

Working shifts and mental health - findings from the British Household Panel Survey (1995-2005)

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Abstract

Objectives: Our objective was to examine the impact of shift work on mental health at the population level. We expected that this impact would depend on duration of exposure, type of shift work and gender.

Methods: We analyzed longitudinal data (1995-2005) from the British Household Panel Survey (BHPS). A subsample of people aged 21-73 years old was selected from the 2005 wave who had been followed annually from 1995 to 2005. Responses in 2005 to the General Health Questionnaire (GHQ, 12-item) and self-reported anxiety/ depression were used as dependent variables. Nested logistic regression models were performed to examine the effect of the duration of night work and varied shift patterns on mental health for men and women controlling for age, marital status, education, number of years working in six occupation categories (1995-2005) and baseline mental health.

Results: Undertaking night work for 4+ years in men was associated with increased risk of having a GHQ score reflecting mental ill health and reporting anxiety/ depression [odds ratios (OR) 2.58, 95% confidence interval (95% CI) 1.22-5.48; OR 6.08, 95% CI 2.06-17.92 respectively]. Women were significantly more likely to report anxiety/ depression (OR 2.58, 95% CI 1.53-4.35) and to have a GHQ score reflecting mental ill health (OR 4.17, 95% CI 1.45-11.98), after working varied shift patterns for 2-3 years, and 4 years or more, respectively.

Conclusions: Different types of shift work had a differential impact on mental health, but this impact varied according to gender. Women's mental health was more adversely affected by varied shift patterns, while night work had a greater negative impact on men's mental health.

Key words: anxiety, depression, gender differences, General Health Questionnaire, longitudinal study, night work, shift work, varied shift pattern

Introduction

There has been a scarcity of studies on the impact of shift work on mental health. Studies have found an association between shift work and general mental health (1-3), psychological well-being (4-6), irritability/irritation/strain (7) and severe emotional problems (8). Studies have also shown that shift workers experienced depression to different degrees [i.e., major depressive disorder (9, 10), sub-clinical depression (11)], general malaise including depression and anxiety elements (12), higher levels of burnout (13), more fatigue (7, 14, 15), and mental tiredness (16). However, most of these studies were cross-sectional, with limited potential to demonstrate causal relationships. Moreover some studies have also shown no relationship between shift work and mental health (17, 18). Therefore, according to some researchers, the causal relationship between mental health and shift work is still questionable (19), and the importance of using longitudinal data (9) to study the impact of shift work on mental health is emphasized.

Shift work is prevalent in many societies. In 2000, 19.3% of employees were shift workers in EU-15 and 23.0% were shift workers in the UK (20). Although shift work is stated as an important public health issue in our 24-hour society, most studies have been based on data from single or only several specific occupational groups, such as health care professionals (16), especially nurses (1, 9) or student nurses (5), garbage workers (21), track workers (3), and chemical labour unions (7). Additionally, either men (7) or women (1, 5) have usually been selected for analysis, but rarely both genders.

We expected a negative impact of shift work on mental health that would vary with the duration of exposure, type of shift work and gender. Regarding duration, Scott et al (10) showed (in a pilot study) that undertaking night work for 6-10 years increased the prevalence of depressive disorders over 6 times compared to undertaking night work for 1-5 years. Another study showed that men's and women's poor mental health measured in 1997 was related to undertaking shift work in 1993 (11). Therefore, we expected a long term negative impact and that exposure to shift work for a greater number of years would have (more) adversely affected mental health.

Men and women have different gender roles in society and in families, and, consequently, undertaking different types of shift work may have a differential impact on men's and women's mental health. However, there has been a scarcity of studies addressing the differential impact of shift work on men and women. Furthermore, most clinical research has focused only on men, thus there has been a lack of evidence to support hypotheses on gender differences. In our study we expected that women would be (more) adversely affected than men by irregular working hours, based on evidence from Shield's research (22). She showed that men working irregular shifts had a relatively high sense of mastery, while women reported adverse effects, in terms of high personal stress.

With respect to night work, studies on (mostly) men (10) and studies on health care workers have shown a negative impact of night work on mental health (i.e., leading to mental tiredness (16) or fatigue (23)) and on psychological well-being (5). There has been a lack of papers addressing gender differences in the impact of night work on mental health, thus we cannot hypothesize in this respect. However, research has shown that women feel less sleepy compared to men during consecutive night shifts, so this may point towards women adapting better to night work (24). Moreover, studies on nurses showed that they were less adversely affected by night work, compared to working other shift patterns (25). Therefore, although these studies were not carried out in the general population, we expected that men's mental health would be (more) adversely affected by night work than by working varied shift patterns, whereas women's mental

health would be more adversely affected by working varied shifts.

Shift workers have often been considered as a self-selected population (7, 19). Some authors argued that shift workers may have pre-existent mental problems (19). In contrast, other authors considered shift workers to be healthier than the general population, because of the process of selection into shift work (“healthy worker effect”) (26). There is also a selection out of shift work (“healthy shift worker survivor effect”). Some recent studies have shown no differences in illnesses or socio-demographic characteristics between future day and shift workers (27), or between shift workers or day workers leaving their work due to illness (28). However, these findings are limited to health care workers and to cardiovascular disease and cannot be extrapolated to a large range of occupations in a general working population and /or to mental health problems. Furthermore, it has been widely acknowledged that studying the impact of shift work on mental health has been a methodological challenge due to self-selection effects (26). Therefore, our methodological approach is to control for pre-existent mental health status.

Studies have shown that the determinants of mental health include: age (2, 29), gender (22), marital status (21, 29), lifestyle, job status (29) and job type (18). Additionally, socioeconomic status influences mental health, especially education and employment status (30). However, a study on the first 8 waves of the British Household Panel Survey (BHPS) found that education and income had no impact on self-reported mental health (29).

The aim of our study was to address the relationship between mental health and shift work, examining the impact of working nights or varied shift patterns on mental health of British men and women. We examined this relationship for men and women controlling for other confounding factors, such as age, marital status, education, employment duration in six occupation categories and baseline mental health.

Methods

We analyzed longitudinal data from the BHPS, a nationally representative sample of private households in Britain. A subsample of people aged 21-73 years old was selected from the 2005 wave who had been followed annually from 1995 to 2005. The response rate ranged from 64.9% (wave 2003) to 77.3% (wave 1995) of eligible respondents from wave one (1991) (31). Our sample was restricted to those who had worked for at least one year between 1995 and 2005 (4549 men and 5216 women). Variables were constructed to measure the number of years working nightshifts and number of years working varied shift patterns between 1995 and 2005. The relevant BHPS question asked: "Which of the categories on this card best describes the times of day you usually work?" The answers were the following: "mornings only", "afternoons only", "during the day", "evenings only", "at night", "both lunchtime and evenings", "other times of day", "rotating shifts", "varies/no usual pattern", "daytime and evenings" and "other"(32). In this paper we analyzed working "at night" and "varies/no pattern". Additionally, variables were derived to measure number of the years of employment in 6 occupation categories (i.e., professional occupations, managerial and technical occupations, skilled non-manual, skilled manual, partly skilled occupations and unskilled occupations), between 1995 and 2005. We had detailed data on shift work for 10 waves out of 11 (except year 2003), while data for employment in six occupation category was available for all 11 waves included in analyses.

The 12-item General Health Questionnaire (GHQ), a screening test for nonorganic, nonpsychosis mental disorders (33), was used in the analyses. The questions included "Have you recently been able to concentrate on whatever you're doing?" or "...lost much sleep over worry?" or "...been feeling reasonably happy, all things considered?", with four response categories. Valid answers to these 12 items were converted into a derived variable running from 0 (the least distressed) to 12 (the most distressed), by recoding "Better than usual" & "Same as usual" as 0, and "Less than usual" & "Much less than usual" as 1, and then summing up (34). We dichotomized the summed GHQ scores as greater or equal to four to reflect mental ill health. Baseline mental health was measured for each individual from the first wave with available information on their GHQ score.

Mental health was also measured via the response in 2005 to the question: "Do you have any of the health problems or disabilities listed on this card?", with the card listing "anxiety, depression or bad nerves, psychiatric problems". Pre-existent self-reported anxiety/ depression, as measured in the first year with available information was used as baseline in the analyses.

Table 1 showed the distributions of the two outcome mental health variables, together with the socio-demographic characteristics of men and women, which are adjusted for in Tables 2 and 3. Cases for which there were missing values for a variable were excluded in the analyses and were not shown in Table 1.

-Table 1, about here-

Mental ill health (GHQ score ≥ 4) and self-reported anxiety/ depression in 2005 were used as dependent variables. Nested logistic regression models were performed separately for men and women to examine the effect of the cumulative exposure to years of night work and years of varied shift patterns on the two measures of mental health, unadjusted in the first model. In the second model, we adjusted for age, marital status, education and number of years working in six occupation categories (1995-2005). In the third model, we added baseline GHQ-caseness or

baseline anxiety/ depression. Only data from the fully adjusted model (i.e., Model 3) were presented in Table 2 and Table 3. However, the first and the second model were discussed in the text. Additionally, the logistic regression was performed on the sample with both men and women, including an interaction term for shift work-by-gender, in order to test whether there was an interaction between gender and shift work. The analyses were performed with SPSS 15.

Results

According to the unadjusted model (Model 1), undertaking night work in men and varied shift pattern in women was associated with increased risk of being a GHQ case (results not shown here). When controlling for age, marital status, education, and duration of working in six occupation categories, undertaking night work for 4 years or more in men and varied shifts in women remained strongly associated with increased risk of being a GHQ case (Model 2). In both genders, controlling also for baseline GHQ-caseness did not alter this association. This was shown in Table 2, which presented the results of the fully adjusted model (Model 3) performed separately for men and women.

-Tables 2 and 3 about here-

Similar results were found from logistic regression of duration of shift work on anxiety/ depression. The association between reporting anxiety/ depression and duration of shift work in the fully adjusted model was presented in Table 3.

Our findings demonstrated differences between the ways in which these two types of shift work, as well as various durations of exposure, affected men's and women's mental health. Men were significantly more likely to be a GHQ case and to report anxiety/ depression [OR 2.58, 95% confidence interval (95% CI) 1.22-5.48 and OR 6.08, 95% CI 2.06-17.92 respectively] after working 4 years or more during nights, compared with men who had never worked nights, while working varied shift patterns did not show a significant impact on men's GHQ or self-reported anxiety/ depression. In contrast, women's anxiety/ depression and minor mental disorders (i.e., GHQ-caseness) were adversely affected by working varied shifts for 2-3 years (OR 2.58, 95% CI 1.53-4.35), and for 4 or more years (OR 4.17, 95% CI 1.45-11.98) respectively, compared with women who had never worked varied shifts. In contrast, working nights was not associated with anxiety/ depression among women. Although there was an association between undertaking 2-3 years night work in women and reporting anxiety/ depression in both the unadjusted model (Model 1) and when adjusting for all the socio-demographic characteristics (Model 2), after mental health baseline was added to the model, there was no association between women undertaking night work and reporting anxiety/ depression (Model 3).

We also analyzed the gender-shift work interaction using the combined sample of both men and women. We found that the interaction between working varied shift patterns and gender was significant; whereas the interaction between night work and gender was not significant.

Discussion

Undertaking shift work for 4+ years was associated with poor mental health for men and women, even after adjusting for the confounding factors. Therefore, shift work had a negative long term impact on mental health, which varied according to the duration of exposure, type of shift work and gender. One possible mechanism was through (mental) stress, which has been found to be associated with shift work (35), and leading to emotional strain i.e., stress-and-strain model (36). Additionally, the level of distress due to shift work may be associated with the combination of changes in sleep patterns and domestic roles (37).

There are gender differences in the mental health effects of different types of shift work. Men's mental health was adversely affected by undertaking night shift work for 4+ years, while for women working varied shifts for 4+ years had a negative impact on their mental health. Gender differences in roles in family life and adaptation to shift work may provide explanatory frameworks for these different patterns of mental health impact. Moreover, men and women frequently work in different occupations which may have also explained the gender difference in the impact of shift work on mental health. We at least partially adjusted this by controlling for years working in six different occupation categories in our analyses of the relationship between shift work and mental health.

Undertaking night work did not appear to be associated with adverse mental health consequences for women. This is an unexpected result, especially because many studies on nurses have had a different outcome (1, 5). However, some authors considered that nurses suffer from cumulative stress, due to their involvement with patients, as well as the stress of working nights, and consequently, their inferences from care work to other types of work and vice-versa may be problematic (38). In our study, women undertaking night work had a wide range of occupations, besides being nurses. Additionally, women might be able to adapt more easily to night work, due to having more free time during the day, when they could perform their household chores and take care of children, and consequently, have less negative consequences on their mental health (25). Furthermore, the association between night work and mental health in women found in some studies may also be due to the lack of adjustment for baseline mental health in their models. This was supported by our results of an association between undertaking 2-3 years night work and poor mental health in women in our unadjusted model 1 and when adjusted for confounders (i.e., Model 2). However, when we adjusted for baseline mental health in Model 3, there was no association between night work and poor mental health in women.

If there was a cumulative effect of night work on mental health, we would expect that workers with more years doing shifts would have poorer mental health than those with fewer years (i.e., dose-response effect). Our findings led support to these dose-response relationships. Although there was a lack of association in some categories of 2-3 years shift work and mental health, our findings showed that the risk of poorer mental health significantly increased when workers were exposed to 4 years of shift work. This is the reason why longitudinal studies on dose-response have used categories with more years of shift work, such as 6-10 years, 10-15 years and 16-20 years (26). If there had been bigger sample numbers undertaking 2-3 years or 4+ years shift work, the dose-response effects might have been more significant.

The possibility of comparing our results with other studies is limited, due to the scarcity of longitudinal studies on this subject, since studies have been primarily cross-sectional. Some researchers have acknowledged the importance of duration of shift work when examining the impact of shift work on mental health disorders (22) and therefore the absence of duration measures has been a limitation of many studies. Our study was longitudinal, used duration

information and was not performed on particular segments of population, thus it has extended results of the negative impact of shift work on mental health to the general working population.

Shift workers represent self-selected populations, and therefore, their characteristics in terms of their mental health status and socio-demographic status may be different compared to day workers. For example, baseline mental health was a very important confounder when studying the impact of shift work on mental health, being one of the strongest predictors of shift workers' mental health and anxiety/ depression in 2005 in both genders. We adjusted for this effect, by including baseline mental health and baseline anxiety/ depression in the analyses. Due to the importance of work environment, we used years working in different occupation categories as a proxy to reduce confounding of our results by other work-related factors. The negative impact of shift work on mental health did not change, after adjusting for occupation categories. It is notable, that our findings contradicted Parkes' results (18) of altering the association between mental health and shift work, after controlling for occupation categories. However, her analysis was on a limited sample, thus her findings cannot be extrapolated to the general working population.

Analyses of secondary data have many advantages, but also some limitations. We lacked more detailed information on work environment factors, for example, which were suspected to cause some diseases and were also associated with shift work (39). Moreover, detailed information on shift work was also lacking. Firstly, the number of consecutive nights undertaken in night work, which has an impact on circadian adjustment (40) was not available, but it would have been useful for a deeper analysis. Secondly, we did not have data on shift schedule; therefore we were not able to consider rotating shift work in this study. Instead, we focused on varied shifts, where there is no usual pattern, which is assumed to lead to (more) difficulties in adaptation of circadian rhythms and therefore health consequences. Additionally, the scarcity of longitudinal studies and/ or shift work research on both men and women challenged our attempt to hypothesize about the reasons for gender differences in the impact of shift work on mental health. Our study was therefore, more exploratory than explanatory, bridging some gaps in the field.

It is essential to examine gender differences and control for self-selection effects when studying the impact of shift work on mental health. More information on the extent of the dose-response effect and the impact mechanism of shift work on mental health is needed from longitudinal research. Our results based on longitudinal data showed that for men working nights and for women working varied shifts for 4 or more years adversely affected mental health.

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Table 1. Socio-demographic characteristics of the respondents

Variables	Men		Women	
	%	N=	%	N=
Age in 2005				
21-25	9.4	417	8.5	436
26-34	21.3	948	21.8	1113
35-44	26.3	1172	26.8	1371
45-54	21.3	951	21.8	1111
55-64	16.1	718	16.6	849
65-73	5.7	253	4.4	227
Marital status in 2005	.	.	.	.
Married/ Living as couple	75.3	3422	72.3	3770
Widowed/ Divorced/ Separated	6.3	287	12.7	662
Never married	18.4	838	15.0	781
Highest educational qualification	.	.	.	.
Degree or higher	19.8	816	19.8	959
Professional	36.3	1496	32.6	1574
GCSE A Levels	12.8	527	12.0	580
GCSE O Levels	15.0	617	17.2	832
Lower qualifications	6.0	247	6.8	328
No qualifications	10.2	419	11.6	559
No of years in professional occupations	.	.	.	.
0 years	83.7	387	93.1	4857
1-3 years	10.5	477	5.2	270
4-6 years	3.6	163	0.8	43
7-11 years	2.2	102	0.9	46
No of years in managerial & technical occupations	.	.	.	.
0 years	50.8	2310	50.2	2620
1-3 years	23.3	1058	24.3	1268
4-6 years	13.0	591	14.1	736
7-11 years	13.0	590	11.3	592
No of years in skilled non-manual occupations	.	.	.	.
0 years	71.3	3245	48.2	2513
1-3 years	19.9	905	24.7	1290
4-6 years	5.6	254	15.6	815
7-11 years	3.2	145	11.5	598
No of years in skilled manual occupations	.	.	.	.
0 years	52.9	2406	81.3	4238
1-3 years	24.0	1092	13.9	723
4-6 years	12.4	562	3.3	174
7-11 years	10.7	489	1.6	81
No of years in partly skilled occupations	.	.	.	.
0 years	68.3	3106	67.7	3529
1-3 years	22.5	1023	22.7	1184
4-6 years	6.3	288	6.9	358
7-11 years	2.9	132	2.8	145

No of years in unskilled occupations	.	.	.	.
0 years	89.6	4077	89.5	4670
1-3 years	8.5	385	7.8	407
4-6 years	1.5	66	1.6	86
7-11 years	0.5	21	1.0	74
No. of waves working in nightshifts	.	.	.	.
0 years	94.8	4314	95.5	4983
1 year	2.7	123	2.1	108
2-3 years	1.5	68	1.5	77
4-10 years	1.0	44	0.9	48
No. of waves working varied shifts	.	.	.	.
0 years	90.3	4106	89.8	4685
1 year	6.8	311	7.1	372
2-3 years	2.4	108	2.7	143
4-10 years	0.5	24	0.3	16
GHQ-caseness at baseline	.	.	.	.
Not GHQ case	86.0	3834	77.5	4014
GHQ case	14.0	623	22.5	1168
Anxiety/ depression at baseline	.	.	.	.
Not mentioned	97.1	4415	93.5	4875
Anxiety, depression, etc	2.8	128	6.3	331
GHQ-caseness in 2005	.	.	.	.
Not GHQ case	76.9	3498	71.9	3748
GHQ case	13.5	614	20.1	1048
Anxiety/ depression in 2005	.	.	.	.
Not mentioned	92.3	4197	86.6	4519
Anxiety, depression, etc	3.7	168	8.3	432

Source: *British Household Panel Survey* (waves 1995-2005)

Authors contributions to the study

Ana-Claudia Bara performed the literature review, performed the statistical analyses and drafted the manuscript.

Sara Arber was responsible for the overall project. She reviewed all drafts of the manuscript and provided conceptual and analytic advice.