

Eating during the night: Three studies examining meal timing and food choice across two industries

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Problem

Shift workers are at higher risk for chronic disease such as obesity and type 2 diabetes than day workers, even after controlling for lifestyle and socioeconomic status. Many shift workers eat at night and snack frequently. Habitually eating during the night is problematic because gastric emptying is slower at night, glucose tolerance is reduced and insulin resistance increased. It is proposed that eating at night when the body is primed for sleep plays a major role in shift workers' increased risk for chronic disease.

Method

Data from three studies that examine meal timing and food choice will be presented. Study one: N=13 male and female nurses (age range 22-63 years) worked a mix of night, afternoon and morning shifts and completed sleep diaries for 2 weeks, and food diaries on three days for each shift type that they worked during this period, as well as on one day off (as a comparison measure). Study two: N=49 male and female nurses (age range 21-81 years) completed a food frequency questionnaire that measured habitual eating patterns and serving sizes over the past 12 months. N=22 also completed an in-depth interview about their experiences preparing for, working and recovering from night shift. Study three: N=19 Australian male and female flight attendants (age range 22-61 years) working international operations. Flight attendants completed an online meal and snack timing questionnaire that also included questions about motivations for why, what and when they ate while at work.

Results

Study one: Figure 1 shows night shift-work was associated with a redistribution of meals from day to night, with an average 30% of total daily calories consumed at night. There was consistency for on-shift consumption of food across repeated night-shifts (ICC=0.72). Given the small number, participants were split into those eating a late meal at night (reference) versus others for preliminary examination of BMI, which was higher among those eating a late meal (29.6 ± 7.8) compared to those with other patterns (25.6 ± 4.2), representing a moderate effect ($r=0.31$). There was a moderate relationship between BMI and proportion of 24h calorie consumption on night-shift ($r=0.34$). Study two: Figure 2 shows indulgence foods consumed by nurses across all shifts. Overall 6.3% nurses reported eating chocolate at least daily; 49.1% reported chocolate, 20.4% reported cake, and 14.3% reported potato chips at least twice per week. Table 1 reports selected participant quotes about why they ate on shift. Study Three: Figure 3 shows 38% of flight attendants reported *time available* determined why and 50% said it also motivated when they ate. 50% reported that the *food available* determined what they ate at any given time. The

work schedule heavily influence why (34%), what (16%) and when (34%) flight attendants ate. Only 22% of the sample said they ate because of *appetite*. The pattern of meal and snack consumption was different between day and night duty periods. Fewer flight attendants consumed meals and snacks during night flights, but the amount of food consumed was consistent across the entire duty period.

Discussion

Habitual approaches to nurses’ food consumption while on night shift are variable and show individual differences, with some workers eating a large proportion of daily energy intake during the shift, while others abstain. Many nurses eat indulgence food while on shift, often sharing with others as a self-reward for working at night. Why and when flight attendants eat while at work is primarily determined by the timing of breaks and other work constraints. What flight attendants eat is limited by the foods available on board the flight. Eating at night has potential health consequences for individuals working irregular hours and may be a mechanism by which chronic disease is increased in this population. Altering when workers eat may be a potential intervention to reduce the impact of chronic disease.

Summary

Eating behaviours change with an individual’s work pattern. However, food selection while working at night is not simply due to personal choice, it is heavily influenced by logistics, break schedules, and also psychological factors arising from the work schedule. Interventions to improve shift worker diet quality and nutrition-related health should consider the work environment as a primary driver for eating behaviour. Both individual and operation-level approaches are likely to be required.

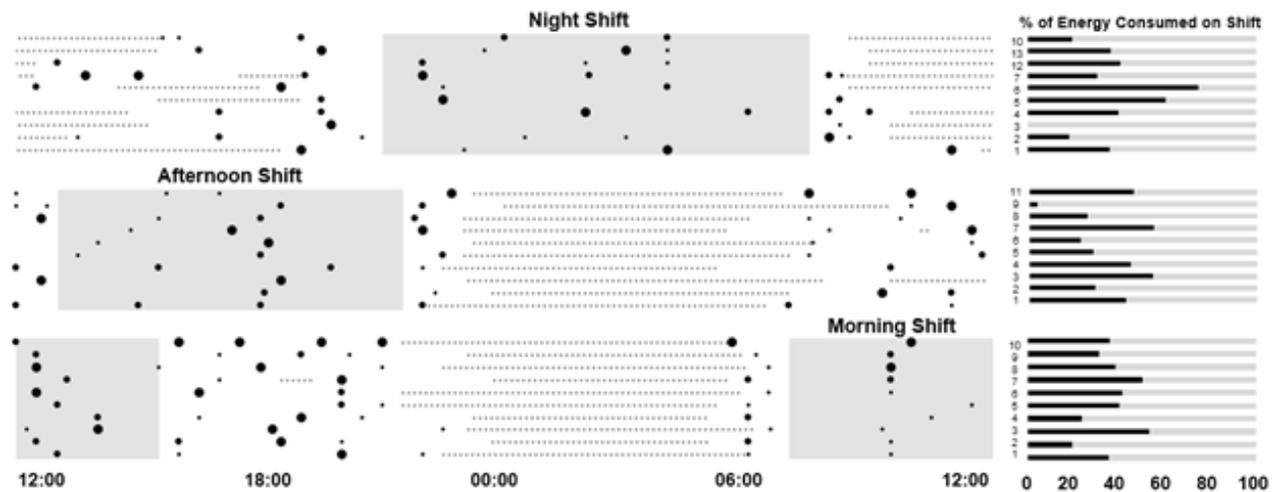


Figure 1: Each line represents a 24 h pattern for each individual. Participants worked a mix of shift types - night, afternoon and morning. Numbers are each shift workers’ individual data. Shifts are shaded in grey, whilst free-living is white. Grey dotted lines are sleep periods, and meal sizes are reflected by dot size. Right column shows proportion of daily energy consumed while on shift.

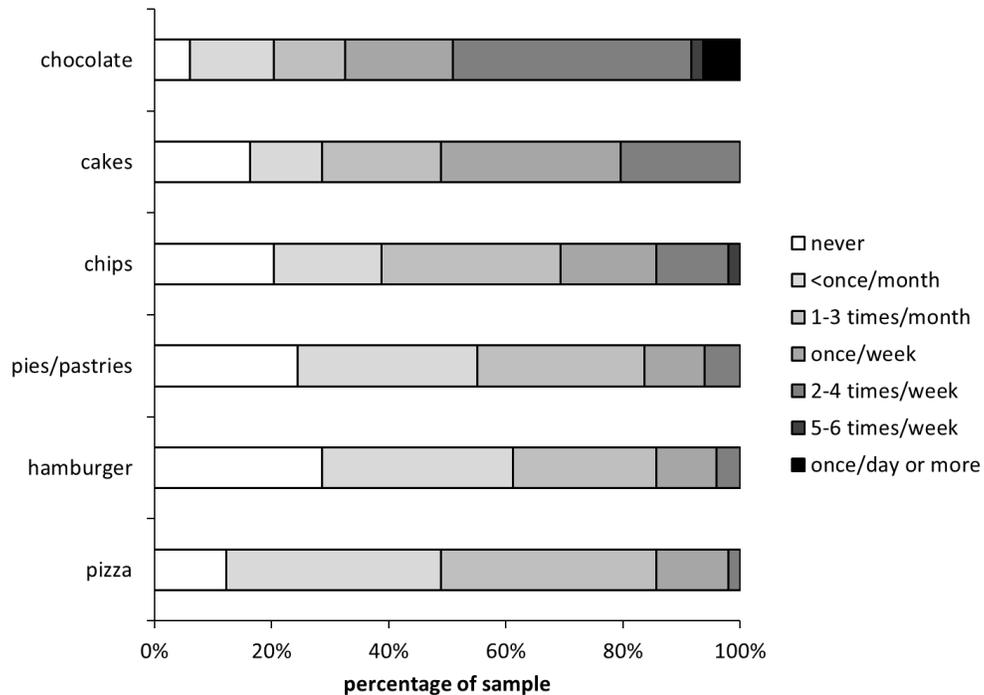


Figure 2: Frequency of nurses consuming indulgence food.

Table 1. Quotes relating to eating on the nightshift – Eating indulgence foods, and using such foods as a reward for night work were strong themes. However, some participants reported that they avoided food where possible at night.

Theme	Example Quotes
Food as a reward for nightshift	<i>“You have to have some sort of a reward so people bring in cheese and dips and chocolates and biscuits.” #4206RA</i>
	<i>“I’ll go down to the vending machine and get a chocolate bar, like if it’s been a hard night.” #3103CO</i>
	<i>“I think I generally eat prettily healthily so I sort of see night shifts as my compensation for being awake all night is I eat lots of junk.” #4206RA</i>
Eating junk food on nightshift	<i>“If there was pizza or if someone brought in lollies and stuff, I’d probably be stuffing my face.” #3207ST</i>
	<i>“CCC: So, Chips, Coke and Chocolate”</i>
Avoiding food or eating light	<i>“Usually what I eat normally, something light, so I try not to eat when I’m at work...Sometimes I do but things like fruit or nuts, just little snacky things, not a full meal.” #4206RA</i>

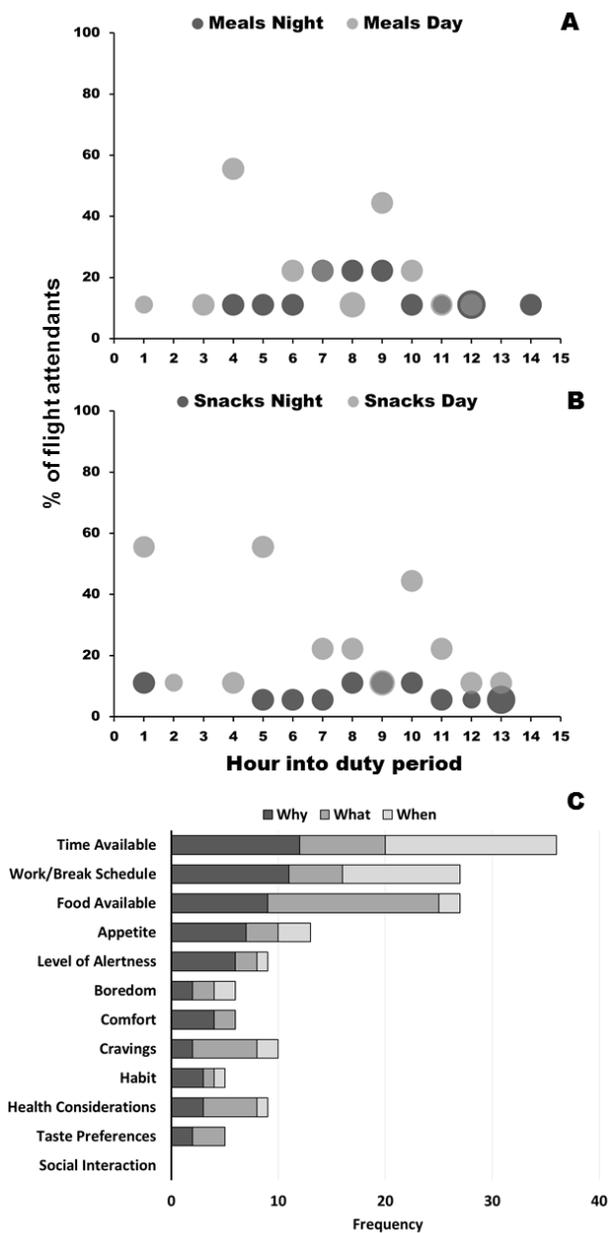


Figure 3: Panel A and B show the percent of flight attendants that consume meals and snacks by hour into duty period. Size of the dot reflects the amount of food consumed, with larger dots indicating a greater amount of food. Panel C show the motivations for why, what and when the flight attendants ate while on duty. Time available, work/break schedule and food available were the most commonly reported motivations.