

## Shift and Day Work

### A Comparison of Sickness Absence, Lateness, and other Absence Behaviour at an Oil Refinery from 1962 to 1965

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Despite the increasing use of continuous process shift work in modern industry, few studies on the medical aspects of shift work can be found in recent literature of occupational health. Physiologists have shown that the ability of the body to adjust its circadian rhythms to alteration in hours of work or sleep can take up to a month. The usual type of shift work in industry involves weekly changes of hours, and thus on theoretical grounds at least this may not be the most suitable frequency for shift changes.

Sickness absence of male refinery workers has been studied over a four-year period. The figures show that continuous three-cycle shift workers have consistently and significantly lower rates of sickness than day workers in similar occupations. The annual inception rate (spells) standardized for age was 108% for shift workers and 182% for day workers, and the average annual duration per man was 11 days for shift workers and 18 days for day workers, although the average length of spell was slightly longer among shift workers. As far as is known, such a difference has not been described before in detail.

Age-related lateness and absenteeism have been measured and show similar wide differences between the two groups.

Although both types of worker are largely self-selected, the difference is not due to medical selection or to an excess of any one type of disease in day workers. Over three-quarters of 150 shift workers interviewed stated that they preferred shift work hours and that sleeping difficulties were not common.

It is suggested that the main reasons for the difference between shift and day workers' sickness absence lie in the degree of personal involvement in the work and in the social structure of the working group.

Full shift work, which involves a recurrent cycle of day and night work, is unattractive to many people and it is sometimes alleged that such irregular hours can have an adverse effect on health. Despite this, it is remarkable how little work on this problem has been reported in the literature on occupational health. Although the 'watch' system has been general practice at sea for centuries, it is only in more recent times that shift work has become common in industry.

In the past few decades the rapid growth of capital-intensive industries, where plant must be operated continuously for economic reasons, has caused a great increase in the amount of shift work. A recent survey into the extent of shift working in this country (Ministry of Labour, 1965) showed that the number of manual workers employed on shift had risen by over 50% in the past 10 years. The proportion of shift workers in manufacturing

industries has risen from 12% to 20% of all manual workers, the greatest rise having occurred in vehicle manufacturing.

Research is frequently stimulated by economic necessity, and the Health of Munition Workers Committee, which was responsible for the first important study of shift work (Vernon, 1918), is a good illustration of this. It was demonstrated that there was little difference in production by day and night workers as long as night work was discontinuous, but continuous night work was associated with lower production. That errors occur most frequently in the early hours of the morning has been shown for telephonists (Browne, 1949) and gas works operators (Bjerner, Holm and Svensson, 1955).

In a study of output, absence, accidents, and attitudes of shift workers when on day and night shift, Wyatt and Marriott (1953) confirmed and extended the findings of Vernon (1918). They showed that output was slightly higher on day than

on night shift by about two-thirds of the men, but that some groups of men worked even better on the night shift. Absence rates of individuals showed little difference when they were on day or night shift, but when shifts lasted for more than a week the absence rates showed a rise in the second and subsequent weeks on night shift. No comparison was made between day and shift workers as such.

The physiological problems involved in the changing rhythms of shift work have been studied in recent years. Teleky (1943) showed that evidence on body temperature rhythms suggested that monthly changes were more suitable than weekly changes. A recent review article (Medical Research Council, 1965) shows that most biological and biochemical rhythms take an appreciable time to adjust and that in shift cycles, where the hours of work change from week to week 'there appears to be insufficient time for physiological adaptation'.

Despite this suggestion that weekly changes of hours may be unsuitable, there has been only one report in recent literature which has been primarily concerned with a comparison of morbidity between shift and day workers (Aanonsen, 1964). This monograph presents sickness absence rates over the years 1948-53 for 372 shift workers, 339 day workers, and 350 men who had transferred from shift to day work. The rates showed that shift workers had less illness than day workers but this, the author concluded, was because shift workers represent a highly selected group. Nevertheless there was a slight excess of gastrointestinal and neurotic disorders among shift workers although cardiovascular disorders, musculo-skeletal disorders, and injuries were more common in day workers. Unfortunately, no statistical evaluation was made.

This paper describes the considerable differences that have been observed over a period of four years in sickness, lateness, and other absence behaviour between day and shift workers in an oil refinery.

### **Hours of Work, Wages and Overtime**

Continuous process operation is always found in a refinery and thus shift work has been the lot of almost half the male hourly paid workers for many years. The five-day week was introduced at this refinery for day workers in 1957 and the working week was reduced from 42 to 40 hours in 1962.

Shift work is arranged in the weekly three-cycle system (6 a.m. to 2 p.m., 2 p.m. to 10 p.m., and 10 p.m. to 6 a.m.) with three days off after each morning and night shift to result in an average of 40 hours per week over a four-week cycle by adding a single 'balance day' off.

As an incentive—and to compensate for the irregular hours of work—the basic effective pay of shift workers is about 30% higher than that of day workers at an equivalent grade. Shift workers also have longer annual holidays by taking two weeks holiday during the afternoon and night shifts which, together with the days off before and after, results in their being away for three weeks.

Overtime can be worked by all men. Shift workers are obliged to remain at their posts, if their relief does not arrive, for a minimum period of four hours and, in groups where a spare relief man is not available, the absence of one man is covered by two men working for 12 hours each. Day workers' overtime is usually worked for two to three hours at the end of the working day or at week-ends. The amount of overtime worked by any one man can vary considerably for some men do little or none and others do as much as they can. In the years surveyed, the day workers, with about six hours a week, had a higher average overtime than shift workers, who had an average of about four hours.

### **Selection of Shift Workers**

Although men are sometimes nominated to do shift work, in practice the great majority select themselves. All employees have a full pre-employment medical examination but this has not been used to guide men into shift or day work for many years. The permanent transfer of men from shift to day work on medical grounds has been extremely rare, and only three men were permanently moved for this reason in the four years under review. Temporary transfer for a few convalescents returning to work can be arranged, but these men remain on the books as shift workers.

### **Numbers and Occupations of Shift and Day Workers**

As in most industrial organizations, the work force can be divided into three groups—production, maintenance, and service departments. At the refinery, shift work is undertaken by a little less than half the male hourly paid workers but these are found mostly in the production departments. The numbers in each group at the end of 1964 are shown in Table I. Similar distributions can be demonstrated for each of the four years.

Over two-thirds of all shift workers are found in production departments and similar proportions of day workers in the maintenance departments. In general, the type of labour involved in production departments is lighter than that in maintenance.

TABLE I

DISTRIBUTION OF MEN BY FUNCTIONAL GROUPS AND DAY/SHIFT EMPLOYMENT ON DECEMBER 31, 1964

Function	Day	Shift	Total
Production	107	461	568
Maintenance	503	63	566
Services	107	142	249
Total	717	666	1,383

Much of the working time of shift production operators is spent in observation of the plant and control instruments, with occasional adjustment of valves or pumps, and may be described as light manual work. Maintenance workers on day or shift do medium or sometimes heavy manual work whilst workers in service departments usually undertake light manual labour.

Although the majority of shift workers do not do the same work as day workers there is a smaller number of men in certain maintenance and service jobs who do the same work on both shift and day. These include engineering craftsmen, such as fitters, electricians, instrument mechanics, and mates, together with service workers, such as storage tank workers, patrolmen, laboratory workers, and vehicle drivers. The relative proportions of skilled, semi-skilled and unskilled men in these day and shift groups are similar. The number of man years in the four-year period under review is shown in Table II.

TABLE II

MAN YEARS AT RISK IN DAY/SHIFT WORKERS WITH SIMILAR OCCUPATIONS 1962-65

Function	Day	Shift	Total
Maintenance workers	965	280	1,245
Service workers	301	361	662
Total	1,266	641	1,907

### Sick Pay and Sickness Absence Recording

The company operates an ex-gratia sick-pay scheme which is related to length of service. It provides for payment of full normal wages except overtime for all medically certified incapacity from the first day, after deduction of any sickness or industrial injury benefit to which the employee is entitled under the National Insurance Acts. There is no difference in these arrangements between

shift and day workers. The sick pay is given at full rate for three weeks followed by two weeks at half pay after six months' service, increasing to 27 weeks at full pay followed by 24 weeks at half pay for employees with 15 years' service.

Since the introduction of this sick-pay scheme in 1946 a full record of all absences attributed to illness or injury has been kept for all employees. These include short absences of a day or two which are included in the sick-pay scheme. A medical certificate was required for all such absences to qualify for sick pay but this requirement was abolished for one- to three-day absences in June 1965. The regulations have always been the same for day and shift workers, and the data presented below refer to all sickness absences of one day or more. The medical department records have always counted calendar days of absence since this is the only method by which shift and day workers in one community can be compared with ease.

### Age Structure of Populations

Sickness rates, as is well known, are affected markedly by age. At this refinery, for example, men aged 20-29 have twice as many spells of absence as men aged 50-59, but the average length of spell is only half as long.

The age structures of the day and shift work forces during the period under review showed some difference with more young day workers. Men retire at the age of 60 and few except trainees, apprentices, and office boys are engaged younger than 18. The age distributions for each group are shown for all male hourly paid workers in the middle of the period in Table III.

For the men in similar jobs on day and shift work already referred to, the age distribution is shown in Table IV. None of these men was under 20 years old.

TABLE III

NUMBERS AND PROPORTIONS OF DAY AND SHIFT WORKERS IN DECENNIAL AGE GROUPS ON DECEMBER 31, 1964

Age Group	Day Workers		Shift Workers		All Men	
	No.	%	No.	%	No.	%
<19	48	6.7	0	0	48	3.5
20-29	151	21.0	101	15.2	252	18.2
30-39	190	26.5	196	29.5	386	27.8
40-49	210	29.3	211	31.6	421	30.4
50-59	118	16.5	158	23.7	276	19.9
All ages	717	100	666	100	1,383	100

TABLE IV  
MAN YEARS AT RISK AND PROPORTIONS IN DECENNIAL AGE  
GROUPS FOR DAY AND SHIFT WORKERS WITH SIMILAR  
OCCUPATIONS, 1962-65

Age Group	Day Workers		Shift Workers		All Men	
	Man Years	%	Man Years	%	Man Years	%
20-29	358	28.3	111	17.3	469	24.6
30-39	430	34.0	197	30.7	627	32.9
40-49	314	24.8	176	27.5	490	25.7
50-59	164	12.9	157	24.5	321	16.8
All ages	1,266	100	641	100	1,907	100

Both these tables show differences in age pattern which, although not great, suggest that age standardization is necessary in order to compare sickness rates.

#### Sickness Absence Among All Day and Shift Workers

There are a number of ways in which sickness absence can be measured. In the literature on occupational medicine, the three methods most frequently used are: (1) annual inception rate (spells), being the number of spells of sickness in the population expressed as a percentage; (2) the average length of spell in days; and (3) the average annual duration per person at risk in days.

Two other measures are also used, the first by the Ministry of Pensions and National Insurance, the second by personnel departments:

(1) annual inception rate (persons), being the number of individuals in the population having one or more spells of sickness expressed as a percentage. This rate can be for all absences or for those of four days or more.

(2) The percentage time lost, being the number of

working hours lost, expressed as a percentage of the total potential working hours. This is a very accurate measure of actual time since it includes all absences due to sickness of a quarter of an hour or more (*i.e.*, men sent home by the medical department during the day) and does not include holidays or days off.

The considerable difference in sickness experience between day and shift workers is shown in Table V, which presents the crude rates for each of the four years. The number of men employed throughout each year is included.

The only measure in which shift workers exceed day workers is the average length of spell; nevertheless the considerable excess of spells among day workers results in their average annual duration being consistently higher.

Before drawing definite conclusions the effect of age structure should be taken into account. This has been done by calculating rates standardized for age for the last two years of the period. This was done by applying the five-yearly age-specific rates for the populations of day and shift workers to the total populations of both groups combined. These standardized rates are presented in Table VI.

These show that the observed differences are not due to the difference in age structure of the two groups of men. As already mentioned, however, the majority of shift workers are employed in the production or operating departments and day workers are mostly in maintenance engineering work. It would, therefore, be better to compare rates standardized for age in groups of men with similar occupations. Since the number of men in any one year who can be included for this purpose is relatively small (about 500, of whom 150 are on shift), the figures for all four years have been combined and are presented in Table VII.

This table demonstrates that the considerable difference in sickness absence experience between day and shift workers is consistent in each age group for workers in similar occupations. The difference

TABLE V  
CRUDE SICKNESS RATES FOR ALL DAY AND SHIFT WORKERS AT RISK THROUGHOUT EACH YEAR, 1962-1965

Rate	1962		1963		1964		1965	
	Day	Shift	Day	Shift	Day	Shift	Day	Shift
Men at risk all year	998	721	1,001	717	730	620	675	626
Inception rate (spells) (%)	183	92	190	83	164	73	195	88
Average length of spell (days)	8.7	12.2	8.8	13.8	9.8	12.6	8.3	9.7
Average annual duration per man	16.0	11.2	16.7	11.4	16.1	9.2	16.3	8.7
Inception rate (persons) (%)	71.2	53.8	74.7	53.2	72.3	47.0	77.6	51.2
„ (absences 4+ days) (%)	62.7	44.0	67.2	43.7	63.4	39.7	59.7	39.5
Percentage lost time	4.8	3.6	5.3	3.5	4.7	3.0	4.5	2.5

TABLE VI

SICKNESS ABSENCE RATES FOR THE YEARS 1964 AND 1965, ALL DAY AND SHIFT WORKERS, STANDARDIZED FOR AGE, AND RATES FOR ALL MEN FOR EACH YEAR

Rate	1964			1965		
	Day	Shift	All Men	Day	Shift	All Men
Inception rate (spells) (%)	182	78	130	190	113	146
Average length of spell (days)	9.2	12.6	10.1	8.8	7.8	8.7
Average annual duration per man	16.6	9.6	13.2	16.6	8.8	12.7

TABLE VII

OBSERVED SICKNESS ABSENCE RATES FOR FIVE-YEAR AGE GROUPS IN DAY AND SHIFT WORKERS IN SIMILAR OCCUPATIONS FOR THE FOUR-YEAR PERIOD 1962-65 TOGETHER WITH AGE-STANDARDIZED RATES

Age Group	Day Workers				Shift Workers			
	Man yrs. at Risk	Inception Rate Spells (%)	Average Annual Duration per man	Average Length of Spell	Man yrs. at Risk	Inception Rate Spells (%)	Average Annual Duration per man	Average Length of Spell
20-24	142	263.4	20.0	7.6	28	171.0	10.4	6.0
25-29	216	231.0	16.3	7.1	83	127.7	9.6	7.5
30-34	220	211.4	16.0	7.6	103	120.4	13.4	11.1
35-39	210	181.9	14.2	7.8	94	99.0	9.0	9.1
40-44	182	163.7	18.2	11.1	111	83.8	12.1	14.5
45-49	132	150.0	20.0	13.4	65	76.9	11.0	14.3
50-54	82	90.3	19.9	22.0	68	86.8	15.6	17.9
55-59	82	106.1	25.0	23.5	89	85.4	11.1	13.0
All ages	1,266	187.8	17.8	9.5	641	101.2	11.6	11.4
Rates standardized for age	—	181.9	17.9	9.9	—	108.1	11.4	10.6

in inception rates is particularly marked in men under 50 years of age and the difference in days of absence is marked in all age groups. In men over 50, day workers have slightly higher inception rates than shift workers but since their average length of spell is much longer their sicknesses are more incapacitating than those of the older shift workers.

No test of statistical significance has been made because the usual chi-square test assumes a Poisson distribution, and it has been shown (Taylor, 1966) that spells of sickness absence tend to have a negative binomial distribution. However, in all eight groups the inception rate and the average annual duration of sickness per man was higher in day workers than in shift workers, and eight pairs of observations can be expected to give the same hierarchical order only once in 128 times by chance.

The use of inception rate (spells) rather than inception rate (persons) to assess differences in sickness absence can be criticized because some men have more than one spell. In theory, one man

might have a spell each week and thus distort the mean for his age group. In the men reported upon in this section, however, no man had more than six absences in any one year, and thus no individual could have produced such a considerable difference. The majority of day workers had one to three absences each year and the majority of shift workers had none to two.

The inception rate (persons) only measures whether a man was absent or not; it could thus show no difference between two groups in which all the men in one group had one spell while all the men in the other group had two spells. The difference between all shift and day workers in this rate has been shown in Table V.

#### Diagnoses of Sickness Absences

Recent evidence from several centres has shown that the pattern of diseases differs very little between industrial groups even when their sickness absence

TABLE VIII  
DAYS OF WEEK ON WHICH SICKNESS SPELLS STARTED, ALL DAY AND SHIFT WORKER ABSENCES, 1965

Group	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Total
Day % of total	463 33.0	316 22.5	254 18.1	191 13.6	179 12.8	— —	— —	1,403 100
Shift % of total	87 14.9	101 17.3	76 13.0	78 13.3	113 19.3	58 10.0	71 12.2	584 100

rates are markedly different. In any given area, 'local or regional differences in sickness absence rates have practically nothing to do with differences in the physical state of health of the groups of workers concerned' (De Groot, 1965). The diagnostic pattern of sickness in all day and shift workers at the refinery in the two years 1964 and 1965 largely supports this observation.

Although the frequency with which day workers went off sick with any given diagnosis was higher than that for shift workers, the distribution of diseases within the groups was remarkably similar. Thus for the commonest diagnostic classification of Upper Respiratory Diseases and Influenza (International Classification No. 470-481 inclusive) the day workers had an annual spells rate of 67 per 100 men whereas for shift workers the rate was 33 per 100 men; nevertheless this group of diseases accounted for 34.3% of all the day worker spells and 36.6% of all shift worker spells of sickness.

The next most common cause was the diagnostic group including acute gastro-enteritis and diarrhoea, which caused brief absences (average length of spell three days), and this accounted for 21% of day workers' absences and 16% of shift absences; the difference is significant at the 0.05 level. Only one other diagnostic group (bronchitis and pneumonia) showed a significant difference by causing 2.6% of day absences and 4.1% of shift absences.

All the other causes of sickness affected similar proportions in both groups of workers, and this also applied to occupational and non-occupational injuries. Gastritis and peptic ulcers caused 5.4% of day absences and 5.5% of shift absences, this lack of difference confirming the classic report by Doll and Avery Jones (1951). This evidence suggests that the difference in sickness rates is not really due to the types of disease but rather to a higher frequency of absence from all causes among day workers.

#### Days of Week Starting Sickness

Hill (1929) showed that sickness spells most frequently begin on a Monday, and this observation

has been confirmed by other authors (Wyatt, Marriott, and Hughes, 1943; Behrend, 1951; Gordon, Emerson, and Pugh, 1959). No reference has been found to similar studies on shift workers. Shift changes occur at this refinery on Tuesdays (start of morning shift) and Fridays (start of afternoon and night shifts). The day of the week in which sickness spells began was recorded for day and shift workers in 1965 and the number of spells and proportions are shown in Table VIII.

The prominent place of Monday among day workers is clear; the frequency falls steadily throughout the week with Friday as the lowest. Pay day, however, is on Thursday and this has not the lowest level.

Among shift workers, where there could be an equal likelihood of sickness starting on any of the seven days, the highest figures are found on Fridays and Tuesdays. These are the days of shift changes and are the beginning of a working week. The days off taken during the full shift cycle cover every day of the week so there are the same number of men at work every day. Application of the chi-square test, on the null hypothesis of an equal risk of spells commencing for shift workers on each day of the week, shows that the numbers of absences starting on a Friday are significantly higher ( $P < 0.001$ ) and on a Tuesday ( $P < 0.05$ ). Saturday starts of absences are significantly lower than expected ( $P < 0.01$ ).

Similar, but even more marked, preferences for Monday in day workers and Tuesday and Friday in shift workers can be found in the day on which sickness spells end.

#### Lateness and Other Absence

The contrast between day and shift workers has also been observed in the number of latenesses and the number of whole or part day absences from work for reasons other than sickness and holidays.

The clock card system is used by all hourly paid employees at the refinery. The card of each man is marked whenever he 'clocks on' more than two

minutes late and whenever he is away for the whole or part of a day. The reasons for such an episode of absence are also recorded as sickness, holiday, union meetings, or other absences. This latter group includes a miscellaneous collection of reasons which range from a family bereavement or illness of spouse to dental appointments or the wedding of a relative. Absence without leave or for which the excuse is unacceptable even without pay is rare, and the annual number varied between 15 and 40 in the four years studied.

The distribution of latenesses and other absences among the total population for any one year resembles that for sickness, being similar to the negative binomial distribution (Taylor, 1966). In any one year, 30% of the male workers are not late at all, 20% are late once, 10% twice, with a long 'tail' to the occasional man who is late on 40 or so occasions. The distribution of other absences is very similar with 35% having no episodes. The mean number of latenesses per man per year varies between three and four and for other absences between two and three.

Day workers have well over twice as many latenesses and other absences as shift workers; the mean rates for the calendar years 1963 and 1964 are shown in Table IX, the populations being employed throughout each year.

The age-related incidence of lateness and other absence for day and shift workers over one year has been obtained. Since the clock card starts in April it was more convenient to study the year beginning in April 1963. The populations at risk in each group

TABLE IX

MEAN LATENESSES AND OTHER ABSENCES FOR DAY AND SHIFT WORKERS IN 1963 AND 1964

	1963		1964	
	Day	Shift	Day	Shift
Mean latenesses per man	5.6	2.2	4.2	1.9
Never late (%)	22	39	24	38
Mean absences per man	4.3	1.1	3.4	1.2
Never absent (%)	13	53	16	54

are those employed throughout the year. The results for latenesses are presented in Table X and for other absences in Table XI. These show the proportions having no episodes as well as the mean number per man.

It can be seen that there is a very marked inverse relationship between lateness and age among day workers and also to a slightly lesser extent among shift workers. Application of the chi-square test to the numbers of men with no episodes of lateness during the year in the separate age groups shows that a significant difference is found between day and shift workers from the age of 25 to 44 years inclusive ( $P < 0.05$ ) but that in the young and older age groups the differences, although suggestive, are not significant. The differences in mean latenesses per man between the two groups are very considerable in the young but are less so in the older men.

In contrast to latenesses, other absences show no

TABLE X

LATENESS IN DAY AND SHIFT WORKERS FOR THE YEAR FROM APRIL 1963 DIVIDED INTO FIVE-YEAR AGE GROUPS

Age Group	Day Workers				Shift Workers			
	Popn.	% with no Lateness	Total Lates	Mean Lates	Popn.	% with no Lateness	Total Lates	Mean Lates
<19	54	17	239	4.4	6	*	25	*
20-24	142	10	1,513	10.6	57	19	157	2.8
25-29	135	9	1,050	7.8	88	25	269	3.0
30-34	113	13	724	6.4	113	29	314	2.8
35-39	132	21	638	4.8	128	37	250	2.0
40-44	148	28	520	3.5	138	45	240	1.7
45-49	98	32	314	3.2	75	36	88	1.2
50-54	61	44	98	1.6	93	53	112	1.2
55-59	49	51	78	1.6	56	71	39	0.7
All ages	932	22	5,174	5.5	754	39	1,494	2.0

\*Population too small

TABLE XI

OTHER ABSENCES IN DAY AND SHIFT WORKERS FOR THE YEAR FROM APRIL 1963 DIVIDED INTO FIVE-YEAR AGE GROUPS

Age Group	Day Workers				Shift Workers			
	Popn.	% with no Absences	Total Absences	Mean Absences	Popn.	% with no Absences	Total Absences	Mean Absences
<19	54	9	238	4.4	6	*	2	*
20-24	142	5	671	4.7	57	56	64	1.1
25-29	135	8	606	4.5	88	39	164	1.9
30-34	113	13	415	3.7	113	44	147	1.3
35-39	132	14	644	4.9	128	47	161	1.3
40-44	148	15	671	4.5	138	59	112	0.8
45-49	98	12	371	3.8	75	57	76	1.0
50-54	61	20	164	2.7	93	69	54	0.6
55-59	49	37	88	1.8	56	52	60	1.1
All ages	932	13	3,868	4.2	754	53	840	1.1

\*Population too small

firm relationship with age except a reduction in the dayworkers over 50 years old. Application of the chi-square test to the numbers with no absences in the separate age groups shows a highly significant difference ( $P < 0.0005$ ) between day and shift workers for all ages except the 55-59 group. This is very similar to the findings regarding sickness spells (Table VII). The differences in mean absences per man are also great in all age groups except the oldest.

### Studies on Shift Workers

In a survey of factors associated with sickness absence (Taylor, 1966) in 194 male hourly paid employees at the refinery, it was shown that a positive correlation exists between latenesses and sickness spells and between other absences and sickness spells. This study also included an assessment of the men's attitudes to their work and showed a significant relationship between sickness spells and job dissatisfaction and desire for promotion. Shift workers showed a higher degree of job satisfaction than day workers.

In the past year 150 shift workers have been seen during the course of routine or special medical examinations. They were asked about their views on shift work and whether if the pay was the same they would prefer day work hours. Over three-quarters of them (114 men) stated that they preferred shift work hours. The reasons they gave were very similar—a regular schedule which allowed them to plan ahead for family outings; less overtime required

to be worked although most of them liked some overtime; being able to work outdoors in the garden in daylight all through the year or to enjoy other outdoor hobbies; being able to take the family out at off-peak periods; and less traffic congestion coming to work. The men who would prefer day work hours gave two main reasons—more social life at weekends or in the evenings (mostly younger men), and wives working full-time day hours. Sleeping difficulties were not common (16 men), and these all arose when men were on the night shift.

### Discussion

The evidence presented in this paper shows that for this population there is a consistent and significantly higher level of sickness absence, lateness, and other absence among day workers. The differences in sickness rates cannot wholly be explained by age or by occupation, and although such differences cannot be inferred to other industrial populations there is some confirmatory evidence from other sources.

The work of Aanonsen (1964) showed that chemical plant shift workers had less sickness absence than day workers, even though they were not paid more and had a poorer standard of housing. A brief reference to this problem was made by Wade (1955), who stated that at a refinery in Baltimore in 1952 the inception rate (persons) among shift workers was 11% lower than in day workers. Neither author gave rates standardized for age or occupation. Personal enquiry in this



country has revealed that similar differences in sickness rates between day and shift workers can be demonstrated in another refinery, a chemical plant, and an agricultural fertilizer plant.

The evidence in this paper also indicates that this difference is not due to an excessive amount of one or two types of illness or indeed to an obscure epidemic confined to day workers. Nor can it be attributed to medical selection or the transfer of unhealthy men to day work on medical advice. Sick pay arrangements are identical for both groups.

There are, however, two factors which cannot be allowed for—the large element of self-selection and the fact that all occupational groups are by definition 'survivor populations' (Reid, 1957). Nevertheless, these do not explain the cause of the difference.

The data on lateness and other absences, however, suggest that there may well be a cause common to all three phenomena. There is, of course, one explanation why dayworkers might be late more often; they travel to work at the same time as many others (working hours commence at 7.45 a.m.) and, although the roads are not congested at that hour, there is more traffic about than the shift workers meet at 6 a.m. and 10 p.m. Four out of five workers come to work by car because of the isolated position of the refinery. Unavoidable traffic delay is, however, unlikely to explain more than a small difference in latenesses. The other absence rates are certainly affected by the hours of work. Many of the routine or non-urgent matters causing part or whole-day absences can only be done during week-day working hours; visits to the dentist or solicitor are an example. Shift workers have weekdays off at frequent intervals and all morning off one week in three; they can and do arrange such appointments during their free time. Even so, it is considered that this alone will not explain all the difference.

The work patterns and group relationships of most shift workers are very different from those of day workers. The shift man is usually in a small working group of two to six, with four such groups successively responsible for a certain unit or task. The unexpected absence of one man almost invariably inconveniences other members of his group or of the groups related by shift hand-overs. The overtime produced is sometimes welcomed for its financial return but this does not always balance other objections. The effects of group size on behaviour is well known and a close association between this and sickness frequency was shown for small groups by Hewitt and Parfit (1953).

This, coupled with the preference that many shift workers have expressed for their hours and the higher degree of job satisfaction and identification

with their work, may well be the real cause of the difference in absence behaviour which includes sickness, other absence, and lateness.

The social structure of day work is usually quite different. With the exception of relatively small groups of specialist civil craftsmen (who have the lowest sickness rate in the entire maintenance workforce), most day workers are in groups of well over 10 men. If they do not come to work their tasks are often absorbed by other members of the group or not done at all. In personal interviews many of them showed little personal involvement in their work. Their hours, although regular on paper, are often extended by overtime which they were expected to do, and it is not uncommon for a day worker to come in on overtime for several Sundays in succession. The basic wage of day workers is lower than that of shift workers but since they keep up a very similar standard of living (40% of each group are owner-occupiers and about 60% have their own cars), there is considerable economic pressure for day workers to increase their weekly wage by means of overtime. Because of wide individual variations an attempt to show a significant association between overtime and sickness was not successful although there were suggestive trends. The labour turnover level is low for both groups but day workers at 5% annually have a higher rate than the shift workers at 3%.

These suggestions have been made in the knowledge that further work is required to substantiate them. This paper has indicated that comparisons of day and shift workers may throw further light on the multiple causes of sickness absence in the working population, and that sickness absence statistics from an industrial organization should distinguish between the day and shift worker groups.

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#### REFERENCES

- Aanonsen, A. (1964). *Shift Work and Health*, Norwegian Monographs on Medical Science, Oslo.
- Behrend, H. (1951). *Absence Under Full Employment*, Birmingham University.
- Bjerner, B., Holm, Å., and Svensson, Å. (1955). *Brit. J. industr. Med.*, **12**, 103.
- Browne, R. C. (1949). *Occup. Psychol.*, **23**, 121.
- De Groot, M. J. W. (1965). Proc. 2nd int. Conf. Sick Absence Statistics, Amsterdam.
- Doll, R., and Jones, F. Avery (1951). *Occupational Factors in the Aetiology of Gastric and Duodenal Ulcers. Spec. Rep. Ser. med. Res. Coun. (Lond.)* No. 276.
- Gordon, C., Emerson, A. R., and Pugh, D. S. (1959). *Brit. J. industr. Med.*, **16**, 230.

- Hewitt, D., and Parfit, J. (1953). *Occup. Psychol.*, **27**, 38.
- Hill, A. Bradford (1929). *J. Roy. Stat. Soc.*, **92**, 183.
- Medical Research Council. (1965). *Diurnal Rhythms in Human Physiological Processes*. In *Report of M.R.C., October 1963-March 1965*, pp. 62-67, H.M.S.O. [Cmnd 2787], London.
- Ministry of Labour. (1965). *Gazette*, **73**, 148, H.M.S.O., London.
- Reid, D. D. (1957). *Roy. Soc. Hlth J.*, **77**, 675.
- Taylor, P. J. (1966). M.D. thesis, London.
- Teleky, L. (1943). *Industr. Med. (Chicago)*, **12**, 758.
- Vernon, H. M. (1918). Health of Munition Workers Committee. Memo No. 21. London.
- Wade, L. (1955). *Arch. industr. Hlth*, **12**, 592.
- Wyatt, S., and Marriott, R. (1953). *Brit. J. industr. Med.*, **10**, 164.
- , —, and Hughes, D. E. R. (1943). *A Study of Absenteeism among Women*. *Emerg. Rep. industr. Hlth Res. Bd. (Lond.)*. No. 4.