LETTERS TO THE EDITOR

Geographical variation in coronary revascularisation rates

Sir – I found the paper by Black *et al*[1] on the geographical variation in coronary revascularisation rates extremely interesting. This is a vital area if the NHS is to try to achieve a more equitable service. I am impressed by the tremendous size of the study embarked upon to investigate these variations and the wealth of information available for analysis.

The authors report a negative correlation between SMRs for coronary heart disease and revascularisation indicating inequities in service provision. However, this conflicts with the positive correlation between social deprivation indices and revascularisation. This implies that higher intervention rates are associated with districts with lower SMRs and with more deprived districts. The authors argue that this could be confounded by the close proximity of specialist centres to more socially deprived districts.

I believe there are important possible explanations for this relationship that have not been discussed. The first is related to the statistical analyses. Pearson correlation coefficients are quoted for relationships between rates for coronary artery bypass grafting (CABG) and percutaneous transluminal coronary angioplasty (PTCA) and both the Jarman social deprivation index and the Department of the Environment social index (DoE). These show CABG to have a significant correlation with both the Jarman and DoE indices, and when all revascularisations are considered together there is a significant correlation with the DoE index. The revascularisation rates and DoE index are illustrated in figure 2 of the paper. On closer inspection, however, it is evident that these relationships could be due to one outlying district. I have entered the data for CABG rates obtained from figure 2 and reanalysed the data removing this district. This shows no significant correlation between CABG and the DoE index. It would also lead to non-significant correlation between rates of all revascularisations and the DoE index. Evidently this unusual district requires further investigation. A more appropriate analysis would be a binomial or Poisson regression model.[2] This could adjust for differences in district population size which is not allowed for in the correlation analysis.

A further issue relates to the indices used as indicators of coronary heart disease morbidity. The Jarman and DoE indices combine both direct measures of material deprivation, for example, unemployment and overcrowding, and indirect measures of material deprivation, for example, lone pensioners, single parents, and ethnicity. Studies[3,4] have shown that these two indices correlate less well with measures of morbidity than indices comprising solely of direct measures of material deprivation such as the Townsend index,[5] and single indicators such as unemployment rates. It would be extremely interesting to see the results of an analysis comparing revascularisation and a material deprivation index to understand more fully this relationship.

I feel the message of this paper could be significantly enhanced by the suggested reanalyses since it will give more convincing results and may well result in conclusions consistent with previous studies. The rate of CHD is known to be higher in more deprived areas and yet here on removal of the outlying district the rate of provision does not appear to vary with deprivation implying that there is still a great deal of inequity in intervention rates.

LUCY K SMITH
Department of Ophthalmology, Leicester University, Leicester.

1 Black N, Langham S, Petticrew M. Coronary revascularisation: why do rates vary geographically in the UK? *J Epidemiol Community Health* 1996;**49**:408–12.
2 Aitkin M, Anderson D, Francis B, Hinde J. *Statistical modelling in GLIM*. Oxford, Oxford University Press.
3 Campbell DA, Radford JMC, Burton P. Unemployment rates: an alternative to the Jarman index? *BMJ* 1991;**303**:750–5.
4 Morris R, Carstairs V. Which deprivation? A comparison of selected deprivation indexes. *J Public Health Med* 1991;**13**:318–26.
5 Townsend P, Phillimore P, Beattie A. *Health and deprivation: inequality and the north*. London: Croom Helm, 1988.

Reply

Lucy Smith points out that the analysis of our paper on geographical variation in coronary revascularisation rates would be enhanced by re-analysing the data without one outlying district. Apart from the dubious scientific basis of selectively excluding inconvenient data, there are three points we would like to make in response to this comment.

Firstly, figure 2 shows the relationship between the revascularisation rates and the Department of Environment index for NHS plus private cases, which excludes South East Thames region for which private data were not available. In table 2, the correlation coefficients for the relationships are based on NHS rates only, which allowed us to include South East Thames, so the re-analysis of our data done by Lucy Smith from figure 2 does not relate to the analysis we conducted.

Secondly, there are several districts with exceptionally high rates in our data, which could have potentially influenced the results. Four districts had NHS rates for coronary artery bypass grafting or percutaneous transluminal coronary angioplasty above 1000 per million population (aged >24 years). However, when these districts were excluded from the analysis the significance of the relationships between the rates and social deprivation indices remained the same, although the confidence intervals became wider.

Thirdly, further investigation into the districts with exceptionally high rates shows that they are all in close proximity to a specialist centre. This observation strengthens our conclusion that the results may have been confounded by distance as the more deprived districts tend to be in inner city areas where many of the specialist centres are located.

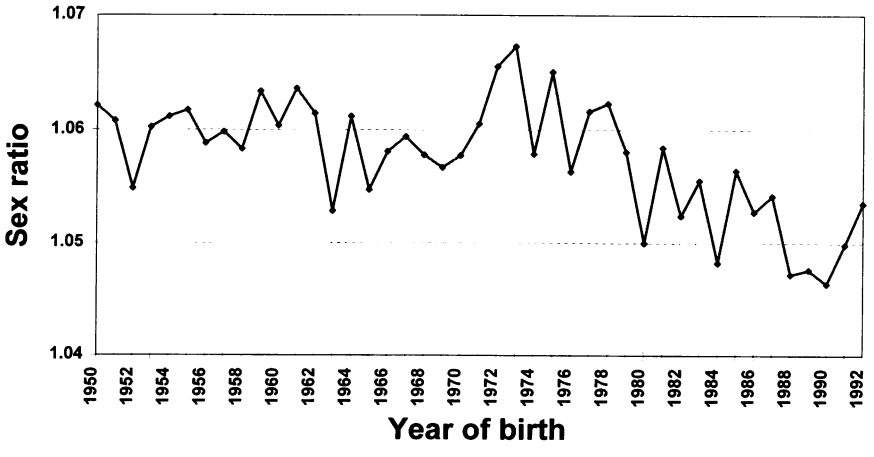
The use of a binomial or Poisson regression model to analyse the data may have been more appropriate given the different sizes in district populations. Finally, we agree that comparison of revascularisation rates with an index that measures deprivation entirely directly may produce different results but in practice does not.

NICK BLACK
SUSAN LANGHAM
London School of Hygiene and Tropical Medicine, London

Why is the sex ratio falling in England and Wales?

Sir – There is concern about the declining sperm count and whether this might be due to the effects of chemicals in the environment affecting the levels of male sex hormones.[1] There is also speculation that the sex ratio (the ratio of the number of boys born to the number of girls) is affected by parental hormone levels.[2]

The sex ratio in England and Wales, as estimated from government statistics, has declined from 1950 to 1992 (figure). There is a lower sex ratio, 1·052, from 1980 onwards compared with 1·060 for the preceding period. Analysis by logistic regression shows a significant linear trend OR=0·9998, (95%CI: 0·9997, 0·9998). It is known that older mothers, in particular those over 35 years, are more likely to have girls.[3] The proportion of these older mothers fell until the



Sex ratio in England and Wales, 1950–92.

late 1970s and is now rising. After allowing for the proportion of births to mothers over 35 years, the trend with year remains significant at the 5% level, OR=0·9996, (95%CI: 0·9995, 0·9997). Over the period there has also been a steady increase in the proportion of single mothers. As single mothers are more likely to have boys,[4] it is likely that the decline in the sex ratio of children born to other women is even greater.

This decline in the sex ratio remains unexplained. Possibilities are a general fall in the frequency of intercourse, perhaps due to the increasing stress of society or changes in male or female hormone levels. The latter could be consequence of air pollution which was shown by Williams *et al*[5] to be associated with a lower sex ratio.

H O DICKINSON
L PARKER
University of Newcastle
Sir James Spence Institute of Child Health
Royal Victoria Infirmary
Newcastle upon Tyne

This research was supported by grants from the United Kingdom Coordinating Committee on Cancer Research, the North of England Children's Cancer Research Fund and Westlakes Research Institute.

1 Harrison PTC, Humphrey CDN, Litchfield M, Peakall D, Schuker LK. *Environmental oestrogens: consequences to human health and wildlife.* Leicester: MRC Institute for Environment and Health, University of Leicester, 1995.
2 James WH. The human sex ratio. Part 2: A hypothesis and a program of research. *Hum Biol* 1987;**59**:873–900.
3 James WH, Rostron J. Parental age, parity and sex ratio in births in England and Wales 1968–1977. *Journal of Biosocial Science* 1985;**17**:47–56.
4 James WH. The human sex ratio. Part 1: A review of the literature. *Hum Biol* 1987;**59**:721–52.
5 Williams FL, Lawson AB, Lloyd OL. Low sex ratios of births in areas at risk from air pollution from incinerators, as shown by geographical analysis and 3-dimensional mapping. *Int J Epidemiol* 1992;**21**:311–19.

Comparing measures of variation

Sir – We recently reported levels of geographical variation in hospital admission rates in the Oxford region.[1] In discussing our results, we briefly compared systematic component of variation (SCV) values from our data with those published by Wennberg *et al*[2] for hospital service areas in Maine, USA. Wennberg *et al* described their method by citing an earlier paper in which SCVs had been calculated using a multiplication constant of 100.[3] We now believe that in the 1984 study[2] they in fact used a multiplication factor of 1000, although it is impossible to discover this from their paper.

The reported differences between our results and those from Maine persist, however, after taking account of the 10-fold multiplication factor. Only 10% of admissions in Maine were for conditions with an SCV (100) of less than 5·0, compared with 44% of surgical workload in Oxford.

Our conclusion remains unchanged. There was substantially less variation in admission rates in the Oxford region than in Maine, USA.

JOHN NEWTON
VALERIE SEAGROATT
MICHAEL GOLDACRE
Unit of Health-Care Epidemiology,
Department of Public Health,
and Primary Care,
University of Oxford.

1 Newton JN, Seagroatt V, Goldacre M. Geographical variation in hospital admission rates: an analysis of workload in the Oxford region, England. *J Epidemiol Community Health* 1994; **48**:590–95.
2 Wennberg JE, McPherson K, Caper P. Will payment based on diagnosis-related groups control hospital costs? *N Engl J Med* 1984;**311**: 295–300.
3 McPherson K, Wennberg JE, Horind OB, Clifford P. Small-area variations in the use of common surgical procedures: an international comparison of New England, England, and Norway. *N Engl J Med* 1982;**307**:1310–14.

Perinatal mortality in a first generation immigrant population and its relation to unemployment in The Netherlands

Sir – In the introduction of the above article[1] we stated in error that a previous study by Doornbos and Nordbeck of the same population[2] showed an odds ratio of 1·50 for perinatal mortality for infants of Surinam origin and of 1·42 for infants of other non-Dutch origin. In fact, these authors reported crude odds ratios of 1·23 and 1·22 for the two groups. The error resulted from a misreading of data provided by these authors.

Our re-analysis of the role of various factors associated with perinatal mortality and ethnic origin therefore confirms the simpler Doornbos/Nordbeck analysis with respect to the marginal role of infant origin itself.

The main finding of our report regarding the important role of parental employment status as a predictor of perinatal mortality is not affected.

L H LUMEY
S A REIJNEVELD
American Health Foundation
New York
USA

1 Lumey LH, Reijneveld SA. Perinatal mortality in a first generation immigrant population and its relation to unemployment in The Netherlands. *J Epidemiol Community Health* 1995; **49**:434–9.
2 Doornbos JPR, Nordbeck HJ. *Perinatal mortality. Obstetric risk factors in a community of mixed ethnic origin in Amsterdam* (proefschrift). Amsterdam: Universiteit of Amsterdam, 1985.

NOTICES

European Journal of Public Health (1996;6)

The contents of the *European Journal of Public Health* for June 1996 are as follows.