# RESEARCH

# Entry Characteristics and Academic Performance of Students in a Master of Pharmacy Degree Program in the United Kingdom

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**Objective.** To evaluate the characteristics of a cohort of master of pharmacy (MPharm) students upon entry into the program and examine associations between entry qualifications, type of secondary school attended, socioeconomic status, age, and academic performance in the MPharm program.

**Methods.** A retrospective cohort analysis was conducted of student data for graduates of the Aston University MPharm program during the 5-year period 2005-2006 through 2009-2010 (n=644).

**Results.** MPharm entrants were disproportionately drawn from socioeconomically deprived areas and independent (private) schools. Achievement prior to admission was related to the type of school attended but not to socioeconomic status. Performance in the program was not related to type of school or socioeconomic status but was strongly correlated with prior academic achievement.

**Conclusions.** Prior academic achievement was the most important predictor of performance in the MPharm program; however, the superior prior achievement of students who attended independent secondary schools was not seen at the point of graduation. These findings may have implications for admissions policies.

**Keywords:** master of pharmacy degree, performance, pharmacy, graduate program

## INTRODUCTION

Entry to higher education in the United Kingdom (UK) is predominantly based on prior attainment of General Certificate of Education (GCE) advanced level (A-level) courses. The use of A-level achievement by higher education institutions as the primary criterion for admission to undergraduate degree programs has been subject to criticism. A-level performance in independent schools (ie, private fee-paying schools where approximately 7% of all children in England are educated) is superior to that of state schools.[1,2]

Given that admission to a university is largely a product of grades achieved in A-level courses, differences in performance between pupils of fee-paying institutions and those in the state sector have given rise to suggestions that universities are indirectly discriminating against pupils from lower socioeconomic groups.[3] Indeed, the higher-education participation rate among people aged 18 to 20 years from lower socioeconomic groups is approximately half that of higher socioeconomic groups.[4]

The higher education sector's response to these suggestions was an agenda that became known as "widening participation."[5] One early response was the "Fair Enough?" project of Universities UK, the representative organization for universities in the United Kingdom.[6] This project recommended that school performance data (in conjunction with other information) should be used to identify applicants with relative educational disadvantage to decide whether some applicants should be offered a lower level of acceptance to undergraduate degree programs. The rationale behind such differential offers was the belief that, all other factors being equal, students from poorly performing schools (ie, *a priori* nonselective state schools) would outperform students from better-performing schools during their higher education.

While school performance, in combination with prior educational attainment, is used by some institutions of higher education, A-level grades remain the primary admission criterion. This is entirely reasonable, considering that A-level grades are the single most important factor in determining expected achievement in higher education.[7] Individuals with higher entrance grades are more likely to graduate from a university program and to graduate within a higher honors category. (In the UK, honors degrees are awarded in 4 classes: first-class honors, second-class honors, lower second-class honors, and third-class honors.)

The independent school sector and certain elements of the UK press have been hostile to the idea of

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"differential offers" amid claims of "social engineering" and poor students being given a "two grade 'head start.'"[8,9] Despite opposition from certain commentators, the widening participation agenda has enjoyed some success, increasing higher-education participation among young people living in the most disadvantaged areas by around 50% between 1995 and 2010.[10] Interestingly, when all other factors (eg, age, gender, ethnicity, and A-level grades) are equal, students from independent secondary schools consistently perform less well in higher education than do students from other secondary schools.[7,11]

Concerns that the use of differential offers may allow substandard students to enter UK institutions of higher education are unlikely to be applicable in the context of pharmacy. Admission to pharmacy degree programs (the 4-year, full-time, MPharm program) is highly competitive, with candidates needing to achieve a minimum of 3 A-level subjects at grade B (designated as BBB) to access courses starting in 2011.[12] The majority of higher education institutions with pharmacy programs demand at least a grade B in an A-level chemistry course as well as a grade B in a biology, mathematics, or physics course. Aston University details typical admission requirements as being grades AAB in 3 specific A-level course subjects, including chemistry and at least 1 other science course (biology, mathematics, or physics).[13]

There is a paucity of published literature on the demographic character of MPharm students in the UK. Research into the socioeconomic background of MPharm students and the type of institution attended immediately prior to admission (ie, independent, state selective, state nonselective) is particularly lacking.

Using University and Colleges Admissions Service (UCAS) data, a 2006 study found that 52% of applicants to pharmacy degree programs in 2003 were from households where the occupation of the homeowner was managerial or professional, as opposed to, for example, a skilled or nonskilled manual occupation. How the occupational background of a student's household affected performance in the MPharm program was not addressed in the study.[14]

Studies on the performance of a final year MPharm cohort at the University of Manchester examined associations among performance, prior educational attainment, and socioeconomic deprivation.[15,16] A students' overall A-level grade profile correlated only weakly with success, with final degree classification being much more sensitive to the grade in an A-level biology course than to the overall grade profile. While the cohort came from the complete spectrum of backgrounds (ie, from the least- to the most-deprived parts of the country), socioeconomic status showed no correlation with achievement. Studies

specifically examining noncompletion of pharmacy courses – particularly noncompletion of UK pharmacy courses – are similarly sparse. However, Hassell and colleagues found that noncompletion of the MPharm degree program was considerably higher among overseas students than among UK and European Union students.[17]

The admissions policy for the MPharm at Aston during the period covered by this study was that students were selected purely on the basis of academic ability, which, in this context, was determined by A-level grades. Staff members at the School of Pharmacy at the University of Manchester reported how their "altruistic" approach had widened access to the MPharm degree. They claim that if universities want to admit the best students, they should be competing for the top students from minorities and disadvantaged backgrounds, even if doing so results in differential grade offers being made for the same program.[18] It may not be possible for Aston Pharmacy School to admit the best students using an admissions policy based solely on prior academic achievement. The current study sought to explore these issues empirically and provide evidence that may influence the admissions policy of the school.

The aim of this study was to characterize a cohort of MPharm students and to explore a range of demographic variables that may be predictive of academic performance in the MPharm program. The objectives of the study were to examine associations between age at entry and academic performance in the MPharm program; to investigate associations between entry qualifications (both the type of qualification and grade[s] achieved) and academic performance in the MPharm program; and to identify any associations between socioeconomic factors (socioeconomic deprivation and type of school attended) prior to admission and academic performance in the MPharm program. The author hopes that the outcomes/findings of this study have a positive impact on pharmacy school admissions and in the provision of support to individual students throughout the MPharm course at Aston University.

## METHODS

A retrospective cohort analysis was undertaken in summer 2011. The study received approval from the Learning and Teaching Research Ethics Committee at Aston University. Data were retrieved from the university's central student information database, SITS: Vision, a student records management system widely used in UK higher education. This database tracks a student's full journey through the university from application to graduation. In the UK, academic years for undergraduate students generally run from September or October to June of the following year. The following data were retrieved for

each individual exiting the MPharm program over 5 academic years (2005-2006 through 2009-2010): unique student number (to enable categorization of the data); date of birth; country in which the student's entry qualifications were obtained; postal code of the student's home address (if known); name and postal code of the school or further-education college attended immediately prior to enrollment (if known); entry year; entry qualifications type(s), such as GCE A-level, overseas); subject(s) and grade(s); degree classification; and exit year.

These data were further manipulated prior to analysis. The date-of-birth data were used to calculate each student's age on October 1st in the year of entry to the program. The country in which the student obtained entry qualification(s) was used to dichotomize students into "home" (ie, UK) and "overseas" (ie, any other country). Data concerning the name and postcode of the school or further-education college attended immediately prior to enrollment at the university were used to create a "type of school" variable. Schools and colleges were categorized into 3 types according to their status on October 1, 2006 (independent, state selective, or state nonselective). State selective schools choose students by ability at age 11 years; prospective entrants who perform best on the entrance examination are subsequently admitted. The admissions policy (independent, comprehensive, or selective) of each institution in England and Wales was checked using the Department for Education's EduBase2 database.[19] Details for institutions in Northern Ireland were obtained from the Web sites of the individual institutions. There were no students from institutions in Scotland.

Wherever possible, UCAS Tariff scores were assigned to the students' entry qualifications. The UCAS Tariff is the system used for allocating points to qualifications used for entry to higher education in the United Kingdom (Table 1). It allows institutions of higher education to make comparisons between applicants with different qualifications. How the Tariff is used varies by institution but typically conditional offers to applicants are made on the basis of a minimum level of Tariff points and often include a minimum level of achievement in a specified subject (eg, 320 points to include a grade of A in A-level chemistry, which would be equivalent to grades of A, B, and B in 3 A-level courses).[20] It was not possible to allocate UCAS Tariff scores for some qualifications, such as those obtained from overseas institutions or cases in which a student entered the program on the basis of possessing a bachelor's degree in a related subject, such as chemistry. There was also a small number of instances (n=4) in which no entry qualification was recorded.

The Indices of Multiple Deprivation (IMD) were used as a proxy for students' socioeconomic backgrounds. Although each administration in the UK has an index of deprivation, they are not directly comparable. Given that a majority of students had an English home address, only English IMD data were collected. The IMD combine several indicators, chosen to cover a range of socioeconomic issues, into a single deprivation score for each small area in England.[21] These areas, known as Super Output Areas (SOAs), are designed for the collection and publication of small area statistics. There are currently 2 levels: lower layer SOAs (LSOAs), which divide England into 34,378 areas with a mean of 1,500 residents in each area; and middle layer SOAs (MSOAs), which divide England into 7,193 areas with a mean of 7,200 residents in each.[22] Higher IMD scores correspond to areas that were more socioeconomically deprived areas at the time of data capture. In 2010, the least deprived LSOA in England had an IMD score of 0.53, and the most deprived LSOA in England had an IMD score of 87.80.

When the postcode of a student's home address was in England, a corresponding LSOA was assigned using data from the UKBorders dataset.[23] Assignment of a LSOA allowed for the IMD 2010 score and IMD 2010 rank (where 1 is the most deprived LSOA in England and 34,378 is the least deprived LSOA in England) to be added to the dataset. The IMD 2010 data were then manipulated to create 2 additional variables: the quintile of the IMD 2010 score for the LSOA containing each student's home address on a national basis, and the quintile of the IMD 2010 score for the LSOA containing each student's home address within the cohort.

Academic performance was measured by final degree classification. The length of time taken to complete the program (calculated using entry and exit year data) was also used as a proxy measure of academic performance. While the MPharm program should be completed after 4 years of full-time study, some students take longer than 4 years. The most frequent reason for this is poor academic performance in a given year of study. However,

Table 1. University and Colleges Admissions Service Tariff Points for General Certificate of Education A-Level Courses

| Grade | Tariff Points |
|---|---|
| A*[a] | 140 |
| A | 120 |
| B | 100 |
| C | 80 |
| D | 60 |
| E | 40 |

[a] A* grades were introduced to General Certificate of Education A-level achievement from 2010 and, therefore, were not available to the members of the cohort in this study.

some caution should be applied to the consideration of time taken to complete the program as a measure of academic performance because, in some cases, there may be a personal reason, such as illness or family bereavement, for taking longer than 4 years.

Data from the extraction were manipulated in Microsoft Excel 2007 (Microsoft Corporation, Redmond, WA) before being imported into SPSS, v 16.0, for Windows (SPSS Inc., Chicago, IL) for analysis. Descriptive statistics were generated, and bivariate analyses of association between variables were also undertaken (Table 2). The Chi square test was used to assign the level of significance of any association between variables in all of the analyses undertaken except in a single case in which the proportion of cells in the contingency table with an expected frequency of less than 5 exceeded 20%. In this instance, Fisher's exact test was used to assign level of significance.

## RESULTS

Data for 646 students were retrieved for analysis. Age at entry to the MPharm program varied from 17 years to 46 years (mean 19 years $\pm$ 2 years [SD]): 55% (n=353/646) of students were age 18 years or under at the time of admission; 29% (n=190/646) were age 19 years at entry; and the remaining 16% (n=103/646) were age 20 years or older.

Five hundred sixty-one of the 646 students in the cohort (87%) attended either a school or further-education college in England immediately prior to admission to the MPharm program. Of the remaining students, 8 attended institutions in Wales immediately prior to admission, and 6 attended institutions in Northern Ireland. Forty-seven students attended a non-UK-based institution, and 3 students enrolled after previous study at a university. Data were missing for the remaining 21 students.

Fifteen percent (n=85/561) of students obtaining their entry-level qualification(s) from English institutions were educated in the independent sector. Of the 85% of students educated in the state sector, 19% (n=108/561) were from selective state institutions (ie, grammar schools) and the remaining 66% (n=368/561) were from a nonselective state institution.

Table 2. Summary of Crosstabular Analyses Undertaken

| Focus of Analysis | Independent Variables | Dependent Variables |
|---|---|---|
| Demographics | IMD 2010 quintile (cohort) | School type |
| Prior achievement | IMD 2010 quintile (cohort)<br>School type | Number of A-level subjects achieved |
| | IMD 2010 quintile (cohort)<br>School type | Total UCAS Tariff points |
| | IMD 2010 quintile (cohort)<br>School type | UCAS Tariff points per A-level subject |
| Performance at Aston | Age<br>UK entry qualifications vs overseas qualifications<br>School type<br>IMD 2010 quintile (cohort)<br>UCAS Tariff points per A level<br>A levels vs other entry qualifications<br>Number of A-levels achieved in biology, chemistry, mathematics or physics | Time taken to complete MPharm |
| | Age<br>UK entry qualifications vs overseas qualifications<br>School type<br>IMD 2010 quintile (cohort)<br>UCAS Tariff points per A level<br>A levels vs other entry qualifications<br>Number of A-levels achieved in biology, chemistry, mathematics or physics<br>Time taken to complete MPharm program<br>Grade achieved in A-level biology<br>Grade achieved in A-level chemistry<br>Grade achieved in A-level mathematics<br>Grade achieved in A-level physics | Degree classification |

Abbreviations: IMD = Indices of Multiple Deprivation; UCAS = University and Colleges Admissions Service.

The IMD 2010 score of the LSOA corresponding to home address postcode was available for 599 of the students. Of those, 41% (n=244) were from the most deprived quintile of LSOAs in England (quintile 1). Conversely, only 9% (n=56) of the cohort came from the fifth least-deprived LSOAs in England (quintile 5). As numbers in national IMD 2010 quintiles 3 to 5 were relatively low, for further analyses, the IMD 2010 quintiles referred to in the remainder of the article were quintiles within the cohort itself. There was an association between IMD 2010 quintile within the cohort and the type of school attended ($p<0.01$), with a disproportional number of students from the least-deprived quintile being educated in the independent sector (Table 3). The majority (93%, n=599/646) of students entered the program having completed at least one A-level subject, with the number ranging from 1 to 5 (3 ± 0) per student. Five percent (n=33) of the cohort entered with overseas qualifications. The remaining few students in the cohort possessed related undergraduate degrees in subjects such as chemistry and biology, and a variety of other educational qualifications with a level of difficulty equivalent to A levels.

Where the school type of students with at least 3 A levels was known (n=534), an association ($p<0.05$) was observed between number of A-levels and school type. Students from independent schools were more likely to have completed 4 or more A-level courses (19%, n=15/79) than were students from either the selective (6%, n=6/107) or nonselective (12%, n=42/348) state sector. There was no relationship between IMD 2010 quintile and the number of A-level courses completed.

The mean number of UCAS Tariff points possessed by the 599 students with at least 1 A level was 305 ± 54. While the number of Tariff points varied widely, the majority of students (58%, n=350/599) achieved between 280 points (equivalent to BBC grades) and 320 points (equivalent to ABB). Eighteen percent of students (n=106/599) achieved fewer than 280 Tariff points, and 24% (n=143/599) achieved more than 340 Tariff points.

The number of UCAS Tariff points obtained within the cohort was associated with the type of institution attended prior to admission. This relationship existed when all students with Tariff points were considered as well as when just those students with 3 A levels were examined ($p<0.001$ and $p<0.01$, respectively). Table 4 shows that, while performance between students in the state selective and nonselective sectors was broadly similar, a considerably higher proportion of students in the independent sector scored 340 Tariff points (equivalent to grades AAB in A-level subjects) than in the state selective or nonselective sectors.

Because of the variance in the number of A-level courses completed and the desire to make suitable comparisons between members of the cohort, the mean number of UCAS Tariff points per A-level course was also calculated for each individual. The mean number of UCAS Tariff points per A level of the cohort was 99 (±11, SD) (Table 5). There was no relationship between IMD 2010 cohort quintile and UCAS Tariff points or mean UCAS Tariff points per A-level course. Furthermore, there was no association between school type and mean UCAS Tariff points per A-level course.

Over the course of the 5 years studied (2005-2006 to 2009-2010), 630 (98%) of the 646 students graduated with an MPharm degree. The majority of students (81%; n=508/630) graduated 4 years after entry to the program, 15% (n=97/630) graduated 5 years after entry, and 4% (n=25/630) graduated after 6 or more years.

Associations were observed between the length of time taken to complete the MPharm program and the type of school attended immediately prior to admission ($p<0.01$) and between the length of time taken to complete the MPharm program and mean UCAS Tariff score per A-level course ($p<0.001$). There was no relationship between all of the other variables examined and the length of time taken to complete the MPharm program (Table 6).

Relationships were observed between performance in A-level courses (as measured by the mean UCAS Tariff score per A level) and final degree classification obtained ($p<0.001$), as well as between the length of time taken to complete the MPharm program and final degree classification ($p<0.001$). There was no relationship between all of the other variables examined and the length of time taken to complete the MPharm program (Table 7).

Table 3. Type of School Attended by Students Accepted into a Master of Pharmacy Degree Program, No. (%)[a]

| | Most Deprived | | | | Least Deprived | |
|---|---|---|---|---|---|---|
| **Type of School** | **1** | **2** | **3** | **4** | **5** | **Total** |
| Independent | 7 (9) | 11 (14) | 15 (19) | 17 (21) | 30 (38) | 80 (100) |
| State selective | 21 (19) | 22 (20) | 20 (19) | 23 (21) | 22 (20) | 108 (100) |
| State nonselective | 85 (23) | 74 (20) | 79 (22) | 65 (18) | 64 (17) | 367 (100) |
| Total | 113 (20) | 107 (19) | 114 (21) | 105 (19) | 116 (21) | 555 (100) |

[a] Lower to higher numbers correspond with most- to least-deprived socioeconomic cohort quintile.

Table 4. Entrants to the MPharm Program by UCAS Tariff Points Possessed and by School Type, No. (%)

| | | | State | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Independent** | | **Selective** | | **Nonselective** | | **All** | |
| **UCAS Tariff Points** | **All**[a] | **3**[b] | **All**[a] | **3**[b] | **All**[a] | **3**[b] | **All**[a] | **3**[b] |
| ≤240 | 4 (5) | 1 (2) | 5 (5) | 4 (4) | 26 (8) | 13 (5) | 35 (6) | 18 (4) |
| 260 | 8 (10) | 8 (13) | 10 (9) | 10 (10) | 42 (12) | 42 (14) | 60 (11) | 60 (13) |
| 280 | 14 (18) | 14 (22) | 26 (24) | 26 (26) | 76 (21) | 76 (25) | 116 (21) | 116 (25) |
| 300 | 12 (15) | 12 (19) | 25 (23) | 25 (25) | 71 (20) | 71 (23) | 108 (20) | 108 (23) |
| 320 | 10 (12) | 10 (16) | 20 (19) | 19 (19) | 73 (20) | 66 (22) | 103 (19) | 95 (20) |
| 340 | 19 (23) | 16 (25) | 7 (7) | 6 (6) | 26 (7) | 24 (8) | 52 (9) | 46 (10) |
| 360 | 4 (5) | 3 (5) | 12 (11) | 11 (11) | 17 (5) | 14 (5) | 33 (6) | 28 (6) |
| ≥380 | 11 (13) | | 3 (3) | | 30 (8) | | 44 (8) | |
| All | 82 (10) | 64 (100) | 108 (100) | 101 (100) | 361 (100) | 306 (10) | 551 (100) | 471 (100) |

Abbreviations: MPharm = Master of Pharmacy; UCAS= University and Colleges Admissions Service
[a] All qualifications
[b] Only 3 A-levels; maximum UCAS Tariff points = 360

Associations were observed between performance in individual A-level courses and final degree classification. The most commonly possessed A levels by members of the cohort were in the classic sciences most coveted by admissions representatives/faculty members/instructors in pharmacy. The grades obtained by students in these subjects were powerful predictors of academic performance, particularly when considering students who graduated with first-class honors (Table 8).

## DISCUSSION

Fifteen percent of students in the cohort attended an independent school immediately prior to admission. This is a significantly higher proportion ($p<0.001$) than in England as a whole (7%).[1] While this difference might suggest that individuals from independent schools are over-represented in the MPharm program, other factors may well render this assumption false.

Entry to pharmacy is unusually competitive when placed in the context of higher education in the UK as a whole, and only students with excellent grades, most usually at A level, are accepted into the program. Pupils at independent schools outperform pupils in state education at A level.[2] This phenomenon was also observed in the

Table 5. Mean University and Colleges Admissions Service Tariff Points Per A-Level Subject

| **Mean UCAS Tariff Points** | **Students, No. (%)** |
|---|---|
| ≤92 | 115 (19) |
| 92.1 - 95 | 133 (22) |
| 95.1 - 104 | 138 (23) |
| 104.1 - 107 | 111 (19) |
| >107 | 102 (17) |
| Total | 599 (100) |

current study, in which pupils from independent schools entered with more UCAS Tariff points than did their contemporaries from state schools.

However, pupils from independent schools were more likely to have taken 4 or more A-level courses than had their state-sector counterparts. The relationship between prior achievement at A level and school type weakened slightly when the number of A-level courses completed was taken into account and ceased to exist when the mean UCAS Tariff score per A-level course was used as the measure of prior achievement. There was a small pool of students from independent schools within the cohort who outperformed their state-school counterparts at the highest end of the Tariff (≥340 points). Entry requirements for the MPharm program tend to coincide with these Tariff scores, which may explain the higher-than-expected proportion of students from independent schools in the cohort. Differences in performance between independent school students and state school students below this level are less marked.

While participation rates in higher education are lower in disadvantaged socioeconomic groups, within the study cohort, participation was markedly higher in the more deprived IMD 2010 quintiles compared with those that are less deprived.[4] This finding appears to contradict the findings of Wilson and colleagues, who reported that over half of all MPharm applicants in England were from higher managerial or professional households.[14] While geography was not considered as a variable in this study, almost half of students in the cohort (47%, n=303/646) were from an area with a Birmingham postcode (ie, unusually proximal to the university, which is located in the geographical heart of Birmingham). The reason participation from deprived areas is unusually high in this MPharm program may be because 56% of the

Table 6. Demographics of Students Taking 4 or >4 Years to Graduate, No. (%)

| Variable | Variable Categories | Years Taken to Graduate, No. (%) | | No. of Students | P |
|---|---|---|---|---|---|
| | | 4 | >4 | | |
| IMD 2010 quintile[a] | 1 | 95 (82) | 21 (18) | 577 | 0.182 |
| | 2 | 99 (87) | 15 (13) | | |
| | 3 | 89 (78) | 25 (22) | | |
| | 4 | 88 (76) | 28 (24) | | |
| | 5 | 99 (85) | 18 (15) | | |
| School type | Independent | 54 (68) | 26 (33) | 541 | 0.003 |
| | State selective | 90 (85) | 16 (15) | | |
| | State nonselective | 295 (83) | 60 (17) | | |
| Qualification type | A levels | 471 (82) | 106 (18) | 613 | 0.722 |
| | Others | 28 (78) | 8 (22) | | |
| Number of A-levels achieved in biology, chemistry, mathematics or physics | ≤2 | 210 (81) | 51 (20) | 577 | 0.581 |
| | ≥3 | 261 (83) | 5 (17) | | |
| Mean UCAS Tariff score per A-level subject | ≤92 | 73 (66) | 37 (34) | 577 | <0.001 |
| | 92.1-95 | 101 (77) | 30 (23) | | |
| | 95.1-104 | 107 (81) | 25 (19) | | |
| | 104.1-107 | 97 (92) | 8 (8) | | |
| | >107 | 93 (94) | 6 (6) | | |
| Location of school | UK | 471 (81) | 110 (19) | 613 | 0.498 |
| | Overseas | 28 (88) | 4 (13) | | |
| Age, years | ≤18 | 293 (84) | 55 (16) | 622 | 0.186 |
| | 19 | 137 (77) | 41 (23) | | |
| | 20 | 36 (77) | 11 (23) | | |
| | ≥21 | 40 (82) | 9 (18) | | |

Abbreviations: IMD = Indices of Multiple Deprivation; UCAS = University and Colleges Admissions Service.
[a] Lower to higher numbers correspond with most- to least-deprived socioeconomic cohort quintile.

population of Birmingham live in the most deprived quintile of LSOAs in England.[24] Regardless, the widening of participation among individuals from socioeconomically deprived areas is to be applauded.

While the IMD 2010 quintile of the LSOA corresponding to the student's home postal code was strongly associated with school type (ie, students living in the least deprived quintile were significantly more likely to attend an independent school then were their contemporaries in more deprived areas), there was no correlation between IMD 2010 quintile within the cohort and prior achievement. Further, there was no relationship between IMD 2010 quintile and achievement at completion of the degree program, a finding that echoes those of previous studies of MPharm students.[15,16]

Within the cohort studied, 16% obtained a first-class honors degree and 54% obtained an upper second-class award. These findings are broadly comparable to the average across all institutions of higher education in the UK: of those gaining a classified first degree in 2009-2010, 14% obtained a first-class honors award, and 48%

obtained an upper second-class honors award.[25] Nationwide figures are not available specifically for undergraduate pharmacy. The most applicable figures for comparison are for a combined "pharmacology, toxicology and pharmacy" category. Figures for the cohort studied are similar to those for students in this category: 17% of those gaining a first degree obtained a first-class honors award and 52% obtained upper second-class honors.[26] Although the class of degree achieved is an important consideration for pharmacy employers, any MPharm graduate is able to pursue a career in pharmacy regardless of the class of degree achieved.

As has been discussed, the IMD 2010 quintile of the student's home address had no impact on achievement prior to or postenrollment. School type was associated with performance prior to admission, but this relationship did not exist upon graduation. While there is a growing body of evidence to suggest that in higher education, students from independent schools perform less well than do students from other schools, the current study is unable to confirm this phenomenon in an MPharm cohort.[7,11,27]

Table 7. Demographics of Students Awarded Each Degree Classification,

| Variable | Variable Categories | Final Degree Classification,[a] No. (%) | | | Number of Students | *P* |
|---|---|---|---|---|---|---|
| | | 1 | 2.1 | 2.2 | | |
| IMD 2010 quintile[b] | 1 | 15 (13) | 64 (55) | 37 (32) | 577 | 0.901 |
| | 2 | 21 (18) | 61 (54) | 32 (28) | | |
| | 3 | 23 (20) | 60 (53) | 31 (27) | | |
| | 4 | 17 (15) | 66 (57) | 33 (28) | | |
| | 5 | 17 (15) | 67 (57) | 33 (28) | | |
| School type | Independent | 7 (9) | 45 (56) | 28 (35) | 541 | 0.172 |
| | State selective | 14 (13) | 64 (60) | 28 (26) | | |
| | State non-selective | 65 (18) | 190 (54) | 100 (28) | | |
| Qualification type | A levels | 89 (15) | 314 (54) | 174 (30) | 613 | 0.774 |
| | Others | 4 (11) | 21 (58) | 11 (31) | | |
| Number of A-levels achieved in biology, chemistry, mathematics or physics | ≤2 | 37 (14) | 150 (58) | 74 (28) | 577 | 0.404 |
| | ≥3 | 52 (17) | 164 (52) | 100 (32) | | |
| Mean UCAS Tariff score per A-level subject | ≤92 | 10 (9) | 50 (46) | 50 (46) | 577 | <0.001 |
| | 92.1-95 | 7 (5) | 66 (50) | 58 (44) | | |
| | 95.1-104 | 10 (8) | 76 (58) | 46 (35) | | |
| | 104.1-107 | 23 (22) | 69 (66) | 13 (12) | | |
| | >107 | 39 (39) | 53 (54) | 7 (7) | | |
| Location of school | UK | 89 (15) | 316 (54) | 176 (30) | 613 | 0.842 |
| | Overseas | 4 (13) | 19 (59) | 9 (28) | | |
| Age, years | ≤18 | 64 (18) | 188 (54) | 96 (28) | 622 | 0.215 |
| | 19 | 20 (11) | 97 (55) | 61 (34) | | |
| | 20 | 5 (11) | 24 (51) | 18 (38) | | |
| | ≥21 | 9 (18) | 28 (57) | 12 (25) | | |
| Years taken to graduate | 4 | 92 (18) | 294 (58) | 120 (24) | 622 | <0.001 |
| | >4 | 6 (5) | 43 (37) | 67 (58) | | |

Abbreviations: IMD = Indices of Multiple Deprivation; UCAS = University and Colleges Admissions Service.
[a] The class of an honors degree is based on a weighted average of all the assessed work completed during the course of the program. Usually, students achieving a weighted average of ≥70% will be awarded a first-class (1) degree, those achieving 60%-69% will be awarded a 2.1, those achieving 50%-59% will be awarded a 2.2, and those achieving 40%-49% will be awarded a 3.
[b] Lower to higher numbers correspond with most- to least-deprived socioeconomic cohort quintile.

What can be emphasized, however, is that despite entering the program as nominally "better" than their state school counterparts, independently educated students take longer to complete the program and do not exit the program with "better" degrees than do their state-educated contemporaries.

While entry into pharmacy school at an older age and lower socioeconomic status have been identified as factors that are more common among poorly performing students, there is no evidence that this was true within this cohort of MPharm students.[28] The results of this study do not support previous findings suggesting that overseas students performed less well on the MPharm course, although this finding may have been influenced by the small number of overseas students in the cohort.[17] However, time taken to complete the degree program was correlated with poor performance, suggesting that taking more than

4 years to complete the program was primarily a function of academic failure earlier in the program.

The only independent variable used in this study that demonstrated an association with both the time taken to complete the program and the final degree classification awarded was prior achievement in A-level courses. This finding is not a surprise, considering that achievement in A-level courses is recognized as the most important factor determining higher education performance.[7] Similar studies of professional pharmacy programs in US institutions of higher education have also shown a strong correlation between achievement prior to admission and academic performance in the pharmacy program.[29,30]

Students with a mean UCAS Tariff score of more than 107 per A-level course were twice as likely to graduate with a first-class honors award than were those with a score of between 104.1 and 107 points, and 4 times more

Table 8. Students Awarded Each Degree Classification by A-level Subject and Grade

| Subject | Grade | Final Degree Classification,[a] No (%) | | | Number of Students | P |
|---|---|---|---|---|---|---|
| | | 1 | 2.1 | 2.2 | | |
| Biology | A | 35 (38) | 50 (54) | 8 (9) | 499 | <0.001 |
| | B | 32 (12) | 150 (58) | 78 (30) | | |
| | C | 14 (10) | 73 (50) | 59 (40) | | |
| Chemistry | A | 41 (33) | 68 (54) | 17 (14) | 564 | <0.001 |
| | B | 41 (12) | 203 (57) | 14 (32) | | |
| | C | 5 (6) | 36 (45) | 39 (49) | | |
| Mathematics | A | 27 (30) | 49 (54) | 15 (15) | 281 | <0.001 |
| | B | 16 (12) | 75 (55) | 45 (33) | | |
| | C | 3 (6) | 25 (46) | 26 (48) | | |
| Physics | A | 5 (36) | 9 (64) | 0 (0) | 87 | 0.001[b] |
| | B | 4 (12) | 18 (5) | 11 (33) | | |
| | C | 1 (3) | 21 (53) | 18 (45) | | |

[a] The class of an honors degree is based on a weighted average of all the assessed work completed during the course of the program. Usually, students achieving a weighted average of ≥70% will be awarded a first-class (1) degree, those achieving 60%-69% will be awarded a 2.1, those achieving 50%-59% will be awarded a 2.2, and those achieving 40%-49% will be awarded a 3.

[b] Determined by Fisher's exact, as > 20% of expected frequencies less than 5.

likely than were those with a score of 104 points or less. The relationship between performance at A level and final degree classification also existed when considering prior performance in individual subjects. While the number of classic entry subjects for pharmacy taken by a student (ie, biology, chemistry, mathematics, or physics) did not correlate with academic performance, an A grade at A level in all of these subjects was a strong predictor of better performance in the MPharm program compared with B or C grades. Echoing the findings of previously published studies related to performance in an MPharm program, performance in A-level biology was a stronger predictor of academic performance than that in chemistry, mathematics, or physics.[15,16]

While not moving away from admission based on academic ability for entry to the MPharm program at Aston University from 2012, an additional "interview" component has been added to the admissions process. In the future, offers to enter the MPharm program will be made only to applicants who attend the interview. In cases in which applicants have been made an offer of a place on the program conditional upon performance in A levels, performance in the interview will be used to differentiate between applicants who narrowly "miss" the grades stipulated in their offer letter.

## CONCLUSION

In a study of students from 1 UK institution of higher education, prior achievement at A level was the most important predictor of performance on the MPharm program. There was a dissonance between independent-school and state-educated students' performance prior

to and post-admission. Independent school students took longer to complete the pharmacy program, and their superior performance prior to admission was not seen at the point of graduation. These findings may be useful in guiding admission policies.

Longitudinal data are needed to determine whether the findings of the current study can be replicated across UK institutions of higher education. Universities offering undergraduate pharmacy degrees should continue competing to attract the best students from disadvantaged backgrounds to their programs.

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