

Absenteeism of shift and day workers

A study of six types of shift system in 29 organizations

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Taylor, P. J., Pocock, S. J., and Sergeant, R. (1972). *Brit. J. industr. Med.*, **29**, 208-213. **Absenteeism of shift and day workers.** Previous evidence on the effects of shift work upon absence behaviour is conflicting, this being due in part to the variety of shift systems in use. A study is described in which absence records over two years were obtained for 965 matched pairs of shift and day workers from 29 organizations. Six types of shift system were involved, providing comprehensive coverage of shift work in the United Kingdom. Matching was achieved for sex, age, workplace, and occupation. Absence records included certified sickness, short sickness, and non-medical absence.

The overall results showed that shift workers had less absence of all three types than their colleagues on day work, this difference being most marked in the numbers of men having several episodes. No significant differences were found in the diagnostic pattern of certified absence. Comparisons between day work and each of the six types of shift work did not provide any definite conclusions as to their relative merits as far as absence is concerned. The results from the different organizations were not wholly consistent, but a substantial majority followed the general trend.

Despite the substantial increase in shift work in industrialized countries, there is still considerable resistance by some workers to its introduction (Bruusgaard, 1969; National Board for Prices and Incomes, 1970a). Although the reasons for this are usually social rather than medical, there is still a widespread belief that shift work can cause ill health.

While a recent study has failed to show any abnormal pattern of mortality among shift workers (Taylor and Pocock, 1972), the findings from the much larger number of sickness absence studies have been less consistent. Those who work on rotating three-shift systems in continuous process industry, for example, have been shown to have less sickness and other absence than day workers in the same firms (Thiis-Evensen, 1958; Aanonsen, 1964; Taylor, 1967a), but a study in three factories in Germany found such shift workers' rates to be higher (Brandt,

1969). A recent comparison between day and night workers by Walker and de la Mare (1971) showed higher sickness absence rates among night workers in two out of the three firms studied.

Generalizations about shift work are bedevilled by the wide variety of systems covered by this term. These include 'round the clock' working with three or four crews, alternate day and night work, permanent nights, and double day shifts. Each poses a different problem of adaptation for the worker and his family. If shift work has any effect on absence it would seem possible that this might vary with the type of system involved. Furthermore, it is now well recognized that social and personal factors can be as important as more strictly medical factors in the inception and duration of sickness absence (Society of Occupational Medicine, 1968).

The present investigation was designed to com-

pare absence from work of men on different types of shift systems with that of men on day work in a number of different industries.

Methods

Studies on absenteeism, recently reviewed by Froggatt (1970), have made it clear that variables such as sex, age, and occupational status must be allowed for before the effects of other factors such as shift work can be evaluated. To achieve this object each shift worker in our sample was matched with a day worker in the same organization who was of the same age and in the same occupation.

Selection of organizations

We approached 85 organizations, either through the occupational physician or by introduction from the Confederation of British Industry. Although almost all were willing to help, for many it proved impossible, either because comprehensive records of absence were not available or because day and shift workers were employed on different types of work. We were able, however, to select 965 pairs of men from 29 organizations satisfying the criteria set out below. Although we had hoped to gather information about matched pairs of women, so few were identified that the investigation was restricted to men.

The participating organizations were drawn from manufacturing industry (including light and heavy engineering and the manufacture of metal, chemicals, vehicles, and food) and also from service industry including public utilities and transport undertakings. The men involved were all manual ('blue collar') employees drawn from skilled, semi- and unskilled occupations in the production, service, and maintenance functions. The largest occupational group consisted of maintenance craftsmen.

Selection of matched pairs

Each organization was visited by one of us to set up the method of selection. The pairs were identified according to the following criteria:

- (a) employed as a manual worker in the same organization and on the same site since before 1967;
- (b) doing identical or similar work, the latter being defined as having the same code number in the Registrar General's 'Classification of Occupations 1966';
- (c) continuously employed without change of job or working hours for the two study years 1968 and 1969;
- (d) each member of the pair being born in the same year or, failing this, within the same year of birth group, e.g., 1905-9, 1910-14, . . . 1945-9;
- (e) the survey excluded any man known to have been transferred at any time during his employment from one system of working hours to another on medical grounds.

For each organization the process of matching was based on complete lists of day and shift workers in the same occupation. Where more than one shift worker could be matched with a day worker (and vice versa) random sampling was used.

Absence data For each man, information was collected about every absence in the two years 1968 and 1969 which lasted for a whole shift or more. Absences were divided into three groups:

(a) *Medically certified absence* lasting more than three days. Information was obtained for 965 pairs of men. We also asked for the final diagnosis, wherever possible, but because three organizations had not recorded this, we were able to obtain diagnoses for only 774 pairs.

(b) *Short spells of sickness absence* lasting up to three days. This information was available for 812 pairs of men for such absences were not recorded in some organizations and others did not distinguish between this and other short absence.

(c) *Other absence*, defined as lasting for one shift or more for reasons other than incapacity. Some organizations did not keep records of this and thus data were available for 643 pairs only.

For each absence we required the date of onset and its duration in days. The majority of organizations calculated this in working days, but seven recorded calendar days. For the latter, the duration of certified sickness absence of over three days was adjusted to working days by a correction factor of 5/7ths. This was inapplicable for uncertified and other absences as the majority lasted only one day.

Types of shift work While there were many variations between organizations in the way in which working hours were arranged, it was possible to identify six main types of shift work in addition to regular day work:

(a) *Three-shift discontinuous* A five-day working week from Monday to Friday, the 24-hour cover being provided by three crews. Shift changeover times around 06.00, 14.00, and 22.00 hours. There were 202 men on this system from seven organizations.

(b) *Three-shift continuous (traditional)* Operated on a seven-day basis by four crews. These usually work for seven days on each of the three shifts in turn. There were 281 men on this system from 11 organizations.

(c) *Three-shift continuous (rapidly rotating)* Similar to the previous type but shift changes occur every two or three days. There were 150 men on this system from four organizations.

(d) *Permanent nights* Regular employment at night for between 8 and 12 hours, from four to seven nights being worked between days off. There were 122 men on this arrangement in nine organizations.

(e) *Alternate day and night* Two shifts in a 24-hour period, one of which is worked at night. Five organizations contributed 118 men on this system. In two of them eight-hour shifts were worked over a five-day week. The other three covered a seven-day week with alternation between day and night shift at less than weekly intervals.

(f) *Double days* Two eight-hour shifts which usually start at 06.00 and 14.00 hours, alternation between shifts taking place at weekly intervals. There were 92 men on this system from seven organizations. In six a five-day week was worked, but in one, three crews provided seven-day cover.

Results

Analysis of the absence data has been made in three ways. First, an overall comparison has been made between the total samples of shift and day workers; secondly, the six different types of shift system have been compared with day work, and

finally the results in individual organizations have been studied.

All shift workers

The mean rates of all three types of absence were lower among the shift workers in our sample (Table 1), and this difference was found both in frequency (spells) and in severity (days). The usual statistical tests cannot be applied to absence rates because their distribution in a population is invariably highly skewed (Taylor, 1967b; Froggatt, 1970). For this reason we have set out the percentages of men having 1 or more episodes of absence of each category (Table 2).

Certified absence The annual frequency rate experienced by the day workers was 15% higher than that of their shift colleagues, while for severity their rate was 27% higher. Although a slightly greater proportion of shift workers had no spells of certified absence in the two years, this did not significantly exceed that of day workers. However, the difference between the proportions of workers

having two or more spells was significant ($P < 0.05$). A study of the distribution of total days lost in the two groups (Table 3) showed that the most marked difference was in the numbers of men having six months or more in the two years. In this category there were 30 day workers as compared with only 10 shift workers ($P < 0.01$).

Short sickness In this type of absence the day workers incurred 20% more spells than shift workers. As the episodes were short with an average length of 1.5 days, the difference in time lost was very similar. A comparison of the distribution of spells of these absences for shift and day workers showed that the percentage of day workers with two or more spells was significantly greater than that of shift workers (62.0% versus 56.8%; $P < 0.05$), and for three or more spells the difference was highly significant (49.7% versus 42.3%; $P < 0.01$).

Other absence The results for other absences show an even greater difference. Day workers had 28% more spells than shift workers. In the frequency

TABLE 1
MEAN ANNUAL RATES OF ABSENCE IN MATCHED PAIRS OF DAY AND SHIFT WORKERS FOR 1968 AND 1969

	Certified sickness		Short sickness		Other absence	
	Day	Shift	Day	Shift	Day	Shift
No. of men	965	965	812	812	643	643
Spells/man year .. .	0.77	0.67	1.70	1.41	0.68	0.53
Days/man year .. .	12.13	9.54	2.53	2.11	0.93	0.71
Average length of spell .. .	15.8	14.2	1.5	1.5	1.4	1.3

TABLE 2
SPELLS OF ABSENCE:
PERCENTAGES OF DAY AND SHIFT WORKERS WITH ONE OR MORE, TWO OR MORE, ETC. SPELLS OF ABSENCE IN THE TWO YEARS 1968 AND 1969

No. of spells	Certified sickness		Short sickness		Other absence	
	Day	Shift	Day	Shift	Day	Shift
1 or more	67.3	64.2	75.1	71.6	49.7	45.1
2 ,, ,, .. .	39.9 ¹	34.8	62.0 ¹	56.8	27.0	24.3
3 ,, ,, .. .	22.7 ¹	18.8	49.7 ²	42.3	17.4 ¹	12.8
6 ,, ,, .. .	2.9	2.1	22.0 ¹	17.4	5.1 ²	2.2
10 ,, ,, .. .	0.3	—	6.5	4.2	2.0	0.8
20 ,, ,, .. .	—	—	0.4	—	0.3	0.2
No. of men	965	965	812	812	643	643
No. of spells .. .	1 492	1 290	2 759	2 285	871	677

Difference in percentages significant at 5% (¹) and 1% (²)

TABLE 3
DAYS OF CERTIFIED ABSENCE:
PERCENTAGES OF DAY AND SHIFT WORKERS HAVING
1 OR MORE, 10 OR MORE, ETC. WORKING DAYS OF
CERTIFIED ABSENCE IN THE TWO YEARS 1968 AND
1969

<i>No. of days</i>	<i>Day</i>	<i>Shift</i>
1 or more	67.2	64.1
10 ,, ,,	51.8	47.6
20 ,, ,,	34.7	31.6
40 ,, ,,	18.4	16.1
64 ,, ,,	9.7 ¹	7.0
130 ,, ,,	3.1 ²	1.0
Total no. of men	965	965

Difference in percentages significant at 5% (¹) and 1% (²)

distribution the excess of day workers was significant at the 5% level for three or more spells and at the 1% level for six or more spells.

Diagnoses of certified sickness The final diagnosis of each absence was available for 774 pairs of men, and this was coded using the International Classification of Diseases (1955). For analysis we looked at eight diagnostic groups and compared both the number of men having one or more spells in each group as well as the total number of spells themselves (Table 4). In no diagnostic group was there a significant difference between the experience of day and shift workers, nor was any significant difference found when we looked at men with two or more spells with the same diagnosis. It therefore appears that the generally higher rates of certified sickness absence among day workers cannot be attributed

to any particular type of illness. However, two diagnoses are worth specific mention because they are popularly believed to be associated with 'stress'. Cardiovascular diseases (except varicose veins and haemorrhoids) had the largest proportional excess of absence among day workers, which would refute any suggestion that shift work might lead to a higher incidence of such disease. Peptic ulceration, on the other hand, was the only diagnostic group with more spells of absence among shift workers, and although the difference was slight, it is in the opposite direction to the general trend. On this evidence, the suggestion that shift work may be associated with this condition cannot be completely rejected.

Comparisons for different types of shift work

The tendency for organizations to opt for one particular type of system, and the difficulty of finding enough matched pairs because of occupational differences, meant that it was not possible to compare absence rates of men on different types of shift work in the same organization. The only possible approach was to compare the absence rates obtained for each of the six groups of different types of shift system and their respective matched groups of day workers. This means that we were not able to compare absence directly between shift systems, but only with day work. The results are presented in the form of a ratio of the shift to day rate for each type of shift work (Table 5).

Certified absence For all types of shift system except alternate day and night, the shift workers had less absence than day workers, both in terms of frequency and severity. The difference was most marked for men on double days who had only half as many days of absence as day workers.

TABLE 4
MAIN CAUSES OF CERTIFIED SICKNESS ABSENCE: SPELLS LASTING 4 OR MORE DAYS IN 774 MATCHED PAIRS
OF DAY AND SHIFT WORKERS, 1968 AND 1969

<i>Diagnostic group</i>	<i>No. of men</i>		<i>No. of spells</i>	
	<i>Day</i>	<i>Shift</i>	<i>Day</i>	<i>Shift</i>
Upper respiratory infection	290	271	423	368
Injuries	127	118	144	134
Musculoskeletal	98	85	130	104
Digestive	90	87	125	105
Bronchitis	83	68	128	90
Mental and psychoneurotic	22	18	23	20
Cardiovascular	18	12	29	15
Peptic ulcer	11	13	14	16
All causes	525	497	1 229	1 030

TABLE 5
THE SIX TYPES OF SHIFT SYSTEM:
RATIOS OF SHIFT WORKER ABSENCE RATES TO DAY WORKER ABSENCE RATES FOR SPELLS AND DAYS
OF CERTIFIED SICKNESS AND SPELLS OF SHORT SICKNESS AND OTHER ABSENCE

Shift system	Spells certified sickness		Days certified		Spells short sickness		Spells other absence	
	Ratio	No. of pairs	Ratio	No. of pairs	Ratio	No. of pairs	Ratio	No. of pairs
3-Shift discontinuous	0.92	202	0.86	202	0.99	92	0.64	92
3-Shift continuous (traditional)	0.87	281	0.77	281	0.96	267	0.53	241
3-Shift continuous (rapid rotation)	0.85	150	0.78	150	0.61	150	0.91	150
Permanent nights	0.86	122	0.79	122	0.77	105	1.11	51
Alternate day and night	1.08	118	1.05	118	0.72	106	0.80	59
Double days	0.56	92	0.52	92	0.78	92	0.72	50

Short sickness In every type of shift rota there were fewer spells of this type of absence. This was most marked among men on the rapidly rotating three-shift continuous system who experienced only 61% of the spells of their colleagues on day work.

Other absence In this category the only exception to the general trend was found among men on permanent nights. The lowest rate was found among men on the traditional three-shift continuous rota who had only 53% of the episodes experienced by day workers.

Experience in different organizations

It remained to determine the consistency of the general pattern established between the different organizations providing the data. A few of them had been able to identify only a small number of matched pairs, and to reduce bias from very small numbers we have restricted the comparisons to those matched groups of shift and day workers from individual organizations which consisted of more than 10 pairs.

For certified sickness absence there were 27 such matched groups available and in 17 of these (63%) the day workers had more spells than shift workers. For severity of sickness the difference was slightly more marked with 19 (70%) of the shift groups having less time away from work. However, two comparisons showed considerably more episodes of certified absence among shift workers although both involved less than 20 pairs of men.

For short sickness, out of 22 matched groups, 15 (68%) had fewer spells among shift workers while for other absence, 15 out of the 18 matched groups available (83%) showed fewer episodes among shift workers.

It is relevant here to note that there was no evidence of any one type of industry having more or less absence among shift workers. Thus engineering,

chemicals, and food factories, for example, were found going both with and against the general trend. Nor could any difference in absence patterns be associated with company sick pay arrangements, every organization taking part having some such scheme. Thus schemes in which shift allowance was included in sick pay were found in groups of shift workers with more and with less absence than day workers. However, further work is currently in progress to see if exceptions to the general pattern of lower absence among shift workers are associated with any aspect of the working situation in such organizations.

Discussion

Before attempting to draw any conclusions from the results of this investigation, it is necessary to consider those sources of bias that may have influenced the findings and also may affect any interpretation.

The sample of workers included in our survey is not representative of the working population of this country since our requirements for information meant that only larger organizations having good personnel and medical records would be likely to be able to assist. Furthermore, as Reid (1957) has argued, all industrial populations are 'survivor populations' with both the company and the man himself exercising some degree of choice as to whether he stays in a particular industrial environment. Some men are liable to opt out of shift work for health or social reasons and this cannot be detected in this or any other study of current shift workers. However, the exclusion from our sample of men known to have been transferred from shift to day work on medical grounds should reduce any resultant chronic ill health among day workers. An additional element of self selection operates in the original decision whether to become a shift worker

or not, and it may be argued that only men who consider themselves in good health decided to take up this way of life.

Another important reservation is that 'sickness absence' is not synonymous with 'morbidity'. There is now ample evidence to show that some men who indulge in frequent episodes of certified sickness are not necessarily less physically healthy than their colleagues (Lokander, 1962; Taylor, 1968a; Raffle, 1970). The converse also applies, for it is certainly not valid to argue that no sickness absence at all is an indication of good physical health (Taylor, 1968b). Indeed, it would seem better to consider sickness absence as one type of withdrawal from work to be looked at in conjunction with other forms of absence (Hill and Trist, 1962).

This investigation has shown that, for the sample of men about which we obtained information, there was a general tendency for shift workers to have less absence than day workers. The evidence also shows that this difference was most marked in the numbers of men having several episodes in the two-year period rather than in the numbers with complete freedom from absence. The fact that this difference was just as marked for 'other absence' suggests that the phenomenon is more likely to be behavioural than medical.

Our own study, we believe, is the first to use a matched pair technique to look at several types of shift rota in different organizations at the same time. The findings are not so dramatic as those reported from an oil refinery where the shift workers had only about half as much absence as day workers, a study in which short and long sickness absences were combined (Taylor, 1967a). Nevertheless the differences described in the present survey follow the same general pattern.

In contrast to these findings, a recent report drawn from a representative sample of all employees in Great Britain suggested that shift workers had slightly more absence than day workers (National Board for Prices and Incomes, 1970b). The information upon which this conclusion was based, however, only measured period prevalence of absentees who lost some pay over one week, and although allowance was made for sex and broad age groups, none was made for occupation. Because it is clear from the report that the day workers included a significantly greater proportion of foremen and skilled workers, and because another analysis from the same survey has shown that absence rates of all types fall with increasing level of skill (Department of Employment and Productivity, 1969) it seems likely that the slightly higher absence rate among shift workers was due to lack of balance in the occupational status of the two groups.

The difference observed between different types of shift system were not substantial enough to allow

firm conclusions to be drawn about their relative advantages in terms of absenteeism. Nevertheless it seems reasonable to conclude that this investigation has found no evidence to suggest that any of the shift systems we have studied adversely affects health.

We gratefully acknowledge the help provided by the 29 organizations and in particular by the staff of their medical and personnel departments. We should also like to thank Mrs. D. Bennett and other members of this Institute.

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Received for publication June 29, 1971.