

# Medical school applicants from ethnic minority groups: identifying if and when they are disadvantaged

I C McManus, P Richards, B C Winder, K A Sproston, V Styles

## Abstract

**Objective**—To assess whether people from ethnic minority groups are less likely to be accepted at British medical schools, and to explore the mechanisms of disadvantage.

**Design**—Prospective study of a national cohort of medical school applicants.

**Setting**—All 28 medical schools in the United Kingdom.

**Subjects**—6901 subjects who had applied through the Universities' Central Council on Admissions in 1990 to study medicine.

**Main outcome measures**—Offers and acceptance at medical school by ethnic group.

**Results**—Applicants from ethnic minority groups constituted 26·3% of those applying to medical school. They were less likely to be accepted, partly because they were less well qualified and applied later. Nevertheless, taking educational and some other predictors into account, applicants from ethnic minority groups were 1·46 times (95% confidence interval 1·19 to 1·74) less likely to be accepted. Having a European surname predicted acceptance better than ethnic origin itself, implying direct discrimination rather than disadvantage secondary to other possible differences between white and non-white applicants. Applicants from ethnic minority groups fared significantly less well in 12 of the 28 British medical schools. Analysis of the selection process suggests that medical schools make fewer offers to such applicants than to others with equivalent estimated A level grades.

**Conclusions**—People from ethnic minority groups applying to medical school are disadvantaged, principally because ethnic origin is assessed from a candidate's surname; the disadvantage has diminished since 1986. For subjects applying before A level the mechanism is that less credit is given to referees' estimates of A level grades. Selection would be fairer if (a) application forms were anonymous; (b) forms did not include estimates of A level grades; and (c) selection took place after A level results are known.

## Introduction

The selection of medical students is necessarily controversial since the number of able applicants exceeds the number of places. Those selecting have a duty to ensure that selection is fair and a legal obligation under the Race Relations Act 1976 and the Sex Discrimination Act 1975 to ensure that selection does not discriminate according to ethnic origin or sex. Agreement is also lacking on the balance of academic and non-academic characteristics needed for a course that leads to a registrable qualification for medical practice. Those selecting also need to ensure that the medical students chosen are well qualified to cope with a demanding course and have the best potential to practise effectively as doctors.

In 1986 the proportion of medical students with non-European surnames differed significantly between London medical schools.<sup>1</sup> Such data, however, could

not indicate "racial discrimination" because entrants with equivalent qualifications were not shown to differ in their success at selection. Reanalysis of our 1981 cohort of medical school applicants<sup>2</sup> showed that applicants with non-European surnames were less likely to be accepted, even after taking differences in academic qualifications into account.<sup>3</sup> In 1987 the Commission for Racial Equality investigated the specific admissions procedure at St George's Hospital Medical School in London and found evidence for discrimination by race and by sex.<sup>4</sup> Cohort studies in 1981 and 1986, however, found no evidence of discrimination against women.<sup>2,5</sup> In the 1986 cohort ethnic origin was based on self reporting, and clear evidence emerged that applicants from ethnic minority groups were less likely to be accepted than white applicants with equivalent qualifications.<sup>5</sup>

As a result of the commission's inquiry<sup>4</sup> and earlier research<sup>2</sup> the (then) Universities' Central Council on Admissions began collecting routine statistics in the autumn of 1989 from applicants on ethnic origin. For university applicants in general, applicants from ethnic minority groups tend to be of lower social class, to have lower educational qualifications, and to have resat more examinations, although such factors only partly explain a lower success rate.<sup>6</sup> Applicants from ethnic minority groups also apply more to higher status institutions, for high demand and competitive courses such as medicine and law,<sup>7</sup> and to local institutions; all such factors make success less likely.

To show that applicants from ethnic minority groups are disadvantaged is not straightforward; it requires prospective information and comparison of those who are successful and those who are not after accounting for relevant background factors. We describe a large study of applicants for admission in October 1991 to five English medical schools. The study examined 68% of all home applicants to British medical schools and is large enough to assess selection individually at most British medical schools as each candidate can apply to five.

## Subjects and methods

The study considered all subjects who applied through the Universities' Central Council on Admissions in 1990 to study medicine in October 1991 at one of three medical schools of the University of London (St Mary's Hospital Medical School, University College and Middlesex School of Medicine (now University College London Medical School), and the United Medical and Dental Schools of Guy's and St Thomas's Hospitals) or to the medical school of the University of Sheffield or University of Newcastle upon Tyne. These English medical schools were chosen because jointly they were geographically disparate and received a high proportion of all applications to British medical schools. Since each applicant makes five university applications, of which typically only one is to the five schools in our study, the other applications on the form allow the indirect study of selection at the remaining 23 medical schools in the United Kingdom. Final destinations of candidates,

St Mary's Hospital Medical School, Imperial College of Science, Technology and Medicine, London W2 1PG  
I C McManus, professor of psychology

P Richards, dean and pro-rector (medicine)  
B C Winder, research coordinator

K A Sproston, research assistant  
V Styles, research assistant

Correspondence to:  
Professor McManus.

BMJ 1995;310:496-500

basic background information, and results at A and AS level were provided by the Universities' Central Council on Admissions at the end of selection. Detailed information on all qualifications, including O levels, GCSEs, and estimated A level grades, were coded from the forms for all applicants applying by the official closing date of 15 December 1990. Mean examination grades were calculated from results using a score of five for a pass at grade A, of four at grade B, of three at grade C, of two at grade D, and of one at grade E; other grades were scored as zero. AS levels were included in calculating the mean grade at A level, scores being weighted as half those for A levels.

All applicants applying by the closing date who were resident in the European Community were sent a detailed questionnaire, which asked about demographic variables and attitudes and opinions on a range of topics and included various specific psychological inventories.

Whenever possible measures reported here are comparable with those in previous studies,<sup>25</sup> although inevitable differences mean that strict comparison with previous studies is not always possible. We note in particular that the 1991 cohort was the first to take GCSE examinations, and that older applicants had taken O levels; that previous studies had not included applicants for the 1st MB examination; that instead of ranking their five choices applicants for 1991 were allowed to mark a "strong preference" for one choice with an asterisk; ethnic origin is as reported by the candidate on the application form, with supplementary information on ethnic origin derived from our questionnaire. In addition, a non-European surname, previously shown to be assessed reliably by independent rates,<sup>8</sup> was coded if either of the two raters (BCW and KAS) reported a surname as non-European. Overall, the rates showed 93·7% agreement, and Cohen's  $\kappa$  statistic was 0·853, showing 85·3% agreement after correction for chance.<sup>9</sup>

Logistic regression used the program GLIM<sup>10</sup>, with missing values replaced by means. Structural equation modelling<sup>11-13</sup> used LISREL<sup>14</sup>; because some variables were not normally distributed owing to ceiling and floor effects restricting the possible range and others were categorical, covariance matrices were computed with PRELIS,<sup>15</sup> with all variables treated as censored above and below; listwise deletion was used for missing data. All other statistical analysis was with SPSS-X.

## Results

Our study considered the application forms of 6901 subjects who applied to at least one of the five participating medical schools (55% applied only to one participating school, 8% to more than two, and none to

all five). Since most applicants had applied to five medical schools in total, most of which were not participating schools, it was possible in principle to assess application and acceptance at all medical schools. Of the 6901 applicants, 2962 were accepted at one of the 28 medical schools in the United Kingdom (2905 for 2nd MB and 57 for 1st MB (premedical) courses), representing 69·7% of the 4248 subjects accepted for medicine in the United Kingdom. A total of 5918 of these applicants had applied to the Universities' Central Council on Admissions by the closing date and had a postal address in the European Community and were sent questionnaires; of the remainder, 352 applied late and the rest had addresses outside the community. Of the 5918 applicants sent questionnaires, 5388 (91%) responded and 2814 (47·5%) were admitted to a medical school. Of the total 6901 applicants in the study, 5553 were British nationals; since non-British nationals are typically more heterogeneous and often subject to specific quotas for admission, the remainder of this report considers only British nationals, of whom 2619 (47·2%) were accepted at medical school. Of the 5553 British nationals, 5152 received a questionnaire (the remainder had addresses outside the European Community, applied late, or had their questionnaires returned as undeliverable by the post office); and it was returned by 4791 (93·0%).

## NUMBERS OF APPLICANTS AND ENTRANTS FROM ETHNIC MINORITY GROUPS

Table I compares the proportions of the various ethnic groups in university applicants and entrants in general (based on data from the Universities' Central Council on Admissions<sup>16</sup>), and medical school applicants and entrants (present study), with population estimates from the 1991 census.<sup>7</sup> The ethnic mix of the applicants and of the general population was clearly different, Asian groups being overrepresented and Afro-Caribbean groups being underrepresented relative to population proportions. In addition, the proportion of applicants to British medical schools who were from ethnic minority groups, as indexed by a non-European surname, increased from 11·2% in 1981<sup>3</sup> to 22·9% in 1986<sup>5</sup> and 26·3% in 1991.

## COMPARISON OF ETHNIC MINORITY AND WHITE APPLICANTS

Applicants from ethnic minority groups differed from white applicants in several ways. Table II summarises statistics on selected educational, demographic, applicational, and outcome measures and compares those who were accepted with those who were not, white with non-white applicants, black with Asian applicants, subgroups of Asian applicants (Indian, Pakistani, Bangladeshi, Chinese, and other Asian), and applicants who chose not to tell the Universities' Central Council on Admissions their ethnic origin with other applicants.

## PREDICTORS OF OVERALL SUCCESS

Successful and unsuccessful applicants were compared by multiple logistic regression with acceptance as the dependent variable. Thirty variables were entered into the analysis and successfully removed in order of significance by backwards elimination with a criterion of  $P < 0\cdot01$ . Table III shows, in order of significance, the significant predictors (all  $P < 0\cdot001$ ) of success. The remaining 22 variables in the analysis were not significant (five choices on form; two or fewer choices on form; two or fewer medical schools on form; number of London medical schools on form; application to Oxford or Cambridge University; application for 1st MB course; being a mature student; being female; being from the north of Britain; having

TABLE I—Numbers (percentages) of people from ethnic minority groups in medical school and university applicants and in general population (census data)

|             | Medicine     |              | All subjects*                  |                              | Total population (aged 16-19)* |
|-------------|--------------|--------------|--------------------------------|------------------------------|--------------------------------|
|             | Applicants   | Entrants     | Applicants (1991) <sup>y</sup> | Entrants (1991) <sup>y</sup> |                                |
| White       | 3 807 (71·1) | 2 085 (79·2) | 180 232 (89·3)                 | 95 467 (91·7)                | 642 933 (92·9)                 |
| Asian       | 1 263 (23·6) | 479 (18·2)   | 14 229 (7·1)                   | 6 009 (5·8)                  | 32 629 (4·7)                   |
| Indian      | 563 (10·5)   | 223 (8·5)    | 6 531 (3·2)                    | 2 745 (2·6)                  | 13 754 (2·0)                   |
| Pakistani   | 364 (6·8)    | 110 (4·2)    | 3 268 (1·62)                   | 1 171 (1·13)                 | 9 390 (1·36)                   |
| Bangladeshi | 95 (1·77)    | 42 (1·60)    | 662 (0·33)                     | 265 (0·25)                   | 4 450 (0·64)                   |
| Chinese     | 90 (1·68)    | 45 (1·71)    | 1 612 (0·80)                   | 806 (0·77)                   | 2 555 (0·37)                   |
| Other Asian | 151 (2·8)    | 59 (2·2)     | 2 156 (1·07)                   | 1 022 (0·98)                 | 2 480 (0·36)                   |
| Black       | 161 (3·0)    | 27 (1·03)    | 4 405 (2·2)                    | 1 306 (1·25)                 | 11 739 (1·70)                  |
| Caribbean   | 43 (0·80)    | 6 (0·23)     | 1 578 (0·78)                   | 459 (0·44)                   | 5 673 (0·82)                   |
| African     | 98 (1·83)    | 15 (0·57)    | 2 195 (1·09)                   | 630 (0·61)                   | 2 663 (0·38)                   |
| Other Black | 20 (0·37)    | 6 (0·23)     | 632 (0·31)                     | 217 (0·21)                   | 3 403 (0·49)                   |
| Other       | 126 (2·4)    | 42 (1·60)    | 2 914 (1·44)                   | 1 293 (1·24)                 | 4 739 (0·68)                   |
| Total       | 5 357 (100)  | 2 633 (100)  | 201 780 (100)                  | 104 075 (100)                | 692 040 (100)                  |

In all cases not known and not stated are omitted.

\*Calculated as half of population aged 16-17.

TABLE II—Significance of comparisons between applicants who were successful and unsuccessful in being accepted into medical school and between applicants from different ethnic groups. Values are percentages of applicants unless stated otherwise

| Variable   | Ethnic group         |                      |         |                   |                       |                   |                   |                      |                        |                   |                           |                  | P value          |                         |                         |                            |                           |        |
|--|----------------------|----------------------|---------|-------------------|-----------------------|-------------------|-------------------|----------------------|------------------------|-------------------|---------------------------|------------------|------------------|-------------------------|-------------------------|----------------------------|---------------------------|--------|
|  | Overall              |                      |         | Asian             |                       |                   |                   |                      |                        |                   |                           |                  |                  |                         |                         |                            |                           |        |
|  | Accepted<br>(n=2619) | Rejected<br>(n=2625) | P value | White<br>(n=3807) | Non-white<br>(n=1550) | Asian<br>(n=1263) | Indian<br>(n=563) | Pakistani<br>(n=364) | Bangla-deshi<br>(n=95) | Chinese<br>(n=90) | Other<br>Asian<br>(n=151) | Black<br>(n=161) | Other<br>(n=126) | Not<br>known<br>(n=196) | White<br>v<br>non-white | Black<br>v<br>Asian groups | Not<br>known<br>v<br>rest |        |
| Mean (SD) A level grade (n=5209)                       | 3.72 (0.71)          | 2.59 (0.85)          | <0.001  | 3.23 (0.92)       | 2.97 (1.04)           | 3.03 (1.04)       | 3.14 (1.01)       | 2.88 (1.05)          | 2.91 (1.06)            | 3.16 (0.92)       | 2.93 (1.10)               | 2.54 (1.01)      | 2.88 (1.00)      | 3.18 (1.00)             | <0.001                  | <0.01                      | <0.001                    |        |
| Mean (SD) A level grade (n=4365)                       | 4.52 (0.45)          | 3.63 (0.79)          | <0.001  | 4.17 (0.69)       | 3.82 (0.92)           | 3.86 (0.91)       | 3.90 (0.89)       | 3.69 (0.96)          | 3.97 (0.81)            | 4.21 (0.79)       | 3.81 (0.95)               | 3.49 (0.98)      | 3.89 (0.79)      | 4.15 (0.74)             | <0.001                  | <0.001                     | <0.001                    |        |
| Mean (SD) GCSE grade (n=4494)                          | 4.60 (0.40)          | 4.01 (0.65)          | <0.001  | 4.43 (0.51)       | 4.02 (0.73)           | 4.03 (0.73)       | 4.09 (0.70)       | 3.78 (0.76)          | 4.11 (0.77)            | 4.33 (0.58)       | 4.17 (0.70)               | 3.73 (0.74)      | 4.16 (0.71)      | 4.36 (0.55)             | <0.001                  | <0.001                     | <0.001                    |        |
| Applied after A levels (n=5244)                        | 26.9                 | 28.2                 | NS      | 26.3              | 30.0                  | 30.1              | 29.6              | 34.3                 | 27.7                   | 32.1              | 22.0                      | 29.9             | 29.6             | 33.6                    | <0.01                   | NS                         | NS                        |        |
| Five medical schools on application (n=5553)           | 95.3                 | 81.8                 | <0.001  | 87.8              | 90.0                  | 89.8              | 90.1              | 88.5                 | 88.4                   | 90.0              | 92.7                      | 87.0             | 96.0             | 86.2                    | <0.05                   | NS                         | NS                        |        |
| Female sex (n=5553)                                    | 51.2                 | 50.5                 | NS      | 52.7              | 45.9                  | 44.2              | 42.5              | 40.9                 | 54.7                   | 46.7              | 50.3                      | 55.9             | 50.0             | 54.1                    | <0.001                  | <0.01                      | NS                        |        |
| Mature applicant (n=5549)                              | 9.1                  | 18.2                 | <0.001  | 13.0              | 13.9                  | 11.2              | 10.1              | 13.2                 | 10.5                   | 8.9               | 11.9                      | 33.5             | 16.7             | 28.1                    | NS                      | <0.01                      | NS                        |        |
| Medical parent(s) (n=5553)                             | 19.0                 | 16.0                 | <0.01   | 13.9              | 26.2                  | 26.6              | 32.0              | 19.0                 | 30.5                   | 15.6              | 29.1                      | 14.9             | 36.5             | 17.9                    | <0.001                  | <0.01                      | <0.001                    |        |
| Mean (SD) social class (n=4609)                        | 1.78 (0.88)          | 2.04 (0.97)          | <0.001  | 1.82 (0.85)       | 2.11 (1.11)           | 2.18 (1.13)       | 2.07 (1.13)       | 2.59 (1.17)          | 2.01 (1.02)            | 2.32 (0.96)       | 1.67 (0.84)               | 1.87 (0.96)      | 1.65 (0.82)      | 1.89 (0.85)             | <0.001                  | <0.001                     | <0.001                    |        |
| Educated privately (n=5553)                            | 46.9                 | 36.0                 | <0.001  | 41.1              | 42.1                  | 43.0              | 44.4              | 35.2                 | 50.5                   | 47.8              | 49.0                      | 32.9             | 45.2             | 38.8                    | NS                      | <0.05                      | <0.01                     | NS     |
| Non-European surname (n=5553)                          | 19.9                 | 32.6                 | <0.001  | 4.0               | 80.6                  | 86.1              | 84.2              | 91.2                 | 90.5                   | 88.9              | 76.8                      | 51.6             | 61.9             | 34.7                    | <0.001                  | <0.001                     | <0.001                    | <0.01  |
| Born in United Kingdom                                 | 90.0                 | 89.0                 | NS      | 95.8              | 75.4                  | 72.9              | 76.2              | 79.9                 | 63.2                   | 61.1              | 57.0                      | 91.3             | 79.4             | 89.9                    | <0.001                  | <0.001                     | <0.001                    | <0.001 |
| Parent(s) born in United Kingdom (n=4750)              | 78.5                 | 62.7                 | <0.001  | 96.4              | 7.2                   | 1.9               | 1.6               | 1.0                  | 1.2                    | 3.8               | 8.7                       | 9.8              | 56.0             | 60.0                    | <0.001                  | <0.001                     | <0.001                    | <0.01  |
| Grandparent(s) born in United Kingdom (n=4771)         | 79.3                 | 63.8                 | <0.001  | 96.6              | 9.3                   | 4.6               | 3.1               | 3.2                  | 7.2                    | 7.7               | 10.2                      | 10.7             | 58.0             | 65.3                    | <0.001                  | <0.01                      | <0.01                     | NS     |
| English spoken after age 3 (n=4772)                    | 4.7                  | 8.6                  | <0.001  | 0.8               | 19.6                  | 22.2              | 12.1              | 27.0                 | 35.7                   | 48.7              | 24.0                      | 4.9              | 10.0             | 24.6                    | <0.001                  | <0.001                     | <0.001                    | <0.001 |
| Mean (SD) date of application (1 Sept 1990=0) (n=5553) | 47.5 (21.9)          | 64.0 (23.6)          | <0.001  | 54.0 (24.0)       | 59.9 (24.4)           | 58.7 (24.1)       | 58.0 (24.1)       | 62.2 (23.6)          | 58.1 (25.7)            | 53.5 (23.6)       | 56.1 (24.3)               | 70.5 (24.0)      | 59.2 (24.6)      | 57.2 (25.1)             | <0.001                  | <0.05                      | <0.001                    | NS     |
| ≥1 Offers for medical school (n=5553)                  | 94.3                 | 13.6                 | <0.001  | 60.1              | 36.6                  | 38.5              | 41.7              | 28.3                 | 47.4                   | 48.9              | 39.1                      | 19.3             | 39.7             | 37.8                    | <0.001                  | <0.001                     | <0.001                    | <0.001 |
| Entered medical school (n=5553)                        | —                    | —                    | —       | 54.8              | 35.4                  | 37.9              | 39.6              | 30.2                 | 44.2                   | 50.0              | 39.1                      | 16.8             | 33.3             | 32.7                    | <0.001                  | <0.001                     | <0.01                     | <0.001 |

TABLE III—Significant predictors of entry to medical school in 1991 by multiple logistic regression analysis

| Variable                   | Significance | Odds ratio (95% confidence interval)                  |
|----------------------------|--------------|---|
| Mean A level grade         | Z=37.1       | 10.10 per unit increase in mean grade (8.94 to 11.42) |
| No of A levels             | Z=10.23      | 1.50 per A level (1.38 to 1.62)                       |
| Mean GCSE grade            | Z=11.24      | 3.06 per unit increase in mean grade (2.52 to 3.73)   |
| No of choices for medicine | Z=8.41       | 3.19 if all five choices for medicine (2.44 to 4.19)  |
| Date of application        | Z=5.91       | 1.35 per 28 days before closing date (1.22 to 1.49)   |
| Previous application       | Z=5.16       | 1.92 if previous application (1.50 to 2.47)           |
| Mean O level grade         | Z=4.84       | 1.79 per unit increase in mean grade (1.41 to 2.26)   |
| Ethnic origin              | Z=3.72       | 1.46 if not from ethnic minority group (1.19 to 1.74) |

medical parents; applying after A level; maths A level taken; biology A level taken; number of AS levels taken; number of GCSEs taken; number of O levels taken; asterisk used on form; private education; number in sixth form; number in sixth form going to university; and proportion of sixth form going to university).

#### Differences between ethnic groups

Comparison of the success of the various ethnic groups after taking the other seven significant predictors into account showed no significant difference in success between black, Asian, and other groups ( $\chi^2=1.2$ , df=2, NS) or between the five Asian subgroups ( $\chi^2=3.6$ , df=4, NS).

#### Ethnic origin, surname, language, place of birth, and parents' and grandparents' place of birth

Members of ethnic minority groups differ from the majority of the population in several ways (table II); they are members of a particular ethnic group, with its own characteristic geographical, genetic, and cultural origins; they typically have surnames distinguishable from non-minority surnames; they are sometimes less acculturated in British society, as indexed by not having been born in the United Kingdom or having parents or grandparents who were not born in the United Kingdom; and English is not always their mother tongue, assessed as having learnt English after the age of 3. The locus of disadvantage can therefore be partitioned for the separate effects of each variable. That the five measures do have additional prediction was shown by entering them in the logistic regression after ethnic origin (non-white v white) had been entered ( $\chi^2=20.06$ , df=5, P<0.001); this effect was entirely due to non-European surname, which predicted acceptance after the other variables were taken into account ( $\chi^2=11.53$ , df=1, P<0.001; odds ratio 1.68 (95% confidence interval 1.25 to 2.27) lower for those with non-European surnames). With surname taken into account the disadvantage of non-white

applicants was not significant ( $\chi^2=0.002$ , df=1, NS, odds ratio 0.99 (0.74 to 1.33) less likely to be accepted). Parents' and grandparents' place of birth and the applicant's age at learning English were not significant when surname was taken into account.

#### Differences between medical schools

We found that a non-European surname predicted overall lack of success at application after the seven variables mentioned earlier had been taken into account. Overall outcome, however, is the aggregate of the processes at the individual medical schools to which an applicant has applied. Selection at each of the 28 medical schools in the United Kingdom was analysed separately to assess how the eight predictors (substituting a non-European surname for ethnic origin) (table III) predicted an offer at a particular school. Figure 1 shows the disadvantage of having a non-European surname after the seven other predictors had been accounted for; a test for homogeneity of effect sizes<sup>17</sup> showed significant differences between

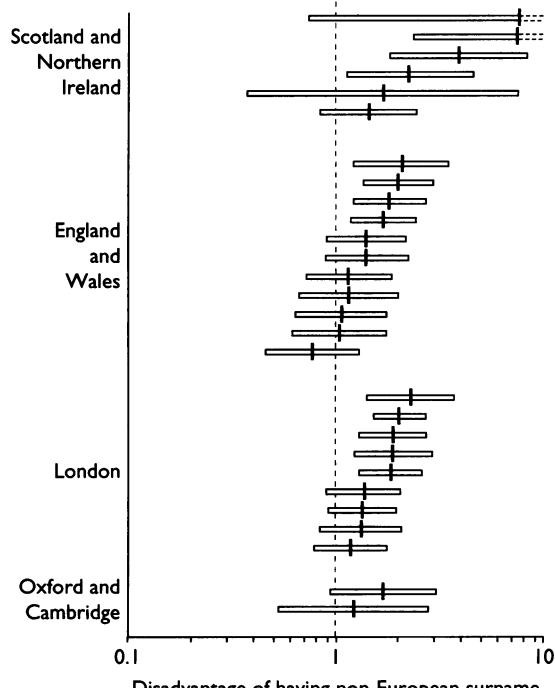


FIG 1—Disadvantage of having non-European surname when applying to British medical schools. Values are odds ratios with 95% confidence intervals, and schools are arranged in order of effect within their groups.

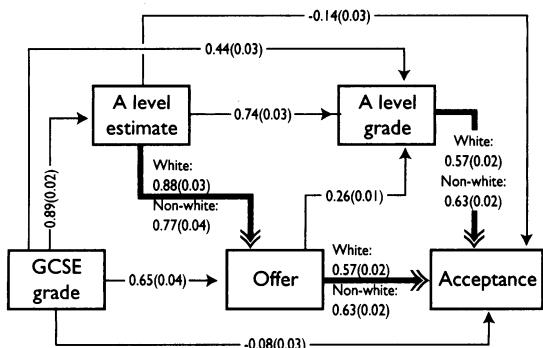


FIG 2—Final fitted path model for relations between grade at GCSE (general certificate of secondary education), estimated grade at A level, being offered a place conditionally, grade at A level, and acceptance at medical school. Values are path coefficients (SE) and are shown separately for white and non-white applicants when the two groups are significantly different.

schools ( $\chi^2=46.56$ , df=27, P=0.011). In 12 British medical schools there was significant evidence ( $P<0.05$ ) of disadvantage resulting from having a non-European surname. In the remaining 16 schools the relative disadvantage of having such a surname was indistinguishable from unity, although in 15 of the 16 schools the effect was in the direction of a disadvantage (binomial test: P<0.0001).

#### PROCESS OF SELECTION

The analysis so far has compared acceptances with rejections and has shown that applicants from ethnic minority groups are less likely to be accepted. We then looked at the process of selection to isolate where applicants from ethnic minority groups were disadvantaged; we considered only the majority of applicants, who apply before taking A levels.

Acceptance at medical school is the last of five stages, for each of which we have measures. Firstly, applicants obtain grades in GCSE examinations. Secondly, on the basis of these and day to day experience of candidates, referees provide estimated A level grades for the application form. Thirdly, medical schools use GCSE grades and estimated A level grades, together with the application form and interviews, to make conditional offers. Fourthly, applicants obtain their A level grades; and, finally, candidates meeting target grades along with others using clearing or other mechanisms, are accepted. Each stage can be affected by an earlier stage, and relation between variables may differ according to ethnic origin. The relation between such variables, which are ordered in time, can be modelled by means of path analysis or structural equation modelling.<sup>11 12</sup>

The first model fitted allowed for the different variances found in the GCSE and A level measures in the two ethnic groups (table II) but forced identical structural relations for the two groups; this model was rejected ( $\chi^2=76.613$ , df=10, PW0.001). Individual structural relations were then allowed to differ for the two ethnic groups until an adequate model was obtained ( $\chi^2=8.02$ , df=7, P=0.33), as shown in figure 2. Three structural relations differed significantly in white and non-white applicants. Equivalent A level estimates were more likely to result in an offer in white than non-white applicants; an offer was more likely to result in acceptance in non-white applicants; and equivalent A level grades were less likely to result in acceptance in non-white applicants; the latter effect presumably acts through the clearing process.

#### Discussion

As has been suggested previously,<sup>18</sup> black people were underrepresented among medical school entrants (1.0%) relative to population proportions (1.7%), despite being overrepresented among medical

school applicants (3.0%). In contrast, subjects from an Asian background were overrepresented relative to population proportions (4.7%), both among medical school applicants (23.6%) and among entrants (18.2%). Nevertheless, overall a smaller proportion of equivalently qualified applicants from ethnic minority groups was accepted relative to white applicants. One reason might be that white applicants were judged to be stronger on non-academic qualities, although our findings of the central role of surnames argue against that conclusion. Another might be a response to the perceived disproportionate number of applicants from ethnic minority groups, although such a reason would not be legitimate. The law is clear that selection or rejection of candidates must be entirely on a person's merits.

#### WHERE DISCRIMINATION OCCURS

White applicants were advantaged relative to non-white applicants (odds ratio 1.46 (1.19 to 1.74)), although the extent of the advantage was lower than that found in the 1986 cohort<sup>5</sup> (odds ratio 2.7 (1.9 to 3.8)). Having a non-European surname was a more powerful predictor of disadvantage than ethnic origin itself, with ethnic origin providing no additional predictive power over surname. This suggests that the poorer performance of candidates from ethnic minority groups (which did not differ between ethnic groups) is unlikely to result from particular academic or non-academic behaviours characteristic of particular groups and that instead the disadvantage is predominantly associated with members of the groups who have certain surnames. Since surnames are arbitrary labels that reveal nothing of a person's aptitudes or abilities, the implication is that surnames are principally being used in selection to identify the ethnic origin of applicants and thereby to discriminate against them. The size of the disadvantage differed between medical schools, probably reflecting procedural differences between medical schools. Because shortlisting is the largest reducer of numbers in application we suspect that it is the main place where discrimination occurs, as is also the case in post-graduate selection.<sup>19</sup>

The path analysis of the process of selection is important in understanding why non-white applicants are less likely to be accepted. Although referees' estimates of A level grades are equally predictive of eventual achievement in white and non-white candidates, higher estimates are more likely to result in an offer in white than non-white candidates. This is probably the main point where disadvantage is experienced by applicants from ethnic minority groups; it occurs early in the selection process, a conditional offer being the principal hurdle in selection so that a large number of applicants will be affected. Non-white applicants are also less likely to be accepted through mechanisms that apply after A level grades are known. The overall result is that with equivalent academic achievement, non-white candidates are less likely to be accepted than are white candidates.

#### THE WAY FORWARD AND SOME GOOD NEWS

Our study shows that judged principally by examination performance, medical school selection is not fair to candidates from ethnic minority groups. We believe, however, that the process would be fairer if application forms forwarded to universities were anonymous and identified only by arbitrary code numbers, with universities being informed of a candidate's name only for the purposes of interview. If candidates could apply to medical school only after A level the bias against non-white applicants of using estimated A level grades would be eliminated and the present handicap experienced by those who apply

## Key messages

- The proportions of medical school applicants from different ethnic groups are different from those in the general population, with some groups being overrepresented and others underrepresented relative to their age group
- Applicants from ethnic minority groups continue to fare less well in being selected for medical school, although the extent of disadvantage is reduced in comparison with previous studies
- Since surname is a better predictor of disadvantage than ethnic origin as such, discrimination could be reduced by making application forms anonymous
- The locus of disadvantage in applicants is principally that estimated A level grades on application forms are given less weight in ethnic minority applicants—the problem could be circumvented by selecting medical students after they have their A level results
- No disadvantage was experienced by female applicants, mature applicants, or those from public sector schools, and no advantage was shown for those from medical families

towards the end of the application time would be reduced. Such changes would benefit all candidates, not merely those from ethnic minority groups.

In examining the selection process we must also not forget the good news: many factors do not show significant influences on selection. Success is not related to the sex of candidates; to coming from a medical family; to their age, social class, or type of schooling; to their A level subjects; nor to coming from a school sending many students to university. These non-significant effects provide a broad reassurance that selection does not discriminate in a host of ways about which suspicions of bias have previously been voiced.

This study could not have taken place without the cooperation and help of the following people: Dr George Tait, Ms Fiona Bishop, Mr Dominic Farnsworth, Mr Simon Richardson, Ms Angela Richards (St Mary's Hospital Medical School); Dr Hywel Thomas, Dr Robert Linton, Dr Mary Dyson, Dr Phil Richardson, Ms Linda Kent (United Medical and Dental Schools of Guy's and St Thomas's Hospitals); Dr John Foreman, Ms Gwen Austin (University College London); Dr Christine Sexton (Sheffield); Dr Mike Laker, Dr Reg Jordan, Mr David Minto (Newcastle upon Tyne). We also thank the Universities' Central Council on Admission, particularly Mr Stuart Smith, for help in providing the final destinations of candidates. The Leverhulme Trust and the Department of Health provided financial support. Finally, we thank the applicants who completed our very long questionnaires.

- 1 Collier J, Burke A. Racial and sexual discrimination in the selection of students for London medical schools. *Med Educ* 1986;20:86-90.
- 2 McManus IC, Richards P. An audit of admission to medical school. I. Acceptances and rejects. *BMJ* 1984;289:1201-4.
- 3 McManus IC, Richards P. Admission to medical school. *BMJ* 1985;290: 319-20.
- 4 Commission for Racial Equality. *Report of a formal investigation into St George's Hospital Medical School*. London: CRE, 1988.
- 5 McManus IC, Richards P, Maitlis SL. Prospective study of the disadvantage of people from ethnic minority groups applying to medical schools in the United Kingdom. *BMJ* 1989;298:723-6.
- 6 Taylor P. *Ethnic group data for university entry*. University of Warwick: Centre for Research in Ethnic Relations, 1992.
- 7 Universities' Central Council on Admissions. *UCCA: statistical supplement to the twenty-ninth report, 1990-1*. Cheltenham: UCCA, 1992.
- 8 McManus IC, Maitlis SL, Richards P. Identifying medical school applicants from ethnic minorities. *Studies in Higher Education* 1990;15:57-73.
- 9 Cohen J. A coefficient of agreement for nominal scales. *Educational and Psychological Measurement* 1960;10:37-46.
- 10 Aitkin M, Anderson D, Francis B, Hinde J. *Statistical modelling in GLIM*. Oxford: Oxford University Press, 1989.
- 11 Kenny DA. *Correlation and causality*. New York: Wiley, 1979.
- 12 Loehlin JC. *Latent variable models: an introduction to factor, path, and structural analysis*. Hillsdale, NJ: Lawrence Erlbaum, 1992.
- 13 Bentler PM, Stein JA. Structural equation models in medical research. *Stat Methods Med Res* 1992;1:159-81.
- 14 Jöreskog KG, Sörbom D. *LISREL 8 user's reference guide*. Chicago, IL: Scientific Software International, 1993.
- 15 Jöreskog KG, Sörbom D. *PRELIS 2 user's reference guide*. Chicago, IL: Scientific Software International, 1993.
- 16 Office of Population Censuses and Surveys. *Census reports. Report for Great Britain, part I. Vol 1*. London: HMSO, 1993:134.
- 17 Rosenthal R. *Meta-analytic procedures for social research*. London: Sage, 1984.
- 18 Kingman S. Black students still underrepresented at UK medical schools. *BMJ* 1992;304:1266.
- 19 McKie PM, Richards JDM, Richards P. Effects of discrimination by sex and race on the early careers of British medical graduates during 1981-7. *BMJ* 1990;301:961-4.

(Accepted 31 January 1995)

## A PATIENT WHO CHANGED MY PRACTICE

### "Is there a doctor around?"

My heart sank as I overheard a member of staff in the duty free shop at Vancouver Airport asking for help with someone who had collapsed. He was the third such person that I had seen that month. I had felt so useless on the two previous occasions that I decided not to respond. I was on holiday after all. I paid for my goods and started to walk back to the departure lounge. As luck would have it my route took me past the scene and I felt unable to walk on. The cardiopulmonary resuscitation was already in progress. I announced my profession and started to direct the proceedings. The patient's distressed wife looked at me gratefully and begged me to "make him breathe." She told me that her husband was in his mid 50s and had already had two heart attacks. Despite our attempts, there was still no output when the paramedical staff arrived on the scene. They were still thumping his chest 20 minutes later when I passed again to board the plane.

The second occasion had been on the plane on the way over. "If there is a doctor on board could they make themselves known to a member of the crew." I was directed to the back of the plane to see a young man who had broken a glass. He was concerned that he might have a fragment in his eye. Could I have a look? Feeling rather sheepish I admitted to being a psychiatrist and not a proper doctor. I was allowed back to my seat.

The first occasion was a couple of weeks before this. I

was in my local gym and could see staff running in and out of the adjacent children's play barn. My suspicion that something was up was confirmed when a member of staff came into the gym and spoke to everyone apart from me. Somehow I guessed that they wanted a doctor. I asked a man nearby what was going on. "Someone's collapsed in there I think," he replied. Dripping with sweat I dashed next door and saw a young woman unconscious on the floor. She was a diabetic patient and had a history suggestive of hypoglycaemia. As she started to come round I encouraged her to drink something sweet. Once again when the ambulance arrived I left, feeling frustrated by my impotence.

Perhaps things run in threes and it will be quieter for a while now. I have managed to avoid such situations in the past and even used to envy colleagues who were always stopping by the road to help at accidents. I have now come to dread being in the wrong place at the wrong time and like many psychiatrists have lost confidence in my ability to deal with medical emergencies. It was thus by lucky coincidence that, on my return from Canada, I was invited to attend a refresher course in basic life support. This time I went. I hope that my recent experiences will encourage me to attend similar courses from time to time. Proper doctor or not, it might just make a difference sometime.—  
GILL SALMON is a registrar in psychiatry in Oxfordshire