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# HISTORICAL RESEARCH REPORT

# Mortality 1967-1977 of industrial workers and ex-workers from the British steel industry: further analyses

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INSTITUTE OF OCCUPATIONAL MEDICINE LTD

MORTALITY 1967-1977 OF INDUSTRIAL WORKERS AND EX-WORKERS
FROM THE BRITISH STEEL INDUSTRY:  FURTHER ANALYSES

by

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# INSTITUTE OF OCCUPATIONAL MEDICINE LTD

## Mortality 1967-1977 of Industrial Workers and Ex-workers from the British Steel Industry:   Further Analyses

JF Hurley, BG Miller, M Jacobsen

## SUMMARY

Further analyses have been carried out on mortality from selected causes (all causes;   non-malignant respiratory disease;   lung cancer;   stomach cancer; ischaemic heart disease) in a large-scale though methodologically suspect cohort of 86 548 steel workers in Britain, of whom 94% were followed up over a 10-year period 1967-1977.   These analyses extend those reported previously by Jacobsen et al (1982), where the study cohort and its reliability have been described in greater detail.   The objectives have been to evaluate, insofar as the data allow, whether steel workers in general are at special risk of mortality from non-malignant respiratory disease;   and to identify what subgroups, if any, may be at special risk from these and other causes.

Expected deaths were based on the general population death rates, taking account of age-group, calendar year of follow-up, and regional differences within Britain. Results are reported by age-group and by region.

Associated analyses of mortality in relation to occupation during 1971/73 have been carried out on a subgroup of 16 120 men over a shorter (43-month) follow-up period.   These are men who had worked in the industry for at least 10 years; they are likely to be unrepresentative of steel workers generally in some other respects also.   Results are reported by various combinations of age, occupation and region, and include : results  from regression modelling of the standardised death rates.

The overall (all-cause) SMR was 78.5, based on 9299 deaths.

The SMR for non-malignant respiratory disease was 72, based on 614 deaths which occurred almost exclusively at ages 45-74.   The study therefore gives no evidence that British steel workers in general have during the 1970s experienced excessive death rates from bronchitis, emphysema and asthma relative to the general population.

In the subgroup analysed for occupational differences, the SMR for non-malignant respiratory disease was lower, at 52.   Against this low background level, more detailed analyses identified suggestively higher SMRs in the West Midlands region. The SMR of 94 in blastfurnace or sinter operatives was also higher than average, but the difference was not statistically significant.

The overall lung cancer SMR was 89.5, with some variations by region, and pointers that any excess occurred in younger men.   Jacobsen et al had indicated excess lung cancer mortality among blastfurnace and sinter men.   The present analyses found a statistically significant twofold relative risk in blastfurnace/sinter

men compared with the other occupations studied, and indicated that there may be regional variations in these risks. Although the subgroup studied for occupational differences may be unrepresentative, this finding underlines a possible problem.

The overall SMR for ischaemic heart disease (IHD) was 80, based on 3331 deaths. Results showed a clear and consistent trend in SMR with age, the highest SMRs being in the youngest age groups. (The SMR at ages less than 45 was almost exactly 100 whereas mortality of an industrial cohort is expected to be less than in the general population.) Limited occupational results indicated that, again, blastfurnace/sinter operatives were at greater risk than most other steel workers, but the differences were not statistically significant, and the comparison varied by region. Some other suggestive patterns by occupation were identified.

The overall SMR for stomach cancer was 83. Analyses by occupation were based on 18 deaths only, giving very little information from which to draw conclusions. There was however no suggestion that blastfurnace workers were at special risk from stomach cancer.

In conclusion, the results provide a strong reassurance that there has not been an 'epidemic' of non-malignant respiratory disease through the 1970s among workers in the British steel industry, while at the same time providing information on possible problems relating to lung cancer and IHD which is helpful in guiding further research. Extension of the mortality follow-up of some of the present study may be one useful part of that further research.

# 1. INTRODUCTION

Early in the 1970s, the then British Steel Corporation (BSC) initiated a large-scale mortality study of steel workers in Britain. Control of the study was passed to the Institute of Occupational Medicine (IOM) in 1974. The identified cohort included 86 548 industrial workers, of whom 81 253 were followed up successfully over 10 years from 1967 to 1977. Results of mortality over that period suggested that death rates from lung cancer were disproportionately high relative to death rates from other causes. The data for analyses by occupation within the industry were limited, but nevertheless suggested that the excess lung cancer occurred among blastfurnace workers in particular (Jacobsen et al, 1982). The authors drew attention to flaws in the conduct of the study, and associated difficulties in interpretation of the results. They recommended further research, with particular emphasis on the mortality of blastfurnace workers.

The health of steelworkers, and especially any effect of work on their respiratory health, has continued to be a controversial issue. As part of its work to clarify the situation and with a view to identifying where future research might best be directed, British Steel asked the IOM to carry out further analyses of mortality of the original cohort of steel workers, without at this stage attempting to extend the follow-up beyond the same 10 year period as previously. There was particular interest in mortality from non-malignant respiratory disease (ICD 490-493) among steel workers generally, (Jacobsen et al, 1982), had not reported results on mortality from this cause); and in any sub groups that might be at special risk. The specific objectives of the present limited extension of previous work were therefore:-

*(a) to describe the mortality from non-malignant respiratory disease of steel workers in the original cohort; and*

*(b) to highlight any particular patterns of excess mortality from this and selected other causes in sub-groups identifiable by combinations of age, geographical region, and occupation; and*

*(c) to interpret the results in the light of known methodological flaws in the study data; i.e. where possible to draw broad conclusions reliably, despite limitations of the data, without necessarily attempting to explain all the details which might appear to be of interest.*

Results of these further analyses are presented and discussed in the present short report. Results refer to non-malignant respiratory disease, mortality from all causes, and from three other major groups of causes: lung cancer (ICD 162); stomach cancer (ICD 151); and ischaemic heart disease (ICD 410-414).

## 2. METHODS

### 2.1 Introductory Remarks

The following description of methods draws very heavily on the report of Jacobsen *et al* (1982), and is in many respects a synopsis of the description given there. Interested readers are referred to Jacobsen *et al*. for a more conventional description and fuller details of methods. The present section is primarily to highlight methodological issues relevant to study reliability, and is not a full description of study methods.

### 2.2 Cohort Definition

The study was intended to include all male industrial workers employed continuously in the British steel industry from 1 January 1963 until vesting date in July 1967 (ie. when the BSC was inaugurated, on nationalisation). In practice, 86 548 men, employed in 1967 at 43 BSC works, were identified as meeting the study definition. During data processing, 164 men were excluded because date of birth had not been recorded, giving a study group of 86 384 men, including a sub-cohort of 2449 coke workers with a shorter qualifying period of continuous employment, and whose mortality has also been reported separately (Jacobsen *et al*, 1982; Hurley *et al*, 1983).

### 2.3 Description and Evaluation of Relevant Data

Several problems, relating to (in)completeness of cohort identification and to other aspects of data quality, should be noted in respect of the material used for this study.

(a) No data were received from 17 works which were in operation in 1967, including six foundries and two tin-plate works. Thus, of the diverse activities of the British steel industry, foundry and tin-plate workers in particular are under-represented in the present cohort.

(b) When the cohort was identified (in 1971/73) different procedures were adopted according to whether or not men were still employed by BSC at that time (ie. were 'current' men or 'leavers'). Subsequent examination of data showed that some men at some works were identified both as 'leavers' and as 'current', implying that co-ordination of the two sets of procedures was imperfect. Because of this lack of co-ordination it seems reasonable to assume that some men (in particular some of those who left during the data collection period in 1971/73), may also have been missed by the study procedures and would therefore have been unidentified.

(c) There was some variation in the interpretation of 'vesting date' in July 1967. Mortality follow-up was therefore defined subsequently as beginning at 1 August 1967.

(d) After their production by BSC computer centres from personnel/payroll records in 1971/73, and during their transfer to the Institute in 1974, data identifying 'current' employees were held in the form of punched cards for subsequent computer entry. Attribution of cards to BSC works was by manuscript

labelling of batches of cards, rather than by punched codes on individual cards. The correct sequencing of cards was not fully maintained before the cards were read to create a computer file of the study data and, though errors were to some extent corrected subsequently, some 'current' men are still wrongly attributed to works. Jacobsen *et al* (1982) give some guidance on the scale of this problem.

(e) The ratio of 'leavers' to 'current' workers varied by plant. Some variation is to be expected, with different manpower turnover in various works or industry sectors. Extreme differences may point to problems such as under-identification of the cohort, or misattribution of men to works, as described above. Numbers of current men and leavers are presented in Table 1, by region.

(f) Vital status at 31 July 1977 was established successfully in respect of 81 253 (94%) of the study group, partly through the Office of Population Censuses and Surveys (OPCS) for England and Wales, and through the Registrar General (Scotland); and partly with assistance from BSC Pensions Office. Notifications of deaths by OPCS or by RG (Scotland) were accompanied by copies of (extracts from) the relevant death certificates, including cause of death coded in accordance with the 8th Revision of the ICD system. In the case of men whose death was notified by BSC Pensions, a copy of (extracts from) the death certificate was requested from OPCS or RG Scotland; or, death registrations form, if available from Pensions Office, was sent to OPCS for coding. In the analyses, individuals have been classified as 'dead' only if a coded certificate is available; or, in Scotland, a suitable extract. Primary (underlying) cause of death only has been used in the present analyses. The number and proportion of untraced men is larger than we would have wished. It includes more than 2 500 for whom searches were still in progress when the follow-up exercise was curtailed in 1980. It may be that these untraced men include a disproportionately large number of workers who had died; though there is no reason to suspect that such a bias, if it exists, would operate preferentially on mortality from some causes of death rather than others.

(g) Work histories of 'leavers' were recorded from personnel records. 'Current' men were asked to attend for survey at works Medical Centres. Those who attended were administered a questionnaire on smoking habit and respiratory symptoms; measurements of anthropometry and simple lung function were recorded; and a work history was taken. These would have been most valuable data if the response rates had been good, and the survey procedures of consistently high quality. In practice, response rates varied substantially by works, and were rarely higher than 75% of those identified as 'current'; and we do not know to what extent the survey procedures were applied consistently. Consequently, the survey data for 'current' men have not been used. Nor, then, have the detailed work histories for 'leavers' who, in the absence of corresponding data for 'current' workers, form a particularly unrepresentative subgroup of steel workers generally.

(h) Some information regarding occupation was however available, for 'current' workers at some plants, as follows. During 1971/73 the BSC was in the process of introducing a relatively crude but informative 'line number' system of classifying job and/or place of work within the industry. The 'line number' of current job was available as part of the personnel information retained on the database of current workers at several works. Where this was the case, 'line number' was recorded at time of cohort identification. In this

way, line number was available for 32 859 of the 'current' men whose vital status had been established (Jacobsen *et al*, 1982; Table 3.4). Jacobsen and co-authors reported a small methodological study, comparing 'line number' as recorded from personnel records with current job reported at medical survey, in a sample of men for whom both sets of information were available. They found good agreement, and on that basis reported some analyses of mortality based on 'line number' occupational information.

Further analyses of a subset of those limited occupational data are reported now. Excluded from the present analyses are 16 196 men whose line number was unspecific with regard to occupation; and three further groups (104 mill ancillary process or coating operatives; 324 forge and ancillary process operatives; and 115 foundry workers) where the numbers at risk were particlarly few. Results are therefore based on a sub group of 16 120 men. Their distribution by region and occupation is given in Table 2.

## 2.4  Scope and Methods of Statistical Analysis

In the present statistical analyses, mortality in the entire traced study group of 81 253 men between 1 August 1967 and 31 July 1977 has been compared with that expected on the basis of published death rates for men generally in the same 10-year age groups, same calendar years, and living in the same regions of Britain, using the well-known 'person-years-at-risk' method (Breslow and Day, 1987). This approach is the same as that of Jacobsen *et al* (1982), with the difference that the present note reports results by region, for selected causes.

Death rates between 1 January 1984 and 31 July 1987 for workers with line number information have similarly been compared with those expected based on the age-, year- and region-specific rates in men generally throughout Britain. (The shorter follow-up period is because all line number men were still employed by BSC, and so were still alive, at the time of data collection in 1971/73). The line number results reported now extend those reported by Jacobsen *et al*, in that they include mortality from non-malignant respiratory causes (ie. bronchitis, emphysema and asthma). Also, they differ from those reported by Jacobsen and colleagues in their choice of reference population: the earlier results used comparisons internal to the overall steel study group.

In addition, some work has been carried out to model death rates from selected causes among the line number men, in an attempt to distinguish regional differences from those related to occupation. The logistic regression methods used have been described by Breslow and Day (1987, Ch. 4), and were implemented using the generalized linear model facilities of Genstat (Genstat 5 Committee, 1987). For ease of implementation, analyses have omitted the youngest age groups, where observed and expected deaths are very low; for example, modelling of lung cancer death rates has focussed on mortality at age 45 or more. Similarly, data from five regions only were included (see 3.2.1 below).

3. RESULTS

3.1     Mortality in 81 253 Men, over 10 Years, by Age and Region

Observed and expected deaths in the traced cohort of 81 253 men, over the
10-year period 1 August 1967 to 31 July 1967, are presented by 10-year
age-group and by region in Tables 3 to 7. The Tables refer, respectively, to
mortality from all causes; bronchitis, emphysema and asthma (ICD 490-493); lung
cancer (ICD 162); stomach cancer (ICD 151); and ischaemic heart disease (ICD
410-414).

3.1.1     Mortality from all causes

The total of 9299 deaths from all causes implied an SMR of 78.5 (Table 3). The
age-specific SMR was somewhat lower both in the younger and in the oldest
age-groups (Table 3), but these were based on relatively few deaths: in general,
the age-specific variations in all-cause SMR were unimportant. Nor, with two
exceptions, were there important variations by region. Those exceptions were an
SMR of .67.3 only, among men at works in Yorkshire and Humberside, based on
1930 deaths; and an SMR of 133 in North-West England, based on 140 deaths.
Further examination showed that all the men at risk (and so all deaths) in
North-West England relate to one works only; and that only 'leavers' from that
works have been included in the population at risk (see Table 1). SMRs of men
at Scottish works declined clearly and markedly with age, from ages 35-44
onwards. These appear to be the main aspects of Table 3.

3.1.2     Non-malignant respiratory disease

Mortality from non-malignant respiratory disease is reported in Table 4. The
overall SMR was 72.2, based on 614 deaths; and so was less than the all-cause
SMR of 78.5. Substantial numbers of deaths were recorded at ages 45-74 only,
spanning three 10-year age-groups, the SMR at these ages declining from 81.8 for
men at ages 45-54, to 68.7 at ages 65-74.

SMRs for bronchitis, emphysema and asthma varied more widely by region than
did all-cause SMRs. (Recall that these SMRs have been adjusted for regional
differences in the general population death rates). The highest values were in
North-West (SMR=152) and North-West/North England (SMR=116), both regions
including a single works only; peculiarities of the risk group in North-West
England have been noted above. All other region-specific SMRs were less than
100. Next highest was West Midlands (SMR=97), where about seven or eight
excess deaths were observed in the age-group 55-64. An SMR of about 80 was
recorded among men in North Wales, in East Midlands, and in Scotland; while the
SMR in the remaining three regions (South Wales, Yorks and Humberside and
Northern England) was about 65. The overall age-related decline in SMRs
between ages 45 and 74 is to some extent found also within regions, but less
clearly so, perhaps because of fewer deaths.

### 3.1.3 Lung cancer

The overall SMR for lung cancer mortality was 89.5 and, though the age–specific values did not show a clear trend, they were highest in the younger age groups i.e. at ages 44 or less (Table 5). Again, there was some evidence of regional differences. The works in North–West England had the highest SMR (196). All others were under 100, but in several regions (North Wales, Northern England, East and West Midlands) only just so, at 95 or greater. Adjusted for region, lung cancer SMRs in South Wales (86), Scotland (80), and Yorks and Humberside (78) were all lower than the average of 89.5 for all the steel workers studied. Age–specific SMRs within region confirmed the finding over all regions, that excess deaths were found primarily in younger men, an observation most clearly marked for men in West Midlands and in Scotland.

### 3.1.4 Stomach cancer

Overall, the SMR for stomach cancer was 82.9 (Table 6). Age–specific results showed a consistent, though not very marked, increase in SMR with age. Discounting regions with very few deaths (including, surprisingly, North–West England where the SMR was low), two regions only showed excess mortality from stomach cancer: West Midlands (SMR=124, 23 deaths) and Scotland (SMR=119, 36 deaths). SMRs for East Midlands and Northern England were each about 90; for men in North Wales the SMR was 81; in South Wales 70; and in Yorks and Humberside, 63. Age–related trends in SMR were not evident within region, possibly in view of the relatively small numbers of expected and observed deaths once the data are subdivided so finely.

### 3.1.5 Ischaemic heart disease

The overall SMR from IHD was 80.2, based on 3331 deaths (Table 7). There is again a clear and consistent trend in SMR with age, the highest SMRs being in the youngest age groups. (At ages 25–34, 11 deaths were observed, compared with just fewer than six expected.) As in many of the other causes considered here, the SMR was high in the North–West England region (44 deaths), and low in Yorks and Humberside (657 deaths). Variations in SMR by region were otherwise unremarkable, ranging from 76 to 89. The age–related decline in SMR was however clearly noticeable within most of the regions considered (Table 7).

### 3.2 Mortality in 16 120 Men, over 43 Months, by Age and Region and Occupation

### 3.2.1 All causes

In all, 581 deaths from all causes were recorded among the 16 120 men studied over the 43–month period from 1 Jan 1974 until 31 July 1977, compared with 761 expected (SMR=76); a relatively small number of deaths on which to base inferences requiring detailed subdivision of the data. Of the nine regions considered previously, there were no 'line number' data for men in North–West England or East Midlands (Table 2); six deaths only (SMR=110) in North–West/North England; and one death only (13.8 expected, SMR=7) among 379 men studied in North Wales. (We do not know why the number of deaths observed in men from works in North Wales is so low, relative to those expected. The difference is very marked; and it is at least in part possibly an artefact of

the methodological flaws noted earlier, though we have not traced a specific mechanism.)

Results summarising mortality from all causes, and from the four major cause groups of interest, by region and by occupations, are presented in Tables 8 and 9 respectively. Further more extensive tabulations for these causes of death, by occupation and age, by region and age, and by occupation and region, are presented in Appendix 1. (Note that the results in Table 9 are based on all 16 120, while those in Table 8 and the Tables of Appendix 1 omit the sparse data from North Wales and North West and North England, and are based on 15 645 men; as a result only Table 9 shows the total number of deaths and the overall SMRs for the whole subset of 16 120.)

Within the context of an overall SMR of 76 for all-cause mortality, the results in Table 8 indicate differences between the five regions included. The highest SMR for all-cause mortality was found in West Midlands (SMR=112), then North England (87) and Scotland (84), then Yorks/Humberside (64) and South Wales (59). (West Midlands also provided the highest region-specific SMR for each of the four causes studied.) The log-linear analyses showed that these differences in all-cause mortality between regions were highly significant statistically (P<0.001), having adjusted for regional differences in the general population death rates.

Examination of age-related variations in SMRs by region showed some evidence of an age-related decline in all-cause SMRs in Scotland and in West Midlands, only.

Table 9 shows variations in all-cause mortality SMRs, by occupation. The all-causes SMR was highest in blastfurnace workers and sinter operatives, at 90 deaths observed, 89 expected (SMR=101). Bricklayers and masons had a relatively high SMR of 90, while boilermakers (SMR=54) and transport workers (SMR=64) were the groups with lowest standardised mortality. The SMRs for the other groups all lay between 70 and 80.

Here and elsewhere, the log-linear analyses considered initially whether the mortality of blastfurnace workers differed significantly from that of all other groups of workers, taken together. For all-cause mortality, that difference was significant at the 5% level (t = 2.37). Further log-linear analyses highlighted that the difference was evident at ages 45 or more, only; and in the regions of Northern England and West Midlands, only.

Differences in all-cause SMRs between the other occupation groups, considered together, were not statistically significant.

### 3.2.2    Non-malignant respiratory disease

The overall SMR from non-malignant respiratory disease in the 16 120 subset was 54 (23 deaths observed, 42.8 expected: Table 8), and so was markedly lower than the all-cause SMR of 76. There were variations by region, with the SMR of 129 in West Midlands (based on four deaths only, 3.1 expected) high by contrast with the other four regions, in three of which the SMR was less than 50.

Despite the very low overall SMR from bronchitis, emphysema and asthma, eight deaths were recorded compared with 6.3 expected (SMR=127) at ages less than 55, in contrast to an SMR of 43 (11 deaths) at ages 55-64, and 36 (four deaths) at ages 65-74. Some small excess in deaths at younger ages was found in four of the five regions, South Wales being the exception.

Log-linear analyses confirmed that these age-related patterns were statistically significant (P<0.05) and, having adjusted for them, the differences in SMRs between regions were statistically significant also (P<0.05), with Scotland as well as West Midlands appearing high relative to the other regions.

The low number of 23 observed deaths complicates the task of identifying patterns by occupation. However, in relation to the very low SMR of 54 in all 16 120 men, the experience of blastfurnace/sinter operatives (SMR=94) and workers in the hot rolling mill (SMR=80) contrasts with that in the melting shop (SMR=30), cold rolling mill (no deaths found, three expected) and in most of the trades (where no deaths were recorded except among bricklayers/masons) (Table 9).

Having adjusted for age and region, the log-linear analyses however provided no evidence that any remaining differences between blastfurnacemen and other occupations were real, nor was the pattern of differences between other occupations significant statistically.

3.2.3    Lung cancer

The overall SMR for lung cancer was 83 (75 deaths observed; 90 expected: Table 8). There was little variation in region-specific SMRs, the lung cancer SMR of 149 in West Midlands being the only notably high value. The SMRs also showed some increase with age, but not clearly so, nor was the effect clearly reproduced within region: an apparently increasing trend with age in Northern England SMRs contrasted with a decline in Yorks/Humberside.

Neither the regional nor the age-related differences were statistically significant at the 5% level.

The lung cancer SMR of 169 in blastfurnace and sinter men was clearly the highest of any of the occupations studied (Table 9). Log-linear analyses confirmed statistical significance of this difference at 5%, with the deviance of 6.59 only just short of statistical significance at the 1% level. Having adjusted for age and region, the lung cancer SMR for blastfurnace and sinter operatives was estimated as about twice that of the other men studied.

Further tabulations showed that the excess deaths occurred primarily in older men, and in the regions of Northern England (11 observed, 5.1 expected, SMR=214) and West Midlands (four deaths observed, 1.1 expected, SMR=351). SMRs among blastfurnacemen from South Wales and Scotland included in the subgroup of 16 120 were both less than 100. (This part of the study included very few blastfurnace workers from Yorks/Humberside: Table 2.) The log-linear analyses however showed that the excess among blastfurnace workers in older men simply reflected the age-related patterns among the occupations generally; and, that the higher lung cancer SMRs for blastfurnacemen in Northern England and West Midlands were also at least in part matched by higher lung cancer SMRs for other occupations, in these regions.

A lung cancer SMR of 110 was recorded for bricklayers and masons, based on five deaths observed (Table 9); three of these occurred in Northern England (1.6 expected). Among main process workers, the SMR was lowest (SMR=67) for men in the cold rolling mill. The experience of tradesmen varied by trade, while the SMR for drivers was low (8 observed, 21.2 expected, SMR=38). Apart from blastfurnace workers, these differences between occupations were however not statistically significant.

3.2.4     Stomach cancer

The overall SMR for stomach cancer was 83, based on 18 deaths observed and 21.7 deaths expected (Table 8).     Information about regional differences in stomach cancer mortality was limited because only 18 deaths were observed.     The data, as represented by the region–specific SMRs, nevertheless indicated substantial regional differences, with values showing almost a ten–fold range:     from 269 (West Midlands) to 29 (Northern England).     This may, of course, be due in part to chance fluctuations related to small (expected) numbers of deaths;  but the log–linear analyses nevertheless showed that overall, the differences between region were statistically significant, at the 5% level.

Like most of the other causes considered, mortality from stomach cancer also gave highest SMRs at younger age–groups:     eight deaths, 4.82 expected (SMR=166) at ages less than 54, contrasting with 10 deaths observed, 16.9 expected (SMR=59) at ages 55 or more.     Possibly because of small numbers of deaths, differences in SMR between the three age–groups considered were not statistically significant.

There were very few deaths from stomach cancer to provide a secure basis for identifying differences by occupation.     Five deaths in melting shop workers compared with 3.4 expected (SMR=148) was the only suggestive result (Table 9).  Table 9 does not suggest any differences between blastfurnacemen and other occupations;  nor did the log–linear analyses find any.     Differences between other occupations were not statistically significant.

3.2.5     Ischaemic heart disease

The overall SMR from IHD in the 16 120 subgroup was 76 (216 deaths observed, 285.4 expected).

Table 8 shows that the region–specific SMRs varied relatively little compared with other cause groups but, in view of the relatively large numbers of deaths, those differences were statistically significant (P<0.05).     The Table shows, and the analyses confirmed, higher SMRs in Northern England and West Midlands than in South Wales men, with lowest SMRs from this cause in Scotland and in Yorkshire/Humberside.

Tabulations indicated an age–related decline in SMRs with values of 86 (aged 45–54), 75 (ages 55–64) and 63 (ages 65–74), a pattern which was not however shown in further analyses to be statistically significant.

Mortality from IHD was relatively high among blastfurnace and sinter operatives, though this was not the occupational group with highest SMR from IHD (Table 9).  Log–linear analyses estimated that the IHD SMR for blastfurnace and sinter men was on average about 1.25 times that of all other groups analysed, but the difference was not statistically significant.     Nevertheless, the blastfurnacemen SMR of 97, based on 32 deaths, included nine deaths (7.1 expected, SMR=127) at ages less than 55.     Within region, the IHD experience of blastfurnace/sinter men showed one very marked contrast, between South Wales (six deaths observed, 11.4 expected, SMR=52) and Northern England (21 observed, 14.4 expected, SMR=146) (P<0.05).

Nor was the overall pattern of differences between other occupations in SMRs from IHD statistically significant.     It may therefore be an over–interpretation of the data to comment on specific patterns.     However, the highest SMR occurred

among welders and burners (11 observed, 89.4 expected, SMR=117), with the
excess deaths again found in Northern England (seven observed, four expected,
SMR=175), and primarily in the age-group 55–64.   Other groups with IHD SMRs
between 90 and 100 included workers in cold rolling mills (19 deaths, SMR=92;
eight deaths at ages less than 55, SMR=141;  within region excess at South Wales);
bricklayers and masons (14 deaths, SMR=99;   five deaths, SMR=194 at ages less
than 55;   excess deaths primarily in Scotland:   five deaths observed, SMR=2.67);
and machinists (nine deaths observed, SMR=93;   no excess deaths in younger men).

# 4. DISCUSSION

The present extension to a large–scale mortality study of steel workers in Britain, over the same follow–up periods as previously (Jacobsen *et al*, 1982), gives no support to the view that steel workers generally in Britain have experienced excessive mortality from non–malignant respiratory disease, relative to the men in the general population. While we have highlighted the methodological flaws of this study, we see no credible mechanism whereby these factors could have artefactually generated such low SMRs as were found in the present study if the true risks among steel workers were high relative to the general population. We therefore think it very likely that the low mortality from non–malignant respiratory disease, as found in this study, reflects the real situation.

The scale and scope of the study, involving more than 80 000 men throughout the British steel industry, increase confidence in this general conclusion. The steel workers studied had been in the industry for over four years, while the subgroup available for study of mortality and occupation had spent at least 10 years in the industry. Thus, all the men studied had some non–trivial experience of work in the industry. On the other hand, particularly susceptible individuals may have been selected out of the study group, by the same token. There were no data on smoking habits, but a limited investigation by Jacobsen *et al* (1982; Table 3.7) indicated that the steel workers studied did not smoke less heavily than men generally in the UK; i.e. the low non–malignant respiratory disease mortality does not seem to be explicable in terms of unusual smoking habits among steelworkers.

There are, however, pointers in the present study to particular occupations and regions where the estimated risks from the causes of death reported here are high relative to steel workers generally, if not relative to the general population. In particular, excess mortality from lung cancer among blastfurnace workers had been noted by Jacobsen *et al* (1982); they suggested further work to find why blastfurnace workers may be particularly at risk. The present analyses describe the situation more fully. The lung cancer SMR of 169 for blastfurnace and sinter operatives relative to the general (regional) populations implied about a twofold risk relative to steel workers in other occupations. These results were based on a subset of 16 120 men, with limited occupational information, which is incomplete and probably unrepresentative in its coverage of steel workers generally. However, the difference in lung cancer mortality between blastfurnace and other steel workers was statistically significant, reinforcing the view that there may be a real effect. Some pointers to regional differences in lung cancer SMRs among blastfurnacemen may help in focussing any further research to clarify the reasons for this difference.

Excess mortality from IHD in younger men had previously been noted among coke workers in particular (Jacobsen *et al*, 1982; Hurley *et al*, 1983), though not among steel workers generally. Analyses of the present study of 81 253 steel workers have now also shown higher SMRs in younger age–groups. The 123 deaths observed at age less than 45 years was almost exactly the number expected based on general population rates. This may nevertheless indicate a problem, because the mortality of an industrial cohort can reasonably be expected to be better than that of the population generally. We do not know whether or to what extent the relatively high IHD mortality among younger men may be related to work in the steel industry in particular; but whatever the cause, it is an issue which may be important in the context of overall health policy for the industry, from the viewpoint of surveillance as well as further research.

These have been informative, if necessarily incomplete, further analyses of existing data. The results provide reassurance that there has not been an 'epidemic' of non-malignant respiratory disease through the 1970s among workers in the British steel industry, while at the same time providing information on possible problems relating to lung cancer and IHD which is helpful in guiding further research. Extension of the mortality follow-up of some of the present study may be one useful part of that further research.

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## ACKNOWLEDGMENTS

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Table 1    Numbers of men included in study cohort, by
           region and by employment status at time of
           data collection (except for coke-worker
           sub-cohort, where men were not distinguished
           by status).

STATUS IN COHORT

| REGION | Leaver | Current | Coke | Total |
|---|---|---|---|---|
| South Wales | 5077 | 14769 | 684 | 20530 |
| North Wales | 1848 | 7288 | 242 | 9378 |
| Yorkshire & Humb | 5957 | 13822 | 612 | 20391 |
| Northern | 5012 | 10409 | 612 | 16033 |
| East Midlands | 1617 | 6846 | 130 | 8593 |
| West Midlands | 1269 | 2698 | 0 | 3967 |
| North Western | 458 | 0 | 0 | 458 |
| Northwest & North | 131 | 257 | 0 | 388 |
| Scotland | 2188 | 4289 | 169 | 6646 |
| All Regions | 23557 | 60378 | 2449 | 86384 |

Table 2 Numbers of men studied by occupation group and region, in analyses of mortality by occupation over a 43-month follow-up, from 1 January 1974 to 31 July 1977. Note that no men were included from works in North West England, or East Midlands.

REGION

| Occupation* Group | South Wales | North Wales | Yorks/ Humber | Northern England | West Midland | North West/ North Eng. | Scotland | Total |
|---|---|---|---|---|---|---|---|---|
| BlastFrn | 642 | 21 | 51 | 600 | 154 | 0 | 94 | 1562 |
| MeltShop | 568 | 150 | 673 | 507 | 256 | 21 | 353 | 2528 |
| HotRoll | 534 | 145 | 1273 | 1350 | 249 | 51 | 466 | 4068 |
| ColdRoll | 842 | 0 | 193 | 150 | 0 | 0 | 102 | 1287 |
| BrickMsn | 206 | 18 | 103 | 191 | 48 | 5 | 80 | 651 |
| Machinst | 127 | 0 | 244 | 129 | 36 | 0 | 8 | 544 |
| Craftsmn | 75 | 8 | 130 | 256 | 23 | 3 | 51 | 546 |
| WeldBurn | 187 | 9 | 72 | 221 | 20 | 1 | 19 | 529 |
| Boilmkrs | 222 | 0 | 72 | 140 | 16 | 7 | 35 | 492 |
| Transprt/ Drivers | 1432 | 28 | 1238 | 709 | 253 | 8 | 245 | 3913 |
| Total | 4835 | 379 | 4049 | 4253 | 1055 | 96 | 3913 | 16120 |

*Here and elsewhere, these abbreviated occupation group names refer respectively to:

BlastFrn : Blast furnace and sinter operatives. (The BSC Line Number system did not distinguish between these two groups.)
MeltShop : Melting shop and continuous coating operatives.
HotRoll : Hot rolling mill operatives.
ColdRoll : Cold rolling mill operatives.
BrickMsn : Bricklayers and masons.
Machinst : Machinists.
Craftsmn : Plumbers, pipe fitters, fitters, electricians, carpenters.
WeldBurn : Welders and burners.
Boilmkrs : Boilermakers.
Transprt/
Drivers : Transport drivers/crane drivers and slingers.

Table 3 Summary of mortality in study group of 81 253 steel workers between 1 August 1967 and 31 July 1977, grouped by age and region. Tabulated values are observed deaths from ALL CAUSES, and expected deaths and SMRs calculated using age- and region-specific published annual death rates. SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

| REGION | 15-24 | 25-34 | 35-44 | AGE (yrs) 45-54 | 55-64 | 65-74 | Over75 | Total |
|---|---|---|---|---|---|---|---|---|
| **South Wales** | | | | | | | | |
| Deaths | 0 | 10 | 95 | 392 | 875 | 590 | 0 | 1962 |
| Expected | 1.48 | 19.71 | 110.17 | 464.47 | 1153.23 | 762.54 | 0.95 | 2512.55 |
| Ratio (SMR) | (0.0) | 50.7 | 86.2 | 84.4 | 75.9 | 77.4 | | 78.1 |
| **North Wales** | | | | | | | | |
| Deaths | 0 | 8 | 35 | 152 | 353 | 374 | 24 | 946 |
| Expected | 0.82 | 8.88 | 47.69 | 190.74 | 450.55 | 434.71 | 30.45 | 1163.85 |
| Ratio (SMR) | | 90.0 | 73.4 | 79.7 | 78.3 | 86.0 | 78.8 | 81.3 |
| **Yorkshire & Humberside** | | | | | | | | |
| Deaths | 1 | 11 | 45 | 243 | 752 | 858 | 20 | 1930 |
| Expected | 2.98 | 21.25 | 85.40 | 400.30 | 1195.19 | 1138.27 | 25.19 | 2868.59 |
| Ratio (SMR) | (33.5) | 51.8 | 52.7 | 60.7 | 62.9 | 75.4 | 79.4 | 67.3 |
| **Northern** | | | | | | | | |
| Deaths | 1 | 12 | 58 | 288 | 900 | 685 | 3 | 1947 |
| Expected | 1.53 | 13.18 | 70.86 | 366.22 | 1001.54 | 864.23 | 6.88 | 2324.42 |
| Ratio (SMR) | (65.6) | 91.0 | 81.9 | 78.6 | 89.9 | 79.3 | 43.6 | 83.8 |
| **East Midlands** | | | | | | | | |
| Deaths | 0 | 6 | 30 | 123 | 393 | 291 | 5 | 848 |
| Expected | 0.54 | 5.80 | 30.88 | 159.23 | 455.09 | 363.74 | 11.52 | 1026.80 |
| Ratio (SMR) | | 103.4 | 97.1 | 77.2 | 86.4 | 80.0 | 43.4 | 82.6 |
| **West Midlands** | | | | | | | | |
| Deaths | 0 | 2 | 13 | 60 | 223 | 207 | 7 | 512 |
| Expected | 0.31 | 2.68 | 13.69 | 75.24 | 241.66 | 263.24 | 9.59 | 606.42 |
| Ratio (SMR) | | (74.5) | 94.9 | 79.7 | 92.3 | 78.6 | 73.0 | 84.4 |
| **North Western** | | | | | | | | |
| Deaths | 0 | 0 | 1 | 15 | 52 | 69 | 3 | 140 |
| Expected | 0.03 | 0.15 | 0.81 | 6.33 | 34.84 | 61.87 | 1.18 | 105.21 |
| Ratio (SMR) | | | | 236.9 | 149.3 | 111.5 | (254.6) | 133.1 |
| **Northwest & North** | | | | | | | | |
| Deaths | 0 | 1 | 1 | 5 | 27 | 21 | 0 | 55 |
| Expected | 0.03 | 0.23 | 1.41 | 7.45 | 29.94 | 34.58 | 0.63 | 74.26 |
| Ratio (SMR) | | | (71.1) | 67.1 | 90.2 | 60.7 | | 74.1 |
| **Scotland** | | | | | | | | |
| Deaths | 1 | 4 | 42 | 155 | 417 | 328 | 12 | 959 |
| Expected | 0.42 | 4.34 | 25.53 | 136.98 | 464.99 | 501.37 | 27.96 | 1161.58 |
| Ratio (SMR) | | (92.2) | 164.5 | 113.1 | 89.6 | 65.4 | 42.9 | 82.5 |
| **All Regions** | | | | | | | | |
| Deaths | 3 | 54 | 320 | 1433 | 3992 | 3423 | 74 | 9299 |
| Expected | 8.13 | 76.23 | 386.44 | 1806.96 | 5027.03 | 4424.55 | 114.34 | 11843.7 |
| Ratio (SMR) | 36.9 | 70.8 | 82.8 | 79.3 | 79.4 | 77.4 | 64.7 | 78.5 |

Table 4 Summary of mortality in study group of 81 253 steel workers between 1 August 1967 and 31 July 1977, grouped by age and region. Tabulated values are observed deaths from BRONCHITIS AND EMPHYSEMA, and expected deaths and SMRs calculated using age- and region-specific published annual death rates. SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

| REGION | 15-24 | 25-34 | 35-44 | AGE (yrs)<br>45-54 | 55-64 | 65-74 | Over75 | Total |
|---|---|---|---|---|---|---|---|---|
| **South Wales** | | | | | | | | |
| Deaths | 0 | 1 | 1 | 16 | 58 | 42 | 0 | 118 |
| Expected | 0.03 | 0.32 | 3.10 | 19.31 | 89.75 | 68.19 | 0.07 | 180.77 |
| Ratio (SMR) | | | (32.2) | 82.9 | 64.6 | 61.6 | | 65.3 |
| **North Wales** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 7 | 23 | 30 | 2 | 62 |
| Expected | 0.01 | 0.12 | 0.90 | 6.65 | 29.22 | 35.94 | 2.25 | 75.08 |
| Ratio (SMR) | | | | 105.2 | 78.7 | 83.5 | (88.9) | 82.6 |
| **Yorkshire &<br>Humberside** | | | | | | | | |
| Deaths | 0 | 0 | 2 | 12 | 63 | 63 | 0 | 140 |
| Expected | 0.04 | 0.29 | 1.86 | 18.23 | 89.66 | 99.92 | 2.05 | 212.05 |
| Ratio (SMR) | | | (107.6) | 65.8 | 70.3 | 63.0 | (0.0) | 66.0 |
| **Northern** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 11 | 54 | 50 | 0 | 115 |
| Expected | 0.03 | 0.28 | 1.94 | 18.32 | 81.44 | 77.61 | 0.51 | 180.14 |
| Ratio (SMR) | | | (0.0) | 60.0 | 66.3 | 64.4 | | 63.8 |
| **East Midlands** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 8 | 26 | 21 | 1 | 56 |
| Expected | 0.01 | 0.09 | 0.71 | 6.41 | 31.17 | 30.32 | 0.85 | 69.56 |
| Ratio (SMR) | | | | 124.9 | 83.4 | 69.3 | | 80.5 |
| **West Midlands** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 3 | 26 | 16 | 0 | 45 |
| Expected | 0.00 | 0.05 | 0.32 | 3.50 | 18.60 | 23.16 | 0.73 | 46.37 |
| Ratio (SMR) | | | | (85.8) | 139.8 | 69.1 | | 97.0 |
| **North Western** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 0 | 7 | 7 | 0 | 14 |
| Expected | 0.00 | 0.00 | 0.02 | 0.30 | 2.93 | 5.87 | 0.09 | 9.22 |
| Ratio (SMR) | | | | | (239.0) | 119.2 | | 151.8 |
| **Northwest & North** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 1 | 2 | 4 | 0 | 7 |
| Expected | 0.00 | 0.00 | 0.04 | 0.37 | 2.38 | 3.21 | 0.05 | 6.05 |
| Ratio (SMR) | | | | | (84.0) | (124.6) | | 115.8 |
| **Scotland** | | | | | | | | |
| Deaths | 0 | 0 | 1 | 6 | 22 | 28 | 0 | 57 |
| Expected | 0.01 | 0.06 | 0.56 | 5.13 | 28.17 | 35.61 | 1.75 | 71.28 |
| Ratio (SMR) | | | | 117.0 | 78.1 | 78.6 | (0.0) | 80.0 |
| **All Regions** | | | | | | | | |
| Deaths | 0 | 1 | 4 | 64 | 281 | 261 | 3 | 614 |
| Expected | 0.13 | 1.20 | 9.45 | 78.22 | 373.33 | 379.83 | 8.35 | 850.51 |
| Ratio (SMR) | | (83.2) | 42.3 | 81.8 | 75.3 | 68.7 | 35.9 | 72.2 |

Table 5  Summary of mortality in study group of 81 253 steel workers between
1 August 1967 and 31 July 1977, grouped by age and region. Tabulated
values are observed deaths from LUNG CANCER, and expected deaths and
SMRs calculated using age- and region-specific published annual death
rates.  SMRs based on less than five expected deaths are reported in
brackets, and those based on less than one expected death are not
quoted.

| REGION | 15-24 | 25-34 | 35-44 | AGE (yrs) 45-54 | 55-64 | 65-74 | Over75 | Total |
|---|---|---|---|---|---|---|---|---|
| South Wales | | | | | | | | |
| Deaths | 0 | 0 | 6 | 33 | 111 | 55 | 0 | 205 |
| Expected | 0.00 | 0.32 | 4.33 | 39.10 | 124.48 | 69.48 | 0.04 | 237.75 |
| Ratio (SMR) | | | (138.4) | 84.4 | 89.2 | 79.2 | | 86.2 |
| North Wales | | | | | | | | |
| Deaths | 0 | 0 | 0 | 20 | 36 | 50 | 1 | 107 |
| Expected | 0.00 | 0.18 | 2.48 | 16.89 | 50.31 | 39.87 | 1.19 | 110.92 |
| Ratio (SMR) | | | (0.0) | 118.4 | 71.6 | 125.4 | (83.7) | 96.5 |
| Yorkshire & Humberside | | | | | | | | |
| Deaths | 0 | 1 | 4 | 38 | 107 | 108 | 1 | 259 |
| Expected | 0.01 | 0.48 | 4.99 | 45.01 | 159.96 | 120.28 | 1.26 | 331.98 |
| Ratio (SMR) | | | (80.2) | 84.4 | 66.9 | 89.8 | (79.6) | 78.0 |
| Northern | | | | | | | | |
| Deaths | 0 | 1 | 3 | 41 | 137 | 97 | 0 | 279 |
| Expected | 0.01 | 0.30 | 4.69 | 45.09 | 138.27 | 93.97 | 0.33 | 282.65 |
| Ratio (SMR) | | | (63.9) | 90.9 | 99.1 | 103.2 | | 98.7 |
| East Midlands | | | | | | | | |
| Deaths | 0 | 0 | 5 | 12 | 58 | 36 | 0 | 111 |
| Expected | 0.00 | 0.12 | 1.77 | 17.01 | 59.20 | 37.46 | 0.51 | 116.06 |
| Ratio (SMR) | | | (283.1) | 70.6 | 98.0 | 96.1 | | 95.6 |
| West Midlands | | | | | | | | |
| Deaths | 0 | 0 | 1 | 13 | 32 | 23 | 1 | 70 |
| Expected | 0.00 | 0.05 | 0.78 | 8.86 | 33.95 | 29.00 | 0.42 | 73.05 |
| Ratio (SMR) | | | | 146.8 | 94.2 | 79.3 | | 95.8 |
| North Western | | | | | | | | |
| Deaths | 0 | 0 | 1 | 2 | 9 | 11 | 1 | 24 |
| Expected | 0.00 | 0.00 | 0.05 | 0.74 | 4.72 | 6.65 | 0.06 | 12.23 |
| Ratio (SMR) | | | | | (190.5) | 165.3 | | 196.3 |
| Northwest & North | | | | | | | | |
| Deaths | 0 | 0 | 0 | 1 | 3 | 4 | 0 | 8 |
| Expected | 0.00 | 0.01 | 0.10 | 0.89 | 4.08 | 3.79 | 0.02 | 8.88 |
| Ratio (SMR) | | | | | (73.5) | (105.4) | | 90.1 |
| Scotland | | | | | | | | |
| Deaths | 0 | 0 | 2 | 20 | 55 | 32 | 1 | 110 |
| Expected | 0.00 | 0.08 | 1.47 | 14.78 | 61.87 | 57.19 | 1.43 | 136.83 |
| Ratio (SMR) | | | (135.7) | 135.3 | 88.9 | 56.0 | (69.8) | 80.4 |
| All Regions | | | | | | | | |
| Deaths | 0 | 2 | 22 | 180 | 548 | 416 | 5 | 1173 |
| Expected | 0.02 | 1.53 | 20.66 | 188.36 | 636.85 | 457.69 | 5.26 | 1310.33 |
| Ratio (SMR) | | (131.1) | 106.5 | 95.6 | 86.0 | 90.9 | 95.1 | 89.5 |

Table 6   Summary of mortality in study group of 81 253 steel workers between
1 August 1967 and 31 July 1977, grouped by age and region.   Tabulated
values are observed deaths from STOMACH CANCER, and expected deaths and
SMRs calculated using age- and region–specific published annual death
rates.   SMRs based on less than five expected deaths are reported in
brackets, and those based on less than one expected death are not quoted.

| REGION | AGE (yrs) | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 15-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65-74 | Over75 | Total |
| **South Wales** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 11 | 30 | 14 | 0 | 55 |
| Expected | 0.00 | 0.11 | 1.85 | 11.82 | 38.99 | 25.68 | 0.02 | 78.48 |
| Ratio (SMR) | | | (0.0) | 93.0 | 76.9 | 54.6 | | 70.1 |
| **North Wales** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 7 | 9 | 15 | 1 | 32 |
| Expected | 0.00 | 0.02 | 1.09 | 5.84 | 16.50 | 15.62 | 0.57 | 39.64 |
| Ratio (SMR) | | | (0.0) | 120.0 | 54.5 | 96.0 | | 80.7 |
| **Yorkshire & Humberside** | | | | | | | | |
| Deaths | 0 | 0 | 2 | 4 | 21 | 24 | 1 | 52 |
| Expected | 0.00 | 0.11 | 1.63 | 10.32 | 36.49 | 33.05 | 0.44 | 82.05 |
| Ratio (SMR) | | | (122.4) | 38.8 | 57.6 | 72.6 | | 63.4 |
| **Northern** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 8 | 30 | 28 | 0 | 66 |
| Expected | 0.01 | 0.10 | 1.49 | 10.74 | 34.28 | 26.20 | 0.13 | 72.95 |
| Ratio (SMR) | | | (0.0) | 74.5 - | 87.5 | 106.9 | | 90.5 |
| **East Midlands** | | | | | | | | |
| Deaths | 0 | 0 | 1 | 1 | 9 | 16 | 0 | 27 |
| Expected | 0.00 | 0.04 | 0.69 | 4.31 | 14.32 | 10.08 | 0.19 | 29.63 |
| Ratio (SMR) | | | | (23.2) | 62.9 | 158.7 | | 91.1 |
| **West Midlands** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 3 | 11 | 9 | 0 | 23 |
| Expected | 0.00 | 0.02 | 0.25 | 2.08 | 8.01 | 8.04 | 0.17 | 18.57 |
| Ratio (SMR) | | | | (144.4) | 137.3 | 112.0 | | 123.8 |
| **North Western** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 |
| Expected | 0.00 | 0.00 | 0.02 | 0.17 | 1.14 | 1.92 | 0.02 | 3.27 |
| Ratio (SMR) | | | | | (0.0) | (104.30) | | 61.2 |
| **Northwest & North** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 3 |
| Expected | 0.00 | 0.00 | 0.03 | 0.21 | 0.99 | 1.03 | 0.01 | 2.27 |
| Ratio (SMR) | | | | | | (0.0) | | 132.3 |
| **Scotland** | | | | | | | | |
| Deaths | 0 | 0 | 2 | 2 | 22 | 10 | 0 | 36 |
| Expected | 0.00 | 0.03 | 0.53 | 3.51 | 13.39 | 12.37 | 0.47 | 30.30 |
| Ratio (SMR) | | | | (56.9) | 164.3 | 80.8 | | 118.8 |
| **All Regions** | | | | | | | | |
| Deaths | 0 | 0 | 5 | 36 | 135 | 118 | 2 | 296 |
| Expected | 0.01 | 0.44 | 7.57 | 49.00 | 164.11 | 133.99 | 2.03 | 357.16 |
| Ratio (SMR) | | | 66.1 | 73.5 | 82.3 | 88.1 | (98.4) | 82.9 |

Table 7   Summary of mortality in study group of 81 253 steel workers between
1 August 1967 and 31 July 1977, grouped by age and region.   Tabulated
values are observed deaths from ISCHAEMIC HEART DISEASE, and expected
deaths and SMRs calculated using age- and region-specific published
annual death rates.   SMRs based on less than five expected deaths are
reported in brackets, and those based on less than one expected death
are not quoted.

| REGION | AGE (yrs) 15-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65-74 | Over75 | Total |
|---|---|---|---|---|---|---|---|---|
| **South Wales** | | | | | | | | |
| Deaths | 0 | 2 | 37 | 170 | 332 | 212 | 0 | 753 |
| Expected | 0.01 | 1.81 | 37.22 | 196.04 | 427.43 | 257.15 | 0.27 | 919.94 |
| Ratio (SMR) | | (110.4) | 99.4 | 86.7 | 77.7 | 82.4 | | 81.9 |
| **North Wales** | | | | | | | | |
| Deaths | 0 | 2 | 17 | 56 | 144 | 103 | 9 | 331 |
| Expected | 0.00 | 0.60 | 12.82 | 74.66 | 166.80 | 145.13 | 8.55 | 408.56 |
| Ratio (SMR) | | | 132.6 | 75.0 | 86.3 | 71.0 | 105.3 | 81.0 |
| **Yorkshire & Humberside** | | | | | | | | |
| Deaths | 0 | 2 | 11 | 100 | 258 | 280 | 6 | 657 |
| Expected | 0.02 | 1.53 | 25.77 | 159.47 | 438.47 | 379.00 | 6.97 | 1011.22 |
| Ratio (SMR) | | (130.4) | 42.7 | 62.7 | 58.8 | 73.9 | 86.1 | 65.0 |
| **Northern** | | | | | | | | |
| Deaths | 0 | 2 | 21 | 123 | 328 | 216 | 1 | 691 |
| Expected | 0.00 | 0.88 | 21.91 | 141.57 | 353.27 | 281.18 | 1.86 | 800.67 |
| Ratio (SMR) | | | 95.8 | 86.9 | 92.8 | 76.8 | (53.8) | 86.3 |
| **East Midlands** | | | | | | | | |
| Deaths | 0 | 2 | 10 | 53 | 144 | 97 | 2 | 308 |
| Expected | 0.00 | 0.39 | 8.50 | 59.34 | 159.51 | 114.65 | 3.00 | 345.40 |
| Ratio (SMR) | | | 117.7 | 89.3 | 90.3 | 84.6 | (66.7) | 89.2 |
| **West Midlands** | | | | | | | | |
| Deaths | 0 | 0 | 5 | 17 | 74 | 58 | 2 | 156 |
| Expected | 0.00 | 0.20 | 3.88 | 27.49 | 78.55 | 77.91 | 2.38 | 190.40 |
| Ratio (SMR) | | | (128.9) | 61.8 | 94.2 | 74.4 | (84.1) | 81.9 |
| **North Western** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 6 | 17 | 21 | 0 | 44 |
| Expected | 0.00 | 0.01 | 0.25 | 2.44 | 12.08 | 19.42 | 0.30 | 34.50 |
| Ratio (SMR) | | | | (246.1) | 140.7 | 108.1 | | 127.6 |
| **Northwest & North** | | | | | | | | |
| Deaths | 0 | 0 | 0 | 2 | 10 | 7 | 0 | 19 |
| Expected | 0.00 | 0.02 | 0.42 | 2.88 | 10.51 | 11.04 | 0.17 | 25.03 |
| Ratio (SMR) | | | | (69.5) | 95.2 | 63.4 | | 75.9 |
| **Scotland** | | | | | | | | |
| Deaths | 0 | 1 | 11 | 73 | 148 | 136 | 3 | 372 |
| Expected | 0.00 | 0.27 | 7.11 | 53.68 | 176.56 | 172.28 | 8.29 | 418.20 |
| Ratio (SMR) | | | 154.6 | 136.0 | 83.8 | 78.9 | 36.2 | 89.0 |
| **All Regions** | | | | | | | | |
| Deaths | 0 | 11 | 112 | 600 | 1455 | 1130 | 23 | 3331 |
| Expected | 0.04 | 5.72 | 117.88 | 717.57 | 1823.18 | 1457.76 | 31.77 | 4153.93 |
| Ratio (SMR) | | 192.2 | 95.0 | 83.6 | 79.8 | 77.5 | 72.4 | 80.2 |

Table 8   Observed and expected deaths, and associated ratio (SMR) by region and
by cause of death, from a 43-month follow-up of 15 645 steel workers
who had 10 or more years employment in the industry.   SMRs based on
less than five expected deaths are reported in brackets, and those
based on less than one expected death are not quoted.

| REGION | | Stomach Cancer (ICD 151) | Lung Cancer (ICD 162) | IHD (ICD410-414) | Non Malignant Respiratory Disease (ICD490-493) | All Causes |
|---|---|---|---|---|---|---|
| South Wales | | | | | | |
| | Deaths | 3 | 12 | 59 | 4 | 138 |
| | Expected | 5.99 | 20.80 | 79.1 | 11.20 | 204.97 |
| | Ratio (SMR) | 50 | 58 | 75 | 36 | 67 |
| Yorks/Humberside | | | | | | |
| | Deaths | 4 | 12 | 34 | 4 | 100 |
| | Expected | 4.41 | 19.27 | 61.58 | 8.82 | 160.95 |
| | Ratio (SMR) | (91) | 62 | 55 | 45 | 62 |
| North England | | | | | | |
| | Deaths | 2 | 30 | 82 | 7 | 200 |
| | Expected | 6.95 | 29.78 | 84.39 | 14.17 | 230.81 |
| | Ratio (SMR) | 29 | 101 | 97 | 49 | 87 |
| West Midlands | | | | | | |
| | Deaths | 4 | 10 | 17 | 4 | 58 |
| | Expected | 1.48 | 6.71 | 17.51 | 3.09 | 51.79 |
| | Ratio (SMR) | (269) | 149 | 97 | (129) | 112 |
| Scotland | | | | | | |
| | Deaths | 4 | 9 | 22 | 3 | 78 |
| | Expected | 2.32 | 11.49 | 35.46 | 4.49 | 93.62 |
| | Ratio (SMR) | (173) | 78 | 62 | (67) | 84 |
| Total | Deaths | 17 | 73 | 214 | 22 | 574 |
| | Expected | 21.16 | 88.03 | 278.03 | 41.77 | 742.14 |
| | Ratio (SMR) | 80 | 83 | 77 | 53 | 77 |

Table 9 Observed and expected deaths, and associated ratio (SMR), by
occupation in 1971/73 and by cause of death, from a 43-month
follow-up of 16 120 steel workers who had 10 or more years
employment in the industry. SMRs based on less than five
expected deaths are reported in brackets, and those based on
less than one expected death are not quoted.

| Occupation Group | | Stomach Cancer (ICD 151) | Lung Cancer (ICD 162) | IHD (ICD410- 414) | Non Malignant Respiratory Disease (ICD490- 493) | All Causes |
|---|---|---|---|---|---|---|
| BlastFrn | Deaths | 2 | 18 | 32 | 5 | 90 |
| | Expected | 2.62 | 10.66 | 33.01 | 5.29 | 88.97 |
| | Ratio (SMR) | (76) | 169 | 97 | 94 | 101 |
| MeltShop | Deaths | 5 | 13 | 27 | 2 | 92 |
| | Expected | 3.38 | 14.39 | 45.35 | 6.58 | 120.52 |
| | Ratio (SMR) | (148) | 90 | 60 | 30 | 76 |
| HotRoll | Deaths | 5 | 19 | 47 | 8 | 137 |
| | Expected | 5.06 | 21.69 | 66.97 | 10.02 | 180.05 |
| | Ratio (SMR) | 99 | 86 | 70 | 80 | 76 |
| ColdRoll | Deaths | 0 | 4 | 19 | 0 | 43 |
| | Expected | 1.55 | 5.96 | 20.56 | 2.97 | 54.16 |
| | Ratio (SMR) | (0) | 67 | 92 | (0) | 79 |
| BrickMsn | Deaths | 1 | 5 | 14 | 2 | 34 |
| | Expected | 1.10 | 4.54 | 14.14 | 2.22 | 38.71 |
| | Ratio (SMR) | (91) | (110) | 99 | (90) | 90 |
| Machinst | Deaths | 0 | 2 | 9 | 0 | 20 |
| | Expected | 0.74 | 3.15 | 9.70 | 1.14 | 25.76 |
| | Ratio (SMR) | | (63) | 93 | (0) | 78 |
| Craftsmn | Deaths | 0 | 3 | 8 | 0 | 18 |
| | Expected | 0.72 | 3.04 | 9.28 | 1.43 | 25.07 |
| | Ratio (SMR) | | (99) | 86 | (0) | 72 |
| WeldBurn | Deaths | 0 | 2 | 11 | 0 | 19 |
| | Expected | 0.73 | 2.96 | 9.42 | 1.41 | 24.96 |
| | Ratio (SMR) | | (68) | 117 | (0) | 76 |
| Boilmkrs | Deaths | 1 | 1 | 4 | 1 | 12 |
| | Expected | 0.63 | 2.54 | 8.32 | 1.24 | 22.11 |
| | Ratio (SMR) | | (39) | 48 | (81) | 54 |
| Transprt | Deaths | 4 | 8 | 45 | 5 | 116 |
| | Expected | 5.19 | 21.16 | 68.62 | 10.20 | 182 |
| | Ratio (SMR) | 77 | 38 | 66 | 49 | 64 |
| Total | Deaths | 18 | 75 | 216 | 23 | 581 |
| | Expected | 21.72 | 90.09 | 285.35 | 42.84 | 761.37 |
| | Ratio (SMR) | 83 | 83 | 76 | 54 | 76 |

Table A1.1:    Summary by occupation and age of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry. Tabulated values are observed deaths from ALL CAUSES, and expected deaths and SMRs calculated using age- and region-specific published annual death rates. SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

AGE (yrs)

| OCCUPATION | | 25-34 | 35-44 | 45-54 | 55-64 | Over65 | Total |
|---|---|---|---|---|---|---|---|
| BlastFrn | Deaths | 0 | 0 | 26 | 47 | 17 | 90 |
| | Expected | 0.09 | 1.92 | 15.43 | 50.75 | 19.68 | 87.87 |
| | Ratio (SMR) | | (0) | 169 | 93 | 86 | 102 |
| MeltShop | Deaths | 0 | 4 | 22 | 50 | 16 | 92 |
| | Expected | 0.47 | 3.58 | 24.45 | 65.04 | 19.65 | 113.19 |
| | Ratio (SMR) | | (112) | 90 | 77 | 81 | 81 |
| HotRoll | Deaths | 1 | 5 | 25 | 79 | 22 | 132 |
| | Expected | 1.18 | 7.77 | 35.14 | 95.70 | 34.23 | 174.02 |
| | Ratio (SMR) | (84) | 64 | 71 | 83 | 64 | 76 |
| ColdRoll | Deaths | 0 | 1 | 12 | 24 | 6 | 43 |
| | Expected | 0.44 | 2.71 | 11.47 | 30.57 | 8.97 | 54.16 |
| | Ratio (SMR) | | (37) | 105 | 79 | 67 | 79 |
| BrickMsn | Deaths | 0 | 1 | 6 | 21 | 6 | 34 |
| | Expected | 0.09 | 0.64 | 5.51 | 23.44 | 6.79 | 36.47 |
| | Ratio (SMR) | | | 109 | 90 | 88 | 93 |
| Machinst | Deaths | 0 | 0 | 2 | 16 | 2 | 20 |
| | Expected | 0.19 | 0.65 | 4.98 | 16.15 | 3.79 | 25.76 |
| | Ratio (SMR) | | | (40) | 99 | (53) | 78 |
| Craftsmn | Deaths | 0 | 0 | 6 | 9 | 3 | 18 |
| | Expected | 0.17 | 1.02 | 5.17 | 13.16 | 5.09 | 24.61 |
| | Ratio (SMR) | | (0) | 116 | 68 | 59 | 73 |
| WeldBurn | Deaths | 0 | 0 | 3 | 13 | 3 | 19 |
| | Expected | 0.12 | 0.67 | 6.26 | 13.42 | 4.09 | 24.55 |
| | Ratio (SMR) | | | 48 | 97 | (73) | 77 |
| Boilmkrs | Deaths | 0 | 2 | 3 | 5 | 0 | 10 |
| | Expected | 0.17 | 0.84 | 5.12 | 11.37 | 4.01 | 21.50 |
| | Ratio (SMR) | | | 59 | 44 | (0) | 47 |
| Transprt | Deaths | 0 | 4 | 36 | 59 | 17 | 116 |
| | Expected | 0.66 | 6.78 | 41.00 | 95.65 | 35.93 | 180.02 |
| | Ratio (SMR) | | 59 | 88 | 62 | 47 | 64 |
| Total | Deaths | 1 | 17 | 141 | 323 | 92 | 574 |
| | Expected | 3.59 | 26.57 | 154.52 | 415.24 | 142.22 | 742.14 |
| | Ratio (SMR) | (28) | 64 | 91 | 78 | 65 | 77 |

Table A1.2:      Summary by region and age of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry. Tabulated values are observed deaths from ALL CAUSES, and expected deaths and SMRs calculated using age- and region–specific published annual death rates. SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

AGE (yrs)

| REGION | | 25-34 | 35-44 | 45-54 | 55-64 | Over65 | Total |
|---|---|---|---|---|---|---|---|
| S–Wales | Deaths | 0 | 7 | 40 | 75 | 16 | 138 |
| | Expected | 1.09 | 9.56 | 49.97 | 111.39 | 32.96 | 204.97 |
| | Ratio (SMR) | (0) | 73 | 80 | 67 | 49 | 67 |
| YorkHumb | Deaths | 0 | 3 | 28 | 54 | 15 | 100 |
| | Expected | 1.43 | 7.17 | 36.47 | 88.83 | 27.05 | 160.95 |
| | Ratio (SMR) | (0) | 42 | 77 | 61 | 55 | 62 |
| Northern | Deaths | 0 | 3 | 41 | 120 | 36 | 200 |
| | Expected | 0.74 | 6.38 | 46.15 | 130.00 | 47.54 | 230.81 |
| | Ratio (SMR) | | 47 | 89 | 92 | 76 | 87 |
| W–Mdlnds | Deaths | 1 | 0 | 12 | 30 | 15 | 58 |
| | Expected | 0.19 | 1.42 | 8.76 | 28.28 | 13.14 | 51.79 |
| | Ratio (SMR) | | (0) | 137 | 106 | 114 | 112 |
| Scotland | Deaths | 0 | 4 | 20 | 44 | 10 | 78 |
| | Expected | 0.15 | 2.04 | 13.17 | 56.73 | 21.53 | 93.62 |
| | Ratio (SMR) | | (196) | 152 | 78 | 46 | 83 |
| Total | Deaths | 1 | 17 | 141 | 323 | 92 | 574 |
| | Expected | 3.59 | 26.57 | 154.52 | 415.24 | 142.22 | 742.14 |
| | Ratio (SMR) | (28) | 64 | 91 | 78 | 65 | 77 |

Table A1.3:    Summary by occupation and region of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry. Tabulated values are observed deaths from ALL CAUSES, and expected deaths and SMRs calculated using age- and region-specific published annual death rates. SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

REGION

| OCCUPATION | | South Wales | Yorks& Humber | North -ern | West Mdlnds | Scot- land | Total |
|---|---|---|---|---|---|---|---|
| BlastFrn | Deaths | 19 | 1 | 51 | 14 | 5 | 90 |
| | Expected | 29.66 | 2.69 | 39.57 | 8.83 | 7.13 | 87.87 |
| | Ratio (SMR) | 64 | (37) | 129 | 159 | 70 | 102 |
| MeltShop | Deaths | 18 | 14 | 23 | 11 | 26 | 92 |
| | Expected | 24.07 | 26.33 | 25.49 | 13.19 | 24.11 | 113.19 |
| | Ratio (SMR) | 75 | 53 | 90 | 83 | 108 | 81 |
| HotRoll | Deaths | 16 | 33 | 53 | 11 | 19 | 132 |
| | Expected | 22.31 | 45.57 | 65.19 | 11.05 | 29.91 | 174.02 |
| | Ratio (SMR) | 72 | 72 | 81 | 100 | 64 | 76 |
| ColdRoll | Deaths | 27 | 4 | 8 | 0 | 4 | 43 |
| | Expected | 31.93 | 7.83 | 8.97 | 0.00 | 5.43 | 54.16 |
| | Ratio (SMR) | 85 | 51 | 89 | | 74 | 79 |
| BrickMsn | Deaths | 9 | 3 | 10 | 4 | 8 | 34 |
| | Expected | 12.50 | 4.08 | 12.13 | 2.82 | 4.93 | 36.47 |
| | Ratio (SMR) | 72 | (73) | 82 | (142) | (162) | 93 |
| Machinst | Deaths | 1 | 10 | 5 | 3 | 1 | 20 |
| | Expected | 4.25 | 11.33 | 7.88 | 1.71 | 0.59 | 25.76 |
| | Ratio (SMR) | (24) | 88 | 63 | (175) | | 78 |
| Craftsmn | Deaths | 2 | 2 | 9 | 3 | 2 | 18 |
| | Expected | 3.19 | 4.76 | 13.20 | 0.98 | 2.47 | 24.61 |
| | Ratio (SMR) | (63) | (42) | 68 | | (81) | 73 |
| WeldBurn | Deaths | 6 | 0 | 10 | 1 | 2 | 19 |
| | Expected | 8.30 | 3.29 | 10.82 | 0.99 | 1.15 | 24.55 |
| | Ratio (SMR) | 72 | (0) | 92 | | (173) | 77 |
| Boilmkrs | Deaths | 5 | 0 | 2 | 0 | 3 | 10 |
| | Expected | 8.95 | 3.29 | 6.85 | 0.42 | 1.98 | 21.50 |
| | Ratio (SMR) | 56 | (0) | 29 | | (152) | 47 |
| Transprt | Deaths | 35 | 33 | 29 | 11 | 8 | 116 |
| | Expected | 59.81 | 51.77 | 40.72 | 11.79 | 15.92 | 180.02 |
| | Ratio (SMR) | 59 | 64 | 71 | 93 | 50 | 64 |
| Total | Deaths | 138 | 100 | 200 | 58 | 78 | 574 |
| | Expected | 204.97 | 160.95 | 230.81 | 51.79 | 93.62 | 742.14 |
| | Ratio (SMR) | 67 | 62 | 87 | 112 | 83 | 77 |

Table A1.4:    Summary by occupation and age of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry. Tabulated values are observed deaths from BRONCHITIS AND EMPHYSEMA and expected deaths and SMRs calculated using age- and region-specific published annual death rates.    SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

AGE (yrs)

| OCCUPATION | | 25-34 | 35-44 | 45-54 | 55-64 | Over65 | Total |
|---|---|---|---|---|---|---|---|
| BlastFrn | Deaths | 0 | 0 | 3 | 0 | 2 | 5 |
| | Expected | 0.00 | 0.04 | 0.57 | 3.09 | 1.53 | 5.23 |
| | Ratio (SMR) | | | | (0) | (131) | 96 |
| MeltShop | Deaths | 0 | 0 | 0 | 1 | 1 | 2 |
| | Expected | 0.01 | 0.06 | 0.88 | 3.80 | 1.43 | 6.18 |
| | Ratio (SMR) | | | | (26) | (70) | 32 |
| HotRoll | Deaths | 0 | 1 | 0 | 5 | 1 | 7 |
| | Expected | 0.02 | 0.14 | 1.29 | 5.72 | 2.53 | 9.70 |
| | Ratio (SMR) | | | (0) | 87 | (40) | 72 |
| ColdRoll | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.01 | 0.05 | 0.39 | 1.82 | 0.69 | 2.97 |
| | Ratio (SMR) | | | | (0) | | (0) |
| BrickMsn | Deaths | 0 | 0 | 0 | 2 | 0 | 2 |
| | Expected | 0.00 | 0.01 | 0.20 | 1.40 | 0.52 | 2.13 |
| | Ratio (SMR) | | | | (142) | | (94) |
| Machinst | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.00 | 0.01 | 0.18 | 0.99 | 0.29 | 1.48 |
| | Ratio (SMR) | | | | | | (0) |
| Craftsmn | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.00 | 0.02 | 0.20 | 0.80 | 0.40 | 1.41 |
| | Ratio (SMR) | | | | | | (0) |
| WeldBurn | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.00 | 0.01 | 0.23 | 0.82 | 0.32 | 1.39 |
| | Ratio (SMR) | | | | | | (0) |
| Boilmkrs | Deaths | 0 | 0 | 1 | 0 | 0 | 1 |
| | Expected | 0.00 | 0.02 | 0.19 | 0.68 | 0.31 | 1.19 |
| | Ratio (SMR) | | | | | | (84) |
| Transprt | Deaths | 0 | 0 | 2 | 3 | 0 | 5 |
| | Expected | 0.01 | 0.12 | 1.46 | 5.76 | 2.74 | 10.08 |
| | Ratio (SMR) | | | (137) | 52 | (0) | 50 |
| Total | Deaths | 0 | 1 | 6 | 11 | 4 | 22 |
| | Expected | 0.06 | 0.48 | 5.59 | 24.88 | 10.76 | 41.77 |
| | Ratio (SMR) | | | 107 | 44 | 37 | 53 |

Table A1.5: Summary by region and age of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry. Tabulated values are observed deaths from BRONCHITIS AND EMPHYSEMA and expected deaths and SMRs calculated using age- and region-specific published annual death rates. SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

AGE (yrs)

| REGION | | 25-34 | 35-44 | 45-54 | 55-64 | Over65 | Total |
|--------|--|-------|-------|-------|-------|--------|-------|
| S—Wales | Deaths | 0 | 0 | 1 | 3 | 0 | 4 |
| | Expected | 0.02 | 0.17 | 1.67 | 6.73 | 2.61 | 11.20 |
| | Ratio (SMR) | | | (60) | 45 | (0) | 36 |
| YorkHumb | Deaths | 0 | 1 | 1 | 2 | 0 | 4 |
| | Expected | 0.02 | 0.09 | 1.27 | 5.41 | 2.02 | 8.82 |
| | Ratio (SMR) | | | (79) | 37 | (0) | 45 |
| Northern | Deaths | 0 | 0 | 2 | 3 | 2 | 7 |
| | Expected | 0.02 | 0.15 | 1.92 | 8.28 | 3.79 | 14.17 |
| | Ratio (SMR) | | | (104) | 36 | (53) | 49 |
| W—Mdlnds | Deaths | 0 | 0 | 1 | 2 | 1 | 4 |
| | Expected | 0.00 | 0.03 | 0.32 | 1.73 | 1.01 | 3.09 |
| | Ratio (SMR) | | | | (116) | (99) | (129) |
| Scotland | Deaths | 0 | 0 | 1 | 1 | 1 | 3 |
| | Expected | 0.00 | 0.03 | 0.40 | 2.73 | 1.33 | 4.49 |
| | Ratio (SMR) | | | | (37) | (75) | (67) |
| Total | Deaths | 0 | 1 | 6 | 11 | 4 | 22 |
| | Expected | 0.06 | 0.48 | 5.59 | 24.88 | 10.76 | 41.77 |
| | Ratio (SMR) | | | 107 | 44 | 37 | 53 |

Table A1.6:     Summary by occupation and region of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry. Tabulated values are observed deaths from BRONCHITIS AND EMPHYSEMA and expected deaths and SMRs calculated using age- and region—specific published annual death rates.     SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

## REGION

| OCCUPATION | | South Wales | Yorks& Humber | North -ern | West Mdlnds | Scot- land | Total |
|---|---|---|---|---|---|---|---|
| BlastFrn | Deaths | 1 | 0 | 3 | 0 | 1 | 5 |
| | Expected | 1.65 | 0.15 | 2.54 | 0.55 | 0.35 | 5.23 |
| | Ratio (SMR) | (61) | | (118) | | | 96 |
| MeltShop | Deaths | 1 | 0 | 0 | 1 | 0 | 2 |
| | Expected | 1.32 | 1.41 | 1.50 | 0.79 | 1.17 | 6.18 |
| | Ratio (SMR) | (76) | (0) | (0) | | (0) | 32 |
| HotRoll | Deaths | 1 | 2 | 3 | 1 | 0 | 7 |
| | Expected | 1.21 | 2.43 | 3.95 | 0.65 | 1.46 | 9.70 |
| | Ratio (SMR) | (83) | (82) | (76) | | (0) | 72 |
| ColdRoll | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 1.74 | 0.42 | 0.56 | 0.00 | 0.24 | 2.97 |
| | Ratio (SMR) | (0) | | | | | (0) |
| BrickMsn | Deaths | 1 | 1 | 0 | 0 | 0 | 2 |
| | Expected | 0.73 | 0.22 | 0.77 | 0.18 | 0.23 | 2.13 |
| | Ratio (SMR) | | | | | | (94) |
| Machinst | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.21 | 0.64 | 0.49 | 0.10 | 0.03 | 1.48 |
| | Ratio (SMR) | | | | | | (0) |
| Craftsmn | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.17 | 0.26 | 0.81 | 0.06 | 0.11 | 1.41 |
| | Ratio (SMR) | | | | | | (0) |
| WeldBurn | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.45 | 0.18 | 0.64 | 0.06 | 0.05 | 1.39 |
| | Ratio (SMR) | | | | | | (0) |
| Boilmkrs | Deaths | 0 | 0 | 0 | 0 | 1 | 1 |
| | Expected | 0.49 | 0.19 | 0.40 | 0.02 | 0.09 | 1.19 |
| | Ratio (SMR) | | | | | | (84) |
| Transprt | Deaths | 0 | 1 | 1 | 2 | 1 | 5 |
| | Expected | 3.23 | 2.89 | 2.51 | 0.68 | 0.76 | 10.08 |
| | Ratio (SMR) | (0) | (35) | (40) | | | 50 |
| Total | Deaths | 4 | 4 | 7 | 4 | 3 | 22 |
| | Expected | 11.20 | 8.82 | 14.17 | 3.09 | 4.49 | 41.77 |
| | Ratio (SMR) | 36 | 45 | 49 | (129) | (67) | 53 |

Table A1.7:   Summary by occupation and age of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry. Tabulated values are observed deaths from LUNG CANCER and expected deaths and SMRs calculated using age- and region–specific published annual death rates. SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

AGE (yrs)

| OCCUPATION | | 25-34 | 35-44 | 45-54 | 55-64 | Over65 | Total |
|---|---|---|---|---|---|---|---|
| BlastFrn | Deaths | 0 | 0 | 2 | 11 | 5 | 18 |
| | Expected | 0.00 | 0.09 | 1.66 | 6.66 | 2.13 | 10.54 |
| | Ratio (SMR) | | | (120) | 165 | (234) | 171 |
| MeltShop | Deaths | 0 | 0 | 3 | 8 | 2 | 13 |
| | Expected | 0.01 | 0.18 | 2.65 | 8.62 | 2.17 | 13.62 |
| | Ratio (SMR) | | | (113) | 93 | (92) | 95 |
| HotRoll | Deaths | 0 | 0 | 2 | 12 | 3 | 17 |
| | Expected | 0.03 | 0.43 | 3.91 | 12.88 | 3.81 | 21.06 |
| | Ratio (SMR) | | | (51) | 93 | (79) | 81 |
| ColdRoll | Deaths | 0 | 0 | 1 | 2 | 1 | 4 |
| | Expected | 0.01 | 0.11 | 1.14 | 3.79 | 0.92 | 5.96 |
| | Ratio (SMR) | | | (88) | (53) | | 67 |
| BrickMsn | Deaths | 0 | 0 | 0 | 4 | 1 | 5 |
| | Expected | 0.00 | 0.03 | 0.59 | 3.03 | 0.74 | 4.39 |
| | Ratio (SMR) | | | | (132) | | (114) |
| Machinst | Deaths | 0 | 0 | 0 | 2 | 0 | 2 |
| | Expected | 0.00 | 0.03 | 0.54 | 2.16 | 0.42 | 3.15 |
| | Ratio (SMR) | | | | (93) | | (63) |
| Craftsmn | Deaths | 0 | 0 | 2 | 1 | 0 | 3 |
| | Expected | 0.00 | 0.06 | 0.59 | 1.78 | 0.56 | 2.98 |
| | Ratio (SMR) | | | | (56) | | (101) |
| WeldBurn | Deaths | 0 | 0 | 0 | 1 | 1 | 2 |
| | Expected | 0.00 | 0.04 | 0.68 | 1.76 | 0.43 | 2.92 |
| | Ratio (SMR) | | | | (57) | | (69) |
| Boilmkrs | Deaths | 0 | 0 | 0 | 1 | 0 | 1 |
| | Expected | 0.00 | 0.04 | 0.55 | 1.45 | 0.42 | 2.47 |
| | Ratio (SMR) | | | | (69) | | (41) |
| Transprt | Deaths | 0 | 0 | 1 | 4 | 3 | 8 |
| | Expected | 0.02 | 0.32 | 4.30 | 12.44 | 3.85 | 20.94 |
| | Ratio (SMR) | | | (23) | 32 | (78) | 38 |
| Total | Deaths | 0 | 0 | 11 | 46 | 16 | 73 |
| | Expected | 0.08 | 1.33 | 16.60 | 54.58 | 15.45 | 88.03 |
| | Ratio (SMR) | | (0) | 66 | 84 | 104 | 83 |

Table A1.8:   Summary by region and age of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry.   Tabulated values are observed deaths from LUNG CANCER and expected deaths and SMRs calculated using age- and region-specific published annual death rates.   SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

AGE (yrs)

| REGION | | 25-34 | 35-44 | 45-54 | 55-64 | Over65 | Total |
|--------|--|-------|-------|-------|-------|--------|-------|
| S—Wales | Deaths | 0 | 0 | 2 | 8 | 2 | 12 |
| | Expected | 0.01 | 0.33 | 4.60 | 12.66 | 3.20 | 20.80 |
| | Ratio (SMR) | | | (44) | 63 | (62) | 58 |
| YorkHumb | Deaths | 0 | 0 | 4 | 7 | 1 | 12 |
| | Expected | 0.04 | 0.43 | 3.92 | 11.96 | 2.93 | 19.27 |
| | Ratio (SMR) | | | (102) | 59 | (34) | 62 |
| Northern | Deaths | 0 | 0 | 3 | 18 | 9 | 30 |
| | Expected | 0.02 | 0.41 | 5.72 | 18.35 | 5.28 | 29.78 |
| | Ratio (SMR) | | | 52 | 98 | 170 | 101 |
| W—Mdlnds | Deaths | 0 | 0 | 2 | 5 | 3 | 10 |
| | Expected | 0.00 | 0.07 | 1.04 | 4.09 | 1.51 | 6.71 |
| | Ratio (SMR) | | | (193) | (122) | (199) | 149 |
| Scotland | Deaths | 0 | 0 | 0 | 8 | 1 | 9 |
| | Expected | 0.00 | 0.10 | 1.33 | 7.52 | 2.54 | 11.49 |
| | Ratio (SMR) | | | (0) | 106 | (39) | 78 |
| Total | Deaths | 0 | 0 | 11 | 46 | 16 | 73 |
| | Expected | 0.08 | 1.33 | 16.60 | 54.58 | 15.45 | 88.03 |
| | Ratio (SMR) | | (0) | 66 | 84 | 104 | 83 |

Table A1.9:    Summary by occupation and region of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry. Tabulated values are observed deaths from LUNG CANCER and expected deaths and SMRs calculated using age- and region-specific published annual death rates. SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

REGION

| OCCUPATION | | South Wales | Yorks& Humber | North -ern | West Mdlnds | Scot- land | Total |
|---|---|---|---|---|---|---|---|
| BlastFrn | Deaths | 2 | 0 | 11 | 4 | 1 | 18 |
| | Expected | 3.04 | 0.34 | 5.13 | 1.14 | 0.90 | 10.54 |
| | Ratio (SMR) | (66) | | 214 | (351) | | 171 |
| MeltShop | Deaths | 2 | 2 | 6 | 0 | 3 | 13 |
| | Expected | 2.44 | 3.18 | 3.33 | 1.70 | 2.98 | 13.62 |
| | Ratio (SMR) | (82) | (63) | (180) | (0) | (101) | 95 |
| HotRoll | Deaths | 2 | 3 | 7 | 3 | 2 | 17 |
| | Expected | 2.27 | 5.40 | 8.33 | 1.43 | 3.63 | 21.06 |
| | Ratio (SMR) | (88) | 56 | 84 | (210) | (55) | 81 |
| ColdRoll | Deaths | 2 | 1 | 1 | 0 | 0 | 4 |
| | Expected | 3.19 | 0.93 | 1.18 | 0.00 | 0.66 | 5.96 |
| | Ratio (SMR) | (63) | | (85) | | | 67 |
| BrickMsn | Deaths | 1 | 0 | 3 | 0 | 1 | 5 |
| | Expected | 1.35 | 0.48 | 1.59 | 0.37 | 0.60 | 4.39 |
| | Ratio (SMR) | (74) | | (189) | | | (114) |
| Machinst | Deaths | 0 | 2 | 0 | 0 | 0 | 2 |
| | Expected | 0.43 | 1.39 | 1.03 | 0.22 | 0.08 | 3.15 |
| | Ratio (SMR) | | (143) | (0) | | | (63) |
| Craftsmn | Deaths | 1 | 0 | 1 | 1 | 0 | 3 |
| | Expected | 0.33 | 0.56 | 1.68 | 0.12 | 0.30 | 2.98 |
| | Ratio (SMR) | | | (60) | | | (101) |
| WeldBurn | Deaths | 1 | 0 | 0 | 1 | 0 | 2 |
| | Expected | 0.84 | 0.40 | 1.39 | 0.14 | 0.15 | 2.92 |
| | Ratio (SMR) | | | (0) | | | (69) |
| Boilmkrs | Deaths | 0 | 0 | 0 | 0 | 1 | 1 |
| | Expected | 0.91 | 0.38 | 0.88 | 0.05 | 0.24 | 2.47 |
| | Ratio (SMR) | | | | | | (41) |
| Transprt | Deaths | 1 | 4 | 1 | 1 | 1 | 8 |
| | Expected | 6.01 | 6.20 | 5.25 | 1.53 | 1.94 | 20.94 |
| | Ratio (SMR) | 17 | 64 | 19 | (65) | (51) | 38 |
| Total | Deaths | 12 | 12 | 30 | 10 | 9 | 73 |
| | Expected | 20.80 | 19.27 | 29.78 | 6.71 | 11.49 | 88.03 |
| | Ratio (SMR) | 58 | 62 | 101 | 149 | 78 | 83 |

Table A1.10:    Summary by occupation and age of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry. Tabulated values are observed deaths from STOMACH CANCER and expected deaths and SMRs calculated using age- and region–specific published annual death rates.    SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

## REGION

| OCCUPATION | | South Wales | Yorks& Humber | North -ern | West Mdlnds | Scot- land | Total |
|---|---|---|---|---|---|---|---|
| BlastFrn | Deaths | 0 | 0 | 1 | 1 | 0 | 2 |
| | Expected | 0..00? | 0.03 | 0.43 | 1.54 | 0.59 | 2.59 |
| | Ratio (SMR) | | | | (65) | | (77) |
| MeltShop | Deaths | 0 | 0 | 2 | 1 | 2 | 5 |
| | Expected | 0.00 | 0.07 | 0.64 | 1.90 | 0.56 | 3.17 |
| | Ratio (SMR) | | | | (53) | | (158) |
| HotRoll | Deaths | 0 | 0 | 1 | 3 | 0 | 4 |
| | Expected | 0.01 | 0.16 | 0.92 | 2.85 | 0.95 | 4.89 |
| | Ratio (SMR) | | | | (105) | | (82) |
| ColdRoll | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.00 | 0.05 | 0.31 | 0.90 | 0.28 | 1.55 |
| | Ratio (SMR) | | | | | | (0) |
| BrickMsn | Deaths | 0 | 0 | 1 | 0 | 0 | 1 |
| | Expected | 0.00 | 0.01 | 0.15 | 0.70 | 0.20 | 1.06 |
| | Ratio (SMR) | | | | | | (95) |
| Machinst | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.00 | 0.01 | 0.13 | 0.49 | 0.11 | 0.74 |
| | Ratio (SMR) | | | | | | |
| Craftsmn | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.00 | 0.02 | 0.14 | 0.40 | 0.15 | 0.70 |
| | Ratio (SMR) | | | | | | |
| WeldBurn | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.00 | 0.01 | 0.17 | 0.41 | 0.12 | 0.72 |
| | Ratio (SMR) | | | | | | |
| Boilmkrs | Deaths | 0 | 0 | 0 | 1 | 0 | 1 |
| | Expected | 0.00 | 0.02 | 0.14 | 0.34 | 0.12 | 0.62 |
| | Ratio (SMR) | | | | | | |
| Transprt | Deaths | 0 | 0 | 2 | 2 | 0 | 4 |
| | Expected | 0.00 | 0.13 | 1.09 | 2.84 | 1.07 | 5.13 |
| | Ratio (SMR) | | | (183) | (70) | (0) | 78 |
| Total | Deaths | 0 | 0 | 7 | 8 | 2 | 17 |
| | Expected | 0.02 | 0.51 | 4.12 | 12.35 | 4.15 | 21.16 |
| | Ratio (SMR) | | | (170) | 65 | (48) | 80 |

Table A1.11:    Summary by region and age of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry.    Tabulated values are observed deaths from STOMACH CANCER and expected deaths and SMRs calculated using age- and region—specific published annual death rates. SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

AGE (yrs)

| REGION | | 25-34 | 35-44 | 45-54 | 55-64 | Over65 | Total |
|---|---|---|---|---|---|---|---|
| S—Wales | Deaths | 0 | 0 | 1 | 2 | 0 | 3 |
| | Expected | 0.00 | 0.16 | 1.42 | 3.29 | 1.11 | 5.99 |
| | Ratio (SMR) | | | (70) | (61) | (0) | 50 |
| YorkHumb | Deaths | 0 | 0 | 2 | 2 | 0 | 4 |
| | Expected | 0.00 | 0.17 | 0.85 | 2.61 | 0.78 | 4.41 |
| | Ratio (SMR) | | | | (77) | | (91) |
| Northern | Deaths | 0 | 0 | 1 | 1 | 0 | 2 |
| | Expected | 0.01 | 0.12 | 1.33 | 4.15 | 1.35 | 6.95 |
| | Ratio (SMR) | | | (75) | (24) | (0) | 29 |
| W—Mdlnds | Deaths | 0 | 0 | 2 | 1 | 1 | 4 |
| | Expected | 0.00 | 0.03 | 0.21 | 0.84 | 0.41 | 1.48 |
| | Ratio (SMR) | | | | | | (269) |
| Scotland | Deaths | 0 | 0 | 1 | 2 | 1 | 4 |
| | Expected | 0.00 | 0.03 | 0.32 | 1.47 | 0.50 | 2.32 |
| | Ratio (SMR) | | | | (136) | | (173) |
| Total | Deaths | 0 | 0 | 7 | 8 | 2 | 17 |
| | Expected | 0.02 | 0.51 | 4.12 | 12.35 | 4.15 | 21.16 |
| | Ratio (SMR) | | | (170) | 65 | (48) | 80 |

Table A1.12: Summary by occupation and region of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry. Tabulated values are observed deaths from STOMACH CANCER and expected deaths and SMRs calculated using age- and region-specific published annual death rates. SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

REGION

| OCCUPATION | | South Wales | Yorks& Humber | North -ern | West Mdlnds | Scot- land | Total |
|---|---|---|---|---|---|---|---|
| BlastFrn | Deaths | 0 | 1 | 0 | 1 | 0 | 2 |
| | Expected | 0.87 | 0.08 | 1.20 | 0.26 | 0.18 | 2.59 |
| | Ratio (SMR) | | | (0) | | | (77) |
| MeltShop | Deaths | 0 | 0 | 1 | 2 | 2 | 5 |
| | Expected | 0.70 | 0.72 | 0.77 | 0.38 | 0.60 | 3.17 |
| | Ratio (SMR) | | | | | | (158) |
| HotRoll | Deaths | 1 | 1 | 1 | 0 | 1 | 4 |
| | Expected | 0.65 | 1.24 | 1.95 | 0.32 | 0.73 | 4.89 |
| | Ratio (SMR) | | (81) | (51) | | | (82) |
| ColdRoll | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.93 | 0.21 | 0.27 | 0.00 | 0.13 | 1.55 |
| | Ratio (SMR) | | | | | | (0) |
| BrickMsn | Deaths | 0 | 0 | 0 | 0 | 1 | 1 |
| | Expected | 0.37 | 0.11 | 0.37 | 0.08 | 0.12 | 1.06 |
| | Ratio (SMR) | | | | | | (95) |
| Machinst | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.12 | 0.32 | 0.24 | 0.05 | 0.02 | 0.74 |
| | Ratio (SMR) | | | | | | |
| Craftsmn | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.09 | 0.13 | 0.39 | 0.03 | 0.06 | 0.70 |
| | Ratio (SMR) | | | | | | |
| WeldBurn | Deaths | 0 | 0 | 0 | 0 | 0 | 0 |
| | Expected | 0.24 | 0.09 | 0.32 | 0.03 | 0.03 | 0.72 |
| | Ratio (SMR) | | | | | | |
| Boilmkrs | Deaths | 1 | 0 | 0 | 0 | 0 | 1 |
| | Expected | 0.26 | 0.09 | 0.20 | 0.01 | 0.05 | 0.62 |
| | Ratio (SMR) | | | | | | |
| Transprt | Deaths | 1 | 2 | 0 | 1 | 0 | 4 |
| | Expected | 1.75 | 1.43 | 1.23 | 0.33 | 0.39 | 5.13 |
| | Ratio (SMR) | (57) | (140) | (0) | | | 78 |
| Total | Deaths | 3 | 4 | 2 | 4 | 4 | 17 |
| | Expected | 5.99 | 4.41 | 6.95 | 1.48 | 2.32 | 21.16 |
| | Ratio (SMR) | 50 | (91) | 29 | (269) | (173) | 80 |

Table A1.13:    Summary by occupation and age of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry. Tabulated values are observed deaths from ISCHAEMIC HEART DISEASE and expected deaths and SMRs calculated using age- and region–specific published annual death rates. SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

AGE  (yrs)

| OCCUPATION | | 25-34 | 35-44 | 45-54 | 55-64 | Over65 | Total |
|---|---|---|---|---|---|---|---|
| BlastFrn | Deaths | 0 | 0 | 9 | 19 | 4 | 32 |
|  | Expected | 0.01 | 0.61 | 6.38 | 19.07 | 6.51 | 32.58 |
|  | Ratio (SMR) |  |  | 141 | 100 | 61 | 98 |
| MeltShop | Deaths | 0 | 0 | 7 | 17 | 3 | 27 |
|  | Expected | 0.04 | 1.11 | 10.09 | 24.70 | 6.58 | 42.51 |
|  | Ratio (SMR) |  | (0) | 69 | 69 | 46 | 64 |
| HotRoll | Deaths | 0 | 4 | 9 | 24 | 9 | 46 |
|  | Expected | 0.09 | 2.35 | 14.53 | 36.20 | 11.54 | 64.71 |
|  | Ratio (SMR) |  | (170) | 62 | 66 | 78 | 71 |
| ColdRoll | Deaths | 0 | 1 | 7 | 9 | 2 | 19 |
|  | Expected | 0.04 | 0.87 | 4.82 | 11.77 | 3.05 | 20.56 |
|  | Ratio (SMR) |  |  | (145) | 76 | (66) | 92 |
| BrickMsn | Deaths | 0 | 1 | 4 | 6 | 3 | 14 |
|  | Expected | 0.01 | 0.19 | 2.28 | 8.88 | 2.27 | 13.63 |
|  | Ratio (SMR) |  |  | (175) | 68 | (132) | 103 |
| Machinst | Deaths | 0 | 0 | 2 | 6 | 1 | 9 |
|  | Expected | 0.02 | 0.21 | 2.08 | 6.13 | 1.27 | 9.70 |
|  | Ratio (SMR) |  |  | (96) | 98 | (79). | 93 |
| Craftsmn | Deaths | 0 | 0 | 2 | 3 | 3 | 8 |
|  | Expected | 0.01 | 0.31 | 2.13 | 4.96 | 1.69 | 9.11 |
|  | Ratio (SMR) |  |  | (94) | (61) | (177) | 88 |
| WeldBurn | Deaths | 0 | 0 | 0 | 10 | 1 | 11 |
|  | Expected | 0.01 | 0.21 | 2.60 | 5.07 | 1.37 | 9.26 |
|  | Ratio (SMR) |  |  | (0) | 197 | (73) | 119 |
| Boilmkrs | Deaths | 0 | 0 | 1 | 2 | 0 | 3 |
|  | Expected | 0.01 | 0.26 | 2.13 | 4.34 | 1.36 | 8.10 |
|  | Ratio (SMR) |  |  | (47) | (46) | (0) | 37 |
| Transprt | Deaths | 0 | 1 | 16 | 24 | 4 | 45 |
|  | Expected | 0.05 | 2.13 | 17.12 | 36.44 | 12.12 | 67.87 |
|  | Ratio (SMR) |  | (47) | 93 | 66 | 33 | 66 |
| Total | Deaths | 0 | 7 | 57 | 120 | 30 | 214 |
|  | Expected | 0.28 | 8.26 | 64.17 | 157.56 | 47.77 | 278.03 |
|  | Ratio (SMR) |  | 85 | 89 | 76 | 63 | 77 |

Table A1.14:    Summary by region and age of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry.   Tabulated values are observed deaths from ISCHAEMIC HEART DISEASE and expected deaths and SMRs calculated using age- and region-specific published annual death rates.   SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

AGE (yrs)

| REGION | | 25-34 | 35-44 | 45-54 | 55-64 | Over65 | Total |
|---|---|---|---|---|---|---|---|
| S—Wales | Deaths | 0 | 3 | 21 | 29 | 6 | 59 |
| | Expected | 0.10 | 3.17 | 21.24 | 43.35 | 11.23 | 79.09 |
| | Ratio (SMR) | | (95) | 99 | 67 | 53 | 75 |
| YorkHumb | Deaths | 0 | 1 | 9 | 18 | 6 | 34 |
| | Expected | 0.11 | 2.23 | 15.50 | 34.47 | 9.28 | 61.58 |
| | Ratio (SMR) | | (45) | 58 | 52 | 65 | 55 |
| Northern | Deaths | 0 | 2 | 15 | 53 | 12 | 82 |
| | Expected | 0.05 | 1.90 | 18.84 | 47.83 | 15.77 | 84.39 |
| | Ratio (SMR) | | (105) | 80 | 111 | 76 | 97 |
| W—Mdlnds | Deaths | 0 | 0 | 4 | 9 | 4 | 17 |
| | Expected | 0.01 | 0.41 | 3.37 | 9.74 | 3.99 | 17.51 |
| | Ratio (SMR) | | | (119) | 92 | (100) | 97 |
| Scotland | Deaths | 0 | 1 | 8 | 11 | 2 | 22 |
| | Expected | 0.01 | 0.55 | 5.22 | 22.17 | 7.51 | 35.46 |
| | Ratio (SMR) | | | 153 | 50 | 27 | 62 |
| Total | Deaths | 0 | 7 | 57 | 120 | 30 | 214 |
| | Expected | 0:28 | 8.26 | 64.17 | 157.56 | 47.77 | 278.03 |
| | Ratio (SMR) | | 85 | 89 | 76 | 63 | 77 |

Table A1.15: Summary by occupation and region of mortality in study subgroup of 15 645 steel workers with 10 or more years employment in the industry. Tabulated values are observed deaths from ISCHAEMIC HEART DISEASE and expected deaths and SMRs calculated using age- and region–specific published annual death rates. SMRs based on less than five expected deaths are reported in brackets, and those based on less than one expected death are not quoted.

## REGION

| OCCUPATION | | South Wales | Yorks& Humber | North -ern | West Mdlnds | Scot- land | Total |
|---|---|---|---|---|---|---|---|
| BlastFrn | Deaths | 6 | 0 | 21 | 3 | 2 | 32 |
| | Expected | 11.45 | 1.04 | 14.39 | 2.96 | 2.73 | 32.58 |
| | Ratio (SMR) | 52 | (0) | 146 | (101) | (73) | 98 |
| MeltShop | Deaths | 4 | 7 | 5 | 5 | 6 | 27 |
| | Expected | 9.28 | 10.17 | 9.43 | 4.47 | 9.16 | 42.51 |
| | Ratio (SMR) | 43 | 69 | 53 | (112) | 65 | 64 |
| HotRoll | Deaths | 7 | 10 | 23 | 3 | 3 | 46 |
| | Expected | 8.63 | 17.41 | 23.75 | 3.72 | 11.20 | 64.71 |
| | Ratio (SMR) | 81 | 57 | 97 | (81) | 27 | 71 |
| ColdRoll | Deaths | 14 | 1 | 2 | 0 | 2 | 19 |
| | Expected | 12.20 | 3.01 | 3.28 | 0.00 | 2.08 | 20.56 |
| | Ratio (SMR) | 115 | (33) | (61) | | (96) | 92 |
| BrickMsn | Deaths | 5 | 0 | 3 | 1 | 5 | 14 |
| | Expected | 4.84 | 1.56 | 4.41 | 0.95 | 1.87 | 13.63 |
| | Ratio (SMR) | (103) | (0) | (68) | | (267) | 103 |
| Machinst | Deaths | 0 | 4 | 2 | 2 | 1 | 9 |
| | Expected | 1.66 | 4.35 | 2.89 | 0.58 | 0.23 | 9.70 |
| | Ratio (SMR) | (0) | (92) | (69) | | | 93 |
| Craftsmn | Deaths | 1 | 1 | 5 | 0 | 1 | 8 |
| | Expected | 1.24 | 1.79 | 4.81 | 0.32 | 0.95 | 9.11 |
| | Ratio (SMR) | (81) | (56) | (104) | | | 88 |
| WeldBurn | Deaths | 3 | 0 | 7 | 0 | 1 | 11 |
| | Expected | 3.21 | 1.27 | 3.99 | 0.34 | 0.45 | 9.26 |
| | Ratio (SMR) | (93) | (0) | (175) | | | 119 |
| Boilmkrs | Deaths | 2 | 0 | 1 | 0 | 0 | 3 |
| | Expected | 3.44 | 1.24 | 2.52 | 0.14 | 0.76 | 8.10 |
| | Ratio (SMR) | (58) | (0) | (40) | | | 37 |
| Transprt | Deaths | 17 | 11 | 13 | 3 | 1 | 45 |
| | Expected | 23.15 | 19.74 | 14.93 | 4.03 | 6.03 | 67.87 |
| | Ratio (SMR) | 73 | 56 | 87 | (75) | 17 | 66 |
| Total | Deaths | 59 | 34 | 82 | 17 | 22 | 214 |
| | Expected | 79.09 | 61.58 | 84.39 | 17.51 | 35.46 | 278.03 |
| | Ratio (SMR) | 75 | 55 | 97 | 97 | 62 | 77 |