AUTHORS' REPLY.—Dr M C F Jenkins criticises our lack of a control group and suggests that the number of cases of carcinoma may have been underestimated because of losses to follow up.

We found a highly significant excess of invasive cancer in women with an initial dyskaryotic smear compared with the number predicted from the incidence in the total population. Dr Jenkins suggests that we should have used a control group of screened women matched for age as background incidence rates derive mainly from unscreened women. If this is true, however, the rate of invasive cancer would be lower in a screened group, which would consist mainly of women with negative smears. The rate of subsequent invasive cancer in screened women would include components of both the false negative rate and spontaneously occurring cancers and is likely to be extremely low. Such a comparison would increase the relative risk conferred by an initial dyskaryotic smear. Also, the confidence limits on such an estimate of the risk would be very wide, reflecting the small number of control subjects compared with the number used to derive national rates.

We agree that the high mobility of the subjects may have led us to underestimate the risk of carcinoma and acknowledged this in our discussion. Dr Jenkins recommends examining the records of neighbouring hospitals, but this would only partially resolve the problem as many of the women moved out of the London area. More complete ascertainment would be obtained by registering the cohort with the NHS central registry for cancer incidence, and we intend to do this for long term follow up.

Dr Jenkins has misunderstood our use of the presence of endocervical or metaplastic cells. These were used not as a criterion for entry to the study but to classify smears as adequate or inadequate. An adequate smear indicated that the squamocolumnar junction had been sampled. An important finding of our study was the poor reliability of inadequate negative smears, emphasising the need to take a further smear. If around half the cervical smears screened in British laboratories lack such cells this is concerning as it suggests an unacceptably high level of sampling error.

Dr Mahmood Shafi and colleagues wonder why we did not follow the recommendations of the intercollegiate working party on cervical screening. Our study was undertaken before colposcopy was widely available and before the working party's report was published. In addition, as we stressed in the paper, there is insufficient scientific evidence supporting these guidelines. Although some of our patients were selected retrospectively, they were all followed up prospectively over four and half years. We used recommendation for a cone biopsy or the presence of invasive carcinoma as an indication of progression and clearly defined our criteria for regression, thus allowing the rates for these two outcomes to be computed. We consider that this type of design is unsuitable for evaluating the "effectiveness of differing management protocols" and emphasised in our paper that only randomised controlled trials could answer questions on the benefits of follow up by colposcopy versus cytological examination. We look forward to the results of such trials from Birmingham and other groups.

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SIR,—In the study by Dr Astrid Fletcher and colleagues biopsies seem to have been performed mainly on women whose initial cervical smears showed mild dyskaryosis and who subsequently had smears that showed a higher grade of abnormality.¹

In this district most women with two smears that

Results of biopsy in women found to have mild dyskaryosis in cervical smears

	No of women ¹
Normal, wart virus, or inflammatory	53
Cervical intraepithelial neoplasia I	124
Cervical intraepithelial neoplasia II	67
Cervical intraepithelial neoplasia III	54
Invasive squamous carcinoma	0
Glandular neoplasia	1

show mild dyskaryosis are referred for colposcopic biopsy, and some women are referred after only one such smear. This makes it possible to compare smear testing with biopsy as a diagnostic indicator. Women were included in the study if they had had a smear showing mild dyskaryosis during 1 January 1988 to 31 December 1989 (not preceded in that interval by a smear showing a more severe abnormality) and a subsequent biopsy before 30 September 1990. There were 299 such patients, some of whom had had two biopsies. If the results of the two biopsies differed the higher grade of abnormality was recorded.

The table shows that a substantial proportion of the women with initial cervical smears showing mild dyskaryosis were diagnosed as having cervical intraepithelial neoplasia grade III (CIN III) on biopsy. Even when those women who had had a second smear that showed a worse abnormality than mild dyskaryosis before the biopsy were excluded the proportion of women with CIN III was still appreciable (37 out of 299). Twenty two of the 37 had had two smears showing mild dyskaryosis and one woman had had three smears showing mild abnormality. In addition, the total number of cases of CIN III diagnosed during the study was 201. Thus 18% of the women with CIN III had had smears that had shown only mild dyskaryosis.

These figures seem to justify the policy of early biopsy after a smear test has shown mild dyskaryosis. Although the ultimate aim of the screening programme is prevention of invasive carcinoma, a reasonable measure of effectiveness (process objective) is the number of cases of the more severe preinvasive lesions identified and treated.

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1 Fletcher A, Metaxas N, Grubb C, Chamberlain J. Four and a half year follow up of women with dyskaryotic cervical smears. *BMJ* 1990;301:641-4. (29 September.)

SIR,—Dr Astrid Fletcher and colleagues make a strong case for referring women with a single abnormal cervical smear for colposcopy.¹ Nevertheless, a second smear was not obtained in 68 of the 424 patients whose initial cervical smear showed mild dyskaryosis. This is alarming in view of the outcome in the 356 patients who were followed up cytologically: 200 had another abnormal smear and four developed invasive cancer. Will this evidence be made available to those women participating in a control trial who are randomised to cytological follow up only?

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1 Fletcher A, Metaxas N, Grubb C, Chamberlain J. Four and a half year follow up of women with dyskaryotic cervical smears. *BMJ* 1990;301:641-4. (29 September.)

Whiplash injury

SIR,—Dr P K Newman's editorial¹ and the letter from Dr J M S Pearce² illustrate the controversy surrounding whiplash injury. In Bristol we

followed up for a mean of 10.8 years 43 of the 61 patients with whiplash injury described by Norris and Watt.³ The clinical results⁴ agreed with previous studies^{5,6}: only five patients recovered completely, and 17 still had intrusive or severe symptoms. The presence of paraesthesia or multiple symptoms at presentation was a poor prognostic indicator. Symptoms that were present two years after injury were still present at 10 years irrespective of legal settlement.

Clinical and radiological assessment⁷ was performed in 35 of the original group. Degenerative spondylosis was more common than in healthy people at all ages but particularly in the 30-40 age group, where it occurred in 33% of the whiplash group compared with 10% of the control group matched for age and sex. Degenerative changes have been shown to predispose to whiplash injury³ and they also seem to be a sequel to this insult.

Contrary to previous studies⁴ we found a correlation between symptoms and degenerative changes. Only one of the five asymptomatic patients showed evidence of degenerative change, but 24 of 30 patients who had symptoms also had evidence of degenerative change. In addition, no patients with intrusive or severe symptoms had a normal cervical spine radiograph. Although this is a small series, it is the only series with a mean follow up as long as 10.8 years and does answer several points raised in the editorial.¹ I agree that a further long term prospective follow up is needed, encompassing clinical, radiological, and psychological factors, to determine whether our impression is significant.

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- 1 Newman PK. Whiplash injury. *BMJ* 1990;301:395. (1 September.)
- 2 Pearce JMS. Whiplash injury. *BMJ* 1990;301:610. (22 September.)
- 3 Norris SH, Watt I. The prognosis of neck injuries resulting from rear end collisions. *J Bone Joint Surg [Br]* 1983;65:608-11.
- 4 Gargan MF, Bannister GC. The long term prognosis of soft tissue injuries of the neck. *J Bone Joint Surg [Br]* 1990;72:901-3.
- 5 Gotten N. Survey of one hundred cases of whiplash injury after settlement of litigation. *JAMA* 1956;162:865-7.
- 6 Hohl M. Soft tissue injuries to the neck in automobile accidents; factors influencing prognosis. *J Bone Joint Surg [Am]* 1974;56:1675-82.

General practitioner maternity units

SIR,—We were concerned that the paper by Dr Vanessa Sangala and colleagues on perinatal mortality rates¹ was so widely and uncritically reported in the lay media. We shall be interested to see whether your correspondents' criticisms² receive the same coverage but suspect that they will not. In particular, will the public be informed that there was no evidence supporting the conclusion that a significant proportion of the deaths of babies born to women booked to deliver in isolated general practitioner units would have been avoided had the women been booked to deliver in an integrated unit or a consultant unit?

In their reply,³ the authors stated that "We reported audit, and the discussion is therefore a matter for debate as there was no hypothesis." This is inconsistent with their later statement that "We believed at the outset of the study that we would find a lower perinatal mortality rate in the isolated units." This is presumably why, in the paper itself, they used a χ^2 test to test the null hypothesis that there was no difference among the perinatal mortality rates for the three types of unit.

There are limits to what can be concluded from an observational study because of the selection biases involved, and, correctly in our view, the authors confined their analysis to singleton babies without congenital malformations and weighing 2500 g and over. It was inappropriate, however, to assume that all the differences in