SOME USES OF INDUSTRIAL SICKNESS-ABSENCE DATA

by

P. A. B. RAFFLE

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During the 1930s there were allegations that London bus drivers and conductors had an undue amount of sickness, especially gastric disorders. Dr Bradford Hill (1937) was asked to investigate this allegation, but found that the data were limited. The London Passenger Transport Board determined that in the future adequate data for such investigations should be available. This was not possible until after the war. In 1948 the Central Record of Staff Statistics was set up to compile sickness-absence statistics and for other purposes. This lecture is mainly an account of the uses made of the statistics produced: how they can be used to study the effect of sick pay provisions, the secular trend of sickness absence in occupational groups, and the differences in sickness-absence experience between groups of various kinds. If the experience of these groups is related to the employees' work and the conditions under which it is done, the results are valuable in answering questions on health from management and unions. The data collected can also be used in medical administration and for research into the causation of disease.

The method of collection of the data and some limitations in their use must first be described.

The punched card system used to record the data was described by Spratling and Lloyd (1951). Briefly, for each occupational group being studied there is a main file in which there is a separate card for each individual from which the populations-at-risk are calculated, and a sickness file in which there is a separate card for each spell of sickness absence. On each card is recorded the day and date of commencement and termination of each spell, the duration of absence (curtailed at 182 days where it lasts longer than this), whether the sickness absence is supported by a medical certificate or
not and the diagnosis. The cards in both files contain sufficient information for the data to be subdivided by age, by sex, by marital status for women, by length of service in London Transport and in the current occupation and, where appropriate, by place of employment. As far as possible the information is based on the same documents that are used for payroll purposes—a system which ensures a high degree of accuracy of recording.

People leave an occupation for many reasons, some of which are medical. The cards of those who do leave are kept separately in a wastage file. On them are recorded the cause of the wastage and the diagnosis if the cause is transfer to other work in London Transport, retiral on medical grounds, or death.

Sickness absence is absence from work attributed to sickness or injury and accepted as such by the employer. This is not the same as morbidity. Some illnesses do not incapacitate the sufferer from particular occupations and some absences attributed to sickness are not in fact due to illness. It will be shown later that the pattern for short spells of absence of 1–3 days, which are not supported by a medical certificate, is completely different from that of spells of 4 days or more which are certificated.

The diagnoses recorded on the sickness and wastage cards are coded according to the 3-figure code of the International Statistical Classification of Diseases, Injuries and Causes of Death (W.H.O., 1948). These 3-figure codes, however, are too detailed for the analysis of sickness-absence data, and it is necessary to amalgamate these codes into broad diagnostic groups (B.D.G.). The International Statistical Classification does suggest some groupings, but these have not been found to be satisfactory so the London Transport statistics are presented in 20 broad groups, two of which are subdivided, as described by Spratling and Lloyd (1951). It is hoped that the 8th Revision of the International Statistical Classification which comes into use on 1 January 1968 will have a pyramidal structure of grouping of codes which will be more useful than previous versions.

The diagnoses on medical certificates supporting sickness absence are less precise than those on death certificates. This reflects the reluctance of doctors to divulge the actual nature of illness to the patient or to third parties for various reasons. Diagnosis is also inherently less accurate in the minor illnesses which form the bulk of absence due to sickness. For the majority of the staff for which statistics are collected, if they are away sick for 28 calendar days or
more they are examined by one of the Board’s doctors before resumption. The diagnosis recorded by the Board’s doctor is recorded in Central Record instead of the one from the patient’s doctor: this applies also to cases of ill-health retirement or transfer to alternative work. Comparison of some 15,000 diagnoses made by London Transport doctors with those made on the same patients by their own doctors showed that more than 80% of the diagnoses went into the same broad diagnostic group, and that apparently general practitioners were not biased towards recording particular diagnoses in particular occupations. Any problems of interpretation or coding of diagnoses which arise in Central Record are referred to me.

The definition of sickness absence and the lack of precision of diagnoses limit the use of the data in their original form for research into the incidence of specific diseases in occupational groups. They are, however, invaluable as the starting point for investigations and for comparing the overall patterns of sickness absence between occupational groups during the same period of time or between the same group at different times.

Absences due to sickness are not discrete and final events like death or wastage from an occupation, but episodes of varying length and severity. It is therefore necessary to have at least two statistical indices of sickness absence: a measure of the frequency of the commencement of spells of absence and a measure of the number of days of absence in a period. From these the average duration of the spells can be derived. There are some interesting similarities and differences in these indices between occupational groups. Table 1 shows the sickness-absence experience for five groups of male staff aged 40-44 from all causes of sickness or injury lasting 4 calendar days or more for the years 1959-62. The clerks, the motormen and guards of the underground trains and the male staff of the bus overhaul works, three different occupations in every way, have about the same average number of days of absence per person per annum, yet they have very different average numbers of spells of absence per person per annum and hence marked differences in the average length of spell. The conductors of the red buses have the same average number of spells as the clerks, but, because they have longer absences, they have more than 50% more days of absence per annum than the three previous groups. The drivers of the red buses have the same average length of spell as the conductors and train staff, but are intermediate in their average number of spells and
days of absence. There are a number of possible reasons for the variations between the indices. Men of different capabilities, temperament and physique select themselves and are selected by management into the different jobs. Persistence in a particular form of employment is in itself a continuing form of selection. There are

Table 1

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<thead>
<tr>
<th>LONDON TRANSPORT</th>
<th>ALL DIAGNOSES 1959/62</th>
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<tbody>
<tr>
<td>SIMILARITIES &amp; DIFFERENCES IN INDICES OF SICKNESS ABSENCE IN OCCUPATIONAL GROUPS</td>
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<td>Spells of sickness absence lasting 4 calendar days or more</td>
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<tr>
<th>Males Aged 40–44</th>
<th>Exposure to risk (man years)</th>
<th>Average annual duration per person (days)</th>
<th>Annual inception rate (spells)</th>
<th>Average length of spell (days)</th>
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<tbody>
<tr>
<td>CLERKS</td>
<td>556</td>
<td>6.3</td>
<td>0.49</td>
<td>12.9</td>
</tr>
<tr>
<td>MOTORMEN &amp; GUARDS</td>
<td>1,636</td>
<td>6.2</td>
<td>0.31</td>
<td>20.0</td>
</tr>
<tr>
<td>WORKS STAFF</td>
<td>717</td>
<td>6.1</td>
<td>0.33</td>
<td>18.6</td>
</tr>
<tr>
<td>CENTRAL BUS CONDUCTORS</td>
<td>3,092</td>
<td>9.9</td>
<td>0.48</td>
<td>20.6</td>
</tr>
<tr>
<td>CENTRAL BUS DRIVERS</td>
<td>5,890</td>
<td>7.7</td>
<td>0.38</td>
<td>20.0</td>
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minor differences in the medical standards for entry into the occupations. The men in the different groups may suffer from different illnesses which may or may not be related to their occupations and where and when they are carried on. They may have the same illnesses but, because of the different physical and mental demands of the occupations, be incapacitated from employment to different degrees. There may be different administrative procedures between the groups, for instance what is accepted as sickness absence by the
employer, though it is not thought that this is a major factor in these rates. There are certainly differences in the social circumstances between the groups, especially in social class, pay, where they live and work, hours of work and type of shift work. In particular there are differences in sick pay provisions. If a man’s family is short of money while he is off sick he is less likely to take time off for sickness

Table 2

LONDON TRANSPORT
ALL DIAGNOSES 1953/5 & 1963
COMPARISON BETWEEN A DEPARTMENT WITH NEW SICK PAY PROVISIONS IN 1962 & MALE CONDUCTORS
Spells of 4 days or more

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<th>Average annual duration per person (days)</th>
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<tr>
<td></td>
<td>Ages up to 44</td>
<td>Ages 45 &amp; over</td>
<td></td>
</tr>
<tr>
<td>1953/5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEPT. ‘A’</td>
<td>5.03</td>
<td>11.47</td>
<td></td>
</tr>
<tr>
<td>CONDUCTORS</td>
<td>7.61</td>
<td>16.17</td>
<td></td>
</tr>
<tr>
<td>1963</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEPT. ‘A’</td>
<td>14.83</td>
<td>18.35</td>
<td></td>
</tr>
<tr>
<td>CONDUCTORS</td>
<td>11.80</td>
<td>18.86</td>
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than if his income is brought near its normal level through sick pay.

It is well known that the effect of sick pay provisions can be profound, especially if generous benefits are introduced in one step and if there is no, or only a short, waiting period for benefits (Buzzard and Shaw, 1952). A department of London Transport had new sick pay benefits in 1962 under a national agreement which provided nearly full wages with no waiting period instead of a proportion of wages after a week’s waiting period. Comparison between the males of this department and male conductors, who retained their previous benefits, in the years 1953–55 and in 1963 (Table 2) shows that while the average number of days of absence per person per annum for certificated spells lasting more than 3 days for conductors increased by less than 50% for ages up to 44, and by about 15% for
ages 45 and over, for Department A the increase was nearly threefold up to age 44 and more than 50% over age 45. Some of this increase was no doubt due to spells of sickness absence, or to the longer duration of individual spells of sickness absence, which were needed on medical grounds but were not previously taken because they could not be afforded. The work of the men in Department A was a mixture of technical, skilled and semi-skilled occupations undertaken mainly under good environmental conditions on rotating shifts including night work, but generally it was less exacting than a conductor's job. It is noteworthy that in 1953–55 Department A staff had rather fewer days of sickness absence per person than male clerical and administrative staff in the rest of London Transport, who had had sick pay provisions similar to the new ones for Department A for many years. In 1962 Department A had about 4 days per person more absence than the clerks in both age groups. It will be interesting to follow the trend of sickness absence in this group of men over the years to see if there is a reduction because it is difficult to explain the whole of this increase on medical grounds alone.

It so happens that the collection and analysis of London Transport sickness absence data has continued during a period of marked social changes, and while there have also been changes in the incidence of some diseases and many advances in medical treatment. These influences seem to be reflected in the statistics. Study of the secular trend of sickness absence is as interesting as the study of differences between occupational groups. In *Health in Industry* (London Transport Executive, 1956) was published the sickness-absence experience during 1949–52 for a number of different occupational groups of London Transport staff which furnished base lines for future study. The data established what had been suspected: that the rates for spells and days of sickness absence of 4 days or more, and therefore mainly certificated, increased with increasing age; that spells of 1–3 days, and therefore largely uncertificated, decreased with increasing age; that the rates for spells and days of absence for women were greater than those for men doing similar work; that at all ages those for married women were greater than for single women; and that there were differences in the sickness-absence experience between people of the same age, sex and marital status doing different jobs. Until recently there have not been any national figures with which to compare these results. The Ministry of Pensions and National Insurance makes available each year the
figures of claims for sickness benefit, but they are of little use for comparison; for instance the definitions of occupation for the numerator and the denominator have to be taken from different sources, claims for sickness benefit for the numerator and estimates based on the previous census for the denominator—the population-at-risk.

Table 3

LONDON TRANSPORT
ALL DIAGNOSES 1953/64
ACTUAL NUMBER OF SPELLS & TOTAL DAYS OF SICKNESS ABSENCE EXPRESSED AS A PERCENTAGE OF THE NUMBERS EXPECTED FROM EXPERIENCE IN 1949/52, ADJUSTED FOR ACTUAL AGE DISTRIBUTIONS

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<th>Drivers — Spells of 4 days or more</th>
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<tr>
<td>UP TO 44</td>
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<td>45 &amp; OVER</td>
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<td>ALL AGES</td>
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The M.P.N.I. recently published a Report on an Enquiry into the Incidence of Incapacity for Work (1965). This is an analysis by occupation and residential area of the claims for sickness benefit under the National Insurance Acts of a 5% sample of employed men and 2½% sample of employed and insured women during the year from 5 June 1961. Employers were asked to define precisely the occupation of each person in the sample at the beginning of the enquiry period. There is a wealth of valuable information in this report, which is the first national study of its kind. It is not possible to compare the London Transport results directly with those of the enquiry because different indices are used, but preliminary comparisons, where this is possible, show in both similar effects of age, sex, marital status of women and occupation.
The basic data for 1949–52 published in *Health in Industry* have been used to study the secular trend of absence in the different occupational groups since then.

By using a similar method to the Registrar General’s standardized mortality ratio it is possible to follow the sickness-absence experience of a group over a number of years. If the actual spells and total days of sickness absence for bus drivers each year since 1953 are expressed as a percentage of the corresponding numbers for drivers in 1949–52, but adjusted to allow for the actual age distribution in 5-year age groups each year, the pattern shown in Table 3 emerges. A sick pay scheme with a 7-day waiting period was introduced at the end of 1956. The Asian influenza epidemic of the winter of 1957–58 is, however, a more likely explanation of the greater increase in spells than days in 1957. Since then there has been a general increase in both spells and days for all ages combined—more marked for spells than days. However, the figure for all ages conceals a marked increase in the men up to age 44 and a decrease in the men of 45 and over. 1963 was a bad year for sickness, a reminder of how unwise it is to use the experience of a single year which may have been distorted by epidemics and other causes. There is a generally similar pattern for other groups of staff, including those in which there was no change in sick pay provisions over the period. Unfortunately it is difficult to compare these results with those of other organizations—the methods of collection and analysis of the data and administrative practices differ so much.

Morris (1965) has assembled data from the M.P.N.I. and the Government Actuary which show similar trends for the national experience. In particular the rates of new claims for sickness benefit per 1,000 insured persons standardized on the age structure of 1951 show a similar pattern to that of spells of sickness absence for bus drivers. Morris summarizes his investigation: ‘Since the middle 1950s there has been a substantial increase in spells of sickness absence. This is most evident, about 40%, in the summer months. The increase affects short absences in particular.’ Professor Morris’s paper is well worth studying. He suggests that, as society becomes more affluent, there are changing attitudes to health and sickness, to work and to leisure which have encouraged ‘absenteeism’ for social reasons and gives examples of revolutions in other indices of social change during the mid-1950s.

But changing social attitudes are not the only factors involved in
the secular trend of sickness absence. There have been changes in the actual incidence of different types of illness and changes in treatment have altered the need for absence due to sickness. Comparison of the experience for bus drivers for 1949–52 with that for a decade later in 1959–62 shows (Fig. 1) that the average number of spells of 4 days or more per person per annum has increased by about a third in the younger ages and has decreased somewhat in the middle ages. Comparison of the annual average duration shows (Fig. 2) that the increase was about a half in the younger ages and the decrease in the middle years was greater than for spells. The younger men were having more spells and the middle-aged men fewer spells which were lasting a shorter time. The average length of spell fell by about 2 days over the age of 45 whereas there was little change in the younger ages and has decreased somewhat in the middle ages. Comparison of the annual average duration shows (Fig. 2) that the increase was about a half in the younger ages and the decrease in the middle years was greater than for spells. The younger men were having more spells and the middle-aged men fewer spells which were lasting a shorter time. The average length of spell fell by about 2 days over the age of 45 whereas there was little change in the
younger ages. The experience in the older ages is not the same as that for new claims for sickness benefit for all employed males where there is an increase in claims at all ages, but the M.P.N.I. figures include all those chronically ill. More people are surviving to the age at which they develop chronic illnesses and treatment enables them to resume work more frequently in spite of chronic illness, to have further spells of absence later. The sickness-absence data are curtailed at 182 days duration whereas the M.P.N.I. data include the whole duration of long spells of sickness. In addition some men are selected out of the bus-driver population because of illness so that recurrent spells of sickness from chronic illness may not be included.

If the increase in sickness absence at younger ages in these certificated absences of 4 days or more is due in part to a change in social
attitude to sickness absence, it would be likely to be more strongly reflected in the uncertificated absences of 1–3 days. This is in fact so (Fig. 3) with an increase over the decade of twofold in the youngest ages and a marked fall with increasing age.

![Graph: London Transport ALL DIAGNOSES 1949/52 & 1959/62 Annual Inception Rate (spells) 1-3 days]

If some of the change of pattern is due to social rather than physical causes, an increase in the number of illnesses with vague diagnoses might be expected. There is some evidence of this. In younger bus drivers in 1959–62 there was a marked increase in the number of spells of absence of 4 days or more attributed to colds and influenza compared with 1949–52 (Fig. 4). In both four-year periods there were three winters in which moderate influenza epidemics were recognized. There was no increase in the older drivers and it will be seen
later that this is not because respiratory infections which might have been called colds had been labelled bronchitis and transferred to that broad diagnostic group. Either there were more infections which were more severe in younger than older men, or they were infections to which the older men had immunity from previous attacks, or many young men who had little immunity had joined the population, or it became more acceptable to take a few days off with a cold. Because many of the absences of 1–3 days are attributed to colds, the same arguments can be applied to the figures in Fig. 3. Some people are not incommoded by a cold at all—others feel quite ill and their performance at skilled or intellectual tasks appears to fall off. Driving is a skilled task and if this increase in spells of absence is due to the
increasing tendency of drivers not wishing to drive when they don’t feel well, then this could be a contribution to the good driving record bus drivers have. There is, however, a similar pattern in the experience of male bus conductors. There are also increases in the younger ages for the vague diagnoses in diagnostic groups such as functional nervous disorders, other respiratory diseases, other digestive disorders and disorders of bones and organs of movement.

During the late 'fifties and early 'sixties a considerable number of young men from Ireland and the West Indies entered a variety of transport jobs in England. This might have distorted the patterns of sickness absence. However, few entered the clerical and administrative
grades in London Transport in which the changes in the experience were similar to that of drivers and conductors.

Because the study of sickness absence started as a result of the allegation that busmen had an undue amount of digestive troubles, it is interesting to see (Fig. 5) the dramatic fall in the average annual duration at older ages in diseases of the stomach and duodenum over the decade. Again there is probably a combination of explanations. The myth of the 'busman’s tummy' was shown to be untrue by a careful M.R.C. survey (Doll and Avery Jones, 1951) so it has become less fashionable to diagnose ulcers in transport workers. Treatment has improved dramatically for those who do have peptic ulceration and an actual reduction in the number of sufferers from
peptic ulcers at all ages for reasons unknown has been recognized
in all branches of medical practice. The increase at the younger ages
appears to be due mainly to gastritis—a vague diagnosis—and may
reflect that any change in attitude to sickness absence has more than
absorbed the improvement in prevalence and treatment.

London Transport
B.D.G. 8 - DISEASES OF CIRCULATORY SYSTEM
1949/52 & 1959/62
Annual Inception Rate (spells)
4 days and more

The conditions labelled bronchitis account for 10% of the spells
and days of absence for most groups of staff. Bronchitis causes a
great deal of chronic ill health and misery. It is a challenge to pre-
ventive medicine because some of the causes, such as smoking and
air pollution, are known and early treatment of respiratory infec-
tions can improve prognosis. It is encouraging to see (Fig. 6) a
reduction in the annual average duration (and in spells as well) in men in their fifties when they are starting to become chronic bronchitics. The improvement is probably due to early treatment of respiratory infections with modern antibiotics and a reduction in air pollution from fewer domestic coal fires. It is coincidence that these rates each include one of the three major smog episodes of recent years—in December 1952, November 1956, and December 1962.

Two other major public health problems of our time are lung cancer and coronary heart disease. The increase in both in the general population is reflected in the London Transport data. The increase (Fig. 7) in spells of absence for drivers in their late fifties and early sixties from diseases of the circulatory system is due partly to increase in coronary heart disease, but also to other cardiovascular...
conditions, which were previously untreated because little could be done to alleviate them, but some of which can now be investigated and treated successfully—such conditions are vascular diseases of the brain and legs and hypertension.

A final example of changes in sickness-absence patterns is of diseases of the skin (Fig. 8). Though there may be disagreement about the precise diagnosis of a skin lesion, there is no doubt whether a patient has a rash or not. There have been considerable improvements in the treatment of skin disease and improvements in living and working conditions, especially washing facilities, in the past decade. This is reflected in the comparison of average number of days of absence attributed to skin disease, in bus conductors this time. Conductors are chosen because they are more incapacitated from work by skin disease than drivers.

Though mainly examples of bus drivers’ experience have been quoted, there are similar patterns of change in bus conductors, in motormen and guards of underground trains, and in clerical and administrative staff. The changes are not identical but not sufficiently different to invalidate the tentative deductions. It is possible to recognize in these sickness-absence statistics changes in the incidence of illness in the population generally, only some of which are expected from the Registrar General’s mortality data. Improvement in treatment also appears to play a part. But there doesn’t seem to be any doubt that there has been a change in attitude which has made absence from work attributed to sickness more socially acceptable. This is apparent in those who have grown up in days of full employment and increased social security benefits. Their fathers couldn’t afford sickness absence and, in many cases, worked when they should not have done. Whether the pendulum has swung too far is a matter for debate. It will be interesting to see whether the younger men will take their higher sickness-absence rates with them as they enter the older age groups and counteract the effects in these groups of improvements in prevention and treatment of disease.

A doctor is interested in these patterns of sickness absence for many reasons, not least because they help him to deploy preventive measures to the best advantage. Actuarial colleagues are naturally interested because of the effect on sick pay schemes, whether run by industry or by friendly societies. Frequency distributions of spells of absence by length of spell are valuable for this purpose (Fig. 9). The effect of weekly medical certificates is immediately
London Transport
ALL DIAGNOSES – SPELLS COMMENCING IN 1964
Males aged 40–44
Frequency distribution according to length of spell

Fig. 9
apparent in both drivers and conductors, with peaks at 7, 14, 21 and even 28 days. This pattern may alter with the recent revision of the rules of certification under the National Insurance Act—but a doctor may still tend to say 'come and see me in a week'. The frequency distribution emphasizes that the majority of spells are of short absence, in fact in the drivers 90% of absences have terminated within 3 weeks. These data are also useful for medical administration. At the moment operating staff—that is staff on vehicles—are medically examined after sickness absence lasting 28 days or more. But treatment has altered and men who have recovered from serious illnesses can resume work earlier. Should the 28-day period therefore be shortened for say drivers and motormen and if so how many more medical examinations would this involve, and to what extent can this load be offset by lengthening the period before medical examinations in conductors and guards? Frequency distributions like these have helped in deciding policy.

The data have helped in medical administration in several ways. At one time persons suffering from varicose veins were excluded from certain occupations at pre-employment examinations. Investigations showed that varicose veins contributed little to the total sickness-absence experience but that the average length of spell of absence for those who did have absence was long. It was therefore possible to ignore the effect of the condition on total sickness absence, concentrate on the individual patient and decide whether or not the particular occupation for which he or she had applied would be likely to harm their condition.

From the time traffic lights were introduced it was medical policy not to accept as new bus drivers men who had defective colour vision. This meant that about 7% of applicants were being rejected on this ground alone. Norman (1960) compared the traffic accident experience of 149 bus drivers who were colour defective (they had been driving before the policy was changed) with colour normal bus drivers. These were matched for age, for length of service as drivers and for garage from which they worked, and hence roughly the routes which they drove. He showed that there was no difference in the accident experience, either for blameworthy or non-blameworthy accidents, or whether they were mildly or severely colour defective. It was therefore possible to reverse the policy and exclude only those new drivers who were grossly colour defective—less than 1% of applicants. This investigation would have been nearly
impossible without the use of the main file of Central Record which defines the populations-at-risk for drawing the matched controls.

Sickness-absence statistics are invaluable for answering questions from management or unions, on the health of employees. Sometimes a manager will feel that a group of his staff is having an abnormal amount of sickness absence. The statistics can provide the facts. Recently two groups of clerks in a department were said to be having increased sickness absence and crude figures supported this contention. However, investigation showed in one group the age, sex and marital status had changed sufficiently to account for the increase. In the other group, which had been very busy and doing much overtime, there was a true increase which supported a request for an increase in numbers of staff. A group of works engineering staff claimed that they were having an abnormal amount of respiratory disease due to dust. Comparison with their fellows in another works did not reveal any difference in sickness absence for respiratory diseases or for all causes. An allegation by a trade union that a group of clerical staff was having an abnormal amount of heart disease was not supported by the facts.

It is an advantage to plan these investigations prospectively when this is possible. With the advent of automation, some people’s work is being changed and it is not known whether these changes affect health. The train operators on the experimental automatic trains running on part of the Central Line of London’s Underground are former motormen—train drivers. Their sickness absence is being watched and compared with current motormen to see whether the change in methods of work and responsibility will alter the amount and type of sickness they have. Similarly the experience of former signalmen who are now traffic regulators monitoring an automated signalling system is being watched. Their new job involves much wider responsibility than hitherto and periods of comparative inactivity interspersed with very busy periods. These are common effects of automation of many processes and doctors in industry want to know whether people’s health will be affected by them and, if so, at what ages. Medical and administrative recommendations carry much more weight when they are backed by facts.

Two of the three major public health problems, bronchitis and coronary heart disease, are influenced by occupation. It is therefore natural that the data collected by Central Record should have
been used firstly to investigate any effects of occupation in London Transport on the prevalence of the conditions and secondly for research into their aetiology. The aim is ultimately to find possible methods of recognizing potential sufferers from the conditions so that preventive measures can be instituted.

Cornwall and Raffle (1961) compared the sickness-absence experience from bronchitis of many groups of London Transport staff during the years 1952–56. The smog episode of 1952 was the stimulus for starting the investigation and it was continued to include the 1956 smog. Both events clearly affected the sickness-absence rates. Of necessity the diagnoses used in this survey were those given on general practitioners’ or London Transport doctors’ certificates and not the more precise definition used in subsequent M.R.C. surveys. The experience of drivers, conductors and garage maintenance staff is particularly interesting. These men have much the same social background, pay and sickness benefits, they live near their garages
(though the bus staff drive to other parts of London), the drivers and conductors work the same shifts and the engineering staff are also on shift work, but of a different type, 40% of them being on permanent night work. The major difference between these men is in their work; unfortunately we knew nothing of their smoking habits.

London Transport
B.D.G. 9 - COLDS & INFLUENZA 1959/62
Annual Inception Rate (spells)
4 days and more

The results showed (Fig. 10) that at all ages the drivers and the engineering staff had about the same number of spells of sickness absence attributed to bronchitis. The drivers are isolated in their warm cabs and do much less physical work than the engineering staff who at that time were working in unheated garages, some of them getting wet while washing buses, others being exposed to dust sweeping out buses and all exposed to higher concentrations of
exhaust fumes than most other occupations. At most ages the conduc-
tors, however, had more spells than either of the others. Bron-
chitis commonly follows as a complication of a cold. Conductors
have more long spells of absence attributed to colds and influenza
than drivers as is seen in the figures for 1959-62 (Fig. 11). It is there-
fore likely that one of the reasons for the conductors’ less favourable

NUMBER OF ABSENCES DUE TO BRONCHITIS. 1952/56
EXPRESSED AS A PERCENTAGE OF THE STANDARD

experience is that they picked up more upper respiratory infections
and developed more bronchitis. But the interaction of illness and
occupation is a two-way track: occupations may not only aggravate
or precipitate illness, a given illness may also incapacitate people from
performing differing occupations to varying degrees. This could also
contribute to the worse experience of the conductors who were faced
with running up and down the stairs of the bus, in spite of the breath-
lessness caused by the bronchitis, once they got to work. The drivers
on the other hand had much less physical work to do and the 
engineers could work at their own pace if they were feeling unwell. 
The effect of the illness on the capacity to work also probably explain-
ed why engineering workers in the major overhaul works and male 
clers had better experiences than any of these men; they not only 
had less physically exacting jobs, but were not on shift work, and so 
were more likely to come to work with a mild attack of bronchitis. 

Air pollution, mainly from domestic fires, had long been suspected 
as a factor in the aetiology of bronchitis. Reid (1956) showed that 
Post Office workers had a worse experience when working in areas 
of high pollution. As a contribution to medical research the Central 
Record data were used to investigate this further. The experience of 
all bus drivers, male conductors and engineering staff of the central 
and, in this case, country bus and coach fleets were combined to 
form a standard population. The staff were divided into the four 
central London sectors (N.E., N.W., S.W., S.E.) and two country 
sectors (South and North) in which they worked and mainly lived. 
The actual bronchitis sickness-absence experience of drivers, con-
ductors and engineers in each of the six sectors was expressed as a 
percentage of the expected experience of the standard population 
(Fig. 12). It will be seen that in the central area the staff in the N.E. 
sector had the worst experience, the S.W. the best and the others 
were intermediate. The South country sector staff had a better 
experience than the North and better than any of the central sectors. 
Because the highest concentration of industry and population, and 
hence pollution (confirmed by measurement), is in the north-east 
sector and the prevailing wind is from the south-west driving pollu-
tion into the north-east area, it was considered that these data 
supported the theory that air pollution was a factor in the aetiology 
of bronchitis. It is interesting to note that in each of the six sectors 
the conductors had the worst experience of the three groups of staffs, 
suggesting that the effect of occupation was independent of air 
pollution. 

This investigation produced new facts but did not provide the 
answer to how to recognize the incipient chronic bronchitic. This 
is not a defect in the collection or analysis of the data but a clinical 
problem of recognizing pre-symptomatic pathology. A prospective 
investigation is being undertaken by Fletcher and Tinker (1961) 
for the M.R.C. in which volunteers (initially without bronchitis) 
from the major London Transport overhaul works (and the G.P.O.)
are being followed for a number of years to see which eventually
develop bronchitis and to relate this to their smoking habits and to
their experience from minor respiratory infections during those
years. It may then be possible to define criteria of sickness absence
from minor respiratory infection and from the Central Record data
pick out those people who need special care to prevent them from
developing this miserable condition.

Coronary heart disease is of particular importance in transport
workers because of the danger of sudden collapse at work. This, and
the ready availability of data from Central Record, led to a
collaborative research effort by the Social Medicine Research Unit
of the Medical Research Council, under Professor Morris, and Lon-
don Transport which has continued since 1949. Three separate
investigations are being undertaken. In the first the data from the
sickness and wastage files are used. Each year Central Record
extracts all those cases of death, ill-health retirement, transfer to
alternative work and sickness absence in drivers and conductors
which have International Statistical Classification codes directly or
indirectly related to coronary heart disease. The diagnoses are then
checked with the medical records held in the medical department or
with death certificates which are obtained for pension purposes or
directly from the Registrar General. All those cases which can be
confirmed as first episodes of coronary heart disease (after enquiry
from general practitioners or hospitals as necessary) are then notified
to the Unit. Because the disease is a serious one and is likely to cause
either death (in a third of the cases) or sickness absence of more than
28 days which is followed by a medical examination before return
to work, and because each medical centre has an electrocardiograph
for investigation of suspicious cases, it is thought that virtually all
the cases are recognized. Central Record provides the Unit
with the relevant populations-at-risk from the main file and the
Unit calculates the incidence in the drivers and conductors, present-
ing the data separately as first clinical episodes and sudden deaths,
defined as death in the first three days of the illness. Heady et al.
(1961) showed that conductors had a better experience than drivers
(Fig. 13), that this was more marked in the younger ages and parti-
cularly so in sudden deaths. Similar rates of incidence were found
for postmen and telephonists at the Post Office, with the postmen
having the better experience. From these studies arose the hypothesis
that physical activity at work protected the middle-aged male from
coronary heart disease, conductors and postmen having active jobs and drivers and telephonists relatively inactive jobs. Numerous other studies, including a necropsy survey in which previous occupation was determined have supported this hypothesis (Morris and Crawford, 1958). The decreasing trend of mortality from coronary heart disease with decreasing social class is well known, yet Morris (1959) showed that if the occupations in the various

**CORONARY HEART DISEASE**
**IN BUS DRIVERS & CONDUCTORS**

**TOTAL INCIDENCE OF FIRST CLINICAL ATTACKS**

<table>
<thead>
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<th></th>
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<th>45-54</th>
<th>55-64</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRIVERS</td>
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<td>3.1</td>
<td>7.8</td>
</tr>
<tr>
<td>CONDUCTORS</td>
<td>0.4</td>
<td>2.6</td>
<td>6.1</td>
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</table>

(per 1,000 per year 1949-50, 1955-56)

**SUDDEN DEATHS**

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<th></th>
<th>35-44</th>
<th>45-54</th>
<th>55-64</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRIVERS</td>
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<td>1.0</td>
<td>2.3</td>
</tr>
<tr>
<td>CONDUCTORS</td>
<td>0.1</td>
<td>0.6</td>
<td>1.3</td>
</tr>
</tbody>
</table>

(per 1,000 per year 1949-1958)

social classes were classified into light, active and heavy occupations, the social class trend disappeared. But coronary heart disease has almost certainly a multifactorial aetiology. Heredity, physique, smoking habits and diet may all play their part. If two men in London Transport busman's uniform are walking down the street and it is not clear which is the driver, it is a fairly sure bet to choose the short squat man rather than the tall thin one. It is known that short squat men are more likely to develop coronary heart disease than tall thin men. It is therefore possible that the difference in incidence between drivers and conductors is due to differences in the physique of the men who chose to do these very different jobs.
A convenient way to investigate this was to compare the sizes of uniforms issued to these men (Morris, Heady and Raffle, 1956). This showed that, making due allowance for height, there was a bigger percentage of drivers than conductors with waist measurements of more than 36 in.—even at ages before occupation was likely to cause the difference. The next obvious stage was to analyse occupation and physique separately (Fig. 14). This showed that in each of two age groups and in each of three waist measurements the occupational difference remained, suggesting that the factors of occupation and physique acted independently. This survey continues.

The main objective of the research is to identify prospectively those men liable to develop coronary heart disease so that preventive measures can be instituted. This forms the second part of the enquiry. From Central Record’s main file was chosen a sample of drivers and conductors stratified for age and garage but otherwise
randomly selected. These volunteer men were examined by a physician of the Unit; only about 5% refused to be examined, thanks to the wholehearted co-operation of the men and of their trade union. Just as in the Framingham and Tecumseh community studies in America, various physical and biochemical measurements were made and smoking and dietetic habits ascertained as far as possible. The measurements confirmed the results from the enquiry into uniform sizes. The first sample of nearly 700 men has now been followed up for five years whether or not they have stayed with London Transport. The first results seem to confirm the American view of the importance of raised blood pressure and, to a lesser extent, of blood lipids as prognostic factors, and to be more important in drivers than conductors. The effects of obesity and smoking are not so clear. These are exciting preliminary results which, if confirmed, will help to define more closely which drivers with borderline hypertension found at age examinations can be allowed to continue driving and which must be excluded from this occupation—perhaps their life's work.

The third study arose out of a change in medical administration. In 1958 routine age examinations were introduced for bus drivers by London Transport doctors at ages 50, 56, 62, 64 and annually thereafter if the driver stayed on after the normal retiring age of 65. Incidentally, Central Record's main file produces the nominal roll of those due for examination each year. Because of the suspected association between coronary and cerebral arterial disease and hypertension, a number of drivers with high blood pressure were removed from driving, most of them being found alternative work in the organization. If hypertension predisposes to coronary disease and these men are selected out of the driver population, the incidence of this disease should begin to fall in those who have remained as drivers. The first study mentioned should reveal this in time though preliminary results for 1962 and 1963, when rather more than half the drivers had had their initial routine age examination, does not show a fall in the drivers' incidence of sudden deaths towards that of the conductors. The counterpart to this is that those drivers taken off driving because of hypertension should have a higher incidence of coronary heart disease than normal for drivers. The Unit, from information provided basically from Central Record's sickness and wastage files, is following up the fate of these ex-drivers, even if they have left the service, and is finding the expected
excess of coronary deaths. These three surveys, which are fundamental medical research, would be impossible without the data on which the sickness-absence statistics are based.

It is hoped that this account shows that the statistics of sickness absence are valuable in themselves for comparing absence attributed to sickness between occupational groups from which some of the interaction between occupation and illness can be deduced and, in some cases, preventive action planned; that trends of sickness absence can be followed in which social changes and changes in incidence of disease in the population and from the results of therapy can be recognized; that changes in medical administration can be based on the findings and that the basic data can be used for fundamental medical research of real value to the community.

Acknowledgments

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