# Dropping out of medical school in the UK:

# Explaining changes over 10 years

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## BACKGROUND

In the context of changing admissions criteria and an expanding medical school intake in the UK, we analyse the determinants of the medical school dropout probability.

## AIMS

To analyse the determinants of the probability that a student will drop out of medical school during their first year. To compare the results of this analysis over time.

## METHOD

Logistic regression analysis for the six intake cohorts of 1990-92 and 1998-2000.

## RESULTS

Between 1990-92 and 1998-2000, there was a substantial increase both in the size of the entry cohort and in the proportion of students dropping out of medical school. A logit model for the 1990-92 and the 1998-2000 cohorts reveals that the probability of dropping out depends on both the medical school attended and the personal characteristics of the students, including academic preparedness. Almost none of the increase in the dropout rate between the two cohorts can be explained by changes in observable characteristics of the students over this period. Instead, most of the increase in the dropout rate is associated with changes at the level of the institution and in unobserved student characteristics.

## CONCLUSIONS

University effects, rather than changes in observed student characteristics, explain most of the increased dropout rate over the time period considered. Candidate explanations behind these effects include: less effective admissions policies; changing curricula, greater costs of attending

medical school and a growing mismatch between student and school characteristics. Testing between these competing hypotheses is left for future work.

**KEYWORDS** Education, Medical, Student dropouts, Non-completion probabilities, Student background, Prior qualifications, Logistic Regression, Cohort Study, UK

## OVERVIEW

### What is already known on this subject

Recent years have seen increases in the number of students entering UK medical schools and in the proportion dropping out.

### What this study adds

For the 1990-92 and 1998-2000 cohorts we find the probability of dropping out of medical school is lower for students (i) with better prior qualifications, (ii) with a parent who is a doctor, (iii) living on campus.

### Suggestions for further research

Despite the richness of our data, we find the increase in the dropout rate is mostly explained by changes in unobserved characteristics of students and medical schools. Future work should consider the influence of: admissions policies; changing curricula; social integration, and medical school fees.

# 1. INTRODUCTION

In earlier work published in this *Journal* we investigated the factors affecting the probability of dropping out in the first year of medical school for the full populations of UK medical students over the period 1980 to 1992.[1] However, since 1992 many changes have taken place which are likely to have impacted on dropout probabilities, raising the issue of the extent to which results for earlier cohorts are informative for more recent cohorts. For recent cohorts of students the subject background at A-level is substantially more diverse compared to earlier. Similarly, there have been important curriculum and pedagogical changes Given all these changes, an analysis of the factors associated with the probability that a student will drop out of medical school is timely and important and updates earlier research.[1,3,4] This paper analyses the data for both the 1990-1992 and the 1998-2000 cohorts. A particular interest is in the question of how the probability of dropping out – and the influence of its main drivers – changed across the two periods.

The analysis of student dropout behaviour has received much attention both in the UK and in the US, [5,6] where one of the most influential theoretical explanations of student attrition is the path analyses model.[7] This class of model emphasises the influence of both academic preparedness and the social integration of students in college. The former is measured in our analysis through a wealth of information in the data regarding students' prior qualifications. The argument regarding social integration - or social 'match' - suggests that a student's propensity to withdraw from their studies will be influenced not only by the extent of the academic challenge they find on their course but also by the extent to which the social environment appeals to the student. The literature suggests that key aspects of this are likely to include factors such as the demographic composition of the student body and residential and other social amenities of the institution. Many of the relevant factors are not observable and hence are simply captured within the general university effect. However, we do observe many of the student's personal characteristics and these in part will be associated with the likely extent of social match. In

particular, we also observe whether the student lives on or off the university campus as this is likely to be associated with the success of student integration.

We focus exclusively on the probability that a medical student will drop out of their degree course by the end of their first year of study. A student is defined to have dropped out if they are not observed to be a registered student on their medical degree after their first year of study. Students failing and repeating their first year are not defined as having dropped out. We concentrate our analysis on the first-year dropout probability because as shown in previous work,[8] the determinants of the dropout probability are significantly different for first year students compared to those for subsequent year students.

The rest of this paper is organised as follows. Section 2 describes the data and presents summary statistics. Section 3 presents results of the binomial logit regression analysis of the first-year medical student drop-out probability. Section 4 concludes with a summary of the results and further remarks.

## 2. THE DATA AND SUMMARY STATISTICS

We analyse administrative data on all students beginning a medical degree in the UK for entry cohorts of students: 1990-1992 cohorts and 1998-2000 cohorts. We pool together three years of data for each of the two cohort groups in order to have sufficiently large cell sizes for the analysis: this follows from the fact that there is a relatively low dropout rate in each year. The data for the period 1990-1992 come from the Universities' Statistical Record (USR). Data for the period 1998-2000 come from the Higher Education Statistical Agency (HESA). Data for the period 1993 to 1997 are not of sufficient quality to be included in the analysis.

*Summary statistics*

Table 1 presents summary statistics on various characteristics of the students across the two cohort groups (using the 3 years which make up each cohort group) broken down by sex. For each block of statistics, the first column shows the proportion of those students with various

characteristics, the second column reports the corresponding proportion for the sub-samples of students who dropped out.

Across the two cohort groups the number of students grew from an annual average of 4,125 (based on 6107 male and 6204 female students) in the 1990-1992 cohort group to 4,876 in the cohort group for 1998-2000. The data do not include those students who entered medical schools on postgraduate entry schemes.

The average first year dropout rate was 3.5% for the earlier cohort group and 4.9% for the later cohort group. For the 1990-1992 cohort group, there is a lower proportion of males among the dropout group than in the total population of medical students, however this is reversed for the 1998-2000 cohort group. The age structure of medical students has also been changing with a shift towards older students in the later cohort group.

In order to make our results comparable to the already published set of results[1], we have carried out our analysis including those students who were overseas (non-EU) students. From Table 1, we see that an increasing proportion of students over the two cohort groups were overseas students and these students appear to have a higher drop-out rate than EU students. Overseas student fees are substantially higher than EU fees; in fact, for the first cohort group, EU students' tuition fees were zero. Tuition fees for EU students were introduced only in 1998 and hence applied only to the second cohort. From the table, we also see that a large proportion of students lived in on-campus accommodation and these students have a markedly lower drop-out rate than students living off-campus, consistent with the social integration argument. [8]

For the 1998-2000 cohort group, we have information on disability and ethnicity. With respect to the latter, more than two-thirds of female students were from a white ethnic background. The largest single other ethnic category was students with an Indian family background. A large proportion of medical students came from a family in which a parent was a medical doctor or from some other professional background, and these students have a lower dropout probability.

Prior to entering university, most UK students study in schools which can broadly be described as either private sector (henceforth, 'Independent' schools) or state sector (Local Education Authority - LEA). The proportion from Independent schools is much higher than for most other university courses in the UK. Information provided on previous schooling for the 1998-2000 cohort group is very poor with more than 60% with missing values, and is therefore not incorporated in the analysis.

The pre-university secondary school qualifications which form part of the basis for offers of places at medical schools are, typically, 'A-levels' for English and Welsh school pupils, and 'Highers' for school pupils from Scotland. Passes at A-level are classified as A (=10 points) through to E (= 2 points). Passes in Highers are classified as A (=3 points) through to C (=1 point).

The proportion of students with A-levels has been increasing slightly among both male and female students. Table 1 reveals the extent to which the dropout rate varies by the students' A-level (or Higher) subjects and grades. Those students who had already been awarded a degree prior to becoming medical students are less likely, on average, to drop out of medical school.

Of those who had A-level qualifications, almost all students had taken Chemistry. While there was a rise in the proportion of those with Biology, there was a marked fall in the proportion with Physics. Overall, students with Biology at A-level were less likely to drop out than others. Over the two periods the proportion with the top score of 30 points at A-level grew, which could indicate that the average academic quality of the intake improved despite expansion, but could also reflect grade inflation. These two trends are likely to be related as Physics tends to produce below average A-level points scores.

In Table 2 we report the results for the Pearson chi-squared statistic of independence between the dropout variable and various explanatory variables. For the 1990-1992 cohort group, with the exception of the qualification variables, there is little evidence of any association between dropping out and any of our other variables, which contrasts markedly with the findings for the 1998-2000 cohort group.

## 3. RESULTS FOR THE PROBABILITY OF DROPPING OUT

We conduct a binomial logit regression analysis of the probability that an individual withdraws from their medical degree during their first year of study. Initially we allow the coefficients on the variables to vary according to both the sex of the student and the cohort group to which the student belongs. This most general model is then reduced by excluding those variables which were insignificant at the 5% level. The final restricted model is reported in Table 3, which reports coefficient estimates (equivalent to the effect of the variable on the log odds ratio) and their standard errors for two specifications. The first specification (Model 1) uses all available variables. The second specification (Model 2), discussed below, uses only those variables which are common to both cohort groups. Although not reported in Table 3, the models also include binary indicator variables for the university the student attended.

As can be seen from the table, the estimated coefficients are very robust across the two models. It is also noticeable that few of the coefficients change across the two cohort groups. In order to discuss and interpret the results in more detail, we calculate predicted probabilities and marginal effects associated with specific variable changes for individuals in each cohort group. Based on the results of Model 1 reported in Table 3, we report in Table 4 the predicted probability (×100) of dropping out for two types of default individuals; one based on the 1990-92 cohort group and one based on the 1998-2000 cohort group. We then change a single characteristic of our 'typical' individual and recalculate the probability of dropping out. The difference in these two probabilities is referred to as the marginal effect associated with that changed characteristic.

From Table 4 we observe that individuals in the 1998-2000 cohort group are around 1.5-2.5 percentage points more likely to drop-out compared to equivalent students in the earlier 1990-92 cohort group. One hypothesis to explain this is that the introduction of EU fees for the later cohorts could have raised the dropout rate.

*Personal characteristics*: From Table 4 we find that the predicted probability (×100) of dropping out for our default modal female student in the 1990-92 cohort group is 4.05%, an equivalent male student has a predicted probability of dropping out of 3.33%. Therefore the marginal effect of being male (compared to female) is approximately 0.72, implying that males are around 0.72 percentage points less likely to drop out than equivalent female students. Note that as the logit model is not linear and as the default individual has modal and not mean characteristics, there is no reason for the predicted probabilities to coincide with those reported in Table 1. For the 1998-2000 cohort group, the predicted probability of dropping out for our 'typical' (default) female is lower than that observed for the 1990-92 cohort group as our typical female has better A-level qualifications than were assumed for the earlier cohort group. For the 1998-2000 cohort group we note that there is little difference in the dropout rates for males compared to females, with males 0.09 percentage points *more* likely to drop-out.

There are no significant age effects for the 1990-92 cohort group, but there are for the 1998-2000 cohort group. We find that 20 and 21 year olds are more likely to dropout by around 1.4-2.7 percentage points compared to 18-19 year olds, whereas the more mature students (>21 years old) are around 1 percentage point less likely to drop out compared to the 18-19 year old students.

For the 1990-92 cohort group, there were no significant overseas student effects. However, for the 1998-2000 cohort group female (male) overseas students were around 1.9 (1.2) percentage points less (more) likely to dropout than our typical female (male). Multivariate analysis thus confirms the findings in the raw data (Table 1).

There are significant effects associated with university accommodation; students living off campus are more likely to drop out by around 1.7 percentage points (irrespective of the cohort group). This is consistent with the path-analysis model and of its emphasis on social integration.[6] There are no major effects associated with recorded disability.

*Social Class and ethnicity background*: Ethnic background of the student is recorded only for the 1998-2000 cohort group. We find that Indian females are around 1.9 percentage points less likely to drop out compared to white females, whereas Indian males are no different from white males. Other ethnic groups are less likely to dropout by around 0.8 percentage points. On social class, we find that female students from a background in which a parent is a medical doctor have a significantly lower probability of dropping out, by around 1 percentage point; for males, there is no such effect.

*Prior qualifications and school background*: We find that students who had already obtained a degree prior to registering for a medical degree are significantly less likely to drop out, by around 2.4 percentage points, compared to a student with A-levels only. For the purposes of this comparison, we assume that the student with a degree had similar A-levels to those students getting into a medical school with only A-levels. This is a remarkably strong effect. It suggests that the creation of post-graduate medical schools could well have a beneficial effect on progression, *ceteris paribus*. The marginal effect on Highers shows that, compared to an A-level student, these students are around 2 percentage points more likely to drop-out in the 1990-92 cohort group, whereas in the 1998-2000 cohort group this effect is much smaller.

We find strong effects of A-level performance on dropping out. The estimated marginal effects imply that each extra A-level grade (equivalent to 2 A-level points) in Biology reduces the probability of dropping out by approximately 0.86 percentage points. Our results are consistent with previous work showing that students with A-level Biology do better in their pre-clinical years.[9,10] By comparison, an increase of 1 grade in either Chemistry or Physics reduces the probability of dropping out by approximately 0.5 percentage points. We find that having studied mathematics, regardless of the grade, reduces the probability of dropping out by 0.5 percentage points. There is also an additional negative effect on the drop out probability of the order of 0.71 percentage points for those students with the maximum score (Topscore) of 30

points, though this is only for the 1998-2000 period. Academic preparedness clearly exerts a substantial influence on the probability of dropping out.

*Medical school effects*: Tables 3 and 4 show results based on a specification in which binary indicator variables were included for each medical school. For reasons of confidentiality the identity of individual medical schools cannot be revealed. However, in Figure 1 we plot the medical school coefficient estimates (and their 95% confidence intervals), relative to a base medical school, for both males and females for the 1998-2000 cohort group. From the figure we can see that there are a number of significant university effects. There is also a relatively high correlation (of 0.76) between the coefficient estimates for males and females (for 1990-92 cohort group the dispersion is slightly greater and the correlation lower at 0.62). This is reflected in the figure by the narrow dispersion of points around the 45° line. However, for 15 of the 19 estimated medical school effects the associated confidence intervals do not cross the 45° line – implying significant differences in the estimated medical school effects for males compared to females. Figure 2 plots the medical school coefficients and confidence intervals for the 1990-92 and 1998-2000 cohort groups, for males only. Again, there are a number of significant effects for both cohorts. These estimated medical school effects have a relatively high correlation (of 0.63) between the point estimates over time (although this is only 0.16 for females). Despite this, there are significant differences over time in the estimated medical school effects and it is noticeable that the effects have tended to shift upwards.

*Changes over time*: In order to address the question of the extent to which the rise in the dropout probability across cohort groups arises from changes in the observed characteristics of medical students, we have conducted a decomposition analysis[11] (based on Model 2), the results of which are reported in the second set of columns in Table 3. These results are qualitatively and quantitatively very similar to those of Model 1. The decomposition procedure involves

predicting what the probabilities of dropping out for students in the earlier cohort would have been using the estimated coefficients from the later cohort, and vice-versa.

For males (females), the average predicted probability of dropping out for the 1990-92 group is 3.3% (3.7%). When these students are attributed the estimated coefficients generated from the regression conducted on the 1998-2000 cohort group, the average predicted probability rises to around 5.5% (4.9%): a rise of 2.2 (1.2) percentage points. The actual dropout rate for the 1998-2000 cohorts is 5.3% (4.5%). Reversing the decomposition and using 1998-2000 cohort group, but taking the estimated coefficients generated from the regression conducted on the 1990-92 cohort group, the average predicted probability of dropping out is 3.5% (3.8%). In either case then, the evidence is that the increase in the dropout rate is not explained by changes in observed characteristics of students over time. Instead, the increase is associated with changes in unobserved characteristics. For example, we incorporate in our analysis a wealth of information on prior qualifications, such as A-level performance: accordingly, we can conclude that a rise in the dropout rate is not attributable to a simple fall in student quality as measured by A-level results. Of course, measures of prior performance might not reflect underlying potential, which is unobservable within the data. If A-levels have become more weakly correlated with ability (for example through grade inflation), then this would be a potential reason for a rise in the dropout rate associated with a change in an unobservable characteristic.

There are, of course, many unobservable characteristics which are potentially important in explaining the increase in the dropout rate of medical students over time. We can group these into unobserved student characteristics and unobserved institutional characteristics. Personal student characteristics which we do not observe but which might be important include personal motivation and commitment. It is interesting that current medical school admission procedures are tending to put more weight on these attributes. A second student-level characteristic concerns the student's social integration into medical school: with the changing nature of the social and demographic composition of medical students and with expansion, it is conceivable that social integration has changed – though our data do not permit us to analyse these factors

thoroughly. Among unobserved institutional characteristics, we would include tuition fees and curriculum design. It is interesting that although the institutional effects are not uniform across medical schools, the dropout probability has increased in the great majority of cases, suggesting that characteristics common to the sector generally – rather than institutionally-specific – lie behind the rising dropout rate.

## 4. CONCLUSIONS

We have presented the results of an analysis of the probability of dropping out of a UK medical school for all first year students entering a medical school in the period either 1990-92 or 1998-2000. We have noted that over the two periods there was a substantial increase both in the size of the entry cohort and in the proportion of students dropping out of medical school and that there were also changes in the average characteristics of students.

We have found that the probability of dropping out of medical school tends to be lower, *inter alia*, for (i) students living on campus, (ii) students with a parent who is a doctor, (iii) students with better prior qualifications.

A main focus of the paper has concerned the question of why the dropout rate increased over time. In a decomposition analysis, we have found that little of the increase in the dropout rate for either males or females is attributable to adverse changes in observed student characteristics, with most being explained by changes in unobserved characteristics of students or of medical schools. Unobserved personal attributes are likely to include factors such as the applicant's commitment, resilience, and motivation to study medicine. These are likely to be discernible to the selector in appropriately designed and structured interviews and aptitude tests. Our results therefore offer further justification for current trends in selection procedures away from purely academic criteria and toward applicants' relevant personal qualities if further medical expansion and policies for accessibility are to avoid costly increases in the rate at which students drop out of medical school.[12]

## CONTRIBUTORS

None.


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## ETHICAL APPROVAL

Ethical approval was not required for this study.

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Table 1: Summary statistics

| | 1990-1992 entry cohort | | | | 1998-2000 entry cohorts | | | |
|---|---|---|---|---|---|---|---|---|
| | Males | | Females | | Males | | Females | |
| | Prop or Mean | Prop or Mean for dropouts | Prop or Mean | Prop or Mean for dropouts | Prop or Mean | Prop or Mean for dropouts | Prop or Mean | Prop or Mean for dropouts |
| Overall dropout | 0.033 | 1.000 | 0.037 | 1.000 | 0.053 | 1.000 | 0.045 | 1.000 |
| **Age** | | | | | | | | |
| 18-19 | 0.870 | 0.873 | 0.911 | 0.890 | 0.812 | 0.745 | 0.815 | 0.765 |
| ‘20 | 0.037 | 0.044 | 0.025 | 0.031 | 0.043 | 0.119 | 0.029 | 0.067 |
| ‘21 | 0.013 | 0.024 | 0.009 | 0.004 | 0.021 | 0.036 | 0.021 | 0.040 |
| >21 | 0.080 | 0.059 | 0.055 | 0.075 | 0.124 | 0.101 | 0.135 | 0.128 |
| Overseas | 0.071 | 0.068 | 0.057 | 0.075 | 0.077 | 0.139 | 0.068 | 0.037 |
| Non-campus accommodation | 0.147 | 0.146 | 0.139 | 0.229 | 0.218 | 0.282 | 0.207 | 0.259 |
| Disability | | | | | 0.027 | 0.018 | 0.022 | 0.029 |
| **Ethnicity** | | | | | | | | |
| White | | | | | 0.577 | 0.549 | 0.676 | 0.770 |
| Indian | | | | | 0.130 | 0.119 | 0.083 | 0.032 |
| Other | | | | | 0.171 | 0.142 | 0.142 | 0.099 |
| Missing | | | | | 0.122 | 0.190 | 0.099 | 0.099 |
| **Social Class** | | | | | | | | |
| Doctor | 0.200 | 0.200 | 0.146 | 0.109 | 0.251 | 0.256 | 0.187 | 0.133 |
| Professional (excl. Doctor) | 0.216 | 0.194 | 0.275 | 0.323 | 0.208 | 0.172 | 0.158 | 0.212 |
| Intermediate | 0.404 | 0.417 | 0.433 | 0.448 | 0.332 | 0.353 | 0.298 | 0.417 |
| Skilled, semi-skilled, unskilled | 0.156 | 0.177 | 0.127 | 0.115 | 0.159 | 0.149 | 0.113 | 0.200 |
| Other | 0.024 | 0.011 | 0.020 | 0.005 | 0.050 | 0.070 | 0.244 | 0.038 |
| **School Type** | | | | | | | | |
| Local Education Authority | 0.315 | 0.376 | 0.349 | 0.357 | | | | |
| Grammar | 0.135 | 0.122 | 0.136 | 0.110 | | | | |
| Independent | 0.406 | 0.380 | 0.369 | 0.352 | | | | |
| FE College | 0.069 | 0.054 | 0.088 | 0.075 | | | | |
| Other | 0.075 | 0.068 | 0.058 | 0.106 | | | | |
| **Qualifications** | | | | | | | | |
| A-levels | 0.819 | 0.795 | 0.816 | 0.771 | 0.839 | 0.828 | 0.826 | 0.818 |
| Higher | 0.081 | 0.137 | 0.089 | 0.075 | 0.076 | 0.074 | 0.085 | 0.083 |
| Degree already | 0.044 | 0.024 | 0.037 | 0.031 | 0.036 | 0.012 | 0.041 | 0.032 |
| Other | 0.056 | 0.044 | 0.058 | 0.123 | 0.049 | 0.086 | 0.048 | 0.067 |
| ***Total number of Students*** | ***6170*** | ***205*** | ***6204*** | ***227*** | ***6368*** | ***337*** | ***8243*** | ***374*** |

Table 1 (cont'd): Summary statistics

| | 1990-1992 entry cohort | | | | 1998-2000 entry cohorts | | | |
|---|---|---|---|---|---|---|---|---|
| | Males | | Females | | Males | | Females | |
| | Prop or Mean | Prop or Mean for dropouts | Prop or Mean | Prop or Mean for dropouts | Prop or Mean | Prop or Mean for dropouts | Prop or Mean | Prop or Mean for dropouts |
| ***Number with A-levels*** | ***5073*** | ***164*** | ***5076*** | ***175*** | ***5342*** | ***279*** | ***6811*** | ***306*** |
| Topscore in A-levels | 0.343 | 0.293 | 0.278 | 0.217 | 0.371 | 0.215 | 0.389 | 0.327 |
| Science score in A-levels | 21.42 | 19.18 | 20.40 | 18.49 | 21.28 | 17.82 | 20.27 | 17.11 |
| | (5.10) | | (5.04) | | (5.69) | | (5.44) | |
| Other score in A-levels | 11.34 | 12.95 | 11.68 | 12.73 | 7.27 | 6.129 | 7.62 | 7.07 |
| | (7.86) | | (7.89) | | (3.12) | | (2.85) | |
| Biology in A-levels | 0.737 | 0.579 | 0.844 | 0.743 | 0.824 | 0.685 | 0.897 | 0.745 |
| Chemistry in A-levels | 0.992 | 0.976 | 0.988 | 0.977 | 0.977 | 0.842 | 0.974 | 0.869 |
| Physics in A-levels | 0.674 | 0.652 | 0.490 | 0.503 | 0.463 | 0.419 | 0.294 | 0.258 |
| Maths in A-levels | 0.642 | 0.750 | 0.661 | 0.651 | 0.685 | 0.556 | 0.633 | 0.559 |
| ***Numbers with Highers*** | ***497*** | ***28*** | ***553*** | ***17*** | ***483*** | ***25*** | ***702*** | ***31*** |
| Topscore in Highers | 0.376 | 0.321 | 0.382 | 0.529 | 0.128 | 0.160 | 0.214 | 0.258 |
| Science score in Highers | 7.77 | 7.75 | 7.39 | 7.18 | 7.52 | 7.32 | 7.52 | 7.55 |
| | (1.33) | (1.33) | | | (2.73) | (2.42) | | |
| Other score in Highers | 9.25 | 8.89 | 10.68 | 10.94 | 3.59 | 3.06 | 3.58 | 3.23 |
| | (3.74) | (3.61) | | | (2.38) | (1.88) | | |
| Biology in Highers | 0.899 | 0.929 | 0.897 | 0.824 | 0.888 | 0.920 | 0.923 | 0.935 |
| Chemistry in Highers | 1.000 | 1.000 | 0.998 | 1.000 | 0.896 | 0.920 | 0.926 | 0.935 |
| Physics in Highers | 0.978 | 1.000 | 0.948 | 1.000 | 0.853 | 0.920 | 0.801 | 0.871 |
| Maths in Highers | 0.964 | 0.964 | 0.989 | 1.000 | 0.886 | 0.920 | 0.923 | 0.935 |

Notes:

1. The summary statistics on A-levels (Highers) are conditional on the student having A-levels (Highers) and the respective sample sizes are reported.
2. For both Science and Other A-level as well as Higher scores we report standard deviations in parentheses.
3. All variables are binary indicator variables, except those for which we report standard deviations.

Table 2: Tests of independence for the dropout probability

| | 1990-1992 cohort | | 1998-2000 cohort | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| Age (4) | 0.303 | 0.477 | 0.000 | 0.000 |
| Non-UK fees (1) | 0.864 | 0.248 | 0.000 | 0.016 |
| Non-campus accommodation (1) | 0.973 | 0.000 | 0.003 | 0.010 |
| Disability (1) | - | - | 0.305 | 0.296 |
| Ethnicity (4) | - | - | 0.001 | 0.000 |
| Social Class (5) | 0.744 | 0.209 | 0.105 | 0.019 |
| School Type (5) | 0.417 | 0.024 | - | - |
| Qualifications (4) | 0.013 | 0.000 | 0.001 | 0.275 |
| Topscore in A-levels (1) | 0.508 | 0.068 | 0.000 | 0.022 |
| Biology in A-levels (1) | 0.000 | 0.000 | 0.000 | 0.000 |
| Chemistry in A-levels (1) | 0.020 | 0.169 | 0.000 | 0.000 |
| Physics in A-levels (1) | 0.549 | 0.724 | 0.129 | 0.160 |
| Maths in A-levels (1) | 0.003 | 0.795 | 0.000 | 0.006 |

Note:

The table reports the p-value for the test of independence between the dropping-out variable and each of the categories of variables. For each category the degrees of freedom associated with the Pearson test are reported in parentheses along with category name.

Table 3: Logit result on the probability of dropping out in the first year

| | Model 1 All variables | | Model 2 Common variables | |
|---|---|---|---|---|
| | Coefficient Estimate | Standard Error | Coefficient Estimate | Standard Error |
| Constant | -1.598 | 0.263 | -1.575 | 0.264 |
| Hesa | 0.341 | 0.091 | 0.192 | 0.088 |
| Male | -0.203 | 0.041 | -0.211 | 0.041 |
| Male_Hesa | 0.233 | 0.049 | 0.306 | 0.055 |
| **Age (Default - <=19)** | | | | |
| Hesa_20 | 0.651 | 0.219 | 0.651 | 0.214 |
| Hesa_21 | 0.379 | 0.333 | 0.370 | 0.329 |
| Hesa>21 | -0.439 | 0.180 | -0.431 | 0.180 |
| Hesa_Overseas | -0.955 | 0.223 | -0.946 | 0.236 |
| Male_Hesa_Overseas | 1.284 | 0.247 | 1.267 | 0.255 |
| Non-campus accommodation | 0.376 | 0.157 | 0.351 | 0.159 |
| Hesa_Disability | 0.355 | 0.353 | - | - |
| Male_Hesa_Disability | -0.766 | 0.515 | - | - |
| **Ethnicity (Default - White)** | | | | |
| Hesa_Indian | -0.993 | 0.325 | - | - |
| Male_Hesa_Indian | 0.978 | 0.369 | - | - |
| Hesa_Other | -0.314 | 0.079 | - | - |
| **Social Class (Default - not Doctor)** | | | | |
| Doctor | -0.303 | 0.118 | -0.381 | 0.114 |
| Male_Doctor | 0.336 | 0.200 | 0.408 | 0.199 |
| **Qualifications (Default - A-levels)** | | | | |
| Scottish Highers | -0.750 | 0.380 | -0.734 | 0.379 |
| Hesa_Highers | -0.977 | 0.329 | -0.947 | 0.333 |
| Degree already | -1.290 | 0.357 | -1.266 | 0.351 |
| Other qualifications | -0.927 | 0.305 | -0.911 | 0.304 |
| Hesa_Topscore in A-levels | -0.365 | 0.111 | -0.365 | 0.111 |
| Biology A-level score | -0.125 | 0.018 | -0.123 | 0.018 |
| Chemistry A-level score | -0.072 | 0.025 | -0.073 | 0.025 |
| Physics A-level score | -0.076 | 0.022 | -0.073 | 0.022 |
| 0 or 1 science A-levels | -0.538 | 0.282 | -0.497 | 0.274 |
| 3 science A-levels | 0.258 | 0.193 | 0.232 | 0.190 |
| Maths in A-level or Higher | -0.177 | 0.117 | -0.198 | 0.122 |

Notes:

1. This is a restricted model derived from a model in which all coefficients were allowed to vary according to the cohort (1990-92 and 1998-2000) and sex. In total the fully interactive model had 200 coefficients and a log-likelihood of -4242.01 across 200 coefficients. The model above (with university coefficients allowed to vary across sex and cohort, although not reported above) has 104 coefficients and a log-likelihood of -4301.69. Testing between the fully-interacted model and that above yields a chi-squared statistic of 119.36 (with p-value of 0.054).
2. Hesa_ = Interaction with a HESA dummy variable.
3. Male_ = Interaction with a Male dummy variable.
4. The models allow the coefficients on all variables to differ according to the cohort to which the student belongs by using a binary indicator variable Hesa; the coefficient on this then measures the effect of a student belonging to the cohort 1998-2000, compared to the default case of a student belonging to the earlier 1990-92 (USR) cohort. In addition, we allow coefficients to vary according to the student's sex by using the binary indicator variable Male; the coefficient on this then measures the effect of the student being male, compared to the default case of being female. We also include the interaction of these two variables, Male_Hesa, which measures the additional effect of being both male and belonging to the HESA cohort.

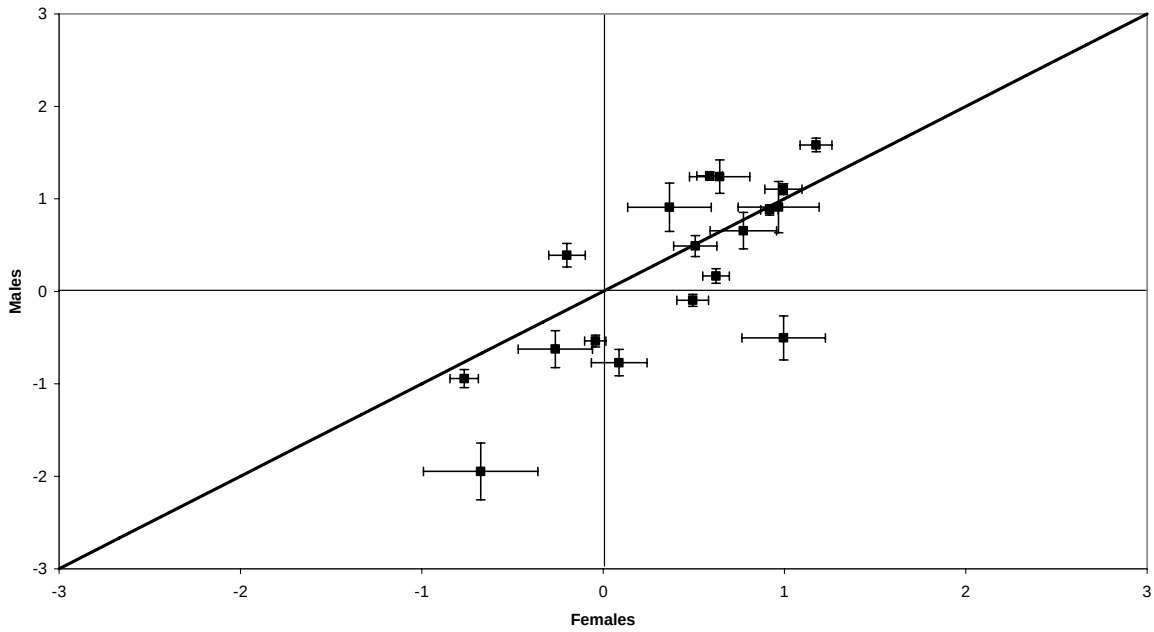
Table 4: Predicted Probability (×100) and marginal effects (×100) of dropping out for specific types of individuals

| Individual type | Probability[1] | ME |
|---|---|---|
| **Cohort 1990-92** | | |
| Default[2] | 4.047 | |
| Default – Male | 3.327 | -0.720 |
| Default – Non-campus accommodation | 5.786 | 1.739 |
| Default – Parent is a doctor | 3.021 | -1.026 |
| Default – Male and parent is a doctor | 3.433 | 0.106[5] |
| Default – Highers | 6.065 | 2.019 |
| Default – Degree already | 1.688 | -2.358 |
| Default – A in A-level Biology | 3.183 | -0.864 |
| Default – A in A-level Chemistry[3] | 3.526 | -0.520 |
| Default – A-level Maths | 3.413 | -0.633 |
| Default – 1998-2000 cohort | 5.597 | 1.551 |
| Default – 1998-2000 cohort and male | 5.754 | 2.427[5] |
| | | |
| **Cohort 1998-2000** | | |
| Default[4] | 3.106 | |
| Default –Male | 3.195 | 0.089 |
| Default – Age=20 | 5.788 | 2.682 |
| Default – Age=21 | 4.473 | 1.368 |
| Default – Age>21 | 2.024 | -1.081 |
| Default – Overseas | 1.218 | -1.888 |
| Default – Male and overseas | 4.385 | 1.190[5] |
| Default –Indian | 1.173 | -1.933 |
| Default – Male and Indian | 3.146 | -0.048[5] |
| Default – Highers | 3.360 | 0.254 |
| Default – Top A-level score | 1.877 | -0.709[5] |

Notes:

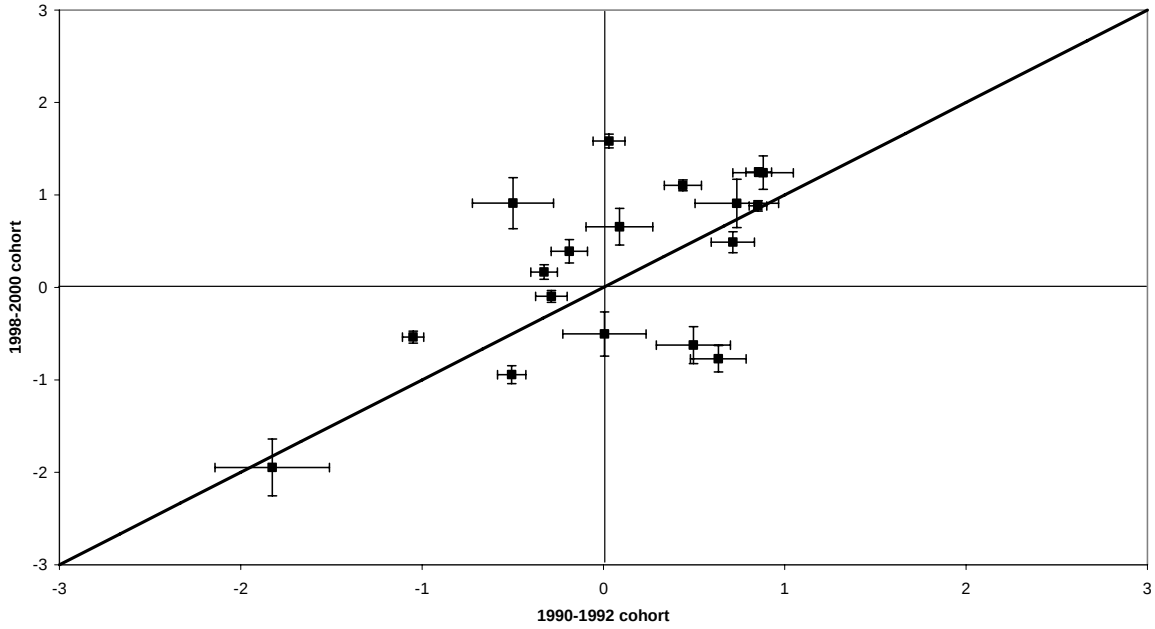
1. The above predicted probabilities use an average weighted combination of the estimated university effects in the calculations.
2. The default person is white female aged 18 or 19 years old, not disabled and is from a social class background in which neither parent is a doctor. She has only taken A-levels and has a B in Biology and a B in Chemistry, but has no Physics or Mathematics A-level. She went to university in the 1990-92 cohort group and lived in on-campus accommodation in her first year.
3. The dropout probability of the equivalent student as above with a B in Physics rather than Chemistry has almost exactly the same dropout probability.
4. The same default person is as above except she had an A in her Biology and Chemistry A-levels and a B in A-level Physics. She went to university in the 1998-2000 cohort group.
5. In these cases the marginal effect calculates the difference in the probability of dropping out relative to the Default – male case.
6. This is the contribution of the Top A-level score binary indicator having taken away the effect of the increase in the physics A-level score from B to A.

**Figure 1: Estimated medical school effects for males and females from the 1998-2000 cohort**




Note: The estimated medical school effects are the coefficient estimates from Model 1 (Table 3) and their corresponding 95% confidence intervals.

**Figure 2: Estimated medical school effects for males from the 1990-1992 and 1998-2000 cohorts**




Note: The estimated medical school effects are the coefficient estimates from Model 1 (Table 3) and their corresponding 95% confidence intervals.