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# Understanding perceptions about the health effects of night working and the barriers and enablers to taking part in nutritional research: A qualitative study among night workers in England

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## Abstract

Working at night is associated with adverse cardiometabolic health outcomes. However, there are a lack of nutritional intervention studies conducted amongst night workers, subsequently contributing to a lack of evidence-based guidelines for night workers. The aim of *The Eating on the Night Shift* study was to understand how night shift workers view working at night in relation to nutritional health and wellbeing, the barriers and enablers to participate in research and what kind of guidance would be useful to them. Semi-structured qualitative interviews were conducted with a convenience sample ( $n=18$ ) of night workers based in England. The interview covered experiences of working night shifts, perceptions about night work and their health, and perceptions of and likely engagement with nutritional research. Interviews were audio recorded and transcribed verbatim. Transcripts were coded using an inductive thematic analysis approach. Of the final sample 13 were female (72%), 39% worked a rotating shift pattern and 78% had worked night shifts for 1 year or more. Four overarching themes were identified: (1) the consequences of night work on health and wellbeing, (2) eating at night means a less healthy diet, (3) working at night has wider knock-on effects on aspects of lifestyle and wellbeing and (4) nutritional research is perceived as important, but there are barriers to participation. Night workers are aware that working at night can negatively impact their diet as well as their health. Nutritional researchers need to engage with night workers when considering intervention design and implementation as well as in the development of any resultant evidence-based guidance to ensure its relevance.

## KEYWORDS

diet, nutrition, qualitative interviews, shift work

## INTRODUCTION

The night-time economy contributes approximately £60 billion annually to the UK economy (Local Government Association, 2019) and requires a substantial night-time workforce. In 2022, there were 8.7 million workers employed in a job that required

working at night (Office for National Statistics, 2023). In their 2019 consensus statement, the Working Time Society (<https://workingtime.org>) stated that there was strong evidence supporting the association between shift work, predominately involving night shifts and adverse cardiometabolic health outcomes (Moreno et al., 2019). Studies have also observed that night

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workers, compared to day workers, are more likely to report gastrointestinal discomfort and irritable bowel-type symptoms (Kim et al., 2013; Nojkov et al., 2010). However, there are limited evidence-based dietary guidelines available for shift workers, employers or nutritional practitioners (D'Annibale et al., 2021).

Working at night results in changes to normal daily activities, including temporal changes in eating patterns (e.g. eating during night-time) and moving rest/sleep opportunities to the daytime. These changes impact physiological processes and result in disruption of circadian rhythms (Johnston et al., 2016; Potter et al., 2016). Previous qualitative research has suggested that shift workers' dietary behaviours are influenced by numerous factors such as irregular working hours, food environment, culture and colleagues (Gupta et al., 2019) and applying conventional healthy eating guidelines can be a challenge for shift workers (Gibson et al., 2024). There is a need to understand how different eating and sleeping patterns impact the physiology and health of shift workers. For example, in non-shift workers, there is emerging nutritional research supporting the hypothesis that consuming energy intake earlier compared to later in the day adversely impacts cardiometabolic health through increased adiposity (McHill et al., 2017). The time of eating may therefore have negative health implications for night workers who tend to eat outside of standard eating patterns that are often referred to in healthy eating advice. Shift work is a frequently stated exclusion criteria for many nutritional and health research studies. Controlled research studies using simulated shift work schedules have significantly contributed to understanding how eating at night impacts physiology (Morris et al., 2015, 2016); however, further real-world research is needed amongst shift workers to assess the physiological impact of dietary interventions. The original *Eating on the Night Shift Study* protocol presented in D'Annibale 2021 was a feasibility trial designed to test whether dietary intakes in line with UK healthy eating recommendations during night work improve markers of health in free-living shift-working employees (NCT04182867); however, this trial was terminated before completion due to recruitment difficulties and the impact of COVID-19. The *Eating on the Night Shift* project was pivoted to investigate the perceptions of shift workers around working at night and potential barriers to taking part in nutritional trials to support the development of future intervention studies. The revised project used a methodology that could be conducted remotely to reduce the impact of COVID-19.

How the experiences of shift work impact participation in nutritional research and engagement with nutritional health promotion is not well characterised. This is important as engaging end users in research development is essential to inform research to support acceptable and feasible guidelines and interventions

(O' Cathain et al., 2019). Research should be relevant to shift workers needs and priorities, and exploring lived experiences can provide rich data to help improve research participation by exploring the barriers and enhancing the relevance and applicability of research outputs by identifying shift worker priorities. The overall aim of *The Eating on The Night Shift – A Night Worker Perspective* study was to understand how night shift workers view working at night in relation to nutritional health and wellbeing and the barriers and enabling factors to participate in nutritional research.

## METHODS

### Study design and methodological approach

A qualitative study was conducted using semi-structured interviews. Semi-structured interviews were selected to gain perspectives and opinions to pre-determined research questions within the context of night work (1) What are the perceptions that shift workers have about how working at night may impact their health? (2) How do shift workers feel working at night impacts their diet and other life behaviours? and (3) How do shift workers perceive nutrition research, and what would be the enablers and barriers to taking part? Compared to focus groups, semi-structured interviews provide logistical flexibility to accommodate individual participant shift patterns. This data collection method also permits reflexivity to allow questions to be added or amended based on an iterative process. The study was conducted through an interpretivism research paradigm. This approach assumes that people's knowledge of reality is formed through social interaction and focuses on the interpretation of behaviours and perceptions to gain an understanding of individual motivations (Chowdhury, 2014). The study was conducted by RG and CF, who are academic research fellows. RG has a background in nutrition and dietetics and is a Registered Dietitian. CF is trained and has experience in qualitative research and conducting interviews but comes from a non-nutritional background. An important question of consideration was how this shaped the research process including formulating the interview schedule, conducting the interviews with the participants and data interpretation and analysis. The role of CF in interviewing participants and assisting with data analysis reduced the risk of bias due to the absence of preconceived ideas and assumptions.

Ethical approval was obtained from King's College London BDM Research Ethics Subcommittee LRM-22/23-35745. The purpose of the research was explained to each participant prior to obtaining consent electronically. All participants were given the

opportunity to ask questions about the research prior to consent. Verbal consent was confirmed at the start of the online interviews prior to recording. The study follows the Standards for Reporting Qualitative Research (SRQR) guidelines (O'Brien et al., 2014) (see File S1).

## Participants and recruitment

The study recruited UK shift workers from any sector and any job role (either self-employed or employed by a company). Participants were required to be working a shift pattern with three or more night shifts per month (a night shift includes a period of 3h of work between 11 PM and 6 AM), have worked night shifts for more than 1 month, not currently participating in a clinical trial, and have access to an electronic device.

A convenience sample of night shift workers was recruited. A convenience sample does not use a sampling framework and does not target participants' specific demographics or occupations. All participants who expressed an interest and met the inclusion criteria were invited to take part. Study recruitment took place between 12 June and 15 September 2023. The sample size estimation was to recruit 18 participants based on recommendations of theory-driven interview studies (Francis et al., 2010) and allowing for attrition. Additional interviews with new participants were conducted until no new themes emerged from the data, thus reaching saturation (Francis et al., 2010). Participants were recruited from adverts placed on the King's Health Partners Internal Research Volunteer Recruitment Circular and social media accounts of researchers on LinkedIn and Facebook. The adverts described the study as an informal online discussion in which participants would be asked about their views on working at night, how this impacts their diet and health, as well as their thoughts and opinions on health research designed for shift workers. Participants expressed interest in participating by sending an email or calling a member of the research team using the contact details provided in the advertisement. Interested participants were emailed a participant information sheet that included inclusion criteria. Participants who reported meeting the eligibility criteria were contacted to arrange the provision of informed consent via an online participant information and consent form, which required their signature. They were then emailed a short questionnaire asking for details about their job role, shift-working history and pattern, gender, age-range and ethnicity. Following this, a date for their informal interview with a member of the research team was arranged. Interviews were conducted between 30 June 2023 and 22 September 2023, and data analyses were conducted from 14 August to 20

November 2023. Participants were able to claim a £25 honorarium for their participation.

## Data collection and analysis

An interview topic guide was constructed by RG and CF. The guide was structured to generate understanding by collecting night workers perceptions, experiences and opinions across three main areas that aligned with the research questions: (1) experiences of working night at night, (2) perceptions of how night work may impact health and wellbeing and (3) perceptions around engagement with nutritional research. As part of this, participants were asked about what support was available to them for looking after their health when working nights and whether they found it helpful. The topics included in the guide were informed by previous research conducted amongst shift workers in the United Kingdom and Ireland (Gibson et al., 2024; Nea et al., 2018) and research investigating participation in clinical research (Sheridan et al., 2020). Initial rapport-building questions initiated the interview and then moved to open questions through the three topics of interest, with prompts to guide participants and probes to allow for clarification. The interview topic guide was piloted with a previous shift worker to check for clarity and relevance of questions. Interviews were conducted via video call (MS Teams, Microsoft Corporation), and participants were requested to be in a quiet place where they would be comfortable talking. During the interviews, the interview guide evolved and additional prompts were added to explore if participants sought healthy eating advice from additional sources outside the workplace, what those were, what kind of support they felt they would benefit from and how they would prefer information to be delivered to them (e.g. through workshops and leaflets). While wanting participants to discuss their broader experiences of night work, health and wellbeing the aim was to keep additional prompts in line with the overarching research question and objectives. All interviews were conducted by CF (female Research Assistant, MSc Psychology, PhD Fellow, trained to conduct semi-structured interviews). There was no relationship between interviewer and interviewee prior to the start of the study. No repeat interviews were conducted, and no field notes were taken during the interview. All interviews were audio recorded using the recording feature in MS Teams. The audio recordings were transcribed verbatim and fully anonymised by an independent professional transcription company. Transcripts were checked against the recording for accuracy (CF). Transcripts were analysed by one coder (CF) using qualitative analysis software, Nvivo 2023 release 14.23.1 (QSR International Pty Ltd); coding was undertaken as transcripts were checked following an iterative process. An inductive thematic analysis approach was applied to identify overarching

and subthemes (Braun & Clarke, 2006). The transcripts were initially read by CF several times to facilitate familiarisation with the dataset. The transcripts were then coded by CF and both CF and RG met to discuss and agree to the initial codes and preliminary themes. Codes were based on the language used by the participant and were applied to each new unit of meaning. Codes were organised into potential themes using tables and such themes were internally consistent, coherent and distinctive and mapped onto the research question and aims. These codes were then collated and defined within a table which was then applied to the 18 transcripts. Codes and themes were reviewed and modified until a coherent pattern of themes was identified. Transcripts were re-read to ensure the analysis was grounded in the data and attention had been given to all data equally. Researchers' consensus coded the data based on the codebook and met to ensure final agreement on codes, themes and subthemes. Analysis was an iterative process which involved ongoing comparison of data, codes and themes. Each overarching theme and corresponding subthemes were illustrated with the inclusion of supporting quotes from all interview transcripts (Table S1). The results are narratively presented by each overarching theme with an equal inclusion of quotes from all respondents for a fair representation.

## RESULTS

### Participant characteristics

Twenty-one participants consented to take part. Three participants did not complete the interview, and no reasons were sought. No participant withdrew their data during or following the interview. The mean interview duration was 36 min (range 18–94 min). All participants worked in England (78% London, 11% South East, 11% North East), 39% worked in the healthcare sector. The majority worked rotating shift patterns (39%) with a night shift duration of more than 10 h (65%) and had worked night shifts for between 1 and 3 years (50%) (Table 1). After sequential analyses of the initial 18 interviews, no new themes emerged and recruitment was stopped. Four key themes were constructed based on an in-depth exploration of the participant's experiences and perceptions of night shift work in relation to diet, health and wellbeing, as well as their thoughts on participating in nutritional research.

### Identified themes

#### Theme 1: The consequences of night work on health and wellbeing

There was a consensus perception that shift work had a negative impact on physical health, psychological

**TABLE 1** Characteristics of participants who took part in eating on the night shift semi-structured interviews.

	n	%
Age range		
18–24 years	6	33
25–34 years	6	33
35–44 years	4	22
45–54 years	0	0
55–64 years	2	11
Gender		
Female	13	72
Male	5	28
Ethnicity		
Asian	5	28
Black	2	11
Chinese	3	17
Other	1	5
White	7	39
Sector of work		
Healthcare	7	39
Hospitality/entertainment	3	17
Retail/distribution	2	11
Emergency services/first responder	2	11
Security	2	11
Other	2	11
Types of shifts worked <sup>a</sup>		
Night only	6	33
Night and morning and/or afternoon shifts	5	28
Night and day shift and/or afternoon	4	22
Night and day shifts	3	17
Shift pattern		
Fixed/permanent	5	28
Irregular	6	33
Rotating	7	39
Typical night shift duration <sup>b</sup>		
Less than 8 h	1	6
8–10 h	5	29
More than 10 h	11	65
Number of night shifts worked per month		
Three to five nights	7	39
Sx to eight nights	4	22
More than eight nights	7	39
Overall years of night shifts worked (all jobs) <sup>c</sup>		
Less than 1 year	4	22
1–3 years	9	50
4–5 years	2	11
More than 5 years	3	17

<sup>a</sup>Types of shifts were self-reported; definitions provided were: Morning/early shifts (usually start before 7 AM), Afternoon/late shifts (usually finish after 7 PM but before midnight), Night shifts (at least 3 hours of work during the 'night period' of 11 PM to 6 AM), Day shifts (any shift that starts 7 AM or later and ends before 7 PM).

<sup>b</sup>Information missing from one participant.

<sup>c</sup>The question asked participants to consider all years of employment, which included night work (not necessarily consecutive).

wellbeing, as well as cognitive functioning and memory. Participants suggested that forced circadian desynchronisation was having an impact on bodily functioning and processes.

## Theme 1 sub-theme 1: Physical wellbeing

Participants recalled the physical consequences of working nights. The participants felt that eating late at night, as well as the types of foods they ate, led to an increase in digestive issues and bloating. Participants also described changes to their weight, including weight gain/difficulties with maintaining weight since starting nights. Participants also felt as though there were impacts on immune system functioning as since starting night shifts, they found they were more prone to illness, and when they did fall ill, it took them longer to recover. Participants also reported struggling with energy levels and nutritional deficits, which resulted in them being advised to/feeling as though they should take supplements.

I think I've had digestion problems and quite easily gain weight for having those sorts of snacks just before midnight. That's why I think I put on much weight.

(Participant PID05—other)

I have to be careful of eating, especially with takeaways which I know is obviously common that you get bloating from that. But even if I eat something that isn't takeaway, my bloating is quite bad.

(Participant PID15—retail/distribution)

I've had to do a few blood tests and the doctor's worried; she's called me and say she has to put me [on supplements] – which I never had to do before I started working nights – and she said to me my vitamin D level is so low.

(Participant PID12—healthcare)

## Theme 1 subtheme 2: Psychological wellbeing

Changes to mood and disruptions to emotional regulation were also reported, with some saying they experienced an increase in irritability, as well as low mood. Participants attributed this to being a consequence of poor sleep when working nights, as well as reduced exposure to sunlight, as when working nights, participants would miss most of the daytime to sleep:

For example, you know how I say like [I get] a bit irritable, a bit moody? I think it does affect the personal relationship with the people around you. And I think if that deteriorates, like even your mental health goes down.

(Participant PID14—Security)

I can get a little bit ratty and that's only because I've not had a good sleep or something's happened or whatever the case may be. So, you can end up getting sort of, like, a little bit ratty, so silly little things might trigger you and you might react, whereas on days you'll laugh about it, you'll joke about it.

(Participant PID16—Security)

I think sometimes, well not so much in summer but in winter, I think it can make you quite depressed, obviously because it's dark when you get home, dark when you leave for work.

(Participant PID15—Retail/distribution)

## Theme 1 subtheme 3: Cognitive functioning and memory

Subjects felt that their cognitive performance was also impacted during night shifts. Participants recalled experiences where at certain points during the night they felt their energy levels “dipped”, and this had a knock-on effect on cognition and work competency. During these periods, workers described difficulties with concentration and focus. Participants also recalled decision making to be impacted:

Anywhere between twelve o'clock midnight and four/five o'clock in the morning your brain just doesn't function as it would typically do.

(Participant PID11—other)

Being tired also affects your mental health in the sense of not processing information as quick as you'd like to

(Participant PID18—First responder)

## Theme 2: Eating at night means a less healthy diet

Subjects reported that priority was placed on the convenience and foods that would provide the most energy, often leading to the consumption of unhealthy “junk

foods.” During discussions, it was also evident that characteristics of the workplace environment created a barrier to eating healthy. In most instances, simply the lack of healthy choices and the availability of unhealthy or processed foods led to a diet of poor nutritional quality. This was further impacted by food temptations brought in by other colleagues, which participants recalled having a lack of self-discipline to turn down, further disrupting their attempts at maintaining a healthy diet.

### Theme 2 subtheme 1: Impact of shift work on eating patterns and meal planning

Shift work heavily influenced eating patterns. Eating habits were described as sporadic and irregular compared to working day shifts or days off. Some made efforts to maintain their eating patterns during the daytime, whilst others expressed how unnatural it was to eat at night and struggled to “flip” their eating schedule. Difficulty maintaining a regular healthy meal pattern was most commonly attributable to an inconsistent routine and a lack of time or energy to purchase and prepare food. Most noted having a meal prior to their night shift and opted for lighter foods and snacks during their shift. Some participants reported feeling tired and nauseous, which resulted in reduced eating behaviours. On the first day, going into a night shift, participants recalled having a more normal routine with food, eating breakfast, lunch and dinner. In contrast, meal skipping or long gaps between meals were common in the middle and towards the end of a block of night shifts. Participants would sometimes skip breakfast and lunch in favour of sleep. Workflow and workload were also determining factors of when participants got to eat during their night shifts, with some saying they did not eat at all due to how busy the shift was. Some stated that they felt as though adrenaline from the busy shift acted as a supplementary energy source. Planning out meals during night shifts also became more of a cognitive burden as participants viewed their night-time eating routine as not simply a reverse of the days, and a lot more thought and consideration had to go into planning their meals. Factors that needed to be considered included how busy the shift was and energy requirements throughout the shift. Participants also had to put more thought into preparing their meals due to limited food availability and options when working nights:

I think you do end up eating more and you do end up eating less healthy things and sometimes after you come off the nights and you can't be bothered to cook and you don't have time, so you might settle for something quick.

(Participant PID09—Healthcare)

It's a bit strange because you have to plan how you eat your meals and stuff before the shift or within the shift. So, then I have to wait and say, 'OK I'll eat my dinner on my break' because I'll be hungry throughout the twelve and a half hours.

(Participant PID17—Healthcare)

### Theme 2 subtheme 2: Impact of shift work on diet behaviours

Impact on dietary quality was adversely affected by shift work, with an overreliance on convenience and less healthy processed foods or takeaways due to a lack of time or energy for meal preparation. Eating quality varied depending on food availability and whether they had the time and energy to prepare and bring their own meals. Despite this, most noted snacking in addition to the homecooked meals they brought with them. Snacks tended to be unhealthy by nature (e.g. examples mentioned included crisps, chocolates and sweets). Whilst participants acknowledged the unhealthy foods they were consuming, their eating behaviours persisted and were influenced by a variety of factors. This was partly attributable to what was available to them during the night shift. Some noted workplace initiatives to offer healthier options, but even these were not perceived to be the best options. Prolonged wakefulness was also felt to contribute to the increased consumption of foods, and some used food as a source of comfort and motivation to get them through the night, whilst others stated their eating habits were fuelled by boredom during quiet periods of their shift. Foods high in sugar such as sweets and chocolates were often consumed as they were perceived to be a good source of energy/provided more calories, particularly to combat the dip in energy experienced at certain points throughout the night. An increase in caffeine consumption including coffee and energy drinks was noted to help keep them alert through the shift. Some were mindful of consuming caffeine too late in the night as it led to sleep disruptions the following day.

You just grab onto any rubbish, junk, eating crisps is really bad...everyone is eating rubbish: chocolates, whatever you can lay your hands on, you just nibble just to keep yourself awake.

(Participant PID12—Healthcare)

And the only fast-food shop that is open, it's literally like a chicken shop. There's nothing else open at that time when I have my break.

(Participant PID14—Security)

A coffee at two is really good but never have after two.

(Participant PID03—Healthcare)

### Theme 3: Working at night has wider knock-on effects

Disruptions to circadian rhythm because of working nights were also perceived to have an impact on overall routine and lifestyle, including physical activity, sleep and social life. Productivity and motivation on days between night shifts were also impacted as participants recalled prioritising rest to prepare them for the next night shift. Participants further struggled with finding the time to accomplish everything they needed to and struggled with getting into a balanced routine. Some reported engaging in exercise and were confident in looking after their health, whereas others were aware of the lifestyle changes required to improve their health. However, factors such as lack of time, energy and motivation were highlighted as barriers to achieving this.

#### Theme 3 sub-theme 2: Physical activity

Engagement in exercise and physical activity was also impacted by night shifts. Low energy levels influenced individuals' confidence and ability to engage in physical activity, particularly after a night shift:

It will impact all the habits of both like diet, sleeping. And also like gym, because you don't have time to go to the gym during the day if you work night shift, only the choices is when you finish work, maybe you go to the gym in the morning and then after that you go to bed, so it's like a little bit in a mess.

(Participant PID01—Hospitality/  
Entertainment)

I'm a lot less active compared to if I were working in the day shift. I would have like maybe gone to the gym or something like that during the evening. But now it's just like work, home, sleep, yeah. There's never like, I don't exercise or anything.

(Participant PID14—Security)

#### Theme 3 sub-theme 2: Sleep

Disruptions to sleep were also a common theme amongst night shift workers. Sleep difficulties were

reported even on days off, resulting in a lack of energy and an inability to be productive on those days. Participants recalled struggles with waking up, needing to sleep in and not wanting to go out and socialise which further impacted their overall routine:

Working nights have definitely messed up my sleep schedule because let's say I go to a night shift and I come home, because my body's not used to being asleep during the day I stay up.

(Participant PID08—Healthcare)

I feel it ruins your sleep schedule, like the day after. If you're sleeping during the day and then you can't sleep in the night again, and it gets a bit messed up there.

(Participant PID06—Retail/Distribution)

It's a constant battle of trying to get my body clock regulated to normal patterns or what's considered normal.

(Participant PID18—First responder)

#### Theme 3 subtheme 3: Social life

Social life was also affected by night shift work. Even on days off, participants recalled having low energy levels which impaired their motivation to make social plans. The day after the night shift was also viewed as a "recovery day" for some as they purposefully avoided making social plans:

I'd say from a social perspective it can be hard to connect with friends who aren't doing night shifts. In those periods of times, I tend to be a bit of a hermit.

(Participant PID10—Healthcare)

I'll just lie in bed because I don't have the energy to do anything and how that has effect on your social wellbeing with your family, with your friends, with other work colleagues.

(Participant PID18—First responder)

I will definitely not have any social interaction on those days following my night shift, so it's a big no-no from me, and my friends and family know that, so there are no things like let's go to the cinema, let's go and eat out, that's not happening. The day after the shift is my recovery day.

(Participant PID04—Hospitality/  
Entertainment)



## Theme 4: Nutritional research is needed but there are barriers

Participants viewed the night shift as both physically and mentally taxing and acknowledged that night shift work was unavoidable, so they wanted more support and advice on how to reduce the associated health risks. Research into health, wellbeing and nutrition was viewed as important, and participants emphasised a need for understanding how food choices when working on a night shift can impact health long term and the food types and meal times that could be chosen on a night shift that may reduce the risk factors associated with working nights.

### Theme 4 subtheme 1: Perceptions of nutritional research in shift workers

When asked about their views on nutritional research in shift workers, there was a consensus that it was important and needed further study:

I think it's really important...there's lots of jobs where night work is inescapable for like emergency services and things like that. So yeah. I mean, I presume it's going to be very helpful and shape the way that we approach night work as a society hopefully.

(Participant PID03—Healthcare)

I think the most important would be that the science can back up some recommendations because I don't think it's efficiently studied. I think there are very many people who work nighttime and they are not in the core of the studies when it comes to health recommendations or eating habits recommendations.

(Participant PID04—Hospitality/  
Entertainment)

Participants provided suggestions of how this could be achieved through comparing different diets and their associations with long term health outcomes:

Maybe following their journey, I don't know, probably giving them a set meal plan or diet plan following, so maybe get a few, a group just have whatever they want and another group have a set diet plan and follow it, they need to be strict on that plan and then make comparisons.

(Participant PID12—Healthcare)

[in response to types of nutritional research that would be helpful]... and your last meal should be at this time because...and you should avoid this food because...and that if I had those I could think about how I can do that....

(Participant PID04—Hospitality/  
Entertainment)

It was further noted by some participants the importance of considering individual differences in professions, shift patterns and diets and how this may impact health:

I would love if there was more research about it and maybe I should eat at night, maybe we shouldn't be eating at night and I just wouldn't mind knowing what research comes out of it and what is the recommendations. I imagine it's all subjective because every body type, every person is different, so I don't know how much we can garner from that kind of information.

(Participant PID18—First responder)

I think sometimes maybe it's not going to be that accurate. I don't think you're really going to find – you might but I don't really feel like from what I see at work, there's much of a pattern of how say like diet and stuff affects shift workers.

(Participant PID15—Retail/Distribution)

For me I think the research should like have a more – not different kinds of such as night shift, I mean, the job can vary, so the night shift worker that would be, like, apart from store assistant there would be also a security or a cleaner, so it's better to cover like different kinds of night shift worker because they like health style, like, I mean also like they're tired, they're happy, may be quite different from each other.

(Participant PID01—Hospitality/  
Entertainment)

Most participants felt that there was a lack of advice and dietary support available for staff working at night. All participants were asked if they sought out additional information/guidance outside of the workplace. Additional information sources came from online sources, family members, journals and podcasts. Any dietary advice specific to night shifts came from personal experience or from other colleagues who worked nights. Some participants said they did not seek information or that

the information out there was not specific for night shift workers and would like more of this. No one recalled having read any specific guidance on night shift work and nutrition. One stated having read evidence-based information, but this was in relation to sleep hygiene and safe driving. When asked about what kind of advice or support participants would feel they would benefit from, responses included more information about the impact of night working and how to reduce health risks. Participants also suggested that dietary advice specific to night shift workers including what to eat and recommended mealtimes would be helpful.

I guess some dietary advice might be helpful because I actually haven't heard a huge amount about dietary advice for night shifts. I just do what I do. Yeah, so that would be nice.... [..]. Maybe about what types of food is recommended, what kind of meal pattern is recommended, yeah.

(PID09—Healthcare)

I think it will be good just to inform us about working the night shift and how it can impact you and also what steps you can take or what measures can you make to prevent these long term effects.

(PID07—Healthcare)

I would like to be given a guide on how to navigate around the night shift, like advising oh from this time to this time before you start your night shift this is what you do. Or after your night shift this is and this is important. Or these are the vitamins or blah blah blah that are going to help you towards that, that, that. I would like that kind of explanation.

(PID12—Healthcare)

Reflecting on helpful formats for information, participants suggested online resources such as leaflets or workshops on navigating the night shift that are easy to follow:

Something a bit clear so I can look and say you know what, this is ticking the box, I need to tick this box if I want to live longer that kind of thing.

(PID12—Healthcare)

Yeah, leaflet, maybe something you can access on the phone I would say, so it's easily there, you can just see it, or like even on a night shift, then I could read it on my phone. I would be more likely to

read it on my phone than if it was like a paper leaflet.

(PID17—Healthcare)

Maybe like you know you do training and stuff, so maybe coming to the wards or coming to the trust and then telling us about what you learned, what the study is about, what research has shown you and then also what can we do to stop, what can we do to prevent the long term and short-term negative effects on night shift work.

(PID07—Healthcare)

## Theme 4 subtheme 2: Barriers and facilitators to engaging in nutritional research

All participants responded positively when asked whether further research was needed and whether they would be interested in participating. Most said they would be happy to change the times and types of food they eat for research. Some noted a barrier to study participation and compliance would be the nature of night shift work and how busy the shift gets, which could cause potential issues with compliance, as they would not be able to take breaks from work just for the purposes of the study. Another potential concern was the use of monitoring devices and if this would impede their ability to carry out their job:

I think that's probably one of the most difficult areas to probably get people to participate from, purely because of how busy we are most of the time. And it's not like we get breaks that we can just go "Right, at one o'clock I'm getting a break. I'll do it then".

(Participant PID13—First Responder)

If it wasn't too bulky, if it wasn't visible, I wouldn't mind [in reference to wearable health monitor]. But if it was visible and if it got in the way of me doing what I needed to do, then I don't think I would.

(Participant PID06—Retail/Distribution)

Incentives to comply included ensuring clear instructions for the study protocol were provided, as well as incentives in the form of financial compensation:

I know it sounds horrible to say but to be compensated for it would be kind of nice, only because I don't want to have to buy foods I don't really want to eat for the research!

(Participant PID18—First Responder)

It might be a little difficult to comply with 100 % but I would give it a go as long as we're not talking months on end of this, but if there's a clear plan and a clear instructions on what to do and there's like an end point so you don't have to do this like indefinitely for years, then that's fine.

(Participant PID09—Healthcare)

## DISCUSSION

Working at night is a necessity in many employment sectors to provide 24/7 emergency services and support. There is a consensus in the research community that working at night has detrimental effects on health (Moreno et al., 2019). To date, there are limited evidence-based guidelines for night workers, employers and practitioners (D'Annibale et al., 2021). To develop the evidence base to inform practical guidance, it is essential to be able to conduct research with end users. This study aimed to explore the perceptions night workers have about working at night, how they view nutritional research and the barriers to taking part.

This study found that shift workers are concerned about the impact of shift work on their physical and psychological health. Physical health concerns were related to gastrointestinal health, weight gain and immunity. Previous qualitative investigation in night working nurses in South Africa reported that overweight and obesity were the main health concerns (Phiri et al., 2014). The physical health concerns reported by night workers in this study are largely supported by observational studies that have shown associations between night work and weight gain (Bernardes Souza et al., 2014) and gastrointestinal complaints (Kim et al., 2013). To the author's knowledge, immunity concerns have not previously been reported by shift workers; however, there have been studies showing impaired immunity in night workers (Loef et al., 2019).

Psychological health concerns were related to mood and cognitive function. Previous research by Nea et al. in Ireland and the Republic of Ireland (Nea et al., 2018) also reported changes in mood, such as low mood and irritability, which were attributed to poor sleep and reduced exposure to daylight. The concern reported in the current study related to cognitive performance maps to the findings of a meta-analysis of observational studies that found shift work was associated with decreased cognitive performance (Vlasak et al., 2022).

One of the three areas that the current study focused on was the exploration of how working at night impacts dietary behaviours. In support of previous qualitative studies, we found that night workers report poorer diet quality due to night work with a reliance on convenience foods and lack of availability of healthy food options at night (Gibson et al., 2024; Dias & Dawson, 2020; Nea

et al., 2018). Focus group research amongst nurses in America reported the main influences on diet intake to be job role, food environment (unhealthy food options and food bought in) and shift work—these were seen as major barriers to healthy eating. The current study also reported the impact of night work on wider aspects of lifestyle, with participants reporting detrimental impacts on sleep, physical activity and social relationships, which is in agreement with themes reported by Nea et al. The focus group investigation by Dias & Dawson also reported the wider impacts of working at night on personal time, further limiting healthy food choices (Dias & Dawson, 2020). Despite several qualitative studies conducted in shift workers highlighting the importance of the food environment and job role as the main barriers to healthy eating at night, a recent mixed methods systematic review highlighted these are commonly not addressed in weight loss interventions (Davis et al., 2023).

There was agreement that research into diet and shift work was important. Areas of interest were around the types of food to eat, and the time of food intake related to mitigating the health risks of shift work. However, there was an acknowledgement that night work and individuals vary and some concern about how the research would meet the range of night workers. While some participants felt they could change the type of foods they ate and the time they ate for a study, other participants raised potential barriers. Several barriers to engagement in nutritional research were identified including the busy workload during the night shift and ability to fit in breaks. With regards to wearing health monitors (e.g. blood pressure and activity), there was concern about how these would impact their ability to carry out their work. A previous qualitative evaluation of shift workers experiences of nutritional intervention reported barriers around workplace related factors such as scheduling breaks and requirements of a job role (Huggins et al., 2022). From an ethical standpoint, researchers should not offer undue financial incentives for taking part in research; however, financial compensation was viewed as an enabler to taking part in research. The importance of providing clear instructions was also highlighted. There are limited studies investigating the participation of shift/night workers in nutritional research. A systematic review that investigated the psychosocial barriers and facilitators for patients taking part in health research also identified information and financial benefits as facilitators for taking part (Sheridan et al., 2020). However, these were reported less frequently compared to the most reported facilitators of perceived personal benefits and altruism (Sheridan et al., 2020). The main barriers reported were related to the risk of side effects and distrust; however, in agreement with the findings reported in this study, practical difficulties were also reported (e.g. times, cost and employment factors). The difference in the findings

around risk and trust may relate to nutrition and diet being seen as lower risk than medical interventions.

## Study limitations

This was a small convenience sample that provided a heterogeneous sample biased towards the healthcare sector. However, the sample did contain participants from the three main employment sectors of night workers in the United Kingdom—health and social work, accommodation and food service and wholesale and retail (Office for National Statistics, 2023). Common themes emerged through the analyses that indicated shared views and experiences across employment sectors. There was an over-representation of female participants in the sample (72%); currently, in the United Kingdom, more male employees work at night (56% vs. 44%); however, the proportion of females working at night has increased over the last decade (Office for National Statistics, 2023). The methods of recruitment for the present study were through digital and online means and, therefore, may not have reached all sections of the night work population. Volunteer bias is likely to be present because of self-selection to take part, for example, night workers with an interest in health and research.

## Implications for policy and practice

The concerns reported by shift workers within the present study about the impact of working at night on their health are risks that have been supported by research evidence suggesting associated risks with night work exposure. As shift work is essential for the provision of many services, it is important that these health concerns shape the priorities for future shift work research. It is important for researchers to consider the range of night worker health concerns when investigating potential interventions (e.g. gastrointestinal symptoms, cognitive performance, immunity, bodyweight and mood). Shift workers want guidance that is backed up by research, as they are more likely to follow advice that is clear and evidence-based—formats suggested were online information and workshops. In the design of future studies, it is important to understand the likely barriers faced in the ability to comply with research protocols—particularly around job content (e.g. lack of standard breaks and workload). This study has also highlighted the social isolation that some night workers face. Again, this is an important consideration in the design of research protocols. Future nutritional research needs to consider individual differences between professions, shift patterns, and diet and understand how these can impact health and influence recommendations and guidance.

## CONCLUSION

Night workers are aware that working at night negatively impacts their health and would be willing to engage in research to support their health; however, researchers need to be mindful of potential barriers to participation and compliance in the design of interventions.

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## CONFLICT OF INTEREST STATEMENT

RG is a volunteer member of the British Dietetic Association Work Ready Steering Group.

## DATA AVAILABILITY STATEMENT

Transcript data are not shared due to confidentiality.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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