Individual Occupations.—The next, more detailed, stage in classification of occupational groups consists of those occupations designated by a single code number in the Classification of Occupations and reveals even higher infant mortality and stillbirth rates. Limiting the discussion to those occupations where there were 50 or more infant deaths (or stillbirths) in the five years one finds the infants of kitchen hands and of other indoor domestic servants with mortality rates of 55.3 and 61.0 per thousand respectively; of "other fitters" with a rate of 60.3; of fishermen with 55.1; of plasterers' labourers and drivers of horse-drawn vehicles with 50.1; and of non-ferrous foundry furnacemen with 50. Stillbirth rates in the 40s are also returned though the groups concerned are not very closely defined, being largely such categories as "other fitters" (with a rate of 47 per thousand), etc. There were no single occupations with rates appreciably lower than for the occupational groups shown in Table II B.

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Clearly there is scope for much quarrying of this mine of material and much speculation on the reasons for such differences. Current theories about the importance of the quality of maternal care, of the mother's education, of the different customs of child care handed down from mother to daughter, of the mother's childhood background, of the differences in availability and of summoning medical help, of the spread of infection, can receive support and discouragement from these figures. There is no space to do more than indicate the extent of the information available.

Reliability of Occupational Data.—One further general point should be mentioned, namely the reliability of the occupational data. In dealing with adult mortality the Registrar General has, very honestly, raised important doubts about the validity of the rates he has published. This is largely because the information about occupations comes from two sources, from census schedules for the "population", or denominator of the mortality rate, and from the death registration documents for the deaths, or numerator of the rate. These may not tally for various reasons: changes of job which mean that the distribution of jobs at the census does not reflect the distribution over the five-year period, differences between census description and death registration description of the same job (in the one case by the man himself and in the other by his widow, for instance) and so on. Moreover, the man may have changed his job because of the illness which finally kills him. Important as these effects may be in adult mortality they are likely to be less important in the analysis of infant mortality by the father's occupation. For, though information about the numerator and denominator comes from two sources as in adult mortality (in infant mortality the two sources are birth and death registration), the first volume of the present report on occupational mortality describes the results of a special enquiry which shows clearly that the effect of such differences is unimportant in infant mortality. In stillbirths, of course, they do not arise. It is also clear that the

father will rarely change his job because his child is ill, so that another reason for doubting the validity of adult occupational mortality rates is not present in the statistics of infant mortality. One particular group of occupations, the validity of whose adult mortality rates has been most seriously questioned in the report, is the group concerned with coal-mining; particularly where comparisons are made between different occupations within the industry. In infant mortality, these difficulties are unimportant since the rates for all three groups of miners distinguished in Table IIA are similar and all well above average.

The fact that differences between the descriptions of occupations on two different occasions, and, quite likely, by two different people, do not appear to affect the validity of infant mortality rates to an important extent alleviates, though it by no means disposes of, corresponding doubts about adult occupational mortality rates. It also adds authority to the evidence mentioned above, on the parallelism of decline of infant mortality rates in different classes and occupational groups over the past few decades.

J. A. HEADY

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Mortality in Mining and Quarrying Occupations

Mining is a good example of the caution needed in the interpretation of death rates tabulated by occupation. The report of a standardized mortality ratio above the national average raises two questions: Is it correct, and, if correct, does it necessarily imply a hazard to life specific to the occupation? As the Registrar General points out in this section of his Commentary, studies designed to answer these questions have been sponsored by the National Coal Board and carried out, with the help of the Board and the General Register Office, in the Department of Medical Statistics and Epidemiology at the London School of Hygiene and Tropical Medicine. The first report of the work was recently published (Heasman, Liddell, and Reid, 1958). Briefly, a comparison of occupation as given either by the informant at the time of death registration or as ascertained by local inquiry largely at the pit where the dead man used to work showed quite serious discrepancies. In general, there was a marked tendency for "promotion" from retirement or doing another job back to the mine; and within the mine, men tended to be described by the informant as coal-face workers. Again, where the description was the rather vague one of "coal-miner", the General Register Office coding conventions assigned the death to the faceworker category. To a lesser extent, the same trends operated even in self-description at the time of census. Although these similar errors in assignment tended to cancel each other out, the net result was still an inflation of the reported death ratio for miners in general and faceworkers in particular, it seemed likely, in fact, that miners do not have a death rate much above the national average and that among men whose

last occupation was at the coalface the death rate was substantially lower. The effect of selection in original choice of job and later selective elimination is thus obvious.

The limitations of the conventional mortality rate by last occupation as a measure of the specific occupational risk to life thus made plain are emphasized by the Registrar General who confines his discussion largely to the experience of coal-miners as a whole. He also relates present death rates in this occupational group to the history of the industry in the present century. The moribund state of coal-mining in this period was reflected in fewer young men joining the labour force and the drift away from the more depressed areas to other mines or to alternative jobs in other parts of the country. These movements within the industry as new coalfields expanded and others shut down caused low death rates in the new districts which have attracted the younger and fitter men and, conversely, high rates in the derelict areas with an older residual population. Outside the industry, the bringing of new alternative forms of employment to a mining area may also have drawn off the younger and fitter men. It is thus not surprising to find that, when accidents have been dropped from the account, miners' mortality is, relative to that of other men, worse at ages over 55; and the position has deteriorated since the last census.

Despite the admitted imperfections of these death rates by occupation, certain hazards to health are still clearly revealed. Accidents among the younger men and the dust diseases of the chest stand out above any likely artifact due to inadequate descriptions of jobs on death certificates or census schedule. As usual, the South Wales anthracite fields have the highest rates in this latter respect. On the other hand, the general tendency towards inflation of death rates underlines the significance of the death rates from lung cancer, vascular lesions of the central nervous system, and coronary thrombosis which, particularly among the underground workers, are well below the national level. Cancer of the stomach seems to be the only malignant disease which causes an excessive death rate among miners.

The death rates among miners' wives are doubtless subject to the same sort of bias in reporting of occupation as those of their husbands. To that extent, therefore, their value as a control of the component of social environment in mortality is limited. Nevertheless, the consistency of the pattern of death rates by cause in the two sexes does suggest that some of the excess mortality among miners, *e.g.*, from tuberculosis, bronchitis, or cancer of the stomach, may be socially rather than occupationally determined. But miners' wives also have disabilities not shared by their husbands: an excessive mortality from all causes even in early adult life and from all the cardiovascular-renal group of disorders at all ages. For suicide at least, both miners and their wives have a relatively low rate.

Some of the problems of interpretation encountered in the coal-mining industry exist for the death experience in other forms of mining in this country. Tin and copper mining, for example, is a dying craft subject to the selective loss of the younger and fitter men. Even for

the period covered by this Occupational Supplement, however, it is difficult to explain 78 deaths from industrial pulmonary disease instead of the one expected except on the basis of a serious and specific occupational risk. For "getters in open quarries" some of these occupational hazards were serious enough, but in general their death rates differed little from the national average.

D. D. REID

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Mortality in Transport Occupations

Difficulties of interpretation, to which the Registrar General refers in his introduction, apply in full measure to the data for transport workers. First, the classification of the data may lead to misunderstanding. For example, the number of "railway transport workers" is about half the total employed by British Railways because engineering, clerical, and miscellaneous grades have been omitted. Only operating grades are covered, and the heading "railway officials" is similarly restricted. By contrast, bus and tramway managers are included among transport workers.

Secondly, mis-statements of occupation are probably frequent. For example, it appears that many owner-drivers of taxis, returned at the census as drivers, are included on death among car and coach hire proprietors; the standardized mortality ratio (S.M.R.) of this group is no less than 427.

Thirdly, public safety demands selection on entry and, subsequently, transfer of the unfit to less responsible posts. This makes it difficult to associate mortality with occupational factors.

This last difficulty is illustrated by the overall S.M.R.s for the various groups of railway workers. The groups with low S.M.R.s are engine drivers (93), firemen (86), guards (86), and signalmen (83). Average figures occur among railway officials (95), shunters (103), porters (104), and running shed workers (96). The only significantly high S.M.R. is for ticket collectors (135). Collecting tickets is not evidently detrimental to health but ticket collectors include many rejects from other grades.

The point is further illustrated by deaths from bronchitis which are higher than expected among ticket collectors, porters, and running shed workers (all receiving grades for chronic bronchitis), and lower among railway officials and signalmen. Deaths from tuberculosis also are higher than expected among ticket collectors and lower among officials, drivers, guards, and signalmen. Coronary diseases, the sudden onset of which may preclude transfer to other work, caused deaths above expected among officials and drivers, below expected among porters.

Deaths from accidents not in the home were above expected among drivers, firemen, guards, and shunters. Deaths from leukaemia were higher than expected for officials and drivers but not significantly different from the expected level for other railway workers. Signalmen enjoyed a low death rate for cancer.

For many groups of road transport workers inter-