BRONCHITIS—SICKNESS ABSENCE IN LONDON TRANSPORT

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This study is based on the records of sickness absence of four days or longer attributed to bronchitis among nearly 60,000 London Transport employees during the years 1952 to 1956. The figures support previous observations that there is a close association between the incidence of bronchitis and the occurrence of fog in any year. The bronchitis experience of employees living and working in the north-eastern sector of London is shown to be worse than in other areas of London. The experience of employees in the country belt round London, particularly in the southern sector, is better than in London itself. With the possible exception of conductors, the figures do not suggest that there are occupational factors in the transport industry causing bronchitis.

Since 1948, London Transport have collected and recorded on punched cards data relating to the sickness absence of various groups of employees. Details of the system adopted for the compilation of these data have been published by Spratling and Lloyd (1951) and London Transport Executive (1956). The information available can be subdivided *inter alia*, by reference to sex, age, occupation, place of employment, and diagnosis.

In particular it is possible to select from the records those absences which were attributed to bronchitis. The diagnosis to be recorded is normally obtained from a medical certificate given by the employee's general practitioner. Where questions of terminology or legibility arise, or where the employee is referred to a London Transport Medical Officer on the termination of his absence, it is the Medical Officer who determines the diagnosis to be recorded.

Bronchitis is notoriously difficult to define. Following Reid (1956), we have defined sickness absence due to bronchitis as "absence from work attributed to bronchitis by a general practitioner or by a London Transport Medical Officer". The diagnosis relating to these absences is coded 500, 501, or 502 in accordance with the three-figure International Statistical Classification. Whilst we recognize the difficulties of diagnosis, we do not think these difficulties invalidate comparisons between, for example, different occupational groups or different parts of the London area.

The analysis which follows is restricted to absences lasting four calendar days or longer, because only a minority of shorter spells of absence are supported by a medical certificate. Days of absence after six months (182 days) of continuous absence are excluded from the statistics, because cases of long-term absences pass out of observation at irregular intervals after the first six months of absence as administrative decisions are taken for the retirement or transfer to alternative employment of the individuals concerned. The figures develop, as it were, a ragged edge and are no longer statistically homogeneous. For convenience the statistics are described as "four to 182 days"; they include the first three days of the absences lasting at least four days.

Roundly 10% of the sickness absence recorded for London Transport employees is attributed to bronchitis. Figures published by the Ministry of National Insurance indicate that in the country as a whole bronchitis accounts for roundly 10% of all sickness absence. We think these figures justify the detailed analysis of any data which can throw light on the incidence of bronchitis.

Objects of the Survey

The London Transport sickness-absence records were examined to see whether they would provide information concerning the following:

(a) The relative incidence of bronchitis in successive years, bringing to light any peaks in the

incidence of bronchitis and facilitating comparison of other surveys covering restricted periods within the years to be covered by the present study;

(b) Differences in the experience of transport workers in different geographical areas of London, for comparison with the results obtained by Reid (1956) in relation to the invaliding rates of postmen;

(c) The incidence of bronchitis among transport employees engaged in different jobs, with the possibility of identifying some occupational factor inducing proneness to bronchitis.

As the study proceeded the data suggested the possibility of obtaining provisional answers to the following two specific questions:

(a) To what extent does a recent history of recurrent absences from work due to bronchitis permit reliable prognosis of future proneness to bronchitis, with reference to further absences from work or incapacity for the present employment?

(b) Is a temporary increase in the level of atmospheric pollution, as in a "smog" period, associated with the first manifestations of subsequent histories of chronic bronchitis?

It is hoped to consider these questions in a further paper.

Available Data

The data available consisted of records of sickness absences of four days or longer attributed to bronchitis during the five years 1952 to 1956 among the following groups of London Transport staff:

(a) Drivers and male conductors of the central (red) buses, of the trolleybuses, and of the country (green) buses and coaches;

(b) Male wages staff engaged on day-to-day maintenance in garages and depots of central buses, trolleybuses and country buses and coaches;

(c) Male wages staff of the Railway Operating Department;

(d) Male wages staff of the Bus Overhaul Works at Chiswick and Aldenham and of the Trolleybus Overhaul Works at Charlton;

(e) Male clerical and technical staff.

The man-years of exposure to risk in broad age-groups and the numbers of absences and calendar days of absence due to bronchitis in each of these groups are shown in Table 1. We have excluded the data for staff at ages 65 and over throughout this study. Data for staff placed in alternative (lighter) work for medical reasons are also excluded.

For the purpose of making the desired comparisons between different years, different geographical areas, and different occupational groups, it was decided to establish a standard with which each subsidiary group of data would be compared in turn. The standard selected for this purpose is the combined experience of all bus and trolleybus drivers and conductors in the years 1952 to 1956. This experience is summarized, in five-year age groups, in Table 2.

Experience in Individual Years

Table 3 shows the number of absences due to bronchitis commencing in each year among each group of staff, expressed as percentages of the combined experience of all bus and trolleybus drivers and conductors shown in Table 2, allowing for the age distribution of each group of staff. Table 4 shows similar results for the number of calendar days of absence.

For the commencement of new absences, it will be seen from Table 3 that 1952 was the worst year for many groups of staff (but not for country bus and coach drivers, conductors, and maintenance

TABLE 1
EXPOSED TO RISK AND ABSENCE FROM WORK DUE TO BRONCHITIS 1952 TO 1956

Group of Staff	Exposed to Risk (man years)					Number of Absences	Number of Calendar Days of Absence*
	Under Age 35	Ages 35-44	Ages 45-54	Ages 55-64	Total		
Central bus drivers	14,435	21,134	21,194	15,988	72,751	2,875	69,420
Central bus conductors	18,864	16,078	11,883	7,626	54,451	2,526	54,317
Trolleybus drivers	4,159	5,479	5,682	2,739	18,059	903	18,287
Trolleybus conductors	5,409	3,980	3,096	1,708	14,193	722	13,552
Country bus and coach drivers	2,806	4,845	5,165	1,603	14,419	410	9,676
Country bus and coach conductors	3,994	3,556	2,518	487	10,555	287	5,802
Central bus maintenance	4,346	4,997	8,471	8,309	26,123	1,222	35,564
Trolleybus maintenance	709	1,478	2,485	2,232	6,904	411	11,293
Country bus and coach maintenance	1,105	1,666	2,210	968	5,949	192	5,846
Railway operating	9,288	7,229	7,839	5,633	29,989	1,301	33,526
Chiswick and Aldenham Works	3,838	4,171	5,416	3,732	17,157	632	14,394
Charlton Works	981	948	1,101	1,199	4,229	127	4,226
Clerical and technical	2,453	1,906	2,775	2,331	9,465	387	7,844
Total	—	—	—	—	284,244	11,995	283,747

* Excluding days of absence after first 182 days.

TABLE 2
BUS, TROLLEYBUS, COUNTRY BUS AND COACH DRIVERS AND CONDUCTORS, 1952 TO 1956
ABSENCE FROM WORK DUE TO BRONCHITIS, 4-182 DAYS

Age Group	Exposure to Risk (man years)	No. of Days Sickness Absence*	Average Annual Duration per Person (days)	No. of Spells	Annual Inception Rate (spells)	Average Length of Spell (days)
-19	105	13	0.124	2	0.019	6.5
20-24	7,015	1,697	0.242	162	0.023	10.5
25-29	17,557	4,298	0.245	335	0.019	12.8
30-34	24,990	6,274	0.251	411	0.016	15.3
35-39	25,188	7,697	0.306	505	0.020	15.2
40-44	29,884	12,493	0.418	722	0.024	17.3
45-49	26,692	17,913	0.671	929	0.035	19.3
50-54	22,846	29,259	1.281	1,289	0.056	22.7
55-59	17,606	43,403	2.465	1,647	0.094	26.4
60-64	12,545	48,007	3.827	1,721	0.137	27.9
All ages	184,428	171,054	—	7,723	—	22.1

* Excluding days of absence after first 182 days.

TABLE 3
NUMBER OF ABSENCES DUE TO BRONCHITIS EXPRESSED AS A PERCENTAGE OF THE STANDARD

Group of Staff	1952	1953	1954	1955	1956	1952-56
Central bus drivers	97	83	75	76	84	83
Central bus conductors	140	105	115	120	121	120
Trolleybus drivers	127	99	108	128	139	120
Trolleybus conductors	136	118	129	139	182	139
Country bus and coach drivers	66	58	60	90	90	74
Country bus and coach conductors	74	92	100	(85)	(110)	92
Central bus maintenance	106	80	54	75	81	80
Trolleybus maintenance	(129)	(106)	(68)	(90)	(103)	99
Country bus and coach maintenance	(70)	(51)	(85)	(76)	(81)	74
Railway operating	125	95	83	97	96	99
Chiswick, Aldenham, and Charlton Works	76	63	60	74	84	72
Clerical and technical	93	78	78	76	80	81
Total	109	88	83	92	99	94

NOTES:—

1. The standard numbers of absences are based on (a) the experience for all years of all drivers and conductors combined and (b) the exposed-to-risk figure for each group of staff in quinquennial age groups.

2. The figures in parentheses are based on an exposed-to-risk figure of less than 2,000 man years.

TABLE 4
CALENDAR DAYS OF ABSENCE DUE TO BRONCHITIS EXPRESSED AS A PERCENTAGE OF THE STANDARD

Group of Staff	1952	1953	1954	1955	1956	1952-56
Central bus drivers	95	105	70	78	83	86
Central bus conductors	124	136	118	107	112	120
Trolleybus drivers	107	114	95	105	124	109
Trolleybus conductors	114	138	126	98	145	124
Country bus and coach drivers	69	68	66	92	105	81
Country bus and coach conductors	72	109	139	(70)	(100)	98
Central bus maintenance	134	104	70	79	90	96
Trolleybus maintenance	(141)	(150)	(76)	(94)	(97)	112
Country bus and coach maintenance	(93)	(75)	(119)	(99)	(112)	100
Railway operating	138	116	93	97	125	114
Chiswick, Aldenham, and Charlton Works	84	74	62	78	79	76
Clerical and technical	78	65	61	69	79	71
Total	109	108	85	88	99	98

NOTES:—

1. The standard days of absence are based on (a) the experience for all years of all drivers and conductors combined and (b) the exposed-to-risk figure for each group of staff in quinquennial age groups.

2. The figures in parentheses are based on an exposed-to-risk figure of less than 2,000 man years.

staff). For all groups of staff combined the worst experience was in 1952. There was an exceptionally heavy smog in December of that year. Table 4 shows that there was a relatively high incidence of calendar days of absence in 1952 and 1953. In general terms, after 1952, the commencement of

new absences was at the highest level in 1956 (when there was a foggy period in January). The best year overall was 1954.

Experience in Different Geographical Areas

Tables 5 and 6 show the numbers of absences due

to bronchitis among men who were employed in different geographical areas of London. These areas correspond to the divisions which have been defined for the administration of London Transport's road services. The boundaries of each division are indicated in the map (Fig. 1). Table 5 relates to the four central divisions and Table 6 to the two country divisions. Tables 7 and 8 show similar results for the calendar days of absence.

It should be remarked that because of the need for shift working and early and late turns of duty the majority of drivers and conductors lived near their place of employment. It can therefore be

assumed that men who were employed in a particular division lived in the corresponding geographical area, but because many bus routes cross central London many of the drivers and conductors spent some part of their working day in one of the other areas. It is calculated that during the period of the study, drivers and conductors spent on average five and three-quarter hours per working day on their vehicle. Maintenance workers mostly worked continuously on the same shift, but the majority of these men also lived near their place of employment and of course did not normally work away from their own garage.

TABLE 5

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

Group of Staff	N.E. Division	N.W. Division	S.E. Division	S.W. Division	All Divisions
Central bus drivers	97	80	79	75	83
Central bus conductors	146	112	113	106	120
Trolleybus drivers	135	114	(67)	107	120
Trolleybus conductors	145	141	(161)	(102)	139
Central bus maintenance	87	83	81	66	80
Trolleybus maintenance	90	99	(135)	(120)	99
Total	115	97	92	85	99

NOTES:—

1. The standard numbers of absences are based on (a) the combined experience of all drivers and conductors and (b) the exposed-to-risk figure for each group of staff in quinquennial age groups.
2. The figures in parentheses are based on an exposed-to-risk figure of less than 2,000 man years.

TABLE 6

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

Group of Country Bus and Coach Staff	North Division	South Division	Total
Drivers	89	59	74
Conductors	112	74	92
Maintenance	79	69	74
Total	93	66	79

NOTE.—The standard numbers of absences are based on (a) the combined experience of all drivers and conductors and (b) the exposed-to-risk figure for each group of staff in quinquennial age groups.

TABLE 8

CALENDAR DAYS OF ABSENCE DUE TO BRONCHITIS, 1952/56, EXPRESSED AS A PERCENTAGE OF THE STANDARD

Group of Country Bus and Coach Staff	North Division	South Division	Total
Drivers	92	71	81
Conductors	120	81	98
Maintenance	108	94	100
Total	102	79	90

NOTE.—The standard days of absence are based on (a) the combined experience of all drivers and conductors and (b) the exposed-to-risk figure for each group of staff in quinquennial age groups.

TABLE 7

CALENDAR DAYS OF ABSENCE DUE TO BRONCHITIS, 1952/56, EXPRESSED AS A PERCENTAGE OF THE STANDARD

Group of Staff	N.E. Division	N.W. Division	S.E. Division	S.W. Division	All Divisions
Central bus drivers	105	75	84	80	86
Central bus conductors	162	111	109	91	120
Trolleybus drivers	117	110	(150)	105	109
Trolleybus conductors	124	126	(191)	(83)	124
Central bus maintenance	104	90	109	78	96
Trolleybus maintenance	102	118	(141)	(120)	112
Total	120	95	97	85	101

NOTES:—

1. The standard days of absence are based on (a) the combined experience of all drivers and conductors and (b) the exposed-to-risk figure for each group of staff in quinquennial age groups.
2. The figures in parentheses are based on an exposed-to-risk figure of less than 2,000 man years.

FIG. 1

It is obvious that some of the bus routes originating in each of the divisions are easier or harder than the average for both drivers and conductors to operate. It is thought, however, that the

distribution of these routes between the four central divisions to which Tables 5 and 7 relate is sufficiently uniform to permit valid comparisons to be made. Similarly comparisons between the two country

divisions, shown in Tables 6 and 8, are unlikely to be invalidated by any preponderance of easy or hard routes in one of the two divisions.

The work of the maintenance staff is broadly the same in all divisions and in fact the numbers of these staff employed at each garage and depot was proportioned to the numbers of vehicles to be serviced.

It is theoretically possible that there is some geographical difference in smoking habits. The only statistics available on this subject are in Research Paper No. 1 of the Tobacco Manufacturers' Standing Committee (1959). Variations given in that paper between different London areas do not, however, appear to be significant.

It will be seen that of the central divisions the men in the north-east had generally the worst experience and the men in the south-west generally the best. The north-west and south-east divisions show an intermediate experience. Of the two country divisions, the north showed a worse experience than the south. The experience in the northern country division was better than in the north-east and north-west central divisions, though generally worse than in the south-east and south-west central divisions. The experience in the southern country division was on the whole the best of all. As a whole the country bus and coach staff showed a better experience than their counterparts in the central area.

Although the work of the driver and conductor is generally lighter in the country area it is unlikely that this could account for the whole of the better experience of the country area staff compared with the central area staff. This view is supported by the similar difference between maintenance staff in the country and central areas, whose work is little different in character or volume.

The results for the central area broadly confirm the figures given by Reid (1956) relating to the geographical pattern of bronchitis invaliding rates of London postmen, and may reflect the effects upon the pattern of air pollution of the prevailing south-westerly wind, of the relative density of population and hence the relative density of domestic fires, and of the geographical location of industry. The London Transport central divisions are considerably larger than the areas covered by Reid's (1956) study.

The results for the country divisions widen the picture by bringing further new areas under observation. The better experience in the country tends to support the hypothesis that atmospheric pollution is an aetiological factor in bronchitis. The better experience in the southern country division, compared with the northern, suggests that the prevailing wind protects the south and moves the metropolitan pollution northwards. There is also more industry

and a greater density of population in the northern country area.

Comparison of Different Occupations

The final columns of Tables 3 and 4 show the sickness-absence experience for all years combined among different groups of staff. The method of recording for each group of staff is the same and it is thought that valid comparisons can be made between the groups. In considering such comparisons, however, it must be remembered that the data relate to sickness absence and not directly to morbidity. The incidence of sickness absence is affected by occupation apart from the incidence of morbidity, because the relative degree of disablement caused by a given clinical condition varies with the physical nature of the work to be performed by the individual. Shift work, too, may give rise to a high level of sickness absence without any variation in the underlying morbidity. For example, it may be much more difficult for a man to come out in the winter in the early morning to some types of job than at a later hour to clerical work. The majority of the staff covered by this survey were engaged in shift work, but this did not apply to clerical and technical staff nor to staff employed at the overhaul factories at Chiswick, Aldenham, and Charlton.

Whilst clerical and technical staff were eligible for sick pay for up to 26 weeks per annum, the majority of staff in the other groups were not covered by sick pay arrangements until December, 1956. Many of the staff in these groups, however, were contributing to Friendly Societies providing sickness benefits.

The role of selection should also be considered. For each occupation there is a process of self-selection in the sense that people do not seek to engage in it unless they consider themselves capable of meeting at least the minimum requirements. Also, they do not remain in it if opportunities arise of other employment which they consider preferable; persistence in a particular occupation is itself a process of continuing self-selection. Superimposed on the self-selection are the employer's selective processes, designed to admit and to retain in his service only those who satisfy physical standards and standards of proficiency and character appropriate to the particular occupation.

Differences between grades in the regulations governing smoking whilst at work are also relevant, particularly as a man who is not able to smoke when he is at work may also be less likely to smoke in his leisure hours, or may at least not smoke heavily. Drivers, conductors, and railway operating staff are not allowed to smoke when on duty, but maintenance and workshop staff are generally allowed to smoke, though there are certain areas where smoking

is forbidden. Clerical and technical staff are allowed to smoke on duty except when in contact with the public.

Drivers and Conductors.—On the central buses, trolleybuses, and country buses alike the conductors experienced more sickness absence due to bronchitis than the drivers. The difference is of roughly the same proportion whether we look at the number of spells of absence or at the number of days of absence from work. This implies that the severity of attacks as measured by length of absence is similar for the two occupations.

Drivers and conductors have broadly similar earnings and social status and similar hours of work. The observed difference in experience of sickness absence due to bronchitis may arise from differences in the nature of their work. The work of the conductor involves more physical effort including frequent movement up and down stairs. The driver works in relatively uniform conditions of temperature and ventilation and is isolated from other people while driving. The conductor is moving about the bus in contact with passengers; this increases his risk of picking up respiratory infections. Previous data (London Transport Executive, 1956) showed that conductors had more absences than drivers because of colds and influenza, especially at younger ages. It is possible that the increased incidence of upper respiratory infections among conductors in their earlier years, compared with drivers, predisposes them to relatively more frequent attacks of bronchitis in later years. To demonstrate this it would be necessary to subdivide the data by length of service and to take special account of drivers who had previously been conductors.

On the other hand the observed differences may also reflect the different standards of medical examination for driving and conducting respectively; in particular, men are sometimes found unfit for driving because they suffer from cough syncope. This is a public safety measure which does not apply to conductors.

There are also differences in the disabling effect of similar clinical conditions for drivers and conductors respectively. The dyspnoea associated with a mild attack of bronchitis would be disabling in the active occupation of conducting a double-deck vehicle but would not necessarily be so in the less physically active occupation of the driver. In addition some conductors experience distress from the tobacco smoke in the upper deck of the vehicle. These considerations suggest that the conductor may be obliged to prolong a spell of absence where a driver would have been able to return to work and, in some cases, to commence a spell of absence from

work where a driver would have been able to continue at work. This would mean that the conductor had more long spells of absence than the driver and also more short spells. As shown in Table 3 the conductors had more spells than the drivers, and as mentioned above these figures in combination with Table 4 imply that the average length of absence was similar for the two groups.

Bus and Trolleybus Maintenance Staff.—On the central buses and trolleybuses the maintenance staff experienced fewer absences due to bronchitis than either the drivers or conductors. By contrast the days of absence recorded for maintenance staff were more than among the drivers, though still fewer than among the conductors. This implies that the maintenance staff whilst having fewer spells of absence, experienced more severe attacks of bronchitis when they were absent. On the country buses and coaches the pattern was broadly similar but the experience of maintenance staff was relatively a little worse so that the incidence of absences among the maintenance staff was the same as for drivers, whilst the days of absence were more than among drivers or conductors.

It should be mentioned that about 40% of the maintenance staff were permanently on night work; it is the night shift which is responsible for cleaning the buses. In the period of this study much of the cleaning of the interiors was done by the dusty method of "sweeping-out". More recently, this method has largely been superseded by the use of vacuum cleaners, but this work still continues to be done in the unheated parking area of the garage. The maintenance staff, especially those on the night shift, are also exposed to the maximum concentration of exhaust fumes in the garage at the periods when the buses are running in after service at night, or when they are running out before service in the morning. Incidentally, Commins, Waller, and Lawther (1957) found no evidence that these fumes were carcinogenic.

Unfortunately it was not administratively possible for us to segregate the data for those men mainly on night work from the remainder. It may be supposed, however, that the type of work undertaken at night, and the conditions under which it was performed, explain to some extent why the maintenance staff as a whole experienced somewhat longer spells of absence than the drivers and conductors.

Railway Operating Staff.—The railway operating staff experienced about the same number of absences as drivers and conductors, but rather more days of absence indicating longer spells of absence. The work performed by this group is heterogeneous,

since it includes train crews, signalmen and shunters, and station staff. Train crews consist of motormen (train drivers) and guards on all London Transport railways. Station staff include stationmen (porters), ticket collectors, station foremen, etc. Data for supervisory staff (e.g. stationmasters) and for booking clerks are not included. Many more railway staff live and work in the north-eastern and north-western sectors of London than south of the river.

All train crews spend part of their working day above ground and part below. Station staff are liable to work for substantial periods wholly above or wholly below ground but considerable movement between stations does take place.

Workshop Staff.—The experience of workshop staff at Chiswick, Aldenham, and Charlton is relatively favourable in respect of numbers of absences and total days of absence. Chiswick (accounting for some 60% of the whole) is situated in the south-west Operating Division, Aldenham (20%) in the northern country area, and Charlton (20%) in the south-east Division. The staff of these three works live all over London. The type of work and the conditions under which it is done are generally similar to the majority of light/medium engineering factories. There is no shift working. The favourable experience does not seem to be due wholly to geographical factors but probably reflects the more regular working hours and the less variable environmental conditions of workshop staff compared with drivers and conductors.

Clerical and Technical Staff.—The clerical and technical staff also have, for the most part, regular working hours and relatively stable environmental conditions. The majority were employed in large offices in the centre of London but some were dispersed over the whole London Transport area. Generally speaking, these staff live further from their work than the groups already discussed and appear to live in widely scattered residential areas inside and outside London. Clerical and technical staff experienced more spells of absence than the workshop staff but were absent for fewer days in total. There is less physical effort in clerical work than in the work of the other groups discussed and it is therefore not surprising that clerical and technical staff have shorter spells of absence.

Conclusions

This study of the sickness-absence experience, attributed to bronchitis, of five large groups of transport workers in London Transport during the five years 1952-1956 has provided the following information.

The relative incidence of sickness absence due to bronchitis found in all the groups of staff in the successive years supports the observations previously made by many authors that there is a close association between the incidence of bronchitis in any year and the occurrence of dense and prolonged fogs in that year. The particularly severe "smog" of December, 1952 probably contributed to the generally higher incidence among staff working in central London of new cases of bronchitis in 1952 and of the calendar days of absence in 1952 and 1953. This pattern was not repeated in the figures for the workers in the country areas. There was another bad, though less severe, foggy period in January, 1956; in general, there were more new attacks of bronchitis among all the groups of staff in this year than in any other year, except 1952. The year 1956 was also a year of high incidence among the country bus drivers and conductors.

The difference found in this study in the sickness-absence experience attributed to bronchitis of transport workers doing similar types of work in different geographical areas of London supports the findings of Reid (1956) and others. These differences therefore support the conclusion that atmospheric pollution from domestic fires and from industry is responsible for the generally consistent excess of mortality, invaliding rates, and sickness absences attributed to bronchitis, in the north-eastern sector of London compared with the south-western sector, which has been shown in so many different studies.

A special point of interest in the current study is the extension of the areas of observation into the country belt round London. The better experience of country bus drivers, conductors, and maintenance workers in the southern division compared with that of their counterparts in the northern division is striking. As a whole, the country bus staff showed a better experience than their counterparts in the central area.

In the geographical pattern which emerges the experience of the staff in the southern country division can be regarded as approximating to the "normal" in relation to the climatic conditions of south-east England. International comparisons of mortality rates, even when due allowance is made for differences in diagnostic procedure, indicate that the English climate is more conducive to bronchitis than that of most other countries of the world. But in the southern country division the aetiological factors in bronchitis which are subject to human control are probably at a minimum. The experience of staff in the other divisions covered by the survey, however, reflects the varying degrees of metropolitan pollution of the air. Overall, the male employees of London Transport, covered by the survey, suffered an average

of one day of sickness absence per annum attributed to bronchitis. Comparison of the overall figures with those for the southern country division suggests that some 20 or 25% of the overall sickness absence may be ascribed to air pollution. In other words, air pollution in London results in an average of, say, one-fifth of a day's sickness absence per man per year attributed to bronchitis. This result is perhaps rather less striking than might have been expected. It must be remembered, however, that estimates of the total cost to the community of the excess of bronchitis due to air pollution, over and above that due to climate and the minimal pollution in the southern country division, must take account of days of sickness absence beyond the first six months which have been excluded from this survey, as well as permanent disablements and deaths.

The incidence of sickness absence due to bronchitis among transport employees engaged in different jobs does not, with one possible exception, suggest that there are occupational factors in the transport industry causing bronchitis. The marked differences in the incidence and severity of such absence between the various occupations studied appear to be due to the effect of the disease on the capacity for different types of work rather than the effect of the work as an aetiological factor in bronchitis. An engineering worker goes to work with a mild attack of bronchitis which would keep a bus driver away from the wheel of his bus. The bus driver also tends to take longer in convalescence than the clerk because he wants to feel fitter before resuming the more exacting job. It is possible that an exception to this explanation for the variation in the rates occurs with the bus conductors. They have consistently higher rates than the bus drivers in both

the central and country areas. Conductors are known to have more upper respiratory infections than drivers and they work in a less sheltered environment, so that the higher rates among the conductors may be due partly to more complications in the form of bronchitis of these upper respiratory infections and partly to an increased proneness to bronchitis because of more frequent respiratory infections in their younger years. Conducting is physically the most strenuous of the occupations studied here, so that, even if infection plays some part in explaining the higher incidence among bus conductors, the disabling effect of even mild attacks of bronchitis would also be most noticeable in this occupation.

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