignment also impacting on diet and exercise. Many of the older workers reported being overweight and find that doing regular exercise is difficult to maintain, despite having some understanding of the importance of a healthy diet and exercise. This has implications for health in the medium and long term, especially in the light of the increased risks in a range of health conditions associated with night shift work. Some workers reported significant resentment at the lack of understanding by managers concerning the way that excessive fatigue and working unsocial hours negatively affected their capacity to maintain healthy diets and to exercise. What needs to be appreciated is how psychosocial risks such as excessive work demands, the structure of night work and associated fatigue both during shifts and between night shifts, the lack of meal breaks, availability of high carbohydrate food in vending machines and the organisation of work, including excessive overtime, compressed hours and long commutes, as well as the specific regimes of night work organised in rosters, all collude to shape workers' conflicts and struggles over diet and exercise while giving the appearance of individual choice.

While a few workers reported mild depression associated with night work, fatigue affects mood when on night shifts and during recovery, with short-temperedness universally reported. For some this can have negative impacts on family and work relations, as well as potentially affecting self-esteem (reported as 'feeling guilty' or 'not being present for others' by some) so this is a potential vulnerability for exacerbating any existing mental health issues. Negative impacts on family and social life were also associated with social desynchronisation. Since supportive families and social networks are central to workers' well-being, it is important to ameliorate these potential negative impacts of nightwork on these relationships. The literature identifies the importance of roster flexibility and providing workers with more genuine control over their rosters and with the ability to book time off work when they need it (Arlinghaus, 2019).

Working night shifts facilitated childcare arrangements for those with dependent children by enabling school drop-offs and picks-ups, and was especially important where workers had few alternatives, such as not having extended family or close friends nearby, or access to affordable childcare. This was a key motivation to do night shifts for these workers. However, night work and weekend work could also reduce the amount of time workers could spend with children and affect the quality of these relationships. In some situations, this could have a negative impact on children as well as on the night shift worker. These risks are well-established in the academic literature and

include higher risks for partner separation, impacts on children, and a reduced sense of connection to social and community life (Arlinghaus et al., 2019).

Several psychosocial risks within the railway work environment were identified – in particular work intensification and extensification (overtime), as well as problems with managerial support, managers' attitudes to rail and worker health and safety and the management of change, all of which can contribute to work-related stress, mental and physical health problems and to fatigue. High levels of overtime and work-intensification were widely report by workers and were largely due to insufficient staff and the loss of experienced staff because of restructures, recruitment freezes and recruitment difficulties. This is likely to contribute significantly to the fatigue and work-related stress experienced by workers, with insufficient staff also influencing managers' flexibility regarding roster changes and the booking of leave for workers which could, in turn, ameliorate some of the negative impacts on family and social life, at least to a degree.

Management approaches to roster flexibility can have a significant impact on workers' wellbeing by ameliorating some of the negative impacts of night work and shift work on workers and their families (Arlinghaus et al., 2019). Reports in this research that managers were commonly prioritising business needs over workers' well-being in rostering and the granting of leave and that they were pressuring workers to do overtime are very concerning. This poses a risk to workers' health and well-being especially when accompanied by a poor managerial attitudes and actions concerning worker fatigue and fatigue assessment, together with workers limited knowledge and confidence to raise issues about fatigue.

These psychosocial risks of excessive work demands and poor managerial support will exacerbate workers' fatigue and work-related stress especially for night workers, with potential negative impacts on their health and family and social life. Psychosocial risks are covered under UK health and safety legislation and are required to be assessed and prevented or minimised and are within the remit of the railways companies and managers to address.

7 RECOMMENDATIONS

7.1 ROSTERS AND NIGHT WORK SCHEDULING

Fatigue from sleep deprivation and circadian rhythm disturbances are strongly associated with night work and accumulates with the number of night shifts worked. All the workers reported excessive fatigue associated with night work. Particularly concerning are situations where longer runs of night shifts with insufficient recovery time is occurring. Long runs of seven night shifts are especially exhausting for workers and these need to be reduced to shorter blocks of night work and ensuring that the number of recovery days are sufficient to overcome sleep deprivation. The HSE (2006) advises against slow rotations of seven nights, recommending instead fast rotations of a maximum of three nights in a row followed by at least two nights of sleep before a shift pattern change. These should be regarded as a minimum. The union needs to continue to negotiate rosters, with input from workers locally. There need to be greater levels of worker control over rosters and managerial support for roster changes and roster flexibility to reduce fatigue.

7.2 RECOVERY DAYS

The recovery time following night shifts should be reviewed. It is concerning that rest days include the day of the morning that a run of night shifts finishes, when the worker is exhausted. Workers reported needing a minimum of two days after finishing night shifts before they feel somewhat recovered and since the effects of sleep deprivation and circadian rhythm misalignment are cumulative, the recovery time should align with the number of days in blocks of night shifts and be sufficient to ensure recovery before shift changes.

There is a case to argue that employers should be making some contribution to recovery time given that night work significantly disadvantages night workers both in relation to their long-term health time and the more limited time they have available for personal, family and social life compared to normal day workers. Furthermore, many night workers and particularly permanent night shift workers are frequently using annual leave to book doctors and related appointments due to social desynchronisation.

These recovery days are currently in the worker's own time and this is not a penalty that day workers' experience. Ways in which this can be compensated for by employers needs to be explored, including recovery days as paid time and additional annual leave needs to be considered for these workers.

7.3 OLDER WORKERS

The older workers report that they are struggling with night work since the impacts of fatigue have increased as they have aged. This is compounded by high workloads and time pressure in some roles, and for maintenance workers by the toll of decades of demanding physical work with several reporting musculoskeletal problems. Night work regimes (the amount of night shifts worked and recovery days) need to be adjusted to the capacity of older workers. There needs to be more support for older workers, who have many years of accumulated knowledge and experience, to remain in the workforce until retirement. Increased recovery days, more flexibility in enabling individual rosters and additional annual leave to be able to book doctors' appointments, etc., could enable these workers to continue to work until retirement while remaining healthy.

7.4 MEAL BREAKS

Many workers reported not being able to take meal breaks during shifts which is likely to increase fatigue. Work breaks are particularly important in safety critical and demanding work as they reduce the risks of accidents (Folkard and Tucker, 2003) and are particularly important in reducing fatigue, and especially so for those doing 12-hour shifts. For those in signalling the lack of meal breaks was related to insufficient staff with the problem worse for those in single signal boxes due to increased workloads. Having sufficient staff in multi-person boxes would help to rectify this problem. For workers in single signal boxes, they need to be consulted on how meal breaks could be better managed. For depot-based maintenance workers, the practice of not having breaks due to travel times between the job and depots could be accommodated to an extent by workers being able to formally finish earlier and /or have a 40-minute rest break to nap for 20 minutes before the end of their shift (see 5.8 below on safe commuting).

7.5 OVERTIME

Significant amounts of overtime are being worked in the rail industry which frequently increases the number of night shifts worked as well. Together these will increase workers' fatigue and potentially have adverse effects on workers' health and their family and social support. While younger workers often want overtime for financial reasons, there is evidence of the negative cumulative effect of night work on worker health, so overtime involving night work should be minimised and workers educated about the risks to health. Ensuring sufficient numbers of staff would minimise overtime and this requires workforce planning. The issue of financial incentives for doing overtime could be partly addressed by inflation- or above inflation- pay rises.

7.6 12-HOUR SHIFTS LENGTHS

Workers generally report preferring to work 12-hour shifts compared to shorter shifts as this gives them more consolidated time away from work and fewer weekend shifts for a better work-life balance, which is currently generally poor for most night workers. Nevertheless, some of this consolidated time is still then used just as recovery time.

The impact of 12-hour shifts on recovery time is uncertain. How 12-hour shifts affect fatigue at the end of a shift is likely to be shaped by the nature of the job, work environment including the demands of the job and breaks, and by the number of shifts worked in a row. There is good evidence that the risks of accidents increases substantially with 12-hour shifts compared to 8 hr shifts (Folkard and Tucker, 2003) with emerging evidence based upon objective measures of performance that fatigue increases across the three days of 12-hour shifts (Thompson, 2019).

The HSE recommends avoiding 12-hour shifts especially in safety critical or demanding work with recommended limits of two to three days of 12-hour shifts and avoiding overtime (Health and Safety Executive (HSE), 2006). Twelve-hour shifts, especially night shifts, may also put workers with long commutes at more risk of fatigue-associated accidents, so taking proper rest and meal breaks and the potential for paid 'nap breaks' (see 5.8 below) becomes particularly important for those working 12-hour night shifts.

7.7 AMELIORATING THE IMPACTS OF NIGHT WORK AND SHIFT WORK ON WORKERS, THEIR FAMILY AND COMMUNITIES

There are generally significant negative impacts of night work and weekend work on workers' personal, family and social life and their sense of social connection. Both fatigue and social desynchronisation play a role in this. Fatigue is also reported by these workers to result in mood disturbances especially being short-tempered and irritable which can compound the negative impacts of night work on both their relationships and on the worker's self-esteem. This could exacerbate any existing mental health issues. Considering the negative consequences of social desynchronisation for these workers, again managers need to be more flexible in relation to booking leave. There is a case to be made for night workers having additional leave days since the workers report difficulties in making and attending doctors, and similar, appointments. This is especially difficult for permanent night shift workers. To minimise the negative impact of night work on workers and their families, workers need to have more genuine control over their rosters and roster flexibility, with support for individual rosters. This is particularly the case for night workers with dependent children or other caring responsibilities and for older workers. Managers need to be more supportive and flexible regarding workers' roster needs. Nightwork and weekend work needs to be minimised more generally, including with additional recovery days to manage fatigue and additional annual leave days. Ensuring a sufficient workforce would assist with this.

7.8 SAFE COMMUTING

Night shift workers are at increased risk of having accidents when driving home, which is exacerbated for those with long commuting times, and for maintenance workers due to the additional fatigue associated with demanding physical work. While some managers currently advise workers to nap at the end of the shift before driving home, this further extends the time before they actually get home and is especially problematic for those doing 12-hour shifts or for those with long commutes. The work schedules should consider HSE guidance (HSE, 2006) to include a 20-minute nap (within a 40-minute rest break to enable sleep inertia to be overcome) before the end of a night shift and driving home. This would need to occur in the context of proper facilities and careful supervision and be subject to the worker's agreement.

7.9. DIET AND EXERCISE

Diet and exercise are particularly relevant to night workers as they intersect with the negative health impacts of night work on workers. However, many night workers reported that fatigue and social desynchronisation led to them struggle to maintain a good diet and exercise routine while doing night shifts. This conflict needs to be understood as contextually framed by the organisation of work and night shift work, presence of meal breaks, the availability of healthy food, social desynchronisation, etc. rather than victim-blaming regarding personal choices concerning diet and exercise. Addressing these problems needs to occur at multiple levels, including rosters that reduce fatigue and provide flexibility, ensuring proper meal breaks for workers and with healthy food available for night shift workers, as well as worker education and support.

7.10 FATIGUE ASSESSMENTS

Fatigue assessment by managers was reported by workers to be superficial and not necessarily acted upon in a reasonable manner. Those who were trade union Health and Safety representatives identified that many workers were not knowledgeable about fatigue assessment processes, or confident in reporting fatigue. RMT could support the education of workers concerning fatigue and fatigue assessment and seek additional ways to ensure that fatigue assessment by management is more robust.

7.11 PSYCHOSOCIAL RISKS

Significant psychosocial risks in the railways were work intensification and extensification (overtime), poor managerial support and poor managerial attitudes to health and safety. These are likely to lead to work-related stress and to further exacerbate worker fatigue. Key recommendations related to psychosocial risk are:

- The RMT should demand that management to conduct a H&S risk assessment of psychosocial risks for rail workers and then work with management to prevent or control the identified risks, as required under H&S legislation, with particular attention to the HSE Management Standards (Health and Safety Executive (HSE), 2017). Currently psychosocial risks are a priority area for the HSE in the UK.
- Work intensification and extensification due to insufficient staff needs to be addressed through working with management on workforce planning to improve the situation. Where this is related to other factors in the work environment these need to be addressed by managers appropriately.
- Poor managerial support can be addressed by policies which give workers greater control over rosters, ensure roster flexibility and that require managers to negotiate with workers locally concerning their rosters, including the use of individual rosters, and to be flexible in granting leave in ways that prioritise workers' health and family and social relationships. This would be facilitated by less overtime and sufficient staff to fill rosters and to cover leave.
- Poor managerial attitudes to health and safety - senior managers are primarily responsible for the priorities of middle and lower-level managers in relation to balancing business operations with health and safety concerns and the overall safety culture. Workers' perceptions of managerial attitudes to health and safety should be part of a psycho-social health and safety risk assessment and may help to enlist senior managers in ensuring that a strong safety culture is developed.

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APPENDIX
LITERATURE REVIEW SEARCH CRITERIA AND RESULTS

This literature review search covers systematic reviews following the Working Time Society's literature reviews and related consensus statements in 2019, as an update on this work.

Database: Web of Science

Date range: 2020 to April 2024

Search terms:

Shift work or night work and health (in topic) and review (in title) – 4 relevant articles

Shift work or night work and depression or depressive symptoms (in topic) and review (in title) – 5 relevant articles.

Shift work or night work and cancer (in topic) and review (in title) - 7 relevant articles.

Shift work or night work and reproductive health or disorders or menstruation (in topic and review (in title) - none

Shift work or night work or non-standard working hours and psychosocial risks or hazards (in topic) and review (in title) – none

Shift work or night work or non-standard working hours and families or work-life balance or work life conflict or work family conflict (in topic) and review (in title) - none

Only papers that had conducted systematic reviews of the literature were included.

REPORT AUTHORS

Dr Ruth Ballardie is a Senior Lecturer in the Sociology of Work with strong record of research in public sector workers and the organisation of work, including recent research and publication on psychosocial risks and mental health in healthcare workers internationally.

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