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SIAN CAROLYNN LAWRENCE

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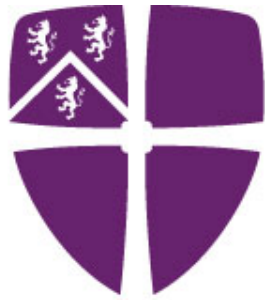
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**Did non-standard undergraduate medical degrees
widen access at British medical schools
(2002 and 2011)?**

**The impact of the extended-entry and
graduate-entry degrees on the demography
of medical school applications and accepted
applicants, in relation to standard-entry degrees
at eighteen British medical schools**

**Siân Lawrence
School of Education
Durham University
2023**

**Thesis submitted in partial fulfilment of the requirements for
the degree of Doctor of Philosophy**

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Diolch yn fawr iawn pawb.

Abstract

Following a report by the *Medical Workforce Standing Advisory Committee* (MWASC) it was agreed that the number of undergraduate medical school places would double over ten years, and medical schools should increase the diversity of their undergraduate students (MWASC 1997) as individuals from lower socio-economic backgrounds and from non-selective state schools were found to be under-represented at medical school and within the medical profession (Angel and Johnson 2000).

The expansion in the number of places on undergraduate medical degrees would be threefold: existing medical schools increased undergraduate intakes per annum; new medical schools were opened; and two new types of (non-standard) undergraduate medical degrees were introduced (Carter and Peile 2007; Petty-Saphon 2008; Papachristodoulou 2010). Four-year graduate-entry undergraduate medical degree (GEM) began at St George's and Warwick universities in 2000; followed by the launch of six-year extended-entry undergraduate medical degrees (EXT) at King's College London, in 2001 (Garlick and Brown 2008; Haldane et al 2012).

The EXT degree was designed for individuals who had been unable to reach their full academic potential, due to the adverse circumstances of their schooling and/or their home life. To compensate for these factors, the A Level entry grades are lower than they are for the standard-entry (STN) undergraduate medical degree (Curtis and Smith 2020). The GEM degree is available to individuals who already have a degree or significant healthcare experience with professional qualifications (James et al 2009; Garrud 2022).

Using three variables, as measures of disadvantaged (NS-SEC, POLAR and school type) this quantitative research explores if and how applications and selection to the two non-standard undergraduate medical degrees (GEM and EXT) succeeded in widening access, compared to the more traditional STN degree. This research examined secondary data from the eighteen university medical schools in England, Scotland and Wales, which ran two or more types of undergraduate medical degree, during the period 2002 to 2011.

The findings indicate that over the ten year period of the study, *some* progress had been made towards the diversification of the undergraduate medical student body, but the changes represented by the existence of the GEM and EXT degrees are small, given that these two non-standard medical degrees comprise only a small percentage of the annual intake to medical schools. The STN degree continues to attract individuals from more affluent backgrounds, and those who have been educated privately or in state grammar schools. The EXT degree does attract more applicants and accepted applicants from non-selective state schools, with lower academic qualifications than those seeking or gaining entry to the STN degree. In part this is achieved by restricting entry to those who have attended an academically under-performing, non-selective state school.

In respect of diversification at medical school, the findings that can be deduced regarding the GEM degree are more nuanced. Where the GEM degree has been successful, is in broadening the age range of undergraduate medical students, with individuals entering this non-standard medical degree, after successfully completing their undergraduate degree. However, GEM and STN applicants and accepted applicants share many of the same demographic and educational background characteristics.

In short, *yes* is the answer to the research question; did non-standard undergraduate medical degree widen access? But this has to be caveated by adding; not as much as might have been expected given the diversification rationale behind the establishment of the GEM and EXT degrees (Carter and Peile 2007; Garlick and Brown 2008). Overall, the data provided in relation to the eight EXT degrees included in this research, does show applicants and accepted applicants were more diverse than those on either STN or GEM degrees, especially in relation to their educational background, but less so in relation to their socio-economic background (NS-SEC) or the area in which they live (POLAR). One of their key areas of diversification for the EXT degree, was the lower A Level grades of accepted applicants, especially in comparison to those on the STN degree.

In relation the fourteen GEM degrees included in this non-random sample, conclusions relating to their success at widening access are not as apparent as they are for the EXT degree. The data suggest the socio-economic and educational background of GEM applicants and accepted applicants are more similar to those of the STN degrees, than the EXT degrees.

Where the EXT degrees in this study appear to have been successful at diversification and widening access to undergraduate medical education, is in terms of providing an opportunity to those who would have been unable to enter a STN degree, as indicated by their lower A Level grades (EXT degree).

Glossary of Terms

Accepted applicant	This refers to an applicant who has met the entry requirements for a particular undergraduate medical degree, and has been <i>accepted</i> by their chosen university. This is the stage <i>before</i> formal enrolment or registration or matriculation.
Admitted	Refers to an <i>accepted</i> applicant who has been admitted or formally enrolled on their chosen degree course and becomes an undergraduate student.
Application	A potential student has applied (via UCAS) for admission to an undergraduate medical degree. Applications to medicine (and other courses, such as veterinary medicine and those applying to Oxford or Cambridge universities) have to apply by the 15 October in the year <i>before</i> they wish to commence their degree. Applicants can apply to five universities/courses but this is limited to four for those who wish to study medicine. However, potential medical students can apply to four medical schools and make their fifth choice a science degree, such as a BSc Medical Science.
Attainment 8 and Progress 8	Used in secondary schools in England. An Attainment 8 score measures a student's academic achievements across eight subjects. Progress 8 scores are awarded to a school based on student Attainment 8 scores. Schools can benchmarked using their Progress 8 scores, with schools in disadvantaged areas often having lower scores.
BMA	British Medical Association is the trade union and professional association for UK medical students and medical professionals.
Conditional offer	A medical school will offer an applicant a place on an undergraduate degree if they meet certain academic criteria, e.g. achieve three As at A Level, including Chemistry. Conditional offers are made to applicants who have yet to sit their examinations. Their place on a medical degree is <i>conditional</i> on them achieving these grades. This is the opposite of an unconditional offer.
Contextual offer	These take account of an applicant's home life and/or the secondary school they attended. Often the A Level entry requirements will be lowered. For example the standard entry requirements for the STN degree (A100) at Birmingham University are AAA grades, for applicants with a contextual offer they are ABB grades.
Enrolled	A student has registered at a university on their chosen degree.
eFSM	Entitled to Free School Meals (eFSM) is a state benefit which children from poorer families receive. It is often used as a measure of socio-economic disadvantage, with the GIAS giving the percentage of eFSM students at a school, compared with their area and England. Its usage as a measure of socio-economic disadvantage is not without its critics. It is referenced in this research as a measure of socio-economic disadvantage in relation to applications and accepted applicants, and school types.
EXT	Extended-entry undergraduate medical degree. These degrees are six years in duration. For admission applicants will have to meet a list of widening participation/access criteria. For example, at King's College, London the EXT degree is only open to those in live in London, Kent or Medway who attended a non-selective academically under-performing secondary school.
Firm offer	UCAS defines this as an applicant's first choice of university, i.e. the place or course they would most like to attend. Universities will make a firm offer to an applicant which will be <i>conditional</i> or <i>unconditional</i> . An applicant can accept or reject this offer from the university
GCSE	These are the examinations that most UK students sit at the age of 15-16 years prior to A Levels. Prior to 2014, they were graded using letters A-G. After this date (in England only) alphabetical grades were replaced with numerical grades 9-1, with former equating to an A grade. Throughout this study the old grading system has been used.

GEM	Graduate-entry undergraduate medical degrees are four years in duration. To be eligible for admission applicants must have a degree or significant healthcare experience with relevant professional qualifications. Some universities, such as Oxford specify applicants must have a science degree, whereas others such as Swansea will accept applicants with any degree subject, but does require science A Levels.
GIAS	This is the government run website Get Information About Schools, which provides an online look up tool for information about individual schools, such as type of school, number of pupils, Progress 8 scores and eFSM rates. Prior to 2017, its predecessor was Edubase. Both were used in this study.
GMC	The General Medical Council (GMC) determines which universities can award a Primary Medical Qualifications (i.e. undergraduate medical degrees). It also determines which universities can open a new medical school or offer new undergraduate medical degrees. Since 1858, the GMC has maintained the Medical Register, which regulates and lists who can practice medicine in the UK, and excludes those whose qualifications are deemed unacceptable.
HEFCE	The Higher Education Funding Council for England (HEFCE) was created in 1992, with responsibilities for the distribution of higher education funding. Wales and Scotland have their own equivalent. In 2018, HEFCE was merged with the Office of Fair Access (OFFA) to create a single organisation; the Office for Students (OFS).
HESA	Founded in 1993, the Higher Education Statistics Agency (HESA) collects, analyses and publishes quantitative data about undergraduate and postgraduate admissions to UK higher education institutes.
High-tariff	This term is used by a range of organisations, such as the UK government, OFS and HESA, to identify the universities which require the highest qualifications for admission to undergraduate degrees. A Level grades of ABB were considered <i>high tariff</i> but this has since increased to AAB. With most STN medical degrees now requiring at least AAA grades.
Home student/s	Refers to UK nationals and/or citizens of other countries who are domiciled in the UK, and are eligible to pay fees at the same rates as <i>home</i> students. Until Britain left the EU (2019) this also included citizens of other EU countries and the EEA.
Insurance offer	This is an applicant's second choice of university. If they are unable to meet the entry requirements of their first choice university (i.e their firm offer) they would be able to attend this university if they met the academic entry requirements, which would usually be lower than their firm offer university.
Last Institution Attended (LIA)	This refers to the last educational institution that a university applicant attended. For most on STN and EXT degree this is likely to be a school or college. For most GEM (if not all) applicants it will be a university. In the context of this study, LIA and school type are used interchangeably, and refer to universities rather than schools and colleges.
Low Participation Neighbourhood (LPN)	POLAR Low Participation Neighbourhood (LPN). This refers to areas of the UK which have the lowest numbers of young people participating in higher education. For more details see POLAR.
Massification (the expansion of higher education systems)	This refers to the expansion of higher education systems globally, especially since 1945. The idea was developed by the American sociologist, Martin Trow (1926-2007), with country's having elite, mass or universal higher education systems. The UK experienced two significant waves of higher education <i>massification</i> ; the first following the publication of the Robbins Report (1963) and the second after the Further and Higher Education Act (1992). Undergraduate medical degrees experienced their largest expansion period following the Medical Act (1858) and again at the beginning of the twenty-first century, with the creation of new medical schools and new

	degree types.
Mismatch or undermatching	This refers to individuals who apply to/or are studying at a university for which are <i>over-qualified</i> . Given the A Levels grade they achieved they would have been eligible for admission to a higher tariff university.
MSC (previously the Councils of the Heads of Medical Schools)	Medical Schools Council (MSC) is the representative body for UK medical schools. Together the heads of the UK medical schools, they determine the curriculum of undergraduate medical degrees, with the delivery methods being delegated to universities.
Non-standard medical degree	In the context of this research this refers to the GEM and EXT degrees, as opposed to the standard-entry medical degree (STN).
NS-SEC	National Statistics Socio-economic Classification (NS-SEC) is used by the Office for National Statistics (ONS) for official statistics, such as the decennial UK census. First used officially in 2001, NS-SEC measures employment relations and the conditions of occupations, and allocates individuals to one of nine categories. UCAS uses an adapted version of this which excludes students from NS-SEC8. In 2017, UCAS ceased to use NS-SEC as one of its performance indicators to monitor the background of university applicants and students, due to the high volumes of missing data but it continues to be used by HESA to monitor admissions, through linked administrative data.
OFFA	Office for Fair Access was created following the Higher Education Act (2004) and the introduction of variable undergraduate tuition fees. Universities who wish to charge the maximum undergraduate tuition fees (currently £9,250 per annum in England), had to produce an <i>Access Agreement</i> , (now <i>Access and Participation Plans</i>) which gives details of outreach activities designed to attract students from under-represented backgrounds. It ceased to exist in 2018, when its functions and those of HEFCE were merged to form the Office for Students (OFS).
Offer	This is what university admissions staff make to an applicant. If they achieve the offer grade they are guaranteed a place at university, irrespective of how many other applicants also achieve the entry grades. This situation led to a hurried expansion in the number of undergraduate medical student places during the Covid-19 pandemic (2020 and 2021) when summative timed examinations were replaced by teacher assessed grades.
OFS	Office for Students (OFS) is the independent regulator of higher education in England. Following the Education and Research Act (2017), the OFS took over the functions of HEFCE and OFFA in 2018.
OFSTED	Office for Standards in Education, Children's Services and Skills. It regularly inspects schools and awards them one of four grades, outstanding; good; requires improvement; inadequate. This information can be accessed via the GIAC website. Most state-educated medical students, especially STN ones come from schools which are graded outstanding or good.
ONS	Office for National Statistics (ONS) is responsible for the production of country-wide national datasets, such as the decennial UK census.
Over-represented or over-representation	In the context of this research, this refers to occasions when the percentage of a given type of applicant/accepted applicant exceeds the percentage they represent in the whole population, for example 7% of the UK population are educated in independent schools but more than 7% of medical students are from this educational background. Also see under-representation.
Oxbridge	This is a portmanteau of Oxford and Cambridge universities.
PMQ	Primary Medical Qualification (PMQ) refers to undergraduate medical degrees. Once students pass this (i.e. they receive their degree) they are eligible to proceed to the next stage of their medical training. This is currently the two year Foundation Programme (F1 and F2). After successfully completing F1, individuals are eligible for full registration with

	the General Medical Council (GMC).
POLAR	Is used by UCAS, OFS and HESA to measure the Participation of Local Areas (POLAR), using Census Area Statistics (CAS) wards and Middle-layer Super Output Areas (MSOAs) and Super Output Areas (SOAs). It refers to the percentage rates that young people (18-19 year olds) in a given local area participate in higher education. It has five quintiles, with Q5 having the highest participation rates (80% or more) and Q1 the lowest (20% or lower). A quintile is determined by an applicant's home postcode. It was introduced by UCAS in 2005 (POLAR2), and has been updated twice since (versions 3 & 4). In 2021, UCAS announced the latest iteration POLAR4 would be the last. Quintiles 1 and 2 are considered a Low Participation (LPN) area, where fewer 18-19 years olds participate in higher education. It is often misunderstood as a measure of socio-economonic (SES) disadvantage or as representing a deprived area, although there can be a degree of overlap between low SES areas and a LPN, in some circumstance.
Post-92	These are ex-polytechnics and higher education colleges which became universities after the Further and Higher Education Act (1992). These generally have lower entry requirements than the pre-92 universities, they attract more local students, and often have larger populations of disadvantaged students and higher numbers of ethnic minority students than pre-92 universities. Examples of these universities include Coventry, Sheffield Hallam and the University of South Wales.
Predicted grades	These are the A Level grades a medical school applicant is predicted by their school/college, to achieve in their forthcoming examinations. As most STN and EXT applicants are aged 18-19 years, they are applying for admission to university before they have sat their A Levels. Predicted grades are what medical school selection staff based their offers on.
Pre-92	This refers to higher education institutions which were formally registered as universities prior to the Further and Higher Education Act (1992). This includes some of the oldest universities in the country, such as Oxford and St Andrew's, but also ones founded in the 20 th century, such as Swansea and Keele.
Registered	A student has <i>accepted</i> by a university for admission to a particular undergraduate degree and has subsequently registered (or enrolled) on their chosen course.
Rejected	An applicant can be rejected by a university or an applicant can reject a university's offer. Unlike undergraduate degrees, generally where the majority will get a place at university, the majority of applications to undergraduate medical degrees result in rejection.
Russell Group (RG)	Formed in 1994, the Russell Group is a self-identified group of 24 (initially 20) of the UK's leading research-intensive universities such as Durham and Cardiff. They tend to be longer established universities, such as Oxford and St Andrews, but also include newer universities, such as Southampton and York. Most of the medical schools included in this study are part of an RG university.
STN	Standard-entry undergraduate medical degrees. Sometimes described as the traditional medical degrees. These are usually five years in duration, but six years at e.g. Imperial College and Oxford University. Generally, these degrees attract school-leavers with very high A Level grades. The average entry grades are AAA or higher.
Triple Science	This refers to separate GCSEs and A Levels in biology, chemistry and physics. These are usually required for entry to STN and EXT degrees. Some secondary schools in disadvantaged areas are less-likely to teach these as separate subjects, than schools in more advantageous areas, selective state

	schools or independent schools.
UCAS	Universities and Colleges Admissions Service (UCAS), almost all undergraduate applicants have to be submitted via the UCAS website. UCAS manages the applications process on behalf of the universities. Like HESA, they also publish data about applicants and admissions to higher education.
UCAS tariff or score or points	This equates qualification grades to a points score. For example (currently), an A* at A Level equates to 56 points; A=48 points, B=40 points, C=32 points, D=24 points and an E=16 points. In this research A Level grades have been scored A*=12; A=10; B=8; C=6; D=4; E=2.
Unconditional offer	Applicants have usually already met a university's offer, usually by already holding academic qualifications. Generally, used to reserved for mature students with qualifications but more recently universities have been awarding them to 18-19 years old who are yet to sit their examinations.
Under-matching or under-matched	This refers to individuals who under-estimate what A Level grades they expect to obtain. Often they choose a university with lower entry grades, when the grades they do achieve would enable them to enter a university with higher entry requirements. This is the opposite of over-matching, where students over-estimate their expected A Level grades, and enter higher tariff universities with lower than expected A Level grades. This has led to the (highly contested) idea that some students, especially those from working-class backgrounds are <i>missing</i> from high tariff universities.
Under-representation or under-represented	In the context of this research, this refers to groups of applicants and accepted applicants who are present on undergraduate medical degrees, in percentage rates which are lower than their percentage rate in a given population. For example around 93% of the UK population is educated in non-selective state secondary schools, but individuals from this educational background do not account for 93% of medical degree students. Also see over-representation or over-represented as its counter measure.
Widening access (WA)	Widening access succeeds widening participation by extending higher education opportunities to individuals from societal groups which are under-represented in universities, such as working-class students at elite institutions.
Widening participation (WP)	Widening participation involves extending higher education opportunities generally, as exemplified by the first wave of UK higher education expansion from the 1960s and again in the late 1980s/early 1990s.
Withdrawn	In the context of university admissions, this refers to an individual who has withdrawn their UCAS application.

Chapter One

Thesis introduction

1.1 Research question (summary)

Did non-standard undergraduate medical degrees widen access at British medical schools between 2002 and 2011?

1.2 Research question (extensive)

When compared to the standard-entry undergraduate medical degree did the type of applicants and students accepted onto the two types of non-standard undergraduate medical degrees (extended-entry and graduate-entry) widen access at the 18 universities in England, Scotland and Wales which ran two or more types of undergraduate medical degrees between 2002 and 2011. Using NS-SEC, POLAR2 and school type as the key variables, comparisons will be made throughout the ten year period and between the three different types of undergraduate medical degrees to examine if access was widened and if so in what ways.

1.3 Why this research question matters

There are few longitudinal or multi-institutional studies and little interrogation of large datasets exploring applications and admissions to UK undergraduate medical degrees (Gorard and Smith 2006; Moore et al 2013). Most medical school widening access research is relatively small-scale, comprising single medical school case studies, or discrete activity such as the application process, medical outreach schemes or admissions (Do et al 2006; Carter and Peile 2007; Powis et al 2007; Mathers and Parry 2009; Reay et al 2010; Yates and James 2010; Haldane et al 2012; Murray et al 2021). There are limited amounts of research which compare the profiles of graduate-entry and extended-entry undergraduate medical degrees with those applying to and enrolling on the standard-entry degree (Garlick et al 2008; Calvert et al 2009; Shehmar et al 2010; Byrne et al 2014; Garrud and McManus 2018; Curtis and Smith 2020).

This longitudinal research involves more than 300,000 individual application and accepted applicant records from the eighteen universities that ran two or more undergraduate medical degrees, during the period 2002 to 2011. Non-standard undergraduate medical degrees were introduced at the start of the twenty-first century as an attempt to diversify the undergraduate medical student body, by attracting students who might not otherwise be able to study medicine (Arulampalam et al 2005; Kumwenda et al 2018). Graduate-entry degrees (GEM) were designed for students who may have missed out of the opportunity to study medicine, at the age of 18-19 years and opted to study a three-year undergraduate degree rather than medicine, or those who have significant professional healthcare experience with relevant professional qualifications (Haldane et al 2012; Garrud 2022). Extended-entry medical degrees (EXT) were designed to attract students who did not fulfil the academic entry requirements of the standard-entry medical degree (STN) because of their socioeconomic, familial or scholastic circumstances (Garlick and Brown 2008; Curtis and Smith 2020).

1.4 Rationale for the research

My own journey to university is encapsulated by three extracts from articles published in academic journals:

It has taken me a long time but I'll get there in the end (Reay et al 2002) because individuals with high aspirations can improve their school achievement levels even if expectations of them are low (Khattab 2015) but it takes a supreme effort and can involve finding an alternative route to university or accessing higher education later in life (McVitty and Morris 2012).

I was admitted to Sheffield University as part of its commitment to students from *non-traditional* backgrounds. Later I gained a master's degree in the history of medicine from Manchester University. I have been employed in three Russell Group universities and two education charities, and have been actively involved in widening participation, outreach or mentoring schemes as a professional and a volunteer. As part of these activities I

maintained an interest in access to higher education, particularly to the Russell Group universities.

In 2009, Alan Milburn (head of the *Social Mobility Commission*) published the first of his reports exploring access to the professions, which outlined how few students from working-class backgrounds entered high-status degrees and professions, such as medicine and the law (Milburn 2009; Milburn 2012). I began to read more about the topic and to formulate my ideas for researching applications and admissions to undergraduate medical degrees. I chose to focus on medicine (rather than law) because of my previous postgraduate studies.

1.5 Obtaining the data

Through preliminary research I identified a *gap-in-the-market* as there were very few longitudinal quantitative studies, which compared applications and admissions to the three different types of undergraduate medical degrees; and those that existed tended to be smaller-scale, concentrating on a small number of cohorts, individual medical schools or a specific type of undergraduate medical degree (McManus 1998, Beedham et al 2006, Parry et al 2006, James et al 2009).

As a loan postgraduate student without access to the UK Medical Education Database (UKMED), data had to be obtained from other sources (Dowell et al 2018). Anonymised individual-level data is not publically available from medical schools, the Universities and Colleges Admissions Service (UCAS) or the Higher Education Statistics Agency (HESA). Although datasets were purchased from both these organisations, these lacked the granularity required for the purposes of this research. A method had to be found to obtain individual-level (disaggregated) data from the eighteen universities in this study.

Further research revealed the possibility of using Freedom of Information (FOI) requests to the eighteen universities, which ran two or more types of undergraduate medical degrees between 2002 and 2011. The *Freedom of Information Act* (2000) and the *Freedom of Information (Scotland) Act* (2002) did not become law until 1 January 2005 (Savage and Hyde 2014) which means this research would not have been possible until after this date,

and it may not be possible now, following the passing of the European Union's *General Data Protection Regulation* (2016), which currently [2023] remains in UK law, despite the country's 2016 decision to leave the EU (Clarke et al 2019).

Using Freedom of Information (FOI) requests to obtain data is more usually associated with investigative journalists and criminologists (Walby and Luscombe 2019) but remains a much under-utilised research tool in the social sciences (Brown 2009). Further research revealed the FOI does not apply to UCAS and HESA in the same way that it does to *public* organisations such as universities and local authorities (Cherry and McMenemy 2013). At this stage in the process, it appeared the only way to obtain the necessary data would be to submit FOI requests to the eighteen universities involved in this research (Birmingham, Bristol, Cambridge, Cardiff, Dundee, Imperial, Keele, King's, Leicester, Liverpool, Manchester, Newcastle, Nottingham, Oxford, Queen Mary, Sheffield, Southampton and St George's).

FOI requests are a highly novel approach to obtaining secondary data for use in quantitative social science research, which allow researchers access to data which is not in the public domain (Clifton-Sprigg et al 2020). A pilot FOI request was sent to Birmingham University. The university duly provided anonymous individual-level applications and admissions data for all its undergraduate degrees, including the standard-entry and graduate-entry undergraduate medical degrees (2002-11). This amounted to 320,929 disaggregated records. Based on the data Birmingham University supplied, FOI requests were sent to the remaining seventeen universities. Every one of these was rejected (as permitted under the terms of the FOI act) on the grounds of costs, time, the availability of the data and its format (Cherry and McMenemy 2013). The scope of the FOI requests was much reduced, reworded and resubmitted to the seventeen universities. Despite near identical FOI requests being sent to the eighteen universities which ran two or more types of undergraduate medical degrees between 2002 and 2011, the quality, quantity and format of the data provided varied greatly, as this was secondary data, which had been collected for an entirely different purpose to the research (Smith 2008; Johnston 2014; Panchenko and Samovilova 2020).

The period 2002-2011 was chosen because it provided a suitable timeframe for longitudinal comparisons to be made between applications and accepted applicants, to the three different types of undergraduate medical degrees at the eighteen universities. This research would not have been possible prior to 2001, as the graduate-entry undergraduate medical degree (GEM) and the extended-entry undergraduate medical degree (EXT) were only launched in 2000 and 2001, respectively (Garlick and Brown 2008; Garrud 2011). The timeframe of this research enabled the longitudinal impact of the two non-standard undergraduate medical degrees to be assessed and benchmarked against the pre-existing standard-entry undergraduate medical degree (STN).

1.6 Analysing the data

Two datasets were created; an aggregated (group-level) dataset comprising data from all eighteen universities; and a second dataset comprising disaggregated (individual-level) dataset. To create the first dataset, the data from the nine universities (Birmingham, Cambridge, Imperial, Keele, King's, Liverpool, Oxford, Southampton and St George's) which provided disaggregated datasets was converted to group-level data and combined with the datasets from the remaining nine universities (Bristol, Dundee, Leicester, Manchester, Newcastle, Nottingham, Queen Mary and Sheffield). These data were analysed using mainly Excel and produced descriptive findings only. More complex analyses, using IBM's Statistical Package for the Social Sciences (SPSS v27) were possible using the second dataset (n=149,599 individual records).

Chapter Two

Theoretical framework

2.1 Background information

Brief details about the attempts to diversify the composition of undergraduate medical degree student bodies at the beginning of the twenty-first century have been furnished below. These are provided to give a better understanding of why the particular theoretical frameworks were chosen to explore applications and admissions to the three different types of undergraduate medical degrees (2002-11) and how these were applied.

The theoretical frameworks which have been utilised for this study include; the social justice theories of John Rawls, particularly the Difference Principle and Justice as Fairness (Peter 2009; Valentini 2012; Sabbagh and Schmitt 2016; Premchand 2017; Capeheart and Milovanovic 2020; Wenar 2021); Pierre Bourdieu's concepts of capitals and habitus (Bourdieu 1989; Wacquant and Deyanov 2002; Burnell 2015; Jack 2016; Huang 2019; Smith 2020; Vakalopoulos 2021); and the Capabilities Approach of Amartya Sen and Martha Nussbaum (Robeyns 2000; Saito 2003; Dean 2009; Unterhalter 2009; Wilson-Strydom 2015; Cowen and Kazamias 2016; Sarojini-Hart 2019; MacKenzie et al 2022).

At the end of the twentieth century and the early twenty-first century, there were widespread concerns in government, and other organisations that intergenerational social mobility had stalled (Dearden et al 1997; McIntosh and Munk 2007; Milburn 2009). This was coupled with the growing realisation that despite the *massification* of UK higher education from the 1960s onwards (Trow 2007; Burrage 2010; Parry 2011) access to higher education remained highly classed with the middle-classes benefitting the most from the expansion of the sector (Harris 2010; Singh 2011; Bathmaker et al 2013; Croxford and Raffe 2013). Those from wealthier homes are concentrated in elite, academically selective and highly-ranked universities, such as the twenty-four Russell Group universities, and on undergraduate degrees such as medicine, with students from less-affluent backgrounds being disproportionately found in less-selective, less-prestigious and lower-ranked

institutions (Singh 2011; Croxford and Raffe 2013; Baars et al 2016; Dilnot 2018; Boliver and Powell 2021; Mulcahy and Martinussen 2023).

The medical profession too became concerned about the background of medical students and its practitioners (Maynard and Walker 1995; Lumb and Vail 1997; MWSAC 1997; McManus 1998; Schwartz 2004). Although much progress had been made to diversify medical schools in terms of ethnicity and gender, those from lower socio-economic backgrounds continue to be *under-represented* at medical school and in the profession (Angel and Johnson 2000; Dixon and Dewar 2000; Rubin and Franchi-Christopher 2002; Arulampalam et al 2005; Stephenson and Stephenson 2010; Jones-Berry et al 2015; Niven et al 2019).

In an attempt to diversify medical schools further two new types of undergraduate medical degrees were introduced; four-year graduate-entry degrees (in 2000) and six-year extended-entry degrees (in 2001) (Carter and Peile 2007; Garlick and Brown 2008). These were launched alongside a two-pronged programme to increase the number of undergraduate medical school places through the expansion in the number of places available at existing medical schools; and the creation of new medical schools, most frequently in areas of the country which did not have a medical school and the surrounding area was deemed to be medically *underserved* (i.e. lacking a sufficient number of medical practitioners), such as Swansea (opened 2004), Aston (2014) and Worcester (2022) (Petty-Saphon 2008; Rapport et al 2009; Bufton 2021; Dowling 2021; Garrud 2021).

Since 2011, when this study concludes, further expansions in the number of undergraduate medical schools and in places available at those schools; this looks set to continue into the 2030s, with plans to increase the number of undergraduate medical students admitted, from 9,500 to 15,000 per annum (Goddard 2018; Tovey 2020; Reed 2021; Iacobucci 2022; Bain 2023; Brennan et al 2023; Pritchard 2023; Wilkinson 2023). Alongside the introduction (or some have argued re-introduction) of medical degree apprenticeships and a part-time

medical degree for healthcare professionals at Edinburgh University (Pringle 2022; Ireland 2023; Thomas 2023; Wilkinson 2023).

2.2 Theoretical framework: an introduction

The theoretical framework for this research utilises three major and distinct theories to explore access and admissions to undergraduate medical degrees. These are the social justice theory of John Rawls, and more especially the Difference Principle (DP), which ensure social and economic inequalities are arranged so the least advantaged in society benefit the most (Reiff 2012; Rodrigues 2014; Premchand 2017). The DP is a useful tool with which to explore widening access initiatives, such as extended-entry undergraduate medical degrees, which were established to provide individuals who due to their socio-economic or educational background were unable to reach their full academic potential (Gibson-Smith et al 2021) and graduate-entry degrees which were introduced to provide a *second chance* opportunity for older students to study medicine (Kumar et al 2021).

Pierre Bourdieu's concepts of capitals and habitus have been employed as *thinking tools* (Wacquant 1989) with which to examine the institutional habitus of schools and colleges and the impact these have on individuals who wish to join the field of university-based undergraduate medical degrees (Lehmann 2013; Donnelly 2015; Huang 2019). Alongside habitus, Bourdieu's inter-related concept of social capital is used for its explanatory potential (Edgerton and Roberts 2014). In this study social capital and the extra resources it provides has been explored through the use of three key independent variables (NS-SEC, school type and POLAR) (Poder 2011; Brown et al 2016; Smith 2020).

Alongside Bourdieu and Rawls, the Capabilities Approach (CA) of Amartya Sen and Martha Nussbaum has been utilised, particularly Functionings (Sen 1985; Nussbaum 1990) which have been described as realised Capabilities (CPBs); with CPBs representing freedoms for an individual to do what they wish to with their life and what they value (Nussbaum 2000; Sen 2009) and Functionings (FNCs) being what they actually achieve (Crocker 1995; Fleurbaey 2006; Al-Janabi 2017). FNCs are discussed in the context of applying to and being admitted

to one of the three different types of undergraduate medical degrees. With admission (or accepted applicant status in this study) being considered the ultimate FNC (or goal) of all medical school applicants. Each of these frameworks will be discussed in more detail below.

2.3 Social justice theory (John Rawls)

Social justice theories, such as Rawls's are considered ideal theories (Rawls 1999). An ideal theory is one which is defined as being concerned with the conception, nature and aims of a just society along with the principles which govern and regulate such a society and the expectations and compliance of people living in that society (Robeyns 2008; Valentini 2012; Matthew 2019). Such theories are concerned with society as it *should* be (ideal) rather than society as it is (non-ideal) (Sangiovanni 2008; Thompson 2020). Theories such as Rawls's social justice, also include discussions about the nature of just societal institutions, along with the distribution and re-distribution of justice within democratic societies, which includes how income, wealth and opportunities should be shared fairly amongst citizens (McCabe 2012; Sabbagh and Schmitt 2016; Wenar 2021). This issue is central to higher education, not just in the UK but globally (Parjanen and Tuomi 2003; McKimm et al 2010; Mukhopadhyay and Sriprakash 2013; Pitman 2015; Wong 2023).

Later philosophers have questioned the very premise of ideal theories and ideal societies, alongside the nature of society, justice, politics and the individual in non-ideal societies, particularly in relation to marginalised groups, such as women, the physically disabled and those without the mental capacity to make informed choices (Schmidtz 2011; Meyer and Sanklecha 2016; Thompson 2020; Moen 2022; Favara 2023).

Modern theories of social justice, such as Rawls's draw heavily on social contractarianism as espoused by Thomas Hobbes (1588-1679), John Locke (1632-1704) and John-Jacques Rousseau (1712-78) and the Classical Utilitarianism of Jeremy Bentham (1748-1832) and John Stuart Mill (1806-73), in which an individual's moral, political, legal and social obligations are dependent upon an agreement (social contract) to form and maintain collectively a particular type of society (Scott 2000; Betram 2003; Driver 2014; Laskar 2014;

Lloyd and Sreehar 2022). In such societies as these, everyone adheres to the rules (social contract) and the morally correct action is that which produces the most good for the greatest number of people (Utilitarianism) (Zerbe and Plotnick 1988; Himma 1998; Peter 2009; Stanovčić 2013; Sabbagh and Schmidtt 2016; Capeheart and Milovanovoic 2020).

For Rawls's anti-foundational theory, law and justice are integral parts of the founding stages of any society, whereas for foundational theories, such as Utilitarianism, rights such as life and liberty have a foundation which is independent of the laws of any particular society (Levine 2002; Meyar and Sanklecha 2016; Mandle and Roberts-Cady 2020; Gutting and Oksala 2022; Tuckness 2020). Rawls views the functions of the principles of justice as twofold; to assign basic rights and duties, alongside the allocation of societal benefits and burdens (Rawls 1971; Rawls 1999).

The first device of Rawls's theory of justice is a thought experiment called the Original Position (OP) in which society is devoid of political institutions (Rawls 1971; Chapman 1975; Rawls 1999; Rawls 2001; Levine 2002; Peter 2009). In this state, free and equal individuals co-operate to establish the Basic Structure (BS) of society; as well as the principles of Justice as Fairness (JAF) and the fair distribution of Primary Goods (PGs) (Mikhail 2011; Liebig and Sauer 2016; Meyer and Sanklecha 2016; Mandle and Roberts-Cady 2020; Kraut 2022; Lloyd and Sreehar 2022; Morris and Brown 2022).

To ensure the fairest type of society is created, discussions in the OP take place behind a hypothetical knowledge deprivation tool, called the Veil of Ignorance (VOI), which limits the amount of information individuals have about themselves, one another, the society and the historical era in which they live (Rawls 1971; Rawls 2001; Rodrigues 2014; Meyer and Sanklecha 2016; Wenar 2021; Driver 2022). The VOI functions as a moral reasoning device to promote the impartiality of individuals, to ensure their decisions about the nature of society are not biased by their own personal circumstances and self-interest (Huang et al 2019). It enables individuals to choose objectively and collectively the best Basic Structure and institutions of justice for society (Young 2006). As more and more of the societal

structure and its principles (such as JAF) are determined, the VOI is gradually thinned or lifted. This is done to enable individuals to explore the implications of the decisions they have already made regarding society and its principles (Ronzoni 2014; Wild 2018). In practice, Rawls's critics have argued, it is difficult for individuals to be completely unaware of their own circumstances and the society in which they live, and to cast this information aside when determining the nature and structures of society (Runcheva 2013; Muldoon et al 2014).

Unlike Utilitarianism, Rawls's redistributive tool Justice as Fairness (JAF) ensures the principles of basic and equal liberties come first in society (Rawls 1993; Levine 2002; Peter 2009; McCabe 2012; Meyer and Sanklecha 2016; Mandle and Roberts-Candy 2020). Once these are established, the second part of JAF, the Difference Principle (DP) ensures fair equality of opportunity for all individuals, irrespective of their personal circumstances or status (Rawls 1971; Rawls 1985; Rawls 1993; Rawls 2001).

Rawls's theory differs from Utilitarianism, which seeks to maximise benefits to the greatest number of people, but still leaves some disadvantaged (Baggio 2013; Premchand 2017; Wenar 2021). The DP ensures fair equality of opportunity for all because it only permits the existence of inequalities if the least advantaged benefit the most, hence the DP is also called the Maximin Principle, because it provides the maximum advantages to the most disadvantaged (Oyeshile 2008; McCabe 2012; Gilabert and O'Neill 2019; Driver 2022). The two types of non-standard undergraduate medical degrees in this research can be viewed through the prism of the DP, as they seek to provide an opportunity to study medicine to those who would not otherwise have the opportunity, especially the EXT degree (Kumar et al 2021; Gibson Smith et al 2021).

The DP seeks to nullify accidents of birth, which can provide unfair advantages to some and not others; Rawls saw fixed status ascribed by birth, gender or race as arbitrary and particularly odious (Rawls 1971; Rawls 1985; Rawls 1993; Anderson 1999; Rawls 2001; Dorling 2012; Rodrigues 2014; Mendes-Silva 2021) because it can engender attitudes of

deference and servility on the part of the least advantaged, and a will to dominate and arrogance in the most advantaged, which have the capacity to destabilise society (Wenar 2021). Liberation critics of the DP argue it takes little account of individuals who receive a benefit without contributing towards society, the so-called *free-rider* problem (Nozick 1973; Gorr 1991).

Despite these criticisms of the DP and its distributive and redistributive fairness, the policy is at the core of many affirmative action education programmes globally, which seek to *level-the-playing-field* in university admissions, by ensuring those from historically disadvantaged minorities and under-privileged communities are able to access higher education, particularly elite universities and degrees such as medicine, which are dominated by those from wealthier backgrounds (Bok and Bowen 1998; Powis et al 2007; Souto-Otera 2010; Keane 2011; Warikoo and Fuhr 2014; Wilson-Strydom 2015; Bloodworth 2016; Diwan and Lal 2020; Sandel 2020; Boliver et al 2021).

2.4 Habitus and capitals (Pierre Bourdieu)

The French sociologist Pierre Bourdieu (1930-2002) developed not so much a sociological theory but a sociological method or a conceptual toolkit for practical application (Wacquant 1989; Bourdieu 1990; Wacquant 1992). Bourdieu's own works rarely focus on pure theory because he believed social research should always begin with a voice and a vision (Heffernan 2022). His dualist approach seeks to build bridges between sociological theory and its research practices, by uniting social structures and individual agency (Smith 2020). With a sociological toolkit born out of the structuralism and functionalism of his fellow countrymen, Claude Lévi-Strauss (1908-2009), Michel Foucault (1926-1984) and the so-called *father of sociology* Emile Durkheim (1858-1917); Bourdieu's work uses capitals to explore an individual's social networks and how these can be exploited by them (Bourdieu 1968; Bourdieu and Znaniecki 1968; Bourdieu 2005; Kushner and Sterk 2005; Honneth and Geuss 2018; Smith 2020; Gutting and Oksala 2022; Stewart 2023) along with the impact an individual's habitus can have on their life's trajectories (Bourdieu 1972; Bourdieu 1977; Bourdieu 1984; Bourdieu 1990).

2.5 Habitus

Central to Bourdieu's sociological toolkit or method is the multi-layered concept of habitus, which is much contested due to its perceived capacity for both latent determinism (an outcome which is predicted by previous events or circumstances) and human agency (which provides the capacity for a durable form of freedom for an individual); the duality of habitus means it functions as both *opus operatum* (result of practices) and *modus operandi* (mode of practices) (Bourdieu 1977; Bourdieu 1999; Reay 2004; Morrison 2005; Akrivou and Di San Giorgio 2014; Maton 2014; Wacquant 2014).

In the context of higher education, research has shown school students from disadvantaged backgrounds struggle to see themselves as *university material* and frequently underestimate their chances of being admitted to elite institutions and onto degrees such as medicine, which leads to them applying to less-selective or local universities for which they are over-qualified (Greenhalgh et al 2004; Smith et al 2013; Murphy and Wyness 2020; McGrath and Rogers 2021). Once at elite universities and on undergraduate degrees such as medicine, students from working-class backgrounds can often feel socially isolated with little in common with their predominately middle-class peers (Reay et al 2009; Jones-Berry et al 2015; Hillyard et al 2020; White 2020; Stahl et al 2023).

Habitus is a habituated state rather than a habit, which is located in an environment of which an individual is a component, such as a family; it is here that they unconsciously learn the values and dispositions of the particular group of which they are a member, and it is this which embodies itself as a disposition towards learning (or not) and becomes an internalised system of perceptions and practices for the individual (Bourdieu 1972; Habermas 1979; Roodenburg 2004; Smith 2020). In essence habitus is an individual's way of being in and with the world (Bourdieu 1977; Bourdieu 1984; Bourdieu 1990; Akrivou and Di San Giorgio 2014; Wacquant 2016; Smith 2020; Heffernan 2022).

Just as individuals have their own habitus, so do groups and institutions, such as schools and universities (Bourdieu 1987). To be successful inside institutions (field), the habitus

(dispositions) of an individual (agent) must align with those of the dominant socio-economic and cultural conditions of that particular field (Bourdieu 1977). Usually, in schools and universities, especially elite ones, the institutional habitus is middle-class, which advantages students from that background, who better understand the *rules-of-the-game*, and whose families have the economic, social, cultural capitals to better exploit the system, in order to maintain and reproduce their power and transmit their advantages intergenerationally to subsequent generations (Bourdieu 1984; Brubaker 1985; Nash 1990; Wacquant 1990).

Studies of undergraduate medical degrees and the medical profession, including this thesis, show these are dominated by individuals who come from affluent backgrounds (Burke 2004; Mathers and Parry 2009; Milburn 2012; Steven et al 2016; Baugh et al 2019; De Freitas et al 2020). Students who attended independent schools and academically selective state schools are *over-represented* on the UK's undergraduate medical degrees as are those who live in affluent parts of the country, such as London and the south-east of England, along with more affluent areas of towns and cities (Tonks and Farr 2003; Brown and Garlick 2007; Dorling 2014; Griffin and Hu 2015; Kumwenda et al 2017; Donnelly and Gamsu 2018; Paterson 2019; Boliver et al 2022; Richardson 2022; Ely et al 2023; Leckie and Maragkou 2023). Research has also shown, not only do individuals from managerial and professional households i.e. middle-class families, dominate medical degrees, but there is a preponderance of medical students who come from *medical families*, i.e. having parents, grandparents or other close relatives who are medical practitioners (Arulampalan et al 2005; White et al 2012; O'Neill et al 2013; Hansen 2015; Simmenroth-Nayda and Görlich 2015; Wouters et al 2017; Polyakova et al 2020; Donnelly 2021; Shahriar et al 2022).

2.6 Field (le champ)

For Bourdieu the use of habitus as a research tool only makes sense when related to the praxis (practice) of capitals and their deployment within a specific field (Bourdieu 1977; Bourdieu 1984; Bourdieu 1987; Bourdieu 1990) because he believed it was the duty of social research to uncover the buried structures in society and the mechanisms which ensure the reproduction and maintenance of elites (Bourdieu 1989; Wacquant and Bourdieu

1992). The *field* of education (school and university) is at the epicentre of this system of reproduction. Individuals enter with differing amounts of capital and resources, such as a familiarity with the middle-class norms of educational environments gained through an upbringing by middle-class parents, along with ready-access to books, a quiet space in which to learn at home and parents who are actively engaged with their child's education (Brooks 2004; Youndell 2006; Lauder et al 2009; Cooper 2013; Kosunen and Seppänen 2015; Sarojini Hart 2016; Cooper 2017; Wilson and Worsley 2021).

Such advantages are then further entrenched by academic credentialism and hidden by meritocratic beliefs; such as ideas that latent or genetic talent exists, with hard work alone leading to advanced academic qualifications, allowing already privileged individuals access to highly-selective universities and professions such as medicine, thereby leading to the social reproduction and maintenance of elites (Bourdieu 1989; Dorling and Tomlinson 2005; McCowan 2007; Wakeling and Savage 2015; Wilson-Strydom 2015; Bunn et al 2022; Batruch et al 2023; Boliver and Powell 2023). This occurs against the backdrop of an individual and collective failure to acknowledge the impact privileged familial circumstances have had on an individual's progress through educational systems, and sustains the tyrannical myth of meritocracy (Bourdieu 1996; Allen 2011; Sandel 2020).

For Bourdieu, a field (*le champ*) such as the medical profession has an internal structure, hierarchies and power relations with a system of social positions (Bourdieu 1989; Akrivou and Di San Giorgio 2014; Kim 2022). Individuals (actors or agents) within a field are invested in the *game* and the *rules of the game* i.e. the specific set of norms and behaviours associated with a particular field (Bourdieu 1984; Wacquant and Bourdieu 1992; Bourdieu 2000). Within any field, some individuals (agents) possess well-informed habitus and capitals which are more highly valued than others, and are therefore able to distinguish themselves from their peers (Bourdieu 1977; Bourdieu 1984). Valuable capitals in the context of the education system (or field) include aligning oneself or one's offspring with the middle-class dispositions and values of that field (Lareau 1987; Reay 1998; Lareau and

Weininger 2003; Thiruttunrthy et al 2010; Edgerton and Roberts 2014; Huang 2019; Hardy and Marcotte 2020).

2.7 Capitals (economic, cultural and social)

Capital is a tool for thinking about inequalities (Smith 2020). According to Bourdieu there are three types of capital; economic, cultural and social (Bourdieu 1986; Wacquant and Bourdieu 1992). Economic capital (wealth) is the most basic and easily quantifiable form, as the richest are at the top of the hierarchy and poorest are at bottom (Bourdieu 2005). By utilising their economic capital families are able to convert their economic capital into social and cultural capitals for their children (Bourdieu and Passeron 1977). This can be done by, for example sending children to a fee-paying school or purchasing a house within the catchment area of a highly-regarded state school, thereby improving their children's chances of entering an elite university (Black 2005; Reay 2006; Crozier et al 2008; Curtis et al 2009; Ball et al 2002; Allen et al 2014; Dorling 2015; Whitty et al 2015; McGowan 2016; Heselwood 2019; Sattin-Bajaj and Roda 2020; Gamsu 2022). Like the *Matthew Effect* [the rich get richer and the poor get poorer] capital in all its forms attracts capital, as economic capital is easily convertible to other forms of capital, such as social and cultural (Merton 1968; Rigney 2010; Stuart et al 2011; Jones 2012; Jerrim 2017; Hajar 2020; Heffernan 2022).

Cultural capital comprises, for example the accent an individual uses, their leisure activities, the clothes they wear and their knowledge of the arts, even where they go on holiday (Bourdieu and Passeron 1977; Bourdieu 1984; Wacquant and Bourdieu 1992). It has three different forms; embodied (dispositions and practices); institutionalised (education qualifications); and objectified (cultural goods) (Willekens and Lievens 2014; Heffernan 2022). Academic qualifications from elite universities or academically competitive degrees, such as medicine, are recognised (by most) as having a higher status than other types of degrees or those from less-prestigious universities; these qualifications have the potential to lead to higher status and highly paid professional roles, such as medical consultants, judges

and barristers (Milburn 2009; Williams and Filippakou 2010; Milburn 2012; Carpentier 2018; Herbaut 2022; Mateos-Gonzalez and Wakeling 2022).

Social capital is the durable network of actual and potential resources an individual has access to, which can be mobilised; it can comprise institutionalised relationships, mutual acquaintances, membership of a particular group, such as university alumni (Bourdieu 1980; Bourdieu and Nice 1980; Bourdieu 1986; Siisiäinen 2000). Here, shared ideas, values and language shape the ideology, structure and social ordering of individuals and groups (Bourdieu 1968; Bourdieu and Zanutti-Kemp 1968; Bourdieu 1984; Beasley-Murray 2000; Yang 2023). Although social capital can be vague to define (Poder 2011), in the UK the *old boys* and *old girls* alumni networks of independent school are probably one of the best examples of social capital in action (Reeves et al 2017; Worth et al 2023).

Social, cultural and educational capitals (often obtained by utilising economic capital) are re-converted into economic capital, in the form of access to elite universities, to elite professions with high status and high salaries, such as medicine (Bourdieu 1986; Coleman 1988; Putnam 2001; Bourdieu 2005). Bourdieu was highly critical of the socially reproductive instrumentalism of schools and elite universities as agents of the legitimisation and perpetuation of existing social class inequalities (Bourdieu and Passeron 1977; Bourdieu 1984; Bourdieu 1988; Bourdieu 1989; Bourdieu 1990; Nash 1990; Wacquant 1990; Bourdieu 1996; Johnson 2002; Riding 2002). These can stifle the aspirations and freedoms of individuals lower down the social strata who lack the capitals to exploit opportunities, something which the Capabilities Approach explores in relation to human flourishing and wellbeing (Sen 1985; Sen 1992; Sen 1993; Robeyns 2005; Walker and Unterhalter 2007; Sarojini-Hart 2009; Sarojini-Hart 2016; Sarojini-Hart and Brando 2018).

2.8 Capabilities and functionings (Amartya Sen and Martha Nussbaum)

The Capabilities Approach (CA) originated with the Indian economist and philosopher Amartya Sen (b. 1933) (McGarth-Morris 2002). Sen devised CA because he believed the crude financial measures used in distributive justice, such as Gross Domestic Product (GDP)

and Gross National Product (GNP) do not adequately consider human complexities, as income is a poor indicator of an individual's lived experience and life chances (Gale and Tranter 2011; Robertson and Picard 2021). The CA draws on the philosophical ideas of Aristotle (384-322BCE), Immanuel Kant (1724-1804), Adam Smith (c1732-90) and Karl Marx (1818-83) to evaluate human flourishing and dignity, alongside the capacity and freedoms to live a good life (Sen 1992; Robeyns 2000; McReynolds 2002; Nussbaum 2003; Dean 2009; Gasper 2014; Topper 2019; Nussbaum 2020; Robeyns 2021; MacKenzie et al 2022; Otteson 2023). Although Sen applied the CA in the context of global development, it has since been used in the fields of regional development, health and housing policy and latterly in educational research (Walker and Unterhalter 2007; Hedge and MacKenzie 2012; Dang 2014; Robeyns 2017; Harrison et al 2018; Sriprakash and Sarojini-Hart 2019; Gracia-Calandin and Tamarit-López 2021). Although the CA was devised by Sen, it was greatly advanced by the American philosopher, Martha Nussbaum (b. 1947) (Sen 1970; Sen 1993; Fabre and Miller 2003; Nussbaum 2006; Alexander 2008; Blythe 2008; Robeyns 2009; Nussbaum 2011; Nussbaum 2015).

The CA rejects Utilitarianism and social justice theories, such as Rawls's, and shifts its focus away from just institutions and onto the individual, mostly through the use of qualitative studies (Sen 1985; Sen 1993; Nussbaum and Sen 1993; Sen 1995; Saito 2003; Stanton 2007; Gale and Tranter 2011; Gasper 2014; Robertson and Picard 2021). For research purposes, the CA explores the lived experiences and life chances of individuals, through the utilisation of their capabilities and functionings (Sen 1992; Alexander 2008; Nussbaum 2011; Gotoh 2014).

Capabilities (CBPs) are defined as the *beings and doings* of an individual's life; comprising their aspirations, expectations and any realistic ambitions they value and could achieve, for example the aspiration to become a doctor (Sen 1979; Nussbaum 1988; Sen 1992; Nussbaum 2000; Nussbaum 2004; Walker 2005). Once CBPs are achieved, they become *Functionings* (FNCs); these are outcomes over which an individual has choice and agency, for example after obtaining three science A Levels (of at least AAA grades) an individual would

be eligible to study a medical degree at a UK university (Robeyns 2000; Fleurbaey 2002; Phillips 2004; Wilson-Strydom 2011; Topper 2019; Garrud 2023).

The quality of life an individual has is not just about what they achieve (Functioning) but what options are available to them to choose from (Capabilities). Often these are restricted by their individual circumstances or the society in which they live (Sen 1992; Sen 1993; Sen 1999; Robeyns 2000; Nussbaum 2011; Wilson-Strydom 2011; Gasper 2014; Capeheart and Milovanovic 2020). For example, a woman living in a modern theocracy will have her Capabilities (opportunities) restricted; irrespective of whether she is rich or poor, that society may not permit women to proceed to higher education or to work outside the home (Nussbaum 1999; Skerker 2004). Like such women, disadvantaged and *some* ethnic minority students in democratic societies, such as the UK and the USA, often have fewer options (Capabilities) available to them than their wealthier counterparts for higher education, and can frequently find themselves restricted to lower-ranked local universities which have less rigorous academic entry requirements (Archer and Leathwood 2005; Reay et al 2010; Bathmaker et al 2011; Hillman 2016; Gamsu et al 2018; Mærsk et al 2021).

To counter the impact of an individual's socio-economic or education background, most universities in the UK have introduced contextual or holistic admissions, which take account of the circumstances in which qualifications were obtained, which ensures a degree of meritocratic *equity* of access to higher education by *levelling-the-playing-field* for those whose academic attainment has been negatively impacted by the quality of the school or college they attended and/or the socio-economic circumstances of their home life (Brosnan et al 2016; Boliver et al 2019; Henderson et al 2020; Torotcoi et al 2020; Ely et al 2023).

This form of equity of opportunity in admissions has a long history, with most authors tracing its origin to the Civil Rights movement of 1960's America (Coleman 1966; Titus 1971; Hitt et al 1983; Loury and Garman 1993; Cohen 2003; Pierce 2014; Lee 2021; Aaron et al 2023). In the USA, one of the better known schemes is the *Texas 10%* which allows students who are in the top 10% of their Texas secondary school's graduating class (by

academic results) access to state universities, such as the University of Texas at Austin (Lavergne and Walker 2002; Harris and Tienda 2012; Fletcher and Mayer 2014; Cantu 2023). In the UK, Sheffield University's Outreach and Access to Medicine Scheme (SOAMS) seeks to develop the capabilities of disadvantaged students so they are able to access undergraduate medical degrees and more importantly flourish once they are on the course and successfully graduate (Mathers and Parry 2009; Harris 2010; Jones-Berry et al 2015; Robinson and Salvestrini 2020). Just as meritocratic *equality* of opportunity to access higher education (with admission determined by examination grades alone) does not equate to equity of access between different social groups, so equality of resources (CBPs) does not create equal outcomes (Sen 1979; Clancy and Goastellec 2007; Mukhopadhyay and Sriprakash 2013; McCowan 2016; Snively 2021; Dewidar et al 2022; Isopahkala-Bouret 2023).

Although a relatively new methodology in the field of education research, the Capabilities Approach (CA) has been used to explore higher education access and admissions, enabling researchers to better an individual's Capabilities (CPBs) set; what they value and their ambitions in respect of higher education and relate these to their Functionings (FNCs) or outcomes (Wilson-Strydom 2015; Harrison et al 2018; Mukwambo 2020; MacKenzie et al 2022). The CA provides a more individualised research perspective to counterbalance structural or economic determinist models, which emphasise the macro causes of education inequalities and higher education access (Bourdieu and Passeron 1977; Willis 1977; Bourdieu 1989; Lynch and O'riordan 1998; Bowl 2001; Milburn 2012; Vietze et al 2022).

The Capabilities Approach (CA) has been used to explore individual CBPs in educational settings (Walker 2005; Alkire 2008; Wilson-Strydom 2011; Gracia-Calandín and Tamarit-López 2021; Owen 2022). Originally used in the global south (Calitz 2015; Loots et al 2016; Mseleku 2022), CA is increasingly being used to explore CBPs in the global north (Cin and Dogan 2021; Costello 2022; Panek and Zwierzchowski 2022). Moving from its original focus on economics and human development (Sen 1992; Nussbaum 1997; Sen 1999; Nussbaum 2000; Sen 2009; Nussbaum 2011) CA has been used to explore the CBPs of individuals

within educational settings, such as schools (Hedge and MacKenzie 2012; Hannon et al 2017) and universities (Wang 2011; Sanz et al 2017; Mahlangu 2020; Madikizela-Madiya 2021; O'Shea 2023). More recently the CA has been used to explore elements of medical education, including applying to medical school and medical student education whilst at university (Sandars and Sarojini-Hart 2015; Sandars et al 2017; Van Rooyen et al 2017; Van Rensberg 2019; Hanks et al 2021; Van Rooyen 2021; Harrison et al 2022; Zhang et al 2022)

Generally, CA is more usually employed in prospective qualitative research studies, such as cohort or case studies (Sanz et al 2017; Sarojini-Hart and Brando 2018; Streitwieser et al 2020; Owens et al 2022). Prospective studies look forward (as opposed to retrospective studies, such as this thesis which look backwards), they are used to observe one or more groups of people over a period of time (longitudinal), and can be used for hypothesis testing or to suggest (but not prove) causality, such as the *Framlingham Heart Study* (1948 to date) (Song and Chung 2010; Sedgwick 2013; De Rango 2016; Kumwenda et al 2018; Andersson et al 2019).

By using an evaluative normative framework, CA is able to better understand human well-being and identify social injustices (Frediani 2010; Terzi 2010; Sandars and Sarojini-Hart 2015; Mitchell et al 2017; Dueñas et al 2022). It can also be used to explore the CBPs of individuals, to better understand what they value, the individual freedoms they possess, the agency they have to achieve well-being and the barriers which prevent them from being able to fully utilise their CBPs to achieve a good life for themselves (Robeyns 2003; Sen 2009; Cibangu 2018). In this context, very recently, the CA has been used to explore the CBPs of individuals from disadvantaged backgrounds and higher education access in countries as diverse as the UK, Canada, India, USA, China, South Africa, Turkey, Ireland, Chile, Middle East and New Zealand (El Khayat 2018; Topper 2019; Mahlangu 2020; Chankseliani and McCowan 2021; (Gallegos-Mardones and Campos-Requena 2021); Wolbring and Lillywhite 2021; David et al 2022; Hannon 2023; Erdemir and Wu 2023).

Ideally, studies utilising a CA framework should be prospective but this is not always feasible or viable (Sarojini-Hart and Brando 2018; Owens et al 2022). However, difficulties can be encountered when using CA to examine the CBPs of an individual retrospectively, such as their recall or the potential for a degree of selection bias (Segdwick 2013; De Rango 2015). Consequently, several studies have noted it is much easier to measure FNCs (or outcomes), such as admission to medical school, than Capabilities (desire to attend medical school) as FNCs are much more tangible than CBPs (Walker and Unterhalter 2007; Sarojini-Hart 2012; Topper 2019). This was something which the originator of the Capabilities Approach, Amartya Sen acknowledges (Sen 1992) and since the 1990s, researchers have discussed and utilised the evaluation of FNCs as a proxy for CBPs (Chiappero-Martinetti and Roche 2009; Burchardt and Hick 2017; Robeyns 2017; Al-Janabi 2017). Given the retrospective nature of the data provided by the eighteen universities included in this study, this is the pragmatic approach taken throughout this research, with admission to one of the three different types of undergraduate medical degrees (FNCs or outcome) acting as a proxy for an individual's CPBs.

2.9 Rawls-Bourdieu-Capabilities framework

This framework was created for this study, by employing an adapted version of the Sen-Bourdieu framework created by Caroline Sarojini-Hart (née Hart). In this framework, Sarojini-Hart unites the social justice theory of John Rawls with the Capabilities Approach of Amartya Sen to operationalise these for quantitative and qualitative research purposes (Rawls 1971; Chapman 1975; Rawls 1999; Rawls 2001; Sarojini-Hart 2012; Meyer and Sanklecha 2016; Sarojini-Hart 2016; Sarojini-Hart 2019; Mandel and Roberts-Cady 2020; Wenar 2021; MacKenzie et al 2022). The Rawls-Bourdieu-Capabilities framework, provides more power and capacity to the Capabilities Approach (Sen 1985; Sen 1987; Sen 1992; Sen 1999) by combining it with Rawl's *Difference Principle* (Rawls 1971; Rawls 1993; Rawls 2001; Rodrigues 2014;) and Pierre Bourdieu's structuralism within the *field* of higher education (Bourdieu 1984; Bourdieu 1987; Bourdieu 1990; Sarojini-Hart 2012; Hart 2012; Sarojini-Hart 2016; Sarojini-Hart and Brando 2018; Sarojini-Hart 2019, Sarojini-Hart and Page 2020).

The *field* being explored in this research is access to undergraduate medical degrees at eighteen British universities. The study commences with the utilisation of Rawls's social justice theory and the Difference Principle (the least advantaged receive the most advantages) to explore the principles and policies of widening access schemes to undergraduate medical degrees (Altham 1973; Rawls 1999; Premchand 2017). This provides the theoretical backdrop with which to explore applications and admissions to the extended-entry (EXT) and graduate-entry medical degrees (GEM), using three independent variables (NS-SEC; POLAR; and school type) as measures of disadvantage; the rationale for the establishment of the EXT and GEM degrees, was to attract applicants from disadvantaged backgrounds (Angel and Johnson 2000; Arulampalan et al 2005; Garlick and Brown 2008; Shehmar et al 2010; Haldane et al 2012; Curtis and Smith 2020).

In conjunction with social justice theory, Bourdieu's theoretical framework or sociological method as he preferred, has been employed to explore the social structures and agency (structuralism) behind applications and admissions to undergraduate medical degrees (Wacquant 1989; Bourdieu 1990; Wacquant 1992; Smith 2020; Heffernan 2022). Of particular relevance to this research are Bourdieu's classed concepts of habitus (institutional and individual) and capitals (especially social and educational capital) which are highly relevant to this study of applications and admissions to undergraduate medical degrees (Bourdieu 1989; Morrison 2005; Sarojini-Hart 2012; Sarojini-Hart 2016; Nairz-Wirth et al 2017; Burawoy 2019; Sarojini-Hart 2019; Espinoza et al 2023) as significant numbers come from elite schools and wealthier backgrounds (Mathers and Parry 2011; Steven et al 2016; Niven et al 2019). Bourdieu's capitals and institutional habitus had particularly relevancy to the aggregated (group-level) datasets used in this research.

This innovative framework also uses the Capabilities Approach (CA) to explore the CBPs and FNCs of those in the disaggregated (individual-level) dataset (Sen 1970; Sen 1992; Sen 1993; Alexander 2008; Nussbaum 2011; Gotoh 2014). Using this dataset it is possible (in a somewhat curtailed capacity) to explore the CBPs and agency of individuals applying to the three different types of undergraduate medical degrees, by using lower socio-economic

status (NS-SEC) and those resident in areas of the country where fewer 18-19 years old proceed to higher education (POLAR) as a proxy for both a lack of individual CBPs and agency (Sen 1970; Sen 1992; Sen 1993). Given the retrospective nature of this research, a greater reliance has been placed on using FNCs (outcomes or realised CBPs) as a proxy for CBPs; with a medical school applicant becoming an accepted applicant being viewed as a successful outcome or FNC (Sen 1992; Walker and Unterhalter 2007; Chiappero-Martinetti and Roche 2009; Nussbaum 2011; Al-Janabi 2017; Robeyns 2017; Topper 2019).

2.10 Theoretical framework conclusion

The CA is an alternative to neo-liberal theories of justice (Harrison et al 2018) which can be employed to advance Rawls's social justice theory by moving beyond just institutions to explore the CBPs and FNCs of individuals, by restating Rawl's Difference Principle in relation to the abilities an individual has to fully participate in the public sphere, and to lead a good life (Rawls 1971; Fraser 1990; Rawls 1993; Robeyns 2004; Walker 2005; Dean 2009). For Bourdieu, the ability an individual has to lead their life, is tempered by their habitus along with the range of capitals they have access to, which are inextricably linked to the structure of the society in which they live (Bourdieu 1972; Bourdieu and Passeron 1977; Bourdieu 1984; Bourdieu 1986; Bourdieu 1990; Roodenburg 2004; Bourdieu 2005; Morrison 2005; Wacquant 2014; Smith 2020). By using the new Rawls-Bourdieu-Sen-Nussbaum framework the policy of widening access, the structural nature of disadvantage and their impact this has on outcomes for individuals, in respect of undergraduate medical degrees can be explored in a greater depth.

Chapter Three

Literature review

3.1 Introduction

The literature review includes an investigation of the published academic and non-academic literature relating to widening access to higher education in the UK, which includes an analysis of policy and practice. It will critically examine the literature which relates directly to widening access (WA) to UK undergraduate medical degrees, and benchmark these against examples of WA activity in countries as diverse as Australia, USA, South Africa, Finland, India, Canada and New Zealand. The available literature relating to WA to *high-status* universities (such as Oxford, Cambridge and Harvard) and *high-status* degrees (such as law and dentistry) will also be examined to provide insights into WA to medical degrees (Karabel 2005; Boliver 2015; Mountford-Zimdars and Moore 2020).

The effectiveness of the three measures of disadvantage which are pertinent to this study: socio-economic (NS-SEC), geo-demographic (POLAR) and scholastic (last institution attended or school-type) will be assessed, and the capabilities and limitations of each of these three measures will be appraised in relation to the benefits and drawbacks of their use by higher education institutions as a measure for successfully targeting WA activities and for reaching individuals from under-represented groups. This chapter will also examine in detail the effectiveness of higher education WA activities (including the EXT and GEM degrees), and the impact they have had on the diversification of undergraduate medical student populations. The chapter concludes with a summary of the gaps in the literature, especially those relating to access to undergraduate medical degrees and how thesis seeks to address them.

3.2 Home, school and work

Factors which can have an impact on the likelihood of an individual progressing to university are neatly encompassed in a tripartite of *gateway contexts* - home, school, and work (Stephens et al 2014). These have been described by academics from the LSE, as the *Great British sorting machine*, with each determining the likely outcome of adolescent

futures from nursery, through to school, university and into the world of work (Mijs and Nieuwenhuis 2018) and are discussed in the next section.

3.2.1 Home

A child's socialisation initially at home by their family is inextricably linked to their educational progress from nursery school onwards, in what the French sociologist Pierre Bourdieu determined as habitus and the cultural transmission of classed values in a family-setting (Byrom and Lightfoot 2012; Akrivou and Di San Giorgio 2014; Smith 2020; Romito 2023; Vakalopoulos 2023). It is in a home setting than an individual imbibes their ideas of the world around them, developing behaviours, attitudes, values and habits and internalising these as habitus, which often linger for a lifetime (Bourdieu and Passeron 1977; Bourdieu 1984). In some families, parental disdain or distrust for all things educational or scholastic is disseminated to their children, meaning some disadvantaged children are already behind their more affluent peers before they even start school, and studies show they fall further behind throughout their schooling (Willis 1977; Jonsson et al 2007; Ready and Wright 2011; Vryonides and Gouvias 2012; Romito 2023).

Early educational researchers stressed the importance of the father's educational level in determining the educational outcomes of their children (McDonald 1977; Erikson 1984, Erikson and Goldthorpe 1988), this is not surprising given that at the time of the monumental *Committee on Higher Education Report* (Robbins 1963), only 25% of university students were female, and the age cohort participation rate was around 8%, largely comprising middle-class male students, from affluent homes and graduates of independent schools and state-selective grammar schools (Mosser 1988; Watson 2014; Patel 2023).

Later research has tended to stress the significance of the mother's educational attainment level (rather than the father's) as critical to a child's development and academic progress (Bukodi and Goldthorpe 2016; Erikson 2016; Sun et al 2017; Thaning and Hallsten 2018). This so-called *mother effect* has been found across the globe in countries as diverse as the UK, Sweden, Germany, USA, Finland, Netherlands China, Finland and Japan (Kalmijn 1994;

Korupp et al 2002; Marks 2008; Buis 2013; Bukodi et al 2014; Erola et al 2016; Vasalampi et al 2018, Yamamoto and Hosokawa 2017).

Research shows parents are playing an increasingly active role in ensuring the best outcomes for their children, which the literature suggests began with the rise of the *parentocracy* in the 1990s (Brown 1990; Ball 2003). The subsequent decades, witnessed the emergence of so-called *tiger moms* and *helicopter parents*, although the latter term was first coined in 1969 (Golden et al 2021; Shaki et al 2022). This style of parenting is often described as *over-involved* or *over-protective* parenting, studies show it is more commonly seen amongst parents who are graduates and those from higher socio-economic backgrounds (Shin and Wong 2013; Cui et al 2019; McCrory-Calarco 2020; Yu 2021; Shaki et al 2022).

This parental style has been described in the literature as encompassing excessive levels of parental involvement with every element of a child's life, from school and more recently through to university (Somers and Settle 2010; Bradley-Geist and Olson-Buchanan 2014; Bland and Stevenson 2018). As it is a relatively recent phenomenon, there are few longitudinal studies of the impact this type of parenting has on children and young adults, and that which is available consists of small scale studies, often at single institutions with studies showing positive, negative, and neutral impacts (Bradley-Geist and Olson-Buchanan 2014; Ang et al 2022; Welch et al 2023). Psychological studies have suggested the phenomenon has the potential to lead to children who are over-dependent on the adults in their lives, with higher levels of anxiety and depression, a potential for adolescent burnout and lower levels of self-advocacy (Schriffrin et al 2014; Love et al 2019; Flamant et al 2022).

The near-global, neo-liberal marketisation of all levels of the education system, has resulted in increased competition to access the most prestigious schools, colleges and universities (Tight 2012; Hall 2015; McArthur 2018; Gracia-Calandín and Tamarit-López 2021; Yang 2023). From early in the twenty-first century, research has shown the education arms race to enable children to enter elite universities begins at an earlier and earlier age, with studies

from China indicating middle-class parents are acutely aware of the role educational credentials play in a child's life, and they compete against one another to get their children admitted to elite international kindergartens in order to give them a head start in life (Koh and Ziqi 2022; Ma 2023). The research shows the pathway from elite preparatory school, to an elite secondary school to an elite university to an elite profession is well-established, historic, and one dominated by those from middle-class and upper-class backgrounds, evidence for this has been found in countries as diverse as the UK, Australia, Hong Kong, Ireland, USA, France, Italy and even Norway (Cookson and Persell 1985; Bourdieu 1989; Mullen 2009; Williams and Filippakou 2010; Wakeling and Savage 2015; Bennett et al 2016; Strømme and Hansen 2017; Hecht et al 2020; Ho et al 2020; Barone and Mocetti 2021; Hogan et al 2023).

3.2.2 School

Within this elite pathway of *nursery-school-university-profession*, research shows middle-class families are adept at employing and deploying all of their economic, cultural and social capitals, to ensure successful educational outcomes for their offspring (Bourdieu 1986; Gorman 1998; Lareau 2002;; Reay 2006; Crozier et al 2008; Siraj-Blatchford 2009; Exley 2013; McCrory-Calarco 2018). Middle-class families also have at their disposal, a set of dispositions, such as accent and manners, which has given them the symbolic mastery of vocabulary, grammar and language, alongside a familiarity with abstraction and theoretical ideas, culture and taste (Bourdieu and Passeron, 1977; Friedman and Laurison 2019). This habitus of middle-class families is absorbed unselfconsciously by their children, and once inside an educational setting it closely aligns with that of the teaching staff (in schools and universities), with research from the last sixty years indicating such staff are predominantly from middle-class backgrounds themselves (Rich 1960; Becker 1972; Bernstein 1973; Bourdieu 1977; Willis 1977; Dworkin 1980; Giddens 1984; Lareau and Horvat 1999; Skeggs 2004; Lehmann 2013; Chetty et al 2014; Reay 2017; Gupta 2023).

For many of the middle-class education becomes a self-fulfilling prophecy of success, as studies show the middle-classes have a shared *typical probability* of gaining a certain

position in life, which can be influenced by external factors and is internalised by individuals, as a real possibility (Bourdieu 1977; Weber 1978; Lopez 2017, Francis et al 2020). Countering this view of the educational experience of middle-class children, research has shown how the opposite is true for many working-class children, as they too internalise an educational self-fulfilling prophecy, but the one provided to them is one of low expectations and educational failure, what Pierre Bourdieu determines as symbolic violence, perpetrated by the middle-classes on the working-classes (Willis 1977; Bourdieu 1986; Reay and Ball 1997; Kaufman 2005; Burke 2006; Crozier et al 2008; Exley 2013; McCrory-Calarco 2018; MacKenzie et al 2022).

The UK (particularly England) has a high degree of social segregation in its education system, which studies have shown is both internal and external; with better-off parents able to afford independent school fees; or to move into an areas of the country which has selective grammar schools or purchase a house in the catchment areas of high-performing comprehensive school (Dunne et al 2014; Montacute and Cullinane 2018). The same is also true in the USA, where higher-income parents make enormous efforts to ensure their children's academic success (Haveman and Smeeding 2006). The average annual fees for UK independent schools are £15,191 for day pupils and £36,000 for boarders (Haine 2021) but there are wide regional and inter-school variations; at the top end, Eton College [boys only boarding] annual fees for the current academic year are £46,000+ (Fitzgerald and Butcher 2023). As a comparison, in 2023, the median annual salary in the UK was £34,963 (Clark 2023). In 2021, English private schools fees were 90% higher than state school spending per pupil (Adams 2021). Around 6-7% of the school-aged population is educated in independent schools, with the remainder (93%) being educated in state/maintained schools (Ryan and Sibieta 2010; Long 2022; Greaves 2023).

There are further divisions between academically selective and non-selective state schools, with 163 grammar schools remaining in England (there are none in Scotland and Wales) in thirty-seven local authority areas, such as Kent, Lincolnshire and Buckinghamshire (Bolton 2016; Craig 2016; Bharkhada and Long 2019). Of the state-educated, 3-5% attend selective

grammar schools with the majority (90-93%) receiving their education in non-selective comprehensive schools (Bolton 2012; Danechi 2020).

Research shows grammar schools are predominantly educating children from higher socio-economic backgrounds; between 12-20% of year seven grammar schools students (ages 11-12 years) have previously attended a fee-paying primary or preparatory school; and only 3-4% of grammar school students are entitled to Free School Meals (eFSM) compared to 17% in selective secondary school areas, and 24% of all schools in England (Sibieta 2016; Jerrim and Sims 2019; Hajar 2020; ONS 2023). Where they do exist, grammar schools have been accused of perpetuating class inequalities and stifling social mobility; as those from the wealthiest backgrounds are much more likely to attend than their working-class peers (Cribb et al 2013; Macmillan 2016; Allen 2017; Morris and Perry 2017; Whittaker 2020).

Studies by organisations as diverse as The Institute for Fiscal Studies (IFS) and Bristol University, suggest those students who do not pass the 11+ entrance examination do worse academically in selective areas than they would in a comprehensive system (Johnson 2016; Sibieta 2016; Burgess et al 2020). However, grammar schools remain popular, particularly amongst older people, middle-class parents and right-wing critics, with some authors claiming they can aid social mobility and improve the chances lower socio-economic and ethnic minority students have of being admitted to elite universities (Smithers and Wainwright 2000; Hitchens 2015; Vernon 2016; Mansfield 2019; Speck 2019; Tanner 2022). However, some of these findings have been contested due to the nature of the datasets employed and the statistical evidence which shows very few children low and middle-income households actually enter grammar schools, particularly disadvantaged White British students; but around 25% of grammar school students are from an ethnic minority, compared to 19% of non-grammar school pupils with disadvantaged British Indian, Chinese and Other Asian children attending grammar schools at much higher rates than disadvantaged White British pupils (Cullinane 2016; Gorard and Siddiqui 2018; Jerrim and Sims 2019; Furlong and Lunt 2020).

Of all the types of state schools, grammar schools have the highest GCSE and A Level attainment rankings (Andrews et al 2016; Carmichael et al 2017). However, these are already high when students enter, as they are selected academically via the 11+ examination (Cullinane 2016). Research shows state grammar schools and independent schools have the highest application and selection rates to the *Oxbridge* universities of all the school and college types (Ashworth et al 2018; Monacute and Cullinane 2018; Richardson 2022). These students also achieve more of the top grades (A* and A) at A Level; in 2023, 47% of independent school students received an A or more, compared to 39% in grammar schools and 22% in comprehensive schools (OFQUAL 2023).

The majority of children in the UK are educated in comprehensive schools and the figure of 90-93% has not changed since 1982 (Bolton 2012). Although these schools are academically non-selective, since the late 1980s, they have been able to select on aptitude for certain subjects (such as music, sports or modern foreign languages) and by adherence to a religious faith (West 2016). The *Academies Act* (2010), saw the diversification of school provision in England, with the introduction of free schools, university technology colleges and studio schools, which are independent of local authority control and controlled directly by the Secretary of State for Education (Bolton 2015; West and Wolfe 2019).

Around 60-65% of English state secondary schools are now academies (there are none in Wales and Scotland), including almost all grammar schools; and the government intends all schools to become academies by 2030 (Gee et al 2015; Ginnis et al 2017; Roberts and Danechi 2019; Roberts 2021; Morton 2022; Whittaker 2022). However, the process of academisation is controversial, and research shows that overall there have been no improvements in pupil academic attainment levels in primary or secondary academies (Andrews et al 2017; Eyles et al 2017). Further studies have indicated disadvantaged students are often excluded from academies due to school catchment areas and so-called *off-rolling* [which OSTED defines as the removal from the school register/roll of disadvantaged and struggling pupils] (Hutchinson and Crenna-Jenkins 2019; Burgess et al 2023).

Not only has state secondary school provision been diversified in England, but external factors such as where a family lives often determines the sort of state school their children can attend (Ball 2018) and internal factors will determine what those children learn once they are at school (Bowes et al 2015; Lupton et al 2021). High property prices in most parts of the UK (relative to annual incomes in those areas) means a lot of median and low-income families are priced out of a high-performing secondary school for their children (Burgess et al 2023). A report from the professional service company, PriceWaterhouse Coopers (PWC) found house prices within the catchment area of a best performing state secondary schools are 6% higher than those in the local area; and living near a top 10% performing secondary school incurs a 19% house-price premium in the West Midlands (Durham et al 2019). The geographic proximity to a school is also a deciding factor in admissions when schools are over-subscribed (as most *good* or *outstanding* schools are), giving what one study called an illusion of choice for economically disadvantaged households (Greaves 2023).

Since 2005, the Sutton Trust has been examining the social composition of the top academically performing comprehensive schools in England. Their research began with 200 schools, but since 2013, this has been extended to 500 schools; these *top* schools are more socially exclusive than the typical comprehensive, with half the national average of disadvantaged students and [like most grammar schools] they are socio-economically unrepresentative of the area in which they are based (Cribb et al 2013; Cullinane et al 2017). In Scotland and Wales, four-out-of-five of the top performing comprehensive schools are located in the 40% most affluent areas (Van den Brande et al 2019). These secondary schools are also socially selective, with only 6% of students being eFSM, compared to 12% in the locality of the school, and 14% nationally (Sutton Trust 2006). The schools in the Sutton Trust's top 200-500, are very much not *bog-standard* comprehensives (Davies et al 2004) and are mostly located in the so-called *leafy suburbs* [middle-class areas] and are attended predominantly by students from middle-class homes (Francis and Wong 2013; Cullinane et al 2017).

Research has found that not only does the quality of schools vary depending on where an individual lives, but so does the curriculum (Bowes et al 2015; Lupton et al 2021). A study for the Royal Society of Arts (RSA), found half the schools in the county of North-East Lincolnshire entered no pupils for GCSE Triple Sciences (separate courses and examinations for biology, chemistry and physics); in Medway, Knowsley, Slough, Hull and Newcastle more than one-third of schools do not enter students for these qualifications; but every school in Sussex and Cumbria has at least some children taking these GCSEs (Alldritt and Taylor 2015).

Several studies have also shown that students from disadvantaged backgrounds are less likely than their advantaged peers, to take what were once termed *facilitating subjects* at GCSE and A Level [such as chemistry, geography, history and modern foreign languages] which can restrict their choice of A Levels and university (Iannelli and Klein 2015; Piatt and Eastwood 2015; Henderson et al 2016; Dilnot and Boliver 2018). High-quality careers advice was also found to be lacking in most state schools, especially when compared with independent schools; this is particularly important for first-in-family and working-class students with little or no familial experience of higher education and a lack professional occupational role models (Greenbank 2009; Eastwood and Thirunamachandran 2011; Tate et al 2015; Wong 2015; Hutchinson 2018; Robertson and Picard 2021).

Within the comprehensive sector, decades of published research indicates there are wide inter-school and intra-school variations, with these divisions often occurring along social class and ethnic lines (Jackson 1964; Willis 1977; Slavin 1990; Reay and Ball 1997; Gewirtz 2001; Blanden and Machin 2004; Muijs and Dunne 2010; Rees et al 2015; West 2016; Kintrea 2018; Halfon et al 2021; Burgess et al 2023). Many comprehensive schools are segregated internally, through setting, banding or streaming by academic ability (Smithers and Robinson 2010; Dunne et al 2013; Macqueen 2013; Reay 2017).

Research shows comprehensive schools are often internally segregated with middle-class students disproportionately placed in the top sets, often called *stretch* or *grammar streams*

with opportunities to participate in enrichment activities, such as the *Gifted and Talented* programme (Crozier et al 2008; Loft et al 2020; Taylor et al 2022; Benson-Egglenton 2022). Students from disadvantaged or lower socio-economic backgrounds are to be found disproportionately in the lower bands, sets or streams (Smithers and Robinson 2010; Dunne et al 2013; Macqueen 2013; Montacute and Cullinane 2018). Several studies, have examined the ways (the largely middle-class) teaching profession interacts with students based on their social class, often favouring middle-class children over their working-class peers (Bourdieu 1977; Boudieu and Passeron 1992; Reay 2001; Siraj-Blatchford 2009).

Like their secondary modern counterparts from the 1940s to the 1970s, the students in these lower sets, can find themselves being taught by less experienced teachers, who very often have *extremely* low expectations of their academic potential and future career prospects, which can all often become a (negative) self-fulfilling prophecy (Jackson 1964; Willis 1977; Slavin 1990; Francis and Wong 2013; Bloodworth 2016; Carter 2023). Supporters of streaming argue, that placing students in streams/bands by attainment enables teachers to set their lessons at an appropriate level; whilst critics highlight the lifelong damage that can be caused to the self-esteem of a child by placing them in a lower set/stream or a secondary modern school if they are unsuccessful in the 11+ examination (Muijs and Dunne 2010; Rosen and Williams 2013; Skipper and Douglas 2016; Rix and Ingham 2021).

3.2.3 Work

Just as the school system and the higher education sector are classed, so is the professional world, with decades of research revealing the chances of a working-class class individual making it to the top in certain professions, such as medicine, journalism, accountancy, politics, academia and the law, has remained low (Bottomore 1964; Goldthorpe and Payne 1986; Dearden et al 1997; Blanden 2007; Neuberger 2010; Milburn 2012; Miles and Savage 2012; Edgley et al 2017; Reay 2020). In the UK, only 4% of medical professionals come from a working-class background (White 2016).

In the 1970s, a relatively closed system of elite recruitment was identified, with employers recruiting individuals from a narrow section of society, such as the *old boys* and *old girls* of elite schools, such as Harrow and Eton (boys) and Cheltenham Ladies' College and Benenden (girls) and *Oxbridge*, thereby ensuring a degree of homogeneity in elite professions, which has continued into the twenty-first century (Giddens 1972; Granoveter 1973; Zimdars et al 2009; Khan 2011; Bennett 2014; Duff 2017; Reeves et al 2017; Lampl and Milburn 2019; Gamsu 2022; Josefy et al 2023; Worth et al 2023). Elite firms recruit mainly from elite universities, such as Oxford (UK) and Harvard (USA); around 70% of graduate recruiters target fewer than twenty universities, seeking out individuals with non-cognitive attributes, including *polish* and *soft skills*, such as leadership and team work, which are highly subjective and highly classed (Bourdieu 1996; Bowles and Gintis 2002; Blanden and Machin 2007; Francis and Wong 2013; Stitch and Reeves 2016).

Since the 1950s the chances of someone from the lower social classes, obtaining a professional or managerial job have declined significantly, as twenty-first century professionals increasingly come from families which are much wealthier than average households (Milburn 2009; Hecht et al 2020). The few socially disadvantaged but upwardly mobile individuals that exist are less likely to reach the highest levels of professional success and seniority, as the link between social origins and professional destinations becomes stronger the higher up the social ladder one progresses (Sullivan et al 2018). Sooner or later they will hit what researchers from the LSE term a *class ceiling*, beyond which someone with lower socio-economic origins will find it almost impossible to succeed due to a lack or perceived lack of economic, social and cultural capitals (Archer et al 2014; Friedman et al 2015; Reeves et al 2017).

A study from Canada suggests that to succeed professionally, working-class individuals must develop a middle-class persona and attitudes, but this is not easily achieved, due to the existence of individual and institutional habitus (Bourdieu 1989; Power 1999; Luke 2003; Morrison 2005; Byrom and Lightfoot 2012; Lehmann 2012; Manstead 2018; Fowler 2020; Jin and Ball 2020). Even if they are able to do this successfully, studies by the Institute for

Fiscal Studies (IFS) and other organisations found privately educated graduates earn seven times more than their state-educated peers, even with the same degree from the same university; and even if they did not attend university, privately-educated students, particularly males have better career prospects than others with degrees (Crawford et al 2016; Milburn 2019; Britton et al 2021; Bolton and Lewis 2023). Researchers also found evidence of classed recruitment and wage differentials in Norway, Japan, Germany, Sweden, and the USA (Jonsson et al 2007; Strømme and Hansen 2017).

Several studies by the Social Mobility Commission have explored the composition of specific elite professions, such as medicine, law, politics and journalism; they revealed medicine remains one of the most elitist professions, and unlike law and politics, has become increasingly so; 51% of doctors were educated privately (1987 and 2007) compared to 61% more recently (Milburn 2009; Milburn 2012; Milburn 2017; Lampl and Milburn 2019). The medical profession (unlike the legal profession) was accused of making too little progress and taking too little interest in fair access to the profession (Neuberger 2010; Milburn 2012).

The Medical Schools Council (MSC) responded to these criticisms by establishing the *Selecting for Excellence* project, which recommended medical schools increase their outreach activities to cover the whole of the UK, make better use of contextual data in the admissions process and become more transparent in relation to the selection methods used, including the nature of the required pre-application work experience (Weetman et al 2014). The latter had been criticised for being informal, unstructured and wide open to gaming, with well-connected middle-class children able to utilise their family's social networks and economic resources for student work placements and (often vital but unpaid and sometimes unadvertised) professional internships (Jonsson et al 2007;; Milburn 2012; Francis and Wong 2013; Willetts et al 2013; Lee 2015; Wright and Mulvey 2021).

In 2016 and 2019, the Social Mobility Commission reinvestigated access to the professions and found little progress had been made, with only 4% of doctors coming from working-

class backgrounds (NS-SEC 6-7), compared to 6% of lawyers and 11% of journalists (Milburn 2016; Lampl and Milburn 2019). Research from the London School of Economics and Political Science (LSE), noted 55% of UK doctors came from a higher managerial or professional background (NS-SEC 1-2), with the children of doctors, twenty-four times more likely to become doctors than those from any other occupational categories (Friedman et al 2015; Friedman and Laurison 2019). A further study for the Sutton Trust revealed 61% of top medics had been educated privately, compared to 22% in grammar schools and 16% in comprehensive schools (Kirby 2016).

Within the UK medical profession, gender, class and ethnic divisions remain between the types of medical specialisms individuals undertake, following graduation from medical school and the completion of the two-year *Foundation Programme* (Esmail and Everington 1993; Moore 2003; Rimmer 2015; Kumwenda et al 2019; Turner 2019; Iacobucci 2020; Collins et al 2021; Pegna 2021).

Several studies including one from the University of York, indicate medical students from higher socio-economic backgrounds and independent schools are less likely to enter general practice (GP) training, and more likely to enter surgical training, than those who were state-educated or are from lower socio-economic backgrounds (Rimmer 2015; Rodriguez-Santana and Chalkley 2015; McDonald et al 2016; Lowe 2019; Turner 2019). A longitudinal cohort study using the UKMED database examined the socio-economic origins of 6,065 specialist medical trainees, and concluded those from non-professional backgrounds (NS-SEC 2-4) and those whose parents did not have a degree were more likely to become GPs or choose mental health specialities. There were no published responses to this BMJ article, however NS-SEC 4-7 are more commonly employed as a measure of low SES background in relation to higher education access and the composition of professions (Milburn 2009; Mathers and Parry 2011; Milburn 2012; Steven et al 2016; Niven et al 2019; Lampl and Milburn 2019; Curtis and Smith 2020). NS-SEC 2 occupations are categorised as *lower managerial and professional*, which includes occupations such as journalists, nurses, musicians, social workers and school teachers, which are not generally perceived as being lower SES or

working-class (Erikson and Goldthorpe 1992; Rose and O'Reilly 1998, Goldthorpe and McKnight 2004; Rose 2006, Stevenson and Lang 2010; Milburn 2012; Rose and Harrison 2012; Oakes 2016).

3.3 Higher education

The UK has one of the world's most highly stratified higher education systems, which is divided along social class lines (Reay 2006; Croxford and Raffe 2013; Bowes et al 2015; Berger 2021). This has implications for individuals because the type of university they attend influences their future professional options (Walker and Zhu 2013; Friedman et al 2015). Successive reports from the Social Mobility Commission and the Sutton Trust indicate just how much those educated in private schools and *Oxbridge* graduates dominate the elite professions; *Elitist Britain* estimated only 6% of those in elite professions have been educated in comprehensive schools (Lampl and Milburn 2019). There appears to be something resembling a *pipeline* from elite private schools to elite universities to elite professions, in the UK and in countries such as France and the USA (Brown et al 2016; Jack 2016; Bennett 2017; Henderson et al 2020; Herbaut 2022; Worth et al 2023). Some authors have described this as a tyranny of meritocracy (Berger 2021; Brighouse 2022) and there are calls for the admissions system to change from one of equality of meritocratic opportunity to one based on social justice; with meritocratic equity of opportunity in admissions, because selection based solely on academic attainment is inherently unjust (Marginson 2018; Boliver and Powell 2022; Isopahkala-Bouret 2023).

Whilst targets have been set and the percentages of those from disadvantaged backgrounds experiencing higher education has grown overall, for example, the percentage of eFSM students in higher education rose from 13% (2005) to 24% (2014); however what these reports do not reveal is whether this includes sub-degree courses, such as foundation degrees or BTECs, nor the type of higher education institution these students are attending (Heselwood 2019). Over the same timeframe (2005-14), there was a 34% increase in undergraduate applications and a 26% increase in accepted applicants (Bolton 2023). The university participation gap between eFSM students and non-FSM students has remained

largely stable in the UK since 2006 (Baines et al 2022; Moss 2023), despite a significant increase in the number of 18-24 year olds in the general population (Bolton 2023).

There have been similar increases in the numbers of disadvantaged students entering higher education overall; according to UCAS the percentage of students from low socio-economic backgrounds (SES) entering higher education has risen by 74% since 2006 but participation rates remain classed (Heselwood 2018). An early twenty-first century study, found even by 1998, young people's higher education participation rates for the highest three social classes (using the Registrar General's (RG) classification) had reached 45% compared with 17% for the lowest three social classes; at the highest RG level (managerial and professional class, group one) the participation rate had reached 80% compared to 14% from the lowest (unskilled occupations, group five) (Connor 2001).

By 2014, 33% of working-class young people went to university (Reay 2018) and by 2018, disadvantaged eighteen year-olds were more likely to enter higher education than ever before (Farhan and Heselwood 2019) but they are attending different types of universities than their wealthier peers (Croxford and Raffe 2013). There is no evidence to suggest that elite universities are actively discriminating against working-class students, but studies have demonstrated parents in working-class families lack knowledge of the university admissions process, especially the extra requirements of *Oxbridge* universities and medical schools, and are therefore unable to guide their child through the process (Jones-Berry et al 2015; Harrison and Waller 2018; McGrath and Rogers 2021).

3.4 Elite higher education

The literature does appear to point to a system of elite higher education in the UK which has largely been unchanged by huge reforms throughout the entire education system, including higher education during the course of the twentieth century (Egerton and Hasley 1993; McCulloch 2006; Crawford et al 2016; Atherton et al 2023). At the elite level, admissions are based almost entirely on academic credentialism and notions of meritocratic equality of opportunity, aside from a small number of cases deemed worthy of contextual admissions,

but even these generally do not reach too far down social hierarchy (Montacute and Cullinane 2018; Lavelle 2019; McIntyre 2020; Stoyanova et al 2020; Askham 2021; Abulafia 2022).

Research in the UK and USA, indicates most disadvantaged students and those from lower socio-economic backgrounds actively avoid elite universities, and instead favour attending their local university or a less-prestigious one, even if they obtain the grades to be able attend a more academically selective institution (Smith et al 2013; Murphy and Wyness 2020). Several studies advanced the notion that students from working-class or ethnic minority backgrounds believe they would not fit in at an elite university or do not see *people like me* when they visit on open days, with others at elite universities reporting feeling like *outsiders* and some experiencing micro-agressions by staff and students (Greenhalgh et al 2004; Jones-Berry et al 2015; Hillyard et al 2020; White 2020; Bhopal and Myers 2023). For the sociologist, Pierre Bourdieu, this relates to the habitus, and the social and cultural capitals of individuals; the sense of belonging and entitlement that middle-class students in elite universities possess, which is lacking amongst working-class students (Bourdieu and Passeron 1990; Franceschelli et al 2016).

At elite universities, the picture for eFSM students is even bleaker, with very few even gaining entry; eFSM students are around one-third as likely as non-eFSM pupils to enrol in higher-tariff universities (Boliver and Powell 2023). However, some of these differences in participation rates at elite universities can be explained by the lower attainment levels of eFSM students; in 2011, only 4% of eFSM students obtained AAA grades at A Level, compared to 32% of privately educated students (Marshall 2013). And there is much evidence to suggest that the awarding A Level grades during the Covid-19 pandemic (2020-21) based on teacher-assessed grades (rather than timed examinations), replicated structural inequalities in education, with students at independent schools receiving far higher grades than those educated in state schools and colleges (Bayrakdar and Guveli 2020; Bhopal and Myers 2020; Pensiero et al 2020; Finn et al 2022; Kippin and Cairney 2023; Bhopal and Myers 2023).

Like eFSM students, low SES students can be found in disproportionate numbers at less-prestigious universities; those from the highest SES group are around three more likely to go to university than lower SES groups; and seven times more likely to go to a selective institution (Crawford and Greaves 2015; Montacute and Cullinane 2018). In part almost all of these differences can be explained due the correlation between high SES and higher A Level attainment levels (Chowdry et al 2013; Boliver et al 2021), with the literature showing working-class or low SES students have poorer academic performance and attainment levels at all stages of the education system, from primary school to GCSEs, which limits their 16-18 educational choices (Strand 2021; Stopforth et al 2021).

Academic credentialism, means qualifications from certain elite universities, such as the *golden-triangle* of Oxford, Cambridge and the elite London-based universities, such as Imperial College, being the most highly prized (Boliver 2011; Raffe and Croxford 2015; Baltaru et al 2022; Mateos-González and Wakeling 2022; Josefy et al 2023). This has created a differentiated credentialism, where the same qualification (e.g. a history degree) from an elite institution is more highly valued by elite employers than an identical qualification from a lower ranked university (Bennett et al 2008; Branine 2008; Zimdars et al 2009; Boliver and Swift 2011; Pollard et al 2015). Increasingly academic qualifications have become a *positional good*, with wealthier students studying postgraduate qualifications in order to stand out in a crowded graduate labour market, where most possess an undergraduate degree (Hirsch 1976; Bourdieu 1984; Walker and Zhu 2013; Marginson 2016; Boliver 2017; Baltaru et al 2022).

3.5 Widening participation to higher education

From a social justice perspective, the academic and non-academic literature shows that widening participation and widening access to higher education policies, especially from the 1980s were largely part of the neo-liberal drive to enhance social mobility levels, in order to improve the country's economy and increase its global competitiveness (Singh 2011; Dandridge 2016; Dilnot and Boliver 2018; Heselwood 2019; Wanti et al 2022). The origins of this can be traced back to the 1960s, and the *Robbins Report* (1963), after which the

number of universities increased, with the demand for places driven largely by middle-class school-leavers (Scott 2013; Willetts 2013; Ainsley 2014; Barr et al 2014; Watson 2014). The 1960s and 1970s, saw the development of polytechnics as an alternative to universities, which were largely a destination for working-class students, with middle-class school-leavers progressing to a university, leading to the creation of the binary divide in higher education, which lasted from 1965 to 1992 (Lewis 1992; Pratt 1997; Hillman 2016). Later research suggests a form of covert binary divide still exists, with those higher education institutions which were universities prior to 1992 attracting far more middle-class and privately educated students than those which became universities after 1992; often this is dictated by individual academic attainment levels, personal choice, financial or familial constraints (Jerrim 2013; Boliver et al 2016; Franceschelli et al 2016; Sundorph et al 2017; Monacute and Cullinane 2018; Barg et al 2020; Boliver and Powell 2021).

Despite the expansion of the higher education sector from the 1970s onwards, the research suggests it was not an evenly distributed system; a study for the Economic and Social Research Council (ESRC) showed the percentage of students from professional homes in universities increased from 55% to 72% (1991-1998) but for those from unskilled backgrounds, the increases were far smaller, from 6% to 13%; similar divergences were found in France, USA, Finland and New Zealand (Glennerster 2002; Blanden and Machin 2004; Parry 2013; Carpentier 2018; Kiniven et al 2018). The advent of the New Labour government (1997-2010) and the subsequent Conservative-Liberal coalition (2010-15) and the Conservative governments (from 2015) led to the further marketisation of the higher education sector, and attempts to diversify the composition undergraduate student bodies, but much of the policies around higher education and widening participation were based on meritocratic ideas of equality of opportunity rather than equity of opportunity (Shattock 2006; Lunt 2008; Clegg 2011; Shattock 2012; Kimura 2013; Maer and Gay 2015; Sartania et al 2018; Coyle et al 2020).

Increases in the number and percentage of young people going to university, from c15% (1988) to c47% (2010); and c50% (2019) have enabled successive governments to

legitimately claim more and more young people than ever are going to university, research shows there are wide variations in higher education participation, with ethnicity, disability, geography and social class, determining what type of university an individual attends and where (Chowdry et al 2010; Bathmaker et al 2013; Crawford and Greaves 2015; Hemsley- (Hemsley-Brown and Oplatka 2015; Boliver 2016; Donnelly and Gamsu 2018; Coughlan 2019; Eyles et al 2022). Whilst the 1980s and 1990s, saw an increase in the number of mature and part-time higher education students, the past two decades have seen their numbers fall dramatically, which the literature has linked to the rise in undergraduate tuition fees (Connor et al 2001; Bolton 2023; Bolton and Lewis 2023; Isopahkala-Bouret 2023). This prompted the Office for Students (OFS) to call for universities to achieve equity in admissions through the use of contextual data, and to improve the progression and completion rates of students from non-traditional backgrounds (Carasso 2023).

3.6 Widening access to higher education

Globally, as higher education participation has increased, with places taken up largely by students from middle-class homes, particularly females (Amaral 2022) attention has shifted from *who* goes to university (widening participation) to *who* goes to *which* type of university (widening access) (Reay et al 2005). Part of this shift in England followed the increase in undergraduate tuition fees from 2006, and the concurrent introduction of *Access Agreements* (now *Access and Participation Plans*) where each university has to outline their initiatives to attract more students from disadvantaged backgrounds and submit these to the Office for Students (previously OFFA) for consideration, which is linked to the rate of undergraduate tuition fees a university can charge (McCaig 2015; Pickering 2021; Moores et al 2023).

Globally, the bulk of the literature relating to widening access to higher education can be divided into three categories, with initiatives designed to attract more students from; (1) numerically non-dominant ethnic and indigenous populations, such as those in Canada, Australia, USA, Finland, India and New Zealand and (2) numerically dominant but deprived ethnic populations, as per South Africa, Brazil, Peru and Mexico; in both categories are

countries which were subject to colonial rule by a Western European nation, which has left a legacy whereby those with close genetic links to European populations have formed a numerically small but powerful elite (Basco et al 2002; Parjanen and Tuomi 2003; Juárez-Nájera et al 2006; Mudur 2006; McKimm et al 2010; Gale and Tranter 2011; Sahlberg 2012; Stratthdee and Engler 2012; White et al 2012; Mukhopadhyay and Sripakash 2013; Griffin and Hu 2015; Johnson and Heringer 2015; Sagarra et al 2015; Norões and McCowan 2016; Curtis et al 2017; Dodo-Balu 2018; Baugh et al 2019; Fontana et al 2019; Lett et al 2019; Medeiros-Figueiredo et al 2019; Alcázar et al 2020; Diwan and Lal 2020; Moitus et al 2020; Pitre et al 2020).

The third category is somewhat unusual in that disadvantaged members of the ethnically *dominant* group are the primary focus of widening access initiatives; the UK and Ireland would appear to be something of global outliers in this respect (Sveinsson 2009; Kennedy and Power 2010; Anders 2017; O'Sullivan et al 2019; Adjogatse and Miedema 2022; Costello 2022; Boyle et al 2023; Halfon et al 2021). In the UK, 87% of the country's population is White, and 34% of the population of England and Wales are considered working-class (NS-SEC 5-7) (Curtice et al 2016; ONS 2018; Uberoi and Burton 2022; Heath and Bennett 2023) but only 10% of the most disadvantaged White boys can be found in higher education institutions; as identified by eFSM, although the use of this measure to identify socio-economic disadvantaged has been subject to challenges (Gorard 2012; Holford 2012; Iniesta-Martinez and Evans 2012; Allen 2015; Crawford and Greaves 2015; Shields 2021; Baines et al 2022; McRae and Westwater 2022; O'Connell et al 2022). And whilst there is something akin to a moral panic about the education of White working-class males, there appears to be a dearth of literature about White working-class girls, whose educational performances and presence in higher education is only marginally better than those of their male counterparts (Reay et al 2001; Archer et al 2007; Byrom 2009; Evans 2009; Siraj-Blatchford 2009; Richards and Posnett 2012; Demie and Lewis 2014; Strand 2014; Baars et al 2016; Atherton and Mazhari 2019; Benson-Egglenton 2021; Adjorgatse and Miedema 2022).

Again the UK is something of an outlier, as published research studies from other countries indicate there is little or no gender divide in widening access policies, instead they have an ethnic, linguistic, caste, geographical location or familial educational-levels focus; there were only two countries (India and Japan) where unequal gendered access to higher education, particularly to undergraduate medical degrees was a concern or focus (Kivinen et al 2001; Basco et al 2002; Lakhan 2003; Zepke and Leach 2007; Gaski et al 2008; Kenway and Hickey-Moody 2011; Ahola et al 2014; Nagarajan 2016; Sobuwa and McKenna 2019; Diwan and Lal 2020; Kosunen et al 2020; Sekonyela 2021; Mseleku 2022; Walker 2022).

3.7 Medical education

Just as the number of universities and the availability of undergraduate places has increased markedly since the 1990s, so has the number of medical schools, rising from twenty-four (1999) to forty-four (2023) albeit at a much slower rate (Petty-Saphon 2008; Garrud 2023) with an annual UK intake of 9,500 undergraduate students per annum (Lewis 2023). Exhibiting some similarities with elite universities, research shows medical degrees are some of the least socially accessible degrees; at the beginning of the twenty-first century, 64% of those enrolled on medical or dentistry undergraduate degrees came from the managerial and professional classes (2003), a figure which has changed little since the 76% of the 1966 intake (Burke 2004).

A study using data from 2009-11, revealed 75% of applicants to medical degrees came from managerial or professional (NS-SEC1-2) homes compared to 3% from homes where parent/s had semi-routine or routine occupations (NS-SEC6-7); for accepted offers these figures were further differentiated, with 80% and 2%, respectively (Steven et al 2016). A larger study using data from 1996 to 2011, discovered fewer than 7% of applicants to undergraduate medical degrees, and 6% of those with an accepted offer came from low SES backgrounds, however this data set did contain high volumes of missing data (36% for applicants and 29% for accepted offers) (Niven et al 2019). A more recent study at a single UK university medical school (Birmingham) stated, 7% of eligible applicants to medicine came from the lowest POLAR4 quintile (Q1), compared to 41% from the highest (Q5)

(Jackson et al 2022); although, the use of POLAR to measure *under-representation* in higher education is much contested in the literature (Bagherli 2014; Harrison and Hatt 2015; Austin 2018; Bell and Burns 2021).

3.8 Diversity on undergraduate medical degrees

The key variables used in this study to explore widening access to undergraduate medical degrees are socio-economic background (NS-SEC), geo-demographic (POLAR) and educational (school type or last institution attended). In relation to these three variables, undergraduate medical degrees have not diversified as much as expected following the introduction of the EXT and GEM degrees, and an expansion in the number of medical schools and undergraduate medical degree places (Petty-Saphon 2008; Ferguson et al 2012; Steven et al 2016; Niven et al 2019). There are however, three other areas (which intersect with the three being measured in this study) where undergraduate medical degrees have successfully diversified: gender, ethnicity and age (Garrud and McManus 2018; Curtis and Smith 2020; Gibson Smith et al 2021).

3.9 Women's medical education

Concerns about the composition of the undergraduate medical student body and the medical profession, are not a new phenomena (Hamilton 1951; Cohen 1968; Waddington 1990; Moskowitz 1994; Watts 2013). In the nineteenth century, as professional organisations, such as the British Medical Association (BMA) and the American Medical Association (AMA) were founded (in 1832 and 1847, respectively) they began to formulise entry to medical degrees and lobby for control of the regulation and licensing of practitioners (Haynes 2005; Bartrip 2007). In the UK, the *Medical Act* (1858) led to the creation of the General Medical Council (GMC) and the Medical Register, which remains the *solitary* register of those licensed to practice medicine in the country (Roberts 2009; Beard 2013; Saks and Adams 2019; Jacob and Saksena 2023).

This professionalisation of medicine had an oppressive side, with the almost exclusively White middle-class males actively organising to exclude certain groups, such as women (in

the UK) and African-Americans *and* women (in the USA), along with irregular practitioners who were more likely to come from the working-classes (Baker et al 2009; Bryder 2012; Khalili et al 2014; Parle and Noble 2014; Saini 2016; Rosenberg 2021). Research shows these *exclusionary* tactics continued into the twentieth century, when British and American female medical graduates found it difficult to obtain post-qualification training posts and employment in hospitals, often being side-lined into paediatrics, gynaecology or low-status public health medical roles; whereas in the USA, African-American medical students were confined to African-American-only medical schools, such as those at Howard and Meharry universities (Moberly-Bell 1953; Roth-Walsh 1977; Watts 2013).

Whilst the reforms of the monumental *Flexner Report* (1910) have been heralded by many as ushering in the modern era of scientific medical education in the USA and Canada, many exclusively female-only and African-American medical schools were closed down following its publication (Flexner 1910; Sharma 1983; Dorman 2005; Miller and Wiess 2008; Halperin 2010; Alzerwi 2023). British female physicians (who were middle-class in the nineteenth century and remain largely so through to the twenty-first century) created their own medical school in 1874, (London School of Medicine for Women) to provide somewhere female medical graduates could receive further clinical training and gain employment (Ogilvie et al 2003; Somerville 2005; Molinari 2011; Cavendish 2015; Brown et al 2015; Belvis and Momblán 2019; Ghasedi 2021).

During the course of the twentieth century the literature suggests, White middle-class women appear to have made better progress in being accepted as medical students and medical professionals than ethnic minority individuals of both genders; or those from working-class backgrounds (Collier and Burke 1986; Witz 1990; Dyhouse 1998). But even here progress was erratic; often cataclysmic events such civil war or global conflict caused a shortage of male doctors, leading to the (sometimes reluctant but necessary acceptance by medical authorities) of higher numbers of female medical students and doctors, but the ceasing of hostilities (such as World War I and II) inevitably resulted in the reimposition of

quotas and restrictions on their numbers (Watts 2013; Jefferson et al 2015; Pass and Bishop 2016; Dolan 2021).

Today, in the UK and the USA, women have comprised the majority of incoming medical students since 1996 and 2017 respectively (Jefferson et al 2015; Moberly 2018; Hieser 2019). Recent data from the OECD shows women comprise between 50-74% of doctors in fifteen countries (2000-19), with the highest percentage in Latvia and Estonia (74%) and the lowest in Korea (24%) and Japan (22%), and in most high-income countries the majority of medical students are female (Al-Busaidi et al 2021; OECD 2022). Despite this progress, female medical professions are often concentrated in certain areas of the medical profession, such as non-surgical specialisms and general practice in the UK (Lambert et al 2018; Garad and Teede 2019; Michas 2021).

This has created something of moral panic in the press, and raised concerns about the *feminisation* of the profession, and the supposed deleterious impact this will have on future workforce planning; although these discussions do not appear to contain any recommendations for structural changes to the medical profession and society, which might make certain specialisms more appealing to female practitioners, particularly those with children (Paik et al 2000; Wynn 2000; Roberts 2005; McKinstry 2008; Winyard 2009; Russo et al 2015; Hossain et al 2019; Haklai et al 2019; Shannon et al 2019; Laurence et al 2020; Haigh et al 2021; Massey and MacEwen 2021; Reed 2021). The published literature does not appear to indicate a similar moral panic about nursing, where the percentage of male nurses in the UK profession has risen from 10.2% (2002) to 10.9% (2022) and in the USA profession where it has increased from 7.0% (2008) to 13.3% (2021) (Egan 2022; Forrest 2023).

Since the late 1990s, females have comprised the majority of UK medical students; in 2018, they represented 46% of all registered doctors and 55% of registered GPs (Marx and Massey 2019; Dacre and Woodhams 2020). Despite this significant gender disparities remain; only 13% of surgeons are female (2020), rising from 3% (1991) but they are heavily

concentrated in paediatrics (25%+) but comprise fewer than 10% of neurosurgical and cardio-theocratic consultants (RCSE 2020). There are far fewer female senior medical academics, such as deans of medical schools; and women are under-represented in key medico-political roles, such as medical directors; and fewer than one in five medical professors are female (Bailey 2020; Jones and Fulop 2021). The *Independent Review into the Gender Pay Gap in Medicine* (2020), found female (mostly hospital) doctors were paid 19% less than their male colleagues; for GPs this figure was 15%; and for clinical academics the pay differential was 12% (the non-adjusted rates for these specialities, which do not take account of women working fewer hours than men, were 24%; 34% and 21%, respectively (Dacre and Woodhams 2020).

Some quite senior medical professionals, such as Professor Carol Black, president of the *Royal College of Physicians* [2002-06] have raised concerns about the *feminisation* of the medical profession and how this could *damage* it and *downgrade* its status due to female medics who are mothers working part-time once they have children (Akbar 2004; Laurance 2004; Thomas 2014). These views have been characterised by younger medics as being *old-fashioned* and *out of touch*; they are asking for more emphasis to be placed on changing the culture in medicine; providing flexibility in the workplace, particularly in relation to doctors with children who may have to work part-time due to the unavailability of suitable and affordable childcare (Shiner et al 2010; Khan 2014; Ward and Outram 2014; Gurney et al 2023; Steiner-Hofbauer et al 2023). Although the overt sexism of previous generations has largely been eliminated, in some workplaces it has been replaced by subtle and often unconscious discrimination and stereotyping, particularly in relation to female doctors (Bellini et al 2019; Critchley et al 2021; Gurney et al 2023). However, the *Royal Australasian College of Surgeons* (2015) identified discrimination, bullying and sexual harassment as pervasive and serious problems in the workplace; and in 2019, following complaints of sexual harassment by female members, the BMA itself was investigated, by an independent reviewer who concluded a hierarchical old boys' club culture lingered in the organisation which went unchallenged (Rogers et al 2019; Romney 2019). And more recently a 2021 report, detailed the extent of sexism within the medical profession (Jewitt and Patel 2021).

3.10 Ethnic minority medical students

For would-be medical students from ethnic minority and indigenous populations (non-dominant groups) progress towards access to higher education and medical degrees has been far less successful than it has for White middle-class women, who the data indicate have taken up the majority of extra places whenever the number of universities and medical schools have expanded globally (Burke 2004; Kaufman 2005; Mathers and Parry 2009; Bolton 2010; Croxford and Raffe 2014; Jones-Berry et al 2015; Vignoles and Murray 2016; Hewitt 2020; Richardson et al 2020; Vieira et al 2020). But not all ethnic groups experience higher education access in the same way, some groups are *over-represented* (when compared to the percentage of their ethnic group in the general population) on degrees such as medicine and dentistry; in the UK this includes British-Indians and British-Pakistanis, along with British-Black-Africans; British-Bangladeshis (particularly women) and British-Black-Caribbean (particularly men) and Gypsy-Roma-Travellers are *under-represented*; in the USA, Asian-Americans are *over-represented*; and African-Americans, Hispanic-Latinos and Native-Americans are all *under-represented* (Bedi and Gilthorpe 2000; Woolf et al 2011; Lett et al 2019; Niven et al 2019; Koseff 2020; Lee 2021; Brassington 2022; Shariar et al 2022).

In the USA, the number of African-American medical students did not increase significantly until the introduction of affirmative action (AA) policies in university admissions during the 1960s (Dobbins 1969; Astin and Synder 1982; Crosby 1994; Collins et al 1997; Lakham 2003; Harris and Tienda 2012; Warikoo and Allen 2019). However, since the 1970s, the use of race-based AA in university admissions has been repeatedly challenged in state and federal courts, beginning with *DeFunis vs Odegaard* [University of Washington Law School] (1974) and ending with the *Students for Fair Admissions [SFFA] vs President and Fellows of Harvard University* (2023) when the US Supreme Court ruled against the use of race-based AA in higher education admissions; the plaintiffs are usually White-Americans (and Asian-Americans in the latter case) who feel they have lost out on a place at university, due to the use of race-based AA in admissions (Totenberg 1974; Henkin 1975; Edley 1996; Morgan

2001; Cohen 2003; Card and Krueger 2005; Parker 2006; Iverson 2012; Stowes 2013; Lee 2021; Aaron et al 2023).

Until the latest ruling, *legacy* and *athlete admits* in the USA (which favour the children of White middle-class alumni and those with sporting prowess) have largely gone unchallenged (Gutiérrez and Unzueta 2012; Massie 2016; Arcidiacono et al 2022; Binkley 2023; Chetty et al 2023; Masih 2023). Unlike the UK where universities make widespread use of holistic contextual admissions, often based on the socio-economic (SES) background of an applicant, in the USA there have been far fewer discussions about the use of class-based AA in the higher education selection process (Magnus and Mick 2000; Wear and Kuczewski 2008; Kahlenberg 2018).

The debate about the use of contextual admissions appears to be less febrile (and less-litigious) in the UK than in the USA, but regular articles do appear in the media, with accusations (usually made by alumni or staff of independent schools, and right-wing journalists) of social engineering, dumbing down and discrimination against the better-off who attended a fee-paying school, alongside calls for the boycott of universities alleged to be discriminating against independently-educated applicants; but contextual admissions continue to play a vital role in the university admissions process, particularly at elite universities, and on undergraduate degrees such as medicine, where they go some way towards *levelling-the-playing-field* (Smithers 2002; Ip and McManus 2008; Mullen 2011; Henry 2012; Nahai 2013; Mountford-Zimdars et al 2016; Boliver et al 2021; Wenar 2021; Howson et al 2022).

Medical students and medical professionals from ethnic minority backgrounds, like their female counterparts have also suffered discrimination in the workplace (Esmail and Everington 1993; Moore 2003; Marx and Massey 2019; Iacobucci 2020; Pegna 2021). Research by the GMC, found Black British medical graduates had lower speciality examination pass rates (62%) as did British Asians (68%) and British Mixed Heritage (74%) when compared with White British students (79%) another factor which impacted these

results was the high/low socio-economic background of a student (59% vs 76% respectively) (Marx and Massey 2019). Similar attainment gaps have also been identified for the past twenty-five years in UK universities, with 68% of UK BAME undergraduate degree students obtaining a first or 2:1 degree (seen as a *good degree*), compared to 81% of White students, similar gaps have also been reported in the USA, Netherlands and Australia (Cramer 2021; Seuwou et al 2023).

In 1993, research published by the BMJ, revealed ethnic minority doctors were more likely to be viewed as unappointable to specialty training positions, than their White colleagues, a situation which had changed little in two decades, when additional research found 93% of White applicants to these roles were considered appointable compared to 74% of BAME applicants, and the respective percentage for surgical roles were 77% and 52% (Esmail and Everington 1993; Moore 2003; Iacobucci 2020; Aggarwal et al 2022). A review of the *Royal College of Surgeons of England* by Baroness Kennedy found Black and Indian doctors earn less and progress less quickly than their White peers (Pegna 2021). BAME doctors are more than 1.5-2.0 times likely than their White peers, to be subject to formal local disciplinary processes by employers and healthcare providers; there were considerable differences in patterns of complaints received by the regulator, with BAME doctors being referred at twice the rate of White doctors, with non-UK graduates being referred 2.5 times more by an employer than UK-graduated doctors (Atewologun et al 2019).

If older members of the medical profession are struggling to come to terms with there being increasing numbers of women in the profession (Black et al 2004; Laurance 2004; Shiner et al 2010; Khan 2014; Thomas 2014; Ward and Outram 2014; Gurney et al 2023; Steiner-Hofbauer et al 2023) research from the twenty-first century, from the USA, Canada Australia, Germany, Austria, UK and Ireland shows medical students and professionals from Millennials (1981-96) to Generation Z (1997-2012) to Alpha (2013-25) and Beta (2026-39) have (or will have) very different personality traits, learning styles and professional requirements from previous generations, and are demanding a much better work-life balance than their predecessors, with individualised career paths and flexible working

patterns which are more compatible with raising a family (Borges et al 2006; Elam et al 2011; Roberts et al 2012; Doherty et al 2015; Baig and Mallu 2017; HEE 2019; Ruzycki et al 2019; Schlecht et al 2021; Joshi et al 2023; Steiner-Hofbauer et al 2023). They are also much more aware of mental health issues and professional *burnout*, with research published in the BMJ, indicating 40% of trainee dentists and medics report being unwell due to workplace stress; 65% of Foundation doctors (two year post-graduate training course) delay their entry to NHS [specialist] training; with 40% of junior doctors planning to leave the NHS as soon as possible, with Australia and New Zealand being favoured destinations (Lock and Carrieri 2022; Waters 2022; Ferreira et al 2023).

3.11 Age of undergraduate medical students

Prior to 2000, mature medical students (those aged 21 years and over) had to enrol on a STN degree, since this time most enrol on graduate-entry (GEM) degrees, but a small number continue to enrol on the standard-entry (STN) degrees (Garrud and McManus 2018). This is because, following recommendations by the Medical Workforce Standing Advisory Committee (MWSAC) in 1997, GEM degrees began at Warwick and St George's universities (in 2000) with the intention of diversifying the undergraduate medical student population (Carter and Peile 2007; Petty-Saphon 2008). By 2018, fifteen universities ran GEM degrees, with around 800 graduates entering these degrees per annum (Garrud and McManus 2018). For entry in 2024/25, seventeen universities across the UK will be running GEM degrees, including ScotGEM, a partnership between the universities of St Andrew's and Dundee (Garrud 2023). Several of the new medical schools, which have opened since 2018 to serve *under-doctored* areas of the country (such as those at Chester, Ulster and Worcester universities) are GEM only (Harrison et al 2022).

There have been several qualitative and quantitative studies exploring entry to GEM degrees, as a standalone topic or in comparison with the STN degree, some of these were at single university sites, and others used large datasets from UCAS or the UKMED database (Carter and Peile 2007; Rapport et al 2009; Bodger et al 2011; Shehmar et al 2010; Garrud 2011; Mathers et al 2011; Ferguson et al 2012; Garrud and Yates 2012; Niven et al 2019).

Studies conducted at Warwick and Swansea universities showed there was no difference in outcomes between arts and science degree holders on the GEM course, but a study comparing the entry grades of the GEM degree at Warwick University and the STN degree at Leicester University found on average STN entrants had higher A Level scores than the GEM degree entrants (Rapport et al 2009; Shehmar et al 2010; Bodger et al 2011).

Using data for 1.2M university applicants (provided by UCAS, 2002-04) one study found overall medical students were likely to be younger (mean age 18.2 years) compared to those of other undergraduates (mean age 18.4 years) (Ferguson et al 2012). Another study of medical and dentistry applicants (UCAS data, 1996-2011) showed the mean age of medical degree applicants was 20.4 years (age range 16-57 years) compared to dentistry applicants who were 19.7 years (age range 16-55 years); this study also noted the admission of mature students was more likely from 2003 onwards, but mature students were less likely to gain entry than younger applicants (Niven et al 2019). It is likely the increase in the numbers of mature students from this date reflects an expansion in the number of medical schools; eighteen opened from 2004-2023, including ScotGEM (Dundee and St Andrew's) and C21 (Bangor and Cardiff) (Petty-Saphon 2008; Bufton 2021; Dowling 2021; Garrud 2023).

One study, using UCAS data (2003-09), found GEM degree students were older and Whiter, and there were fewer Asian students, than on STN degrees (Garrud 2011). Using data provided by the same source but for different years (2006-11), another study concluded students admitted to GEM degrees, were on average 6.9 years older than those on STN degrees, but GEM degrees did not seem to have led to significant changes in the overall SES background of medical students (Mathers et al 2011). Later research using a different database (UKMED, 2007-08) found GEM students were more likely to be older than STN students, with a mean age of 25.1 years (GEM) compared to 24.6 years (STN) (Garrud and McManus 2018). Although GEM degrees have failed to dramatically increase the number and percentage of students from low SES, ethnic minorities and the state-educated backgrounds, they appear to have been successful in recruiting older students; in part this is because for almost all of the GEM degrees, apart from the one at Newcastle University, GEM

applicants are required to have an undergraduate degree (Arulampalam et al 2005; Garrud 2011; Mathers et al 2011; Jackson et al 2022; Garrud 2023).

3.12 School background and medical education

Evidence from the British Medical Association (BMA) shows 20% of UK secondary schools provide 80% of applicants to undergraduate medical degrees (Jones-Berry et al 2015). A later study by the Medical Schools Council (MSC) revealed 50% of secondary schools had no applicants to undergraduate medical degrees (Garrud 2018). Studies by the Social Mobility Commission and the London School of Economics (LSE), show independent and grammar school educated students are *over-represented* on undergraduate medical degrees, given they comprise 6-7% and 4-5% of the English school-aged population, respectively (Milburn 2009; Milburn 2012; Kirby 2016; Friedman and Laurison 2019; Lampl and Milburn 2019; Danechi 2020; Long 2022).

Data show 23% of UK applications to undergraduate medical degrees came from independent schools with 29% of accepted applicants; the corresponding figures for grammar schools are 12% and 14%, respectively (Niven et al 2019). For English applicants only, 26% came from independent schools and 20% came from grammar schools; accepted offers comprised 29% from independent schools and 22% from grammar schools (Steven et al 2016). Research shows this is due in part to the higher percentage of grammar and independent school students achieving the highest (A and A*) grades at A Level, when compared to comprehensive school students; these differences were particularly marked during the two years of the Covid-19 pandemic (2020 and 2021) when timed summative examinations were replaced by teacher-assessed grades (Bhopal and Myers 2020; Belger 2021; Hazell 2021; Finn et al 2022; Bhopal and Myers 2023).

Not only do medical students come from higher socio-economic backgrounds (Steven et al 2016; Thiele et al 2016), there is some evidence of a preponderance of medical students from *medical families*; identified as having one or more parent or grandparent who is a practicing physician or surgeon, in countries such as German, Norway, Australia, USA, Denmark, UK, Canada, Netherlands, Ireland and Sweden; in some of these studies coming

from a *medical family* was shown to be advantageous when applying medical school, particularly for obtaining relevant work experience and medical internships, providing a better understanding of the hidden curriculum once at medical school, and being less likely to drop out of medical school than those who had no family history of medical practice (Lentz and Laband 1989; Magnus and Mick 2000; Arulampalan et al 2005; Hansen 2005; White et al 2012; O'Neill et al 2013; Simmenroth-Nayda and Görlich 2015; Knorr et al 2019; Polyakova et al 2020; Donnelly 2021; Shahriar et al 2022).

3.13 Working-class medical students

Just as the number of universities and the availability of undergraduate places has increased markedly since the 1990s, so has the number of medical schools, rising from twenty-four (1999) to forty-four (2023) albeit at a much slower rate (Petty-Saphon 2008; Garrud 2023) with an annual UK intake of 9,500 undergraduate students per annum (Lewis 2023). This expansion was mirrored by an increase in the percentage of (middle-class) female medical students, along with an overall increase in the percentage of ethnic minority students; however there has been no increase in the percentage of medical students from low socio-economic backgrounds, with 64% of medical and dentistry undergraduates coming from the managerial and professional classes in 2003, a figure which has changed little since the 76% of the 1966 intake (Burke 2004; Arulampalam et al 2005; Mathers and Parry 2009; Mathers et al 2011; Ferguson et al 2012; Cleland et al 2015; Steven et al 2016; Niven et al 2019; Boliver and Powell 2021).

A study using data from 2009-11, revealed 75% of applicants to medical degrees came from managerial or professional (NS-SEC1-2) homes compared to 3% from parents who had semi-routine or routine occupations (NS-SEC6-7); for accepted offers these figures were even higher with 80% and 2%, respectively (Steven et al 2016). A larger study using data from 1996 to 2011, discovered fewer than 7% of applicants to undergraduate medical degrees, and 6% of those with an accepted offer came from low SES backgrounds, however this data set did contain high volumes of missing data (36% for applicants and 29% for accepted offers) (Niven et al 2019). A more recent study at a single UK university medical

school (Birmingham) stated, 7% of eligible applicants to medicine came from the lowest POLAR4 quintile (Q1), compared to 41% from the highest (Q5) (Jackson et al 2022); although, the use of POLAR to measure *under-representation* in higher education has been much contested in the literature (Bagherli 2014; Harrison and Hatt 2015; Austin 2018; Bell and Burns 2021).

Several studies have concluded low SES students lack the aspirations for higher education, particularly to degrees such a medicine which takes many more years to complete than a standard three-year honours degree (Archer and Yamashita 2004; Drinkwater 2007; Taylor 2008; Vryonides and Gouvias 2012; Kenway and Hickey-Moody 2014; Khattab 2015; Harrison and Waller 2018; Baker 2019; Rainford 2023; Ho et al 2023). Studies in various countries such as Germany and the USA, point to the class-based biases of teachers in primary and secondary schools, over-estimating capabilities, attainment and achievement levels for students from high SES backgrounds, whilst simultaneously underestimating those from low-SES and ethnic minority students (Tobisch and Dresel 2017) with about half of these discrepancies being explained by between-group differences and the other 50% being due to teacher background (Ready and Wright 2011; Chetty et al 2014).

Other research points to a *mismatch* or *under-matching* (Britton et al 2021) between an individual's expectations of examination results and teacher-predicted grades, which has a negative impact on the types of universities low SES students can apply to and therefore receive offers from, with several studies questioning the validity of teacher predicted grades, particularly those awarded at independent schools during the Covid-19 pandemic (2020-21) when the percentage of students at these schools awarded the top A* grade increase from 16.1% (2019) to 24.7% (2020) to 39.5% (2021) (Hubble and Bolton 2020; Johnson 2020; Nye and Thomson 2020; Belger 2021; Hazell 2021; Holt-White and Cullinane 2021; Lough 2021). It does appear from the research, that low-SES students are more likely to have their grades *under-predicted* by their teachers, particularly if they are high achievers (Wyness 2017; Campbell et al 2019). This can have a devastating impact in respect of undergraduate

medical school admissions, especially to the STN degree, where predicted, offer and A Level entry grades of a least AAA are routinely required (Garrud 2023).

twenty-first century studies of the student composition of undergraduate medical degrees point to improvements being made in terms of the number and percentages of females, the age range of medical students (largely due to the existence of GEM degrees) and ethnic minority students (particularly on STN and EXT degrees) but students from lower socio-economic backgrounds remain *under-represented* at most medical schools (Seyan et al 2004; Mathers et al 2011; Steven et al 2016; Niven et al 2019). However, more recent studies of individual and newer medical schools, point to better outcomes for working-class medical applicants and students, such as Sunderland University, where more than 60% of the intake are first-in-family students and more than 98% were educated in non-selective state schools (Gillan 2020; Brennan et al 2023).

Likewise new medical schools at universities in Chelmsford, Canterbury, Edge Hill, Lincoln, Brunel, Chester, Portsmouth, Guildford and Worcester, appear (or have the potential) to attract more students who are local to the area, and hence more diverse than the general medical student population (Brennan et al 2023). The new ScotGEM degree (launched 2018 as a partnership between Dundee and St Andrew's universities) appears to have attracted a more diverse medical workforce to rural and remote areas of Scotland (MacFarlane et al 2020; Pringle 2022).

3.14 Student aspirations

Aspirations are vital to individuals as they journey through the education system (Archer et al 2014) but research by the Education and Employers charity and the Institute of Education, suggests children as young as seven years have already formed perceptions about jobs and careers, influenced by the people around them in their social networks (Moulton et al 2015; Mountford-Zimdars et al 2016; Chambers et al 2018; Jones 2018). Often these can be stereotypical, as NHS Health Careers found in a study of 700+ children, ages 7-11 years; 70% of respondents said nurses are female; with 72% of boys and 80% of

girls believing surgeons are male, suggesting very early adoption of such gendered attitudes (Aldrich 2016).

Research has shown that once at school, some working-class children who may have high aspirations to go to university or to study medicine, can be discouraged by their teachers, which can have long-lasting and negative consequences (Greenhalgh et al 2004; Archer et al 2007; Jones-Berry et al 2015; Harrison and Waller 2018; Alexander et al 2017; Easterbrook et al 2022). Other studies have revealed a class, gender and ethnic divide in relation to aspirations, particularly for STEM subjects and medicine; with some working-class students viewing these subjects and occupations as *not for the likes of us*; the lack of role models for women and ethnic minorities has also been identified as having a negative impact on the recruitment to some STEM occupations and medicine, particularly surgery, which has implications for the diversity of medical schools and the medical profession (Wong 2012; Archer et al 2014; Khattab 2015; Wong 2015; Niven et al 2019; Saks and Adams 2019; Joseph 2020).

Research by NGOs has stressed the importance of assisting working-class children to realise their educational and career aspirations; calling for high-quality career advice, information and guidance to be embedded in all state schools as it is in independent schools (Kintrea et al 2011; Huddleston et al 2012; Francis and Wong 2013; Archer et al 2014; Montacute and Cullinane 2018; Loft et al 2020). The Capabilities Approach of Amartya Sen, has been employed in small-scale studies to explore the nature of aspirations and how individuals can develop these (their Capabilities) into successful educational outcomes (Functionings), this does not necessary translate into advanced academic qualifications but does enable them to lead a good life (Sarojini-Hart 2012; Hannon 2023).

3.15 Deficit model of higher education access

Several studies have been critical of the deployment of the deficit model in relation to activities designed to raise the aspirations of disadvantaged students, arguing that the absence of an acknowledgement of the role structural inequalities play in the formation and

shaping of aspirations and access to professional careers, such as medicine, hampers the ability of these activities to be truly effective because they ignore the impact of education as an instrument of social reproduction (Bourdieu and Passeron 1977; Kenway and Hickey-Moody 2011; Khan 2012; Kintrea et al 2015; Khattab 2015; Rainford 2017; Brown and James 2020). There remain strong links in the UK between social class origins and educational attainment, which has the potential to limit an individual's higher education choices and any subsequent career choices (Rose and Pevalin 2000; Goldthorpe 2016; Bukodi and Goldthorpe 2011; Kumwenda et al 2019).

The medical profession at home and abroad, remains one of the most classed occupations, despite decades of investment in widening access and outreach initiatives, to ensure the profession more accurately reflects the population it serves (Gaski et al 2008; Winyard 2009; Mathers and Parry 2010; Ramakrishnan et al 2014; Dowell et al 2015; Patterson and Price 2017; Parry and Parry 2018; Medeiros-Figueiredo et al 2019; Dolan 2021; Groene et al 2023; Sartania 2023).

3.16 Educational attainment gaps and UK politics

Since 2010, successive Conservative prime ministers have sought to alleviate the educational gap between the most and least advantaged. In 2016, Theresa May's inaugural speech as prime minister, spoke of her desire to improve the life chances of the least advantaged in society, which she proposed to do by creating a state grammar school in every English town (May 2016; Pabst 2017; Abulafia 2022). Despite the evidence consistently finding these schools almost entirely occupied by those from middle-class homes with exceptionally low-levels of disadvantaged students (McCulloch 2006). Research and publically available data, show around 13% of year seven English grammar school students (ages 11-12 years) were educated outside the state sector, compared to 7% nationally; and only 3% of grammar school students are entitled to Free School Meals (eFSM), compared to 16% at all English secondary schools (Cribb et al 2013; Skipp and Sadro 2013; Andrews et al 2016; Sibietta 2016; Morris and Perry 2017; Gorard and Siddiqui 2018; Long et al 2018; Jerrim and Sims 2019).

May's successor, Boris Johnson (2019-22) promised to *level-up* the country by providing increased levels of funding to areas of the UK deemed to be disadvantaged (Tomaney and Pike 2021), and during her forty-nine days as prime minister, Elizabeth Truss (2022) proposed moving the start of the university academic year to January and the introduction of post-qualification-application (PQA) to universities, with *Oxbridge* being given the first opportunity to interview those who achieved the highest grades in their A Levels (Abulafia 2022; Williams 2022). Her replacement Rishi Sunak (in 2022) announced a crack-down against what he termed low-value, rip-off degree courses which he defined as those which do not lead a graduate into a good job or those courses with high drop-out rates (DfE 2023; Laker 2023). His motives were widely questioned, and he was accused by opposition parties and a previous Conservative education secretary of attacking working-class educational aspirations and of being anti-levelling up (Adams and Crerar 2023; Crear 2023; Forrest 2023).

Since 2010, calls for social class to be added to the nine protected characteristics of the *Equalities Act* (2010) due to the high level of socio-economic inequalities in the UK have been ignored (Rickett et al 2022) as poverty and disadvantage are increasingly viewed as due to an individual's bad luck or poor lifestyle choices, rather than because of deep-rooted structural inequalities and injustices (Pitketty 2014; Malleson 2018). In the meantime, social mobility appears to have stalled and according to some studies, the education system has been shown to have failed to function as a social leveller (Wiederkehr et al 2015; Bukodi and Goldthorpe 2018; Roberts and Kibasi 2018; Eyles et al 2022) but others argue it was never intended to be so, and has functioned as a vehicle for the reproduction of the social elite for decades if not centuries, here in the UK and in other countries (Cookson and Persell 1985; Bourdieu 1989; Clark and Cummins 2013; Haslett 2016; Bennett 2017; Green and Kynaston 2019; Barone and Mocetti 2021; Gamsu 2022; Worth et al 2023).

3.17 Literature review conclusion

Home, school and work are highly segregated in the UK, and their forms of disadvantage involve the micro (individual) and the macro (social structures) through *weak ties*, whereby

the social networks an individual can utilise outside their immediate social circle, are more limited for those from working-class backgrounds who may lack the different forms of capital (Granovetter 1973; Bourdieu 1986; De Witte 2023).

The extent to which each factor, whether it is 'work, home, school' (Stephens et al 2014) influences the educational and professional outcomes of individuals, has been much researched, often from a paediatric and child development perspective, which recommend early interventions to support cognitive ability as the way to reduce the socio-economic gaps in academic attainment (Pearce et al 2016). Three separate reports about *Sure Start* [early years children's centres] stress the importance of early interventions and the values these have for the development of children's speech, language and communications and the long term economic benefits of early childhood educational interventions which may not be seen for fifteen or more years (Meadows 2011; Bate and Foster 2017; Buick 2020).

Chapter Four

Medical education

4.1 Introduction

This chapter provides the historical context for today's system of university-based medical education and explains how this shaped of today's medical profession. It includes a brief history of medicine, its practice outside the universities, the growth of scientific medicine and the centuries-long professionalisation of medical practice, involving internal and external regulation of medical practice and practitioners. It examines the shift of medical education away from the lay-person and religious organisations, and into the universities, exploring the negative consequences this had on members of communities which had previously practiced medicine, such as traditional herbalists, bone-setters and female practitioners, such as midwives. The first part of the chapter provides a detailed examination of the policies successive UK governments have implemented from the creation of the NHS (1948) to the present day, as they attempt to make the country self-sufficient in medical professionals. The middle elements of this chapter include an examination of medical education in the twenty-first century, including the expansion in the number of medical schools, increases in the number of undergraduate places, the introduction of two new types of undergraduate medical degrees, alongside contextual admissions, all designed to attract students from *under-represented* backgrounds.

4.2 Medicine outside the universities

For centuries medicine was conducted outside a hospital or university setting; local women acted as midwives, blacksmiths as bonesetters and all housekeepers had a working knowledge of medicinal herbs in order to treat their household and occasionally people in the locality (Lyons and Petrucelli 1987). Although the current Barts and London School of Medicine and Dentistry, traces its origins back to 1123, the primary function of hospitals in this era was as places of shelter for people, such as travellers and pilgrims; functioning largely as almshouses for the poor and destitute some of these institutions did care for the sick, although treatments were very limited (Dainton 1976; Waddington 2003).

Medieval medicine remained very much outside the confines of the universities in England, with any practical skills being passed through the generations via apprenticeships or word-of-mouth (Porter 1997). Eventually, such medical knowledge as existed, was codified into manuscripts, such as the *Rosa Anglica Practica Medicinae a Capite ad Pedes* [English rose of practical medicine from head to toe] (c1314) and the *Llyfr Coch Hergest* [Red Book of Hergest] (c1375) (Pearn 2013; Luft 2020). With the arrival of the printing press in England (1476) medical treatise could be distributed more easily; books such as *Culpepper's Complete Herbal* (1652 and still in print) provided details medical herbal treatments, many of which such as St John's wort and foxglove/digitalis have found their way into modern medicine (Henderson 1994; Eschner 2017).

The Medieval period saw a flourishing of hospital construction across Europe, most of which were associated with religious, charitable or military orders; often they were places of refuge (Huggson 2018) such as Barts and St Mary Bethlehem [Bedlam], London were founded in the twelfth century (Porter 1997; Agha and Agha 2011). These hospitals did not function as medical schools, although St Thomas's Hospital, London had a medical student apprenticed to a surgeon (1561) and in the seventeenth century, sixty-four medical students were listed for breaking hospital regulations in the same hospital (Bonner 1995; Morris 2014).

England's two oldest extant universities (Oxford founded 1096; Cambridge founded 1231) did not have medical schools until centuries later, when a regius professorship of physic (i.e. medicine) was created at Cambridge (1540) and Oxford (1546). In this era, these two universities existed solely to educate upper-class male elites for ruling, priestly and military service (Perkin 2007; Petty-Saphon 2008). From the sixteenth century until the middle of the nineteenth century, there were only ever one or two registered medical students per annum at Cambridge (Logan 1977). Oxford appears to have fared little better; by the 1800s, clinical teaching here had declined to such an extent that a Royal Commission (1850) noted there had ceased to be a functioning medical school at the university; after this medical

studies at both universities went through something of a renaissance (Franklin 1936; Clark 1966; Roderick and Stephens 1976).

In the medieval and early modern periods, those men (and they were almost always men) who were serious about a medical education went elsewhere, to universities and teaching hospitals in Europe; to Paris (founded 1110); Bologna (1158); Montpellier (1181); Padua (1222); and Naples (1224) (Chaplin 1919; Rook 1973; Porter 1997). There are much disputed claims of female doctors, surgeons and professors practicing at the co-educational University of Salerno [Italy], especially the 11th century Trotula (Appel 2014). In 1313, Parisian women were banned from practicing surgery, unless deemed competent by a jury and in England in the 1540s, Henry VIII banned carpenters, smiths, weavers and women from performing surgery (Wirtzfeld 2009). Then there is the equally disputed colonial surgeon Dr James Barry (c1799-1812) who has variously been described as transvestite, transgender or hermaphrodite, believed to have been born Margaret Ann Bulkley in Ireland, Barry gained a MD from Edinburgh University (1813) and is claimed by some to be the first female medical graduate (Birch 1998; Brandon 2008; Du Preez and Dronfield 2016).

During the Enlightenment, the Scottish universities (St Andrew's, Glasgow, Aberdeen and Edinburgh) led the way in medical science and medical education, drawing in students from across Europe (Jenkinson 1991; De Ridder-Symoens 2003; Dingwall 2003; Nutton and Porter 2020). At the same time medical professionals began to organise themselves into local guilds and societies; with physicians at the top, followed by apothecaries and at the very bottom of the hierarchy, surgeons; this formed a tripartite system of medical professionals (Roberts 1964; Lawrence 1980; Martin 1996; Porter 1997; Sheehan 2012).

4.3 Tripartite system of medical professionals

Until the fifteenth century in England, medical practice was largely unregulated by the state; local trade guilds governed the profession in their immediate area, jealously guarding their professional status, outlining the terms of apprenticeships and dealing with any transgressors (Bullough 1961; Lyons and Petrucelli 1987). As medical practice and surgery became more scientific and medical training moved into university medical schools the state

was increasingly drawn into the regulation of medical practice and power of the professional and regulatory power guilds declined, with many remaining into the twenty-first century as philanthropic organisations (Reinarz 2008; Palfreyman 2010).

4.3.1 Physicians

University educated physicians sat at the top of the medical hierarchy and generally only treated those with high status and wealth (Epstein 1998; Berkowitz 2013). The College of Physicians [now the Royal College of Physicians] was incorporated by royal charter in 1518 (re-incorporated 1540), with the latter charter recognising physicians as *the* medical specialists (Copeman 1967). Physicians were the only medical professionals who received university-based medical training, which could take between 14-16 years to complete; beginning with theology and liberal arts; followed by mathematics, music, geometry and astronomy; after which the student [male only] began their medical education (Mellinger 2006; Huggson 2018; Pearn 2018). Across Europe, trainee physicians in the universities studied the ancient medical texts of Galen, Hippocrates and Ibn Sīnā [Avicenna]; a theoretical medical knowledge and a good bedside manner being more highly valued than the ability to diagnose and cure (Cook 1994; Bonner 1995; Katz 2019). The social status of an individual determined how and where they were treated, what they were treated with and how much they were charged (Thoss 2016; Chapin 2020; Connelly 2020; Davidson and Duggins 2023).

4.3.2 Apothecaries

Apothecaries are considered to be forerunners of today's general practitioners, as they openly practised all four branches of medical practice; medicine, surgery, midwifery and pharmacy (Loudon 1983). The training and professional lives of London's apothecaries, spicers and pepperers were governed by the Worshipful Company of Grocers (founded 1345) (Hunting 2004). Generally, apothecaries worked under the direction of a physician by providing remedies to the public, much like today's dispensing pharmacist (Huggson 2018). By 1617, the Worshipful Society of Apothecaries gained its royal charter, to further regulate membership of the profession, govern trade and oversee apprenticeships (Copeman 1967;

Palfreyman 2010). The House of Lords ruling following the Rose Case (1701-03) led to those apothecaries who had served an apprenticeship being able to practice medicine, and function as today's general practitioner (Loudon 1983; Jones 2006; Roche 2018). Others morphed in dispensing chemists and pharmacists, eventually forming the Pharmaceutical Society of Great Britain (1841) (Copeman 1967).

4.3.3 Surgeons

In the time before anaesthesia and antiseptics, speed was of the essence in surgery to minimise patient pain and improve survival chances (Soniak 2012). Surgery was considered to be a manual occupation, requiring physical strength rather than the refined university-gained education of the physicians, with surgical skills acquired via a lengthy apprenticeship with a master surgeon (Bullough 1961; Lyons and Petrucelli 1987; Lawrence 2018 Camison et al 2022). In 1540, the Fellowship of Surgeons within London (founded 1368) merged with the Worshipful Company of Barbers (founded 1462) to form one organisation the Company of Barbers and Surgeons (Copeman 1967). As scientific and medical knowledge advanced and surgical techniques improved surgery became a more specialised profession, and the barbers and surgeons formed separate organisations (1745) with the Royal College of Surgeons of England emerging in 1800 (McNee 1958; Dunn 2002; Robinson and Toledo 2012). During the course of the nineteenth century medical advances, including antiseptic surgery, surgical sterilisation and pain relief led to surgery becoming more complex with improved survival rates (Pitt and Aubin 2012; Ataman et al 2013; Michaleas et al 2022).

The legacy of this tripartite division within the medical profession has survived into the modern era, with many of today's royal medical colleges, such as the Royal College of Physicians, tracing their origins back to this system (Clark 1965; Waddington 1973). The centuries old tradition of apprentices learning from a master has morphed into today's surgeon-led *ward round* where medical students accompany a consultant as an intergral part of their medical education (Epstein 1998).

4.4 Medicine moves into the universities

Once the Company of Barbers and Surgeons went their separate ways (1745), there was a proliferation of new private medical schools in London (Charlton 1993; Burn 2000 RSC 2021). For a fee any interested men (but no women) could watch dissections being performed (Berkowitz 2013). By 1826, there were eight independent anatomy schools in London, compared to four in-hospital medical schools (Mitchell et al 2011). Often university medical students would supplement any deficiencies in their lectures by attending classes at one of these private medical schools (Dingwall 2000; Wells 2018). The most famous of these was Great Windmill Street (1745-1831) opened by William Hunter (1718-83), it survived until the era of private medical schools ended and medical education became the exclusive preserve of university medical schools, in the nineteenth century (Thomson 1942; Hamilton 1951).

Early attempts to set up medical schools in hospitals were often rebuffed; William Hunter's younger brother John (1728-1793) was refused permission by the governors to set up a medical school at St George's Hospital, London (Weiner and Silver 2011). William Blizard (1743-1835) faced similar opposition, but in 1785 together with James Maddocks (c1735-1786) he opened London Infirmary's School of Medicine in the grounds of the London Hospital; it would be 1822 before the hospital governors approved the teaching of medicine *inside* the hospital building itself, making this the first UK medical school of its type to be hospital-based (Morris 2014). Outside London, there is widespread evidence for the existence of this type of medical school in towns and cities, which were attached to (but not necessarily within the walls of) a local infirmary, in Bath, Leeds, Liverpool and Manchester (Bonner 1995).

Whilst universities, medical schools and teaching hospitals opened and flourished elsewhere in Europe, including Scotland; England still had only two universities (Oxford, founded c1096 and Cambridge, founded 1209), until Durham opened its doors in 1832, quickly followed by the University of London (1836); any attempts to found universities between

1209 and 1832, were suppressed by the crown, often at the behest of the two *Oxbridge* universities (Lawrence 1980; Martin 1996; Sheehan 2012; Whyte 2018).

At the turn of the nineteenth century, Scotland had twice as many universities than England (De Ridder-Symoens 2003; Nutton and Porter 2020). The medieval *Oxbridge* universities were only open to those who followed the Protestant faith, with Dissenters forced to set up their own academies, travel to Scotland or further afield for their higher education (Reid 2010; Hill 2015; Sanderson 2018). Women of course were not admitted, Oxford only allowed women to read for degrees in 1920 but a strict quota controlled their numbers until 1957; Cambridge held out for longer, not awarding women degrees until 1948 (Sultan 2019).

4.5 Scottish medical education and the Enlightenment

During the Enlightenment, the four Scottish universities (Aberdeen, Edinburgh, Glasgow and St Andrew's) and the private medical schools in close proximity to them, led the way in scientific medical education, whilst their English counterparts lagged behind, wedded to the classical medical theories of the four humours, and still instructing and examining in Latin (Porter 1996; Emerson 2004; Huggson 2018). When Edinburgh University's school of medicine opened in 1720, the decision to instruct students in English (rather than Latin) drew opprobrium from medical schools in England, but also drew students from that country and further afield (Bonner 1995; Emerson 2004). Scottish universities and medical education were more open to intellectually talented [male] individuals from less-affluent backgrounds, the so-called *lad o-pairts* (Rosner 1992; Dingwall 2003; Nuttall and Mander 2011). The esteemed reputation of the Scottish medical education spread across the globe; the first American medical school, the College of Philadelphia (1765) [now the Perelman School of Medicine, University of Pennsylvania] was established by two Edinburgh University graduates (Fee 2015). In 1837, it was a Scottish university (Glasgow) which graduated the first African-American with a medical degree, James McCune Smith (1813-1865), who had been unable to enrol in any American medical school (Morgan 2003; Lujan and DiCarlo 2019).

Traces of these educational legacies can still be seen in Scottish higher education today, which the Scottish government (unlike its UK counterpart) regards as a public good, and does not charge undergraduate tuition fees, at least for Scottish residents (Minty 2021). Edinburgh University, was the first in the country (in 2001) to launch the *Pathways to the Professions* widening participation programme to encourage more disadvantaged and state-educated students to study medicine and law (Blythe 2001). In 2018/19, the universities of Dundee and St Andrew's launched a new Scottish Graduate-entry Medicine degree (ScotGEM) designed to recruit doctors to remote and rural parts of the country, with much of their medical education and training taking place in these *under-doctored* areas (MacFarlane et al 2020; Pringle 2022). Starting in 2020/21, Edinburgh University launched a unique medical degree; the Healthcare Professional (HCP-Med), open to Scottish healthcare professions, veterinary surgeons and scientists; students study part-time and mostly online for the first three years, and then join the main undergraduate degree for years four and five (Walker et al 2020).

4.6 English universities and medical schools (1800-1900)

By 1800, there were eight medical schools in England and Scotland (Petty-Saphon 2008). There were however, a proliferation of independent medical schools around the country, such as William Sands Cox's Birmingham School of Medicine and Surgery (1825); Wilson Overend's Sheffield School of Anatomy and Medicine (1828) and Charles Turner Thackrah's Leeds School of Medicine (1831), many of which were incorporated into the new university colleges in the nineteenth century, such as Birmingham, Leeds and Sheffield, which would become universities in 1900, 1904 and 1905 respectively (Anning and Walls 1982; Sturdy 1992; Porter 1997; Reinartz 2009; Mathie 2017).

The nineteenth century saw many changes in the structure of society, huge population growth, rapid urbanisation, new types of employment, along with the increased professionalisation of many occupations, including medicine (Waters 1989; Thompson 1990; Roberts 2009; Sanderson 2018). The passing of the Apothecaries Act (1815) was heralded by many as the first attempt to set the professional standards of medical education

in England and Wales, dictating as it did what those applying for the Licentiate of the Society (LSA) had to study and the duration of any practical hospital work experience (Porter 1997; Corfield 2009). A growing number of university medical graduates also sought the LSA (Copeman 1967; Hunting 2004). It would be via a loophole in the rules of the LSA, allowing any *person* who met certain criteria to sit the licentiate examinations, that Elizabeth Garrett Anderson (1836-1917) became Britain's first qualified female doctor (1865) but she would have to wait until 1870, to gain her medical degree (MD) from the University of Paris, as the doors of the UK's university-based medical schools remained firmly closed to women (Scharlieb 1917; Porter 1997; Dacre 2011; Mould 2017; Hudson 2022).

Education changed too in the nineteenth century; with the creation of mechanics' institutes, designed to provide a *useful knowledge* of science for the working-class male (Kelly 1952; Shapin and Barnes 1977; Roderick 1986). Some of these institutions, such as the Manchester Mechanics' Institution (1824), would form constituent parts of universities, in this instance Manchester University (Cardwell 1974). Alongside these institutes, university colleges opened in industrial towns across England, initially with degrees validated by the University of London (Harte 1986; Hillman 2015) with teaching specialisms determined by key local industries, for example, Sheffield (metallurgy) and Liverpool (marine engineering) (Thomson 1990; Sanderson 2018). Women remained outside these new university colleges; the University of London (opened 1836) was the first in the world to admit women (1868) but they had to wait another ten years to be awarded degrees (Carter 2018) with Cambridge being the last university in the UK to grant degrees to women in 1948 (Delap and Griffin 2019).

4.7 Universities and medical schools in early 20th century

The first decade of the twentieth century saw a flurry of so-called *red brick* universities, which were created in urban centres [named for their building material] by converting university colleges into fully fledged universities, able to award their own degrees, including Liverpool (1903) and Bristol (1909) (Whyte 2015). By 1900, there were twenty medical

schools in the UK, the oldest founded in 1123 (Barts) and the newest in 1899 (London School of Hygiene and Tropical Medicine), the last medical school to be opened in the UK until Nottingham University's in 1966 (Petty-Saphon 2008).

The aftermath of the First World War (1914-18) saw industrial and economic collapse, resulting in mass unemployment, along with inadequate housing, poor health and shortages of medical practitioners particularly in deprived areas; with mutual aid societies, such as the Tredegar Workmen's Medical Aid Society [Aneurin Bevan's blueprint for the NHS] and voluntary or charitable hospitals filling the void left by state run institutions and organisations (Cronin 1937; Becker 1951; Levitt et al 1976; Baggs 2004; Jones 2015; Black 2016). An economic situation which would exacerbated by the global economic reverberations following the Wall Street Crash (1929) (Hobsbawn 1989; Kesternich et al 2012).

Given this backdrop, the pace of higher education and medical school expansion slowed considerably during from the 1920s to the 1960s (Eichengreen 2002; Donson 2014). Aside from the creation of the University Grants Committee (1919) which financed the universities, the governments of this era appear to have had little capacity for higher education (Owen 1980). The opening of new universities slowed to a trickle in the 1920s; Reading converted from a university college (1926) and Swansea and Leicester each gained a university college (1920 and 1927 respectively) with none opening in the 1930s (Sutherland 1997).

The First World War (1914-18) saw the mass enlistment and later conscription of males across Europe (Donson 2014). At Leeds University, the number of students fell by 35% between 1913 and 1916 (Taylor 2020). For the duration of the war, 5.76 per thousand officers were killed per month, compared to 3.12 per thousand in the ranks; leading to a generation of so-called *surplus women* and a *lost generation* of men; with 1.26 women to every man amongst the 25-34 year age group by 1921 (Winter 1977; Nicholson 2008; Wall 2012; Bailey et al 2023).

4.8 Women's medical education (1919-39)

During the interwar years (1919-39), professional opportunities for female medics were severely curtailed, even for those who had seen active military-medical service (Colpus 2018). Several issues coalesced to create a hostile environment towards female medical students and doctors during this time period (Thane 2004). There was a resurgence of the nineteenth ideals of women as wives and mothers, with men as the sole breadwinners (Aiston 2005). Females were viewed as physically and mentally incapable of higher education, particularly medical studies (Jefferson et al 2015). Demobbed servicemen returned from the war keen to resume work as medical practitioners, recommence interrupted medical studies or embark on a medical degree, only to find women in *their* place (Dyhouse 1998). Pre-war marriage bars were reinstated in many sectors (until the outbreak of the Second World War in 1939), forcing married women out of professions, including medicine, with many female medics remaining unmarried in order to practice medicine or setting up general practice with their husband (Thane 2004; McIntyre 2007).

At the same time, many previously co-educational medical schools, including seven in London, became male-only or severely restricted the number of women by quota (Bunniss and Kelly 2010). This was justified on the grounds that the male students preferred single-sex education; female medical students were an unwelcome distraction; they detracted from the prestige and ethos of a medical school, which was essential male, middle-class, public school-educated and sports playing, especially rugby (Elston 1986; Dyhouse 2016). Some medical schools remained closed to women until the Goodenough Report (1944), which recommended all medical schools should be co-educational and the withholding of government funding from those which were not (Maynard and Walker 1977). This presented something of a dilemma for the London School of Medicine for Women (founded 1874) but it continued to exist until 1998, when it merged with University College London (Aitken 1951; Hunting 2004).

There is some evidence that the few female students who were admitted to medical school during the inter-war period were more highly selected than male applicants (Thane 2004).

A practice which does not appear to have disappeared in the twenty-first century, when it recently emerged that from 2006, ten Japanese medical schools, including the prestigious Tokyo Medical University systematically lowered the entrance examination scores of females in order to admit more male students; at the same time widespread workplace and sexual discrimination was also reported by female medical practitioners in Japan (Ramakrishnan et al 2014; Szendi-Schieder 2019).

The woes of female medical students did not end once they graduated; increasingly during the inter-war period female medical practitioners found it difficult to obtain postgraduate training posts (Dyhouse 1998). Often women could only gain employment in specialisms relating to public health, general practice, women and children's health; roles which were often lower status and poorly remunerated, with some roles being advertised with differentiated pay rates for men and women (Rusterholz 2019; Almond 2022). Taking the only medical roles available to them, female doctors were often subject to criticism and sometimes outright hostility from within the medical profession; with accusations they were undermining the status of the whole profession by taking the lesser paid medical roles which were often the only ones available to them (Dyhouse 1998).

In addition to feeling threatened by female medical students and practitioners, the 1920s and 1930s, saw an influx of around 5,250 refugee doctors who were fleeing the Nazi regime, along with fascist dictatorships in Spain and Italy and later medics from the Polish Free Forces, many of whom had to re-qualify at British medical schools (Seth 2005; Weindling 2015). The response of the British government and certain professional organisations towards these refugee doctors was controversial; an association of chemists and medics lobbied against their presence, just as they had done earlier against female doctors (Dyhouse 1986; Weindling 2009; Rusterholz 2020; Almond 2022).

4.9 Higher education and medical school expansion post-1945

Just as happened in the First World War (1914-18), the Second World War (1939-45) saw the mass enlistment and conscription of men and later women; the number of medical

students fell from 50,002 (1938) to 37,284 (1940); many London-based medical schools relocated temporarily to other cities, such as Bristol and Cambridge to escape aerial bombing (O'Flynn 2006). Approximately 3% of the world's population died in the Second World War, along with 384,000 British soldiers and 70,000 civilians (Kesternich et al 2012; Thompson et al 2012). The 2,700 charity and local authority hospitals in Britain were overwhelmed and almost bankrupted by the sheer volume of casualties (Broxton 2017). By 1947, the western European economy had virtually collapsed, prompting America to step in with the Marshall Plan (1948); a \$5 billion loan to the UK (which was not repaid in full until 2006) (Tumlir and La Haye 1981; Mitchell 2007).

After the war, Britain's status on the global stage declined as countries that had once been part of the Empire gained their independence, such as India (1947) and Israel (1948) and the nation endured significant periods of economic crises (Black 2017). The 1940s, saw the introduction of the modern welfare state, including the creation of the NHS (1948), as the newly elected post-war Labour government implemented William Beveridge's Social Insurance and Allied Services Report (1942) designed to tackle the *Five Giants* (squalor, want, ignorance, disease and idleness) (Mossialos et al 2018; Ollard and Declercq 2018).

The University Grants Committee (UGC) had been discussing expansions to the higher education sector since the 1940s; to meet new demands for technical university-level education, it had overseen the upgrading of several university colleges to full-status universities; Nottingham (in 1948); University of College of North Staffordshire (1949, which became Keele University in 1962); Southampton (1952); Hull (1954); Exeter (1955) and Leicester (1957) (Benn and Fieldhouse 1993). The UGC plans for further higher education expansion were incorporated into the Robbins Report (1963) (Shattock and Berdahl 1984; Willetts 2011; Barr 2014). New medical schools would have to wait until the 1960s and 1970s; Nottingham (in 1966); Dundee (1967); Southampton (1969); Cambridge and Leicester (1975), after which the period of expansion ceased until the following century (Gorsky 2008; Petty-Saphon 2008; Godden 2017).

4.10 Massification of higher education and new medical schools (1963-1975)

The Report of the Committee on Higher Education (1963) made 178 recommendations for higher education expansion, including increasing the number of universities and doubling the number of higher education students between 1963 and 1980 (Robbins 1963; Dent 1964; Mosser 1988). During the 1960s, the number of universities across the country almost doubled from twenty-four to forty-three, with new universities opening in York (1963), Strathclyde (1964), Salford (1967) and the Open University (1969) (Shattock and Berdahl 1984; Owen 1990; Sutherland 1997; Eichengreen 2002; Heller 2013). Higher education participation was viewed as one of the main vehicles for upward social mobility (Brennan and Naidoo 2008; Roberts and Kibasi 2018; Warren 2020). Although critics such as the author Kingsley Amis (privately educated and St John's College, Oxford) believed *more will mean less*; predicting a decline in academic standards as the number of universities increased (Black and Sykes 1971); a debate which continues into the twenty-first century (Beblavy et al 2013; Callender 2014; Patel 2023).

Polytechnics were introduced (1965-92), such as Sheffield (1969) and Oxford (1970) primarily as vehicles for teaching practical and vocational degree subjects, with part-time study options available, leaving academic subjects, such as medicine as the preserve of the universities (Brosan 1972; Pratt 1997; Taylor 2003; Stewart 2015; Hillman 2016; Warren 2020). The higher education and medical school expansion plans came to an end due to the economic fallout following a series of international oil crises (1967-79) which negatively impacted the global economy, including the UK (Macalister 2011).

4.11 Investigating medical education: future workforce requirements

In the course of the twentieth century, there were several major investigations into medical education as the country sought (and largely failed) to become self-sufficient in doctors including reports by Haldane (1919); Goodenough (1944); Willink (1957) with the final royal commission into medical education (Todd 1968). Thereafter medical education and undergraduate student numbers were reviewed on an ongoing basis, rather than irregular (and costly) royal commissions (Maynard and Walker 1993; Maynard and Bloor 2005).

4.12 Haldane Commission (1919)

Immediately before World War I, the Royal Commission on University Education in London (1910-13) began, led by Richard Haldane, it investigated the quality of education in London's twelve medical schools (Wade 1976; Stephenson 2019). The war delayed its publication until 1919, with Haldane recommending the amalgamation of London's semi-independent medical schools and teaching hospitals into three university-based clinical units, led by full-time paid clinical chairs under the auspices of the University of London, prior to this these posts had been part-time and without remuneration (Haldane 1919; Nature 1926). Despite Haldane's recommendations that all medical schools should be led by full-time clinical professors, as late as 1943, there were only sixteen such posts in the country's twenty medical schools (Wade 1976; Petty-Saphon 2008).

4.13 Goodenough Report (1944)

At the same time as the war-time government was planning Britain's post-war education, social and health futures, William Goodenough was asked to investigate medical education, reporting his findings in 1944 (Clark 1966). His report was conducted in the long shadows of the poverty and destitution of the 1920s and 1930s; and should be seen as part of the post-war Labour government's attempts to create a better world for the population, alongside the Beveridge Report (1942), National Health Service White Paper (1944) and the National Health Service Act (1946), (Burns 1943; Smith and Tudor 2018; Gazeley et al 2022).

Goodenough viewed a properly planned and carefully conducted medical education as the essential foundation of a comprehensive state run health service, and one which should be conducted only in co-educational university medical schools, closure was recommended for those which failed to comply with co-education (Goodenough 1944). This threatened the very existence of the London School of Medicine for Women (LSMW), set up in 1874, to enable women to complete their medical education and training; but despite merger or closure threats the LSMW would remain open until 1998, when it eventually merged with two other London medical schools (Molinari 2011; Campbell 2022).

In his report, Goodenough paid special attention to the selection of medical students, believing those deemed *unsuitable* for medical studies should be identified *before* they had a chance to enter medical school and not as was the current practice to allow them to enter medical school, fail examinations and be dismissed (Lancet 1944). He called on medical school student selectors to use reports from headmasters [sic] and personal interviews with prospective students; he even considered the possibility of using aptitude tests (Goodenough 1944). This was the era of the belief that intelligence was largely fixed by biological determinism, and could be easily measured through testing, such as IQ tests (Jones 1980; Mackintosh 1995; Rushton 2002).

Much of what Goodenough proposed for medical school admissions still exists in the twenty-first century; with applicants completing personal statements, headteachers and principals [rather than headmasters alone] providing references via UCAS, and selected applicants called for interview (McManus et al 2005; Turner and Nicholson 2011; Jones 2012; Patterson et al 2016; Wright 2015). It would be the twenty-first century before UK medical student applicants had to sit aptitude tests; the Graduate Medical School Admissions Test (GAMSAT), which began in Australia in 1996, arrived in the UK in 2000 (Coates 2008). This was followed by the Biomedical Admissions Test (BMAT) which was introduced in the UK in 2003, and is being phased out from 2024 (Emery et al 2011; Garrud 2023). Finally, there is the University Clinical Aptitude Test (UCAT originally called UKCAT), which applicants have sat since 2006 (Lambe et al 2012).

The Goodenough report went on to suggest funds, scholarships and grants should be made available *to ensure that no young person with the necessary qualities is hindered by poverty from entering a medical school* (Goodenough 1944). Like the later Robbins Report (1963) which extolled the virtues of a higher education for the public good and was quick to dismiss the idea that students should pay their own tuition fees (Callender 2014), Goodenough believed *all classes of society must be enabled to provide candidates for medicine* (Goodenough 1944; Nature 1944). This has echoes into the twenty-first century, when the report *Fair admissions to higher education* (Schwartz 2004) recommended the university

admission system provide equality of opportunities for all, to gain admission to a suitable course, regardless of their background (McCaig et al 2008).

An anonymous article (dated 22 July 1944) in the *Lancet* entitled *The case of the poor student*, drew attention to the narrow sectors of society that medical schools in England and Wales (but not Scotland) recruited their undergraduate students from (Lancet 1944). This continues to be an issue in the twenty-first century, which despite decades of widening participation, widening access, outreach activities and the existence of two new types of undergraduate medical degrees specifically designed to widening access, those from wealthier backgrounds, independent schools and selective state schools dominate admissions to undergraduate medical degrees (Powis et al 2007; Milburn 2009; Mathers et al 2011; Jones-Berry et al 2015; Steven et al 2016; Kumwenda et al 2018; Niven et al 2019).

The author of the *Lancet* article, then went on to state that poorer students may not be encouraged by their schools to consider medicine as a career and their parents may be unaware of the financial support which is available for their child once they are at medical school (Lancet 1944). Over seventy years later many studies have shown that some students from disadvantaged backgrounds struggle to envisage themselves as future university or medical students, with many believing medicine is not for like of them and struggling with the idea of student debt (Connor 2001; Reay 2001; Archer and Yamashita 2003; Greenhalgh et al 2004; Mathers and Parry 2009; Doyle and Griffin 2012; Cleland et al 2015; Khattab 2015; Kintrea et al 2015; Southgate et al 2017; Evans and Donnelly 2018; Martin 2018; Rainford 2023; Easterbrook et al 2022).

Central to Goodenough's plans for a new style of undergraduate medical education interlinked with the new healthcare service [NHS], which was being planned at the same time, were university medical schools, with a group of associated teaching hospitals and local clinics (Nature 1944; Smith and Tudor 2018). Goodenough recommended an annual intake of 2,500 medical students per annum across the UK (Goodenough 1944). In response, the British Medical Association (BMA) noted the task of interviewing between 2,500 and

5,000 applicants to medical schools per annum was a *formidable one* (Nature 1944). By 1950, Durham, Birmingham, Leeds, Glasgow and the Welsh National School of Medicine, Cardiff were reporting difficulties arising from the *many hundreds* of applicants they had to interview, with Birmingham University complaining of over-crowded labs (Lancet 1950). In the twenty-first century, these numbers have been dwarfed; in 2021 alone, 28,690 individuals applied for around 9,500 places on undergraduate medical degrees across the UK (Tidman 2020; MSC 2021).

In the 1950s, an article in the Lancet noted that the pool of medical undergraduates had been *considerably widened* since the Goodenough Report (1944), with means-tested scholarships reducing financial hardship for students from poorer backgrounds, but the author bemoaned how much harder it was for those from the professional classes to send their sons and daughters into medicine because they were ineligible for means-tested financial support (Ellis 1956). Though presumably families in the professional classes were (and still are) better placed than poorer households to have been able to afford to fund their child's medical aspirations without state assistance; but the issue of university admissions, funding, the allocation of financial support and fairness continues to plague universities, teachers, students and their parents (Garner 2003; Smithers 2003; ISC 2005; Clark 2012; Bhopal and Myers 2020; Johnson 2020; Finn et al 2022). By 1950, the number of newly qualified doctors graduating from the UK's medical schools was almost the same as it had been in 1939, with the increase in doctor numbers being due to a large influx of overseas doctors who were educated outside the UK (Last 1968; Wright et al 2010).

4.14 Willink Report (1957)

In the decade after the Goodenough Report (1944) there was another major investigation of medical student numbers; chaired by William Willink, the Report of the Committee to Consider the Future Numbers of Medical Practitioners and the Appropriate Intake of Medical Students (1955-57), concluded [counter to Goodenough] that a reduced number of doctors would be required after 1961, and recommended the number of medical students be cut by 10% as soon as possible (Maynard and Walker 1993). Beyond 1971, Willink felt

unable to make an accurate prediction of the number of doctors required, due to the limitations of the data provided, but did advise that the country would need to increase the number of doctors from 1975 (Willink 1957). To meet this future demand Willink recommended the number of students admitted to medical school should increase after 1970 (Lafitte and Squire 1960). In line with Willink's recommendations, the number of students admitted to medical schools in Britain fell from 2,741 (1955) to 2,504 (1958), mainly through recruiting fewer female students, as had been the case during the interwar years (Lafitte and Squire 1960; Elston 1986; Dyhouse 1998; Thane 2004; Kelly 2010). By the early 1960s, it was apparent the Willink Report (1957) had significantly underestimated the number of doctors the country required (Seale 1961) and the decision to reduce the number of undergraduate medical students was promptly reversed by the Platt Working Party (1961) which recommended an immediate increase (Last 1968).

Gradually, the number of female doctors recovered after the Willink recommended cuts; in 1960, there were 44,960 active doctors on the Medical Register of whom 18% were women (Lafitte and Squire 1960). By 1968, the percentage of female doctors had increased to around 25% of the total (Last 1968). Data provided for a debate about medical student numbers in the UK parliament in the 1970s, revealed there were 11,177 applications to study medicine of whom 3,466 were admitted (amounting to 3.2 applications per place) of these 32% were female (1972); by 1975, there were 12,046 applications for 3,602 places (3.3 applications per place), 35% of whom were women (1975) (Hansard 1976). The Willink recommendations had clearly been a vast underestimation of the demands for medical education (Searle 1961; Last 1968; Maynard and Walker 1993).

The Willink Report (1957) came at a time when there were huge demographic pressures to expand the higher education sector (Shattock and Berdahl 1984). Following the end of the war (1945) there was a significant increase in the number of babies born [*baby-boomer generation*]; the Education Act (1944) had created more grammar schools across the country which selected their students academically, and the act also raised the school-leaving to fifteen years (1947) with plans to increase it to sixteen years, which were delayed

until 1972, which led to increasing numbers of students *staying-on* at school to take A Levels [introduced in 1951] making them eligible to apply for a university-level education (McCulloch et al 2012; Ku 2013; Smithers 2014; Roberts and Kibasi 2018; Danechi 2020). The number of universities increased rapidly following the Robbins Report (1963) and the creation of polytechnics (1965) led to a diversity of higher education provision (Brosnan 1972; Lewis 1992; Pratt 1997; Hillman 2016). Following the Further and Higher Education Act (1992) most polytechnics became universities, but a binary divide remains between pre-92 (old) and post-92 (new) universities, often along social class lines (Taylor 2003; Bathmaker et al 2013; Marginson 2016; Ratcliffe 2017; Benson-Egglenton 2022). Against this backdrop, the final royal commission into medical education took place from 1965-68 (Todd 1968).

4.15 Todd Report (1968)

The far-reaching and far-sighted, 400 page Royal Commission on Medical Education chaired by Alexander Todd (1965-68), outlined the current state of medical education and produced plans for each stage of medical education; from student selection through to postgraduate training (BMJ 1969). Todd believed the *aim of the undergraduate course should be to produce not a finished doctor but a broadly educated man [sic] who can become a doctor by further training* and his report outlined how medical schools should meet the demands for new doctors into the twenty-first century (Todd 1968). The Todd Report recommended improvements be made to the selection of students; the undergraduate curriculum was to be broadened and modularised; didactic teaching methods using *authoritarian methods* were to be replaced with an increase in the use of demonstrations, practical work and group discussions (Townsend 1968). He also recommended the enlargement of existing medical school and the creation of new medical schools; with each one admitting between 150-200 students per annum (Todd 1968). By 2019, the average intake of first-year undergraduate medical students was 249 per medical school, ranging from fifty students at the recently created Sunderland University Medical School to 430 students at King's College London (OFS 2020).

The teaching style Todd proposed was more akin to the *problem-based learning* (PBL) used to teach medical students in the twenty-first century; consisting of self-directed and patient-orientated learning, removing the student from formal classrooms and placing them in healthcare settings to experience early-interactions with patients, as used by many UK medical schools, including newer university medical schools, such as Brighton and Sussex, Hull-York, East Anglia and Plymouth (Reed 2021).

Todd recommended the duration of undergraduate medical degrees should be standardised to five years, with the first three years consisting of a medical science degree, followed by two years clinical practice, to be followed by three years post-graduate training (Todd 1968). In the twenty-first century, most standard-entry (STN) undergraduate medical degrees are five years in duration, apart from at Cambridge, Edinburgh, Imperial, Oxford and St Andrew's universities where it takes undergraduate medical students six years to complete their studies, but essentially medical degrees today follow the pattern proposed by Todd in the 1960s (Garrud 2023). Todd's plan to standardise undergraduate medical degrees prefigured the European Union's attempts to harmonise higher education, through the Bologna Accord (1999); a defined degree-masters-doctorate pathway through higher education was to be in place by 2010 across the EU, using the European Credit Transfer System (ECTS) which would enable students to more easily transfer between institutions across Europe; in total 442 European medical schools signed up (Patricio and Harden 2010; Sin and Saunders 2014).

Echoing the earlier Willink Report (1957), the Todd Report (1968) recommended the number of medical school graduates should double by 1975 (Todd 1968). Once again, a recommendation was made to reduce the number of medical schools in London and for them to be fully integrated into the University of London; the same recommendation had been made at the beginning of the twentieth century (Haldane 1919; Todd 1968). Todd also recommend the creation of new medical schools at Cambridge, Leicester and Swansea universities, along with keeping under constant review *the claims* of Keele, Hull and Warwick universities for a medical school (Todd 1968; Townsend 1968). An article in the

Lancet called the plans for these new medical schools *misguided and expensive* and favoured instead the expansion of pre-existing medical schools (Last 1968). By 2008, all of the universities identified by Todd as potential sites for new medical schools had gained one; Southampton (in 1969); Cambridge and Leicester (1975); Warwick, initially in partnership with Leicester University (2000, but standalone from 2007); Hull and York (2001); Swansea and Keele (2004) (Todd 1968; Petty-Saphon 2008). For entry to an undergraduate medical degree in 2024, there are forty-four undergraduate medical schools (including one at the private Buckingham University) (Garrud 2023).

4.16 Medical education in the 1970s

The Todd Report (1968) laid the foundations of medical education and medical workforce planning into the 1970s and beyond, recommending the UK should have a target intake of 4,230 new undergraduate medical students per annum by 1980 (Todd 1968); a target which would not be exceeded until 1991 (Maynard and Walker 1993). Following the opening of new medical schools at Cambridge and Leicester universities (1975) no new medical schools would be opened in the UK until the twenty-first century (Petty-Saphon 2008). In part this was due to a series of oil crises between 1967 and 1979, which led to periods of economic recession, structural changes to industry and high levels of unemployment in the 1980s (Macalister 2011; Cookingham-Bailey 2016; Warren 2020). By the end of the 1970s, as there had been at the end of the 1950s, there were calls for a reduction in the number of first-year medical students, due to the lack of available training places for medical graduates (Willink 1957; Brearley 1993).

From the 1980s, formal, lengthy and costly royal commissions investigating medical education were dispensed with, and replaced by the Advisory Committee for Medical Manpower (1982-1991); Medical Manpower Standing Advisory Group (1991-95); Medical Workforce Standing Advisory Group (1995-to date) which advise government on the required number of medical students to meet the future workforce needs of the NHS (Goldacre 1998; Salter et al 2016).

4.17 Medical workforce planning (1980s and 1990s)

In the 1980s, future medical workforce planning by the government moved away from ad hoc royal commissions (such as the Willink and Todd reports) to more stable and ongoing permanent advisory committees (Maynard and Walker 1993). Set up in 1982, the Advisory Committee for Medical Manpower Planning (ACMMP) regularly reviewed current and future undergraduate medical education and student numbers (Maynard and Bloor 2005). In 1985, the ACMMP estimated the annual average growth rate for the number of new doctors would be 1.1% between 1980 and 2010 (BMJ 1985) but they were unable to reach a consensus about the number of new doctors required over the next thirty years; by 1989, the latest ACMMP report forecast a *modest shortage of doctors* in the early 2000s (Maynard and Walker 1993).

By 1991, the government replaced the ACMMP with the Medical Manpower Standing Advisory Group (MMSAG). It published its first report in 1992, advising that the increased use of nurses in medical settings, particularly in general practice would lead to a surplus of doctors by the year 2000 (MMSAG 1992). In the short term, MMSAG recommended a small increase (6%) in the number of incoming UK medical undergraduates per annum, amounting to the admission of an extra 240 students per year (MMSAG 1992). This was to be coupled with an increase in overseas medical student numbers, from 2.5% to 7.5% of total incoming undergraduate medical students (Brearley 1993). It has remained at 7.5% ever since, although there has been a significant increase in the number of undergraduate places available in UK medical schools (Li et al 2023).

Although the MMSAG found 50% of the medical school intake was female, it noted women still faced too many barriers in their medical careers and had too few career choices; the same issues as had been identified by reports in the 1940s and 1960s (Goodenough 1944; Todd 1968; Maynard and Walker 1993) and are still identifiable in the twenty-first century (Drinkwater et al 2008; Shiner et al 2010; Bleakley 2013; Rogers et al 2019; Massey and MacEwen 2022). In 1960, only 24% of medical students were female (Shiner et al 2010), but by the beginning of the twenty-first century, women comprised 60% of all UK medical

school entrants (Drinkwater et al 2008) and they continue to be the majority of medical students globally (Bleakley 2013). By 2010, women comprised 40% of UK doctors; 43% of GPs; 28% of consultants but only 9% of surgeons (Shiner et al 2010). By 2017, women comprised 54% of UK doctors (Bostock 2018). There are similar gendered patterns in the USA, with women comprising 31% of surgical trainees but only 14% of working surgeons, where they are concentrated in obstetrics and gynaecology (Rogers et al 2019).

In England, a significant gender pay gap remains, with female hospital doctors paid 24% less than their male colleagues; for GPs the gap is 34% and for clinical academics is it 21% (Dacre and Woodhams 2020). By the 2020, 62% of new medical students were female (OFS 2020) but women still faced barriers in certain areas of the medical profession; with men dominating the GMC's Specialist Register (63%); there were 1.30 women for every man on the General Practice Register (2019), despite females comprising 46% of doctors on the GMC's Medical Register (GMC 2021; Michas 2021). For some in the medical profession this so-called *feminisation* of the profession is a worrying trend, like their counterparts in the 1920s and 1930s, they are concerned too many women in the medical profession will impact negatively on its status whereas others are concerned that women with children are more likely to work part-time due to childcare commitments or the unavailability of childcare (Dyhouse 1998; Thane 2004; Bleakley 2013; Khan 2014).

By 1995, the MMSAG became the Medical Workforce Standing Advisory Group (MWSAG); the key recommendation of their second report was a gradual increase in the medical school intake from 4,470 to 4,970 students per annum by the year 2000 (Campbell 1995). Between 1976 and 1996, the number of doctors in the UK increased by around 18% per annum with much of this increase coming from doctors who had acquired their primary medical qualification (PMQ) [usually their undergraduate medical degree] outside the UK (Lee 1999). Despite this, the number of undergraduate medical schools in the UK had remained unchanged at twenty-four since 1975 (Petty-Saphon 2008).

When the MWSAG published its third report (1997), it recommended the intake of first- year undergraduate medical students should rise by around 1,000 per annum (by 20%) to between 5,000-6,000 new students per annum (Campbell 1997). The group also recommended the creation of two new medical schools in areas of the country which lacked a medical school (HENSE 2012), one of which, Norwich had been earlier identified by the Todd Report in the 1960s (Todd 1968; Townsend 1968). At the turn of the century, seven new medical schools were opened; Norwich; Warwick (with Leicester); Brighton and Sussex; Keele; Swansea (with Cardiff) and Peninsula (Exeter and Plymouth) (Petty-Saphon 2008).

The MWSAG identified high attrition rates at all stages of medical training with 10% of medical students dropping out during their undergraduate degree (Campbell 1997). Various studies have identified factors which make students less likely to drop out of medical studies including; having the highest A Levels grades in biology, chemistry and physics; having medical parents; being older or female; high grades in A Level biology or in chemistry and biology (Tomlinson et al 1977; Arulampalam et al 1993; Green et al 1993; McManus et al 2005; Smithers 2014; McPherson 2022). Once medical students have graduated into the profession, there is an even higher attrition rate, with between 15-20% of doctors leaving in the first ten years of their career (MWASG 1997). Often, however this exodus is temporary, due to childcare commitments or further studies (Goldacre 1998).

The MWSAG also recommended *the recruitment of doctors from a more diverse range of social backgrounds* (Campbell 1997). The idea of *like-treating-like* appears to have begun in the USA, as part of the Civil Rights movement of the 1960s (DeVill 1999) but evidence of it can also be found in Canada, UK and Australia, with a particular emphasis on ethnic minority medical students, those from rural or remote areas or a socio-economically disadvantaged background, as individuals from these backgrounds are more likely to return to the areas they grew up in to practice medicine or to work amongst diverse or less affluent communities (Keith et al 1985; Kaufman 1986; Moy and Bartman 1995; Komaromy et al

1996; Farmer et al 2003; Curran and Rourke 2004; Worley et al 2008; Cleland et al 2012; Dowell et al 2015; Xierali and Nivet 2018; Beckett 2019).

In 1999/2000, the MWSAG (1999) and the NHS Plan (2000) recommended the number of doctors trained in England and Wales should increase by 1,000 per annum (Arulampalam et al 2005) with the government agreeing to increase the number of places at medical school by 700 from 2000/01 (Salter et al 2016). Eighty years after it had been recommended by the Haldane Report (1919), all London's medical schools were under the aegis of the University of London (McManus et al 2020) but this was short-lived when Imperial College announced in 2006, it was parting company with the University of London from 2007/08 (Hudson 2006).

At the end of the 1990s, the new Labour government announced plans to revitalise the NHS, published in *The New NHS* (1997), *Agenda for Change* (1999) and the NHS Plan (2000) (Dixon and Dewar 2000). By the start of the twenty-first century, the government was concerned about shortfalls in the medical workforce but also the mal-distribution of physicians, particularly in *under-served* areas, such as rural and remote areas, amongst certain ethnic communities and in economically disadvantaged parts of the country; and shortages in certain medical specialisms, such as general practice and psychiatry (Strathdee and Engler 2012; Cleland et al 2012; Thiele 2015; Crampton et al 2016; Sims 2018). These shortages were by no means unique to the twenty-first century or to the UK, similar shortages of generalist practitioners and specific specialisms have also identified in Australia, Canada, Thailand and the USA (Snadden et al 2011).

4.18 Medicine in the twenty-first century

4.18.1 NHS Plan (2000)

This plan outlined government intentions to expand the medical workforce with an extra 7,500 consultants; an additional 2,000 GPs; an extra 7,000 hospital beds; 20,000 extra nurses; and a significant investment in NHS facilities (Dixon and Dewar 2000; Maynard and Bloor 2005). A Joint Implementation Group (JIG) was established, comprising

representatives from the NHS, HEFCE and the Department of Health (DOH) to oversee the expansion of medical schools places (Salter et al 2016). There was to be a 20% increase in the number of first year medical students raising the intake to 7,500 students per annum in England, and to 9,500 across the UK (Rimmer 2020). With the exception of an unplanned intake of 10,000+ medical students per annum in 2020 and 2021, due to the Covid-19 pandemic (Lewis and Lewis 2023) the figure of 9,500 incoming medical students per annum has remained largely unchanged since, despite a 43% increase in the number of applications, between 2016-21 (MSC 2021).

Alongside the NHS Plan (2000), and the proposed increase in undergraduate medical students numbers, Modernising Medical Careers (Tooke 2008) was developed by the DOH and Academy of Royal Medical Colleges (Brown and Bhugra 2005). In 2005, the two-year Foundation Programme (F1 and F2) was introduced as a further two years of clinical rotations after medical school with reforms to Speciality Training taking place in 2007 (Ali et al 2015; Powell 2022). At the time some consultants were sceptical that a two-year competency framework allowed sufficient time for medical trainees to demonstrate their capabilities in certain medical specialisms (Higgins and Cavendish 2006). The Foundation Programme remains in place in 2023, but following a consultation, changes will be made to the way training places are allocated from 2024 (UKFP 2023).

4.18.2 Diversifying medicine: two new types of undergraduate medical degrees

In an attempt to widen access to the medical profession and to diversify the composition of medical undergraduates, the British Medical Association (BMA) and the Medical Schools Council (MSC) along with the Higher Education Funding Council for England (HEFCE) and individual universities agreed to introduce two new types of undergraduate medical degrees (MWSAC 1997). These were the four-year Graduate-entry (GEM) degree which was introduced in the year 2000 at St George's, London and Warwick/Leicester University and the six-year Extended-entry (EXT) degree which began at King's College, London in 2001 (Garlick et al 2008; Garrud 2011).

4.18.3 Graduate-entry medical degree (GEM)

The UK was a relative latecomer to GEM degrees. Since the early twentieth century, all USA medical degrees have been graduate-entry only (Savitt 2006; Duffy 2011) and Australia launched its first GEM degree at Flinders University, Adelaide in 1996 (Prideaux and McCrorie 2004). Prior to the introduction of the GEM degree in the UK (2000), graduate entrants joined a STN degree, a small percentage continue to do so (Garrud and McManus 2018). The idea for a GEM degree had been mooted for UK healthcare professionals in the 1970s (Tudor-Hart 1974) but their introduction (for graduates rather than healthcare professionals) took another twenty-five years (2000) (Shehmar et al 2010). Only two GEM degrees (at Edinburgh and Newcastle universities) allow those without degrees but with significant healthcare experience and professional healthcare qualifications to study medicine (Barrett et al 2022; Pringle 2022; Garrud 2023).

Although GEM degrees were launched with the intention of widening access to undergraduate medical degrees, the research findings are somewhat inconclusive (James et al 2008; Calvert et al 2009; Garrud 2011; Byrne et al 2014; Garrud and McManus 2018; Guedon et al 2021). An early study at Nottingham University, found applicants to the GEM course were more likely to be male, from a lower socio-economic background and to have lower A Level scores than applicants to the STN degree (James et al 2008). Although later studies have shown GEM students share many of the same demographic, educational and socio-economic characteristics of students on the STN degrees (James et al 2009; Rapport et al 2009; Garrud 2011; Kumwenda et al 2018; Olivarius-McAllister et al 2021). Studies of Swansea and Warwick GEM students suggests they had been high-academic achievers throughout school (Carter and Peile 2007; Bodger et al 2011). A Level grades do not appear to matter as much for GEM students as they do for STN students, but most enter GEM degrees with an undergraduate degree, usually in sciences (Haldane et al 2012; Tarmey et al 2019; Aston-Mourney et al 2022).

An Irish study of STN and GEM students found no difference between these two groups of students in respect of the examination results for clinical disciplines, but GEM students

performed significantly better than STN students in the senior research dissertation assessment (Duggan et al 2014). Other studies have found GEM students are more motivated, more likely to obtain the highest marks throughout their studies and have lower drop-out rates than those on STN degrees but this is likely to be because they already possess an undergraduate degree, and have chosen to commit to four more years of studies (Daly 2004; Calvert et al 2009; Byrne et al 2014; Haldane et al 2012; Sulong et al 2014; Garrud and McManus 2018; Guedon et al 2021; Kumar et al 2021; Olivarius-McAllister et al 2021; Aston-Mourney et al 2022). There is also some evidence from the UK and Ireland, which shows that GEM students are more likely to become GPs than their STN counterparts, which was the rationale for the launch of ScotGEM in 2019 (Rimmer 2018; Gillies et al 2019; Lowe 2019; Glynn et al 2021)

Unlike EXT degrees, the number of GEM degrees has not expanded as much as was initially planned (Garrud and McManus 2018). By 2011, GEM degrees were attracting 10,000 applicants per annum, around 10% of total medical school applicants, with the majority being female and White (Garrud 2011). By 2015, GEM students accounted for 40% of medical graduates (Kumwenda et al 2018). Between 2013-19, concerns were raised that some universities *might* close GEM degrees; an EU directive required 5,500 hours of training time for doctors (2013) and the UK's Shape of Training Report (2013) which recommended moving the point of registration on the GMC's Medical Register from the end of FY1 to graduation from medical school, would have made GEM courses untenable (Sullivan 2015; Rimmer 2018). However, these issues appear to have been resolved; as in 2023/24, GEM degrees were available at seventeen universities (including ScotGEM); twenty ran EXT degrees (Garrud 2023). Many of the newer GEM degrees, such as those at Chester and Worcester universities are currently only available to international students, due a shortfall in government funding for UK students (Wilkinson 2022).

4.18.4 Extended-entry medical degree (EXT)

EXT degrees were created to support the diversification of undergraduate medical students (Dueñas et al 2021) and to attract those who have experienced some form of educational

and or socio-economic disadvantaged and have therefore been unable to reach their full academic potential whilst at school (Gibson Smith et al 2021). Six-year extended-entry undergraduate medical degrees began in 2001, at King's College London (Garlick and Brown 2008; Garlick et al 2008; Papachristodoulou 2010; Garrud 2011; Curtis and Smith 2020). Since this time the number of university medical schools running six-year EXT degrees has increased; for entry in 2024, fourteen will be running this type of undergraduate degree; with several other universities offering one-year foundation courses, with links to STN degrees, such as the Bradford University's Clinical Sciences course (B991) which enables graduates to progress to (STN degree) undergraduate medical studies at Sheffield University (Garrud 2023).

The first cohort of students at King's was drawn from non-selective state schools in fifteen of the most deprived boroughs in inner London (Garlick et al 2008). Almost all of King's EXT students were from an ethnicity minority background (91% compared to 50% on the STN degree); one-third came from a middle-class background, compared to 75% of students on the STN course (Garlick and Brown 2008). Students on EXT degrees at three universities were found to be more likely to have been educated in the state sector, have lower A Level grades, be from an ethnic minority and from a lower social class than students on STN degrees (Curtis and Smith 2020).

During the foundation year of the EXT degree, the so-called *deficits* in an individual's social and cultural habitus and their academic science capabilities are developed through extra academic and pastoral support, along with mentoring (Gibson Smith et al 2021). This has resulted in EXT degrees being time-consuming and resource intensive to run (Mathers et al 2011) which has led some to question their long-term viability, cost-effectiveness and fairness, as students from wealthier backgrounds, those educated in private schools or educationally selective state schools are generally excluded (Ip and McManus 2008; Dueñas et al 2021).

Aside from issues of resources and finances, several recent studies have raised concerns about the socio-economic diversity of students on EXT courses (Cleland et al 2012; Patterson and Price 2017; Curtis and Smith 2020; Dueñas et al 2021). The well-established EXT courses, such as the one at King's appear to have greater socio-economic diversity than more recently established ones (Cleland et al 2012) but there remains a dearth of White working-class students (Curtis and Smith 2020). Discussions have also taken place about the criteria used to identify *disadvantage* and whether students on the EXT courses are *genuinely* disadvantaged (Patterson and Price 2017; Dueñas et al 2021). This is a highly complex issue, which is little discussed in academic literature but occasionally features in the mainstream media (Lavelle 2019; Friedman et al 2021; Aviv 2022).

Studies utilising Critical Race Theory have questioned the extent to UK widening access policies frame and target White working-class students as the most under-represented group in higher education, often to the exclusion of those from other ethnic groups, such as Gypsy, Roma and Irish Travellers (GRT), who are the lowest-achieving ethnic group at every stage of the education system, with only 660 university students and thirty Russell Group students coming from a GRT background (Gillborn 2005; Crawford 2019; Myers 2019; Brassington 2022; Madriaga 2022).

The evidence does suggest that collectively EXT students are more diverse than those on STN degrees; they do well academically (despite lower academic entry grades) with the majority successfully graduating, but given the nature of the extra resources these courses consume, they can only ever attract a small number of students each year, particularly in relation to STN degrees (Garlick and Brown 2008; Curtis and Smith 2018; Gibson Smith et al 2021; Elmansouri et al 2023).

4.18.5 New medical schools in the twenty-first century (2000-10)

At the same time as the two new different types of undergraduate medical degrees were being introduced in the UK (GEM in 2000 and EXT in 2001) the number of medical places and medical schools was also increasing (Garlick and Brown 2008; Petty-Saphon 2008;

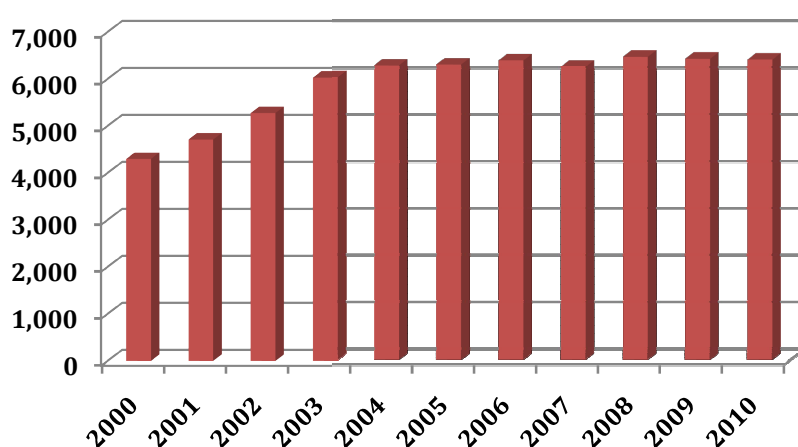
Shehmar et al 2010). Similar increases were also seen in Australia, Canada and the USA (Mihalynuk et al 2008; Whitcomb 2009; Geffen 2014). Like the UK, the USA had opened no new medical schools during the 1980s and 1990s, but the early 2000s saw an acceleration in the number of medical schools in both countries; beginning with Florida State University College of Medicine (2000) another nine medical schools opened across the USA (Whitcomb et al 2009). Australia too saw a similar expansion to the USA, starting with the College of Medicine and Dentistry at James Cook University, Queensland (2000), eight new medical schools were opened in a decade and seventeen rural clinical schools were attached to new and existing medical schools (Geffen 2014).

In the UK, the Joint Implementation Group (JIG) oversaw one of the biggest expansions of medical school places ever; the introduction of two new types of undergraduate medical degrees (EXT and GEM) and the building of the first new medical schools in twenty-five years (Arulampalam et al 2005; Salter et al 2016). In total, seven completely new medical schools were opened across the country (Petty-Saphon 2008; Haldane et al 2012; McManus et al 2020). Founded in the 1960s, Norwich, Warwick, Brighton-Sussex, Hull-York universities were chosen as the sites of new medical schools because they were in areas which lacked a medical school, and some of these universities had ambitions to join the Russell Group and having a medical school was seen as a *sine qua non* of membership (Salter et al 2016). The creation of new medical schools in some of these towns and cities, had first been suggested in the 1960s (Todd 1968; Townsend 1968).

There was an increase of 20% in the number of first year medical students, raising the intake to 7,500 students per annum in England, and to 9,500 across the UK, where it has remained since (Cavanagh et al 2017; Rimmer 2020). Aside from the *pandemic years* (2020 and 2021) when the number was temporarily raised in order to accommodate those students who had met the academic entry requirements following the cancellation of examinations and their replacement with teacher-assessed grades (Bolton et al 2023).

With health and education policy devolved to the home nations in 1999 (Gallacher and Raffe 2012) there was no increase in the intake to undergraduate medical degrees in Scotland and Northern Ireland during this decade; and the thirty-five student expansion in Wales was limited to the new four-year GEM degree at Swansea University, which enrolled its first students in 2004, with degrees initially validated by Cardiff University until 2014 (Rapport et al 2009; Griffith 2014; Cavanagh et al 2017).

Table 4.1: UK medical school undergraduate student intake by academic year (2000-2010)



Source: HENSA (2012)

During the first decade of the twenty-first century the number of undergraduate medical students admitted to UK universities increased by almost 50%; the largest year-on-year growth in the medical school intake came at the beginning of the decade, 12% (2001 to 2002) and 14. % (2002 to 2003); thereafter the growth rate was much smaller and there were three years (2007, 2009 and 2010) when there were fewer first year medical students than the previous year (HENSE 2012).

4.18.6 New medical schools in the twenty-first century (2011-20)

Following an agreement between HEFCE and the Department of Health, which allowed medical schools to admit more international students, along with concerns about the availability of post-graduation training places (F1 and F2 programme) for those leaving

medical school and a possible oversupply of doctors, in 2012, there are a 2% fall in the number of incoming UK/home medical students, amounting to 236 fewer places (HENSE 2012; Reed 2021; Lewis and Lewis 2023). Since this time UK universities have increasingly relied on international student fees to meet shortfalls in other sources of funding, including from undergraduate tuition fees (Hall 2015). International medical students pay three times the amount of *home students* for the non-clinical years of their studies and almost five times more during the clinical years (Oliver 2021).

Following changes to immigration rules in 2008, and the rapid increase in the number of medical schools and undergraduate medical student places, the Labour Health Secretary, Alan Johnson said the UK was moving towards self-sufficiency of its medical workforce by relying less on overseas trained doctors (Healy and Oikelome 2011). With the costs of training each doctor in the UK estimated at between £200,000-£250,000 (Snyder 2009; Jaques 2011), Johnson stated he wanted to ensure there were enough Foundation Programme (FY1 and FY2) training posts available for graduates from UK medical schools (Healy and Oikelome 2011).

This decision by Johnson should be placed in its global context. In 2010, the World Health Organisation (WHO) published data stating there were 9.2M doctors practising globally, but a world shortage of 4.3M doctors, with shortages being particularly acute in poorer countries, with national governments in the global north being encouraged to train more of their own doctors and nurses, rather than rely on recruiting from the global south (Crisp and Chen 2014). Since its launch in 1948, the NHS has tried and failed to be self-sufficient in doctors and nurses, significant numbers joined the service in the 1950s, from the Indian subcontinent and the West Indies (Last 1968); Esmail 2007; Simpson et al 2010; Bivins 2017; Wardle and Obermuller 2019; Younge 2018; Hewitt 2020; Morgan 2022). At the end of the 1950s, research found 12% of NHS doctors were trained overseas (Willink 1957). By the mid-1970s, the Royal Commission on the NHS (1975-79) estimated 18,000 to 20,000 doctors registered in the UK had been born outside the country (Simpson et al 2010). In 1980, 26% of the UK's doctors were from *overseas* (Schroder 1984). By 2005, the Institute

for Public Policy Research (IPPR) found 29% of NHS doctors had been born outside the UK; which had risen to 38% by 2022 (McGee and Johnson 2005; Baker 2020).

In 2012, a joint initiative by HEFCE and the Department for Health; the Health and Education National Strategic Exchange (HENSE) made ten recommendations about the nature of undergraduate medical students and the medical workforce, the five most relevant to medical education [with their original numbers] were:

(4) A rolling cycle review of medical and dental student numbers every three years.

(5) 2% reduction in medical student intakes from 2013.

(6) A further review of 2014 and 2015 intakes.

(9) No immediate changes to the cap on overseas medical and dental intakes.

(10) UK wide perspective was to be allied to reviews wherever possible.

Source: HENSE (2012).

In the 2012/13 academic year, 6,200 students were admitted to medical schools across the UK, the following year numbers again fell to 6,000 students; by 2015/16 there were 5,800 students admitted to medical school, which represented a fall of 6.5% over three years (Taylor 2020). This was part of planned reduction in medical school intakes (Stephenson and Dickson 2016). Although the government lifted the cap on undergraduate student numbers in 2015, it remained for medical and dentistry courses because the cost of running these degrees was higher than the receipts from tuition fees in the form of student loans repayments (Roberts and Bolton 2017). In 2016, the Department of Health (DOH) estimated it cost £230,000 to train each doctor in the UK (DOH 2016) but this figure was disputed because £163,000 is paid out in grants, either directly to individual students or to healthcare providers such as the NHS to support clinical placements or to universities to reflect the higher costs of delivering medical degrees and £64,300 is repaid by the medical graduate in the form of student loan repayments (Milne and Braham 2017).

A report by the Royal College of Physicians (RCP) found there were fewer medical students in 2016 than there had been in 2010, and it noted the UK was still not training enough of its own doctors (RCP 2016). Almost 6,500 students were admitted to undergraduate medical degrees in England in 2016 (HEE 2017). The BMA raised concerns that too many medical graduates would be left without a training place or employment, despite earlier reassurances from the government that there would be enough Foundation Programme (FY1) training places for all graduates from UK medical schools in 2015 (Healy and Oikelome 2011; Taylor 2020).

In 2016, the Conservative Secretary of State for Health, Jeremy Hunt, pledged to remove the cap on medical student numbers and announced an increase in the number of first year undergraduate medical degree places; increasing them from 6,000 per annum to 7,000 per annum (in England) starting in 2017 (Torjesen 2016; Hunt 2017). Established providers (such as pre-existing medical schools) were allocated an extra 500 places to be available for incoming students from 2018, and an extra 1,000 places were awarded through a *competitive process* with individual university medical schools bidding against one another for the extra places in the upcoming 2019/20 academic year (Tovey 2020).

The General Medical Council (GMC) raised a note of caution, that these measures were insufficient to meet the current demands to increase the physician workforce, because these new medical students would not graduate until 2025, and the earliest date they could become a GP would be 2028, and as hospital specialists they would not be fully qualified until 2033 (Patel 2016; Roberts and Bolton 2017). It was hoped these new doctors would take up less popular specialist training posts, such as general practice, core psychiatry, histology, cardiothoracic surgery and paediatrics, where there are significant staff shortages (Tovey 2020). Health Education England (HEE) estimated the country needed to train at *least* 8,000 medical students per annum to become self-sufficient in doctors (Roberts and Bolton 2017). The health secretary also raised the possibility of requiring new medical graduates to work for NHS for four years after leaving medical school (Roberts and Bolton 2017). The BMA objected to this, citing the international and transnational nature of the

medical profession (Roberts 2016). Although the ScotGEM degree, run in partnership between the universities of Dundee and St Andrew's does offer a *return of service* bursary of £16,000 for graduates of this course who agree to work for NHS Scotland for up to four years post-graduation (NHS Scotland 2019; Pringle 2022).

In its 2017 document *Expanding Medical Education*, the Department of Health (DOH) welcomed an increase in the number of medical schools, as it provided an opportunity to widen participation in medical education to attract more students from *different* backgrounds (DHSC 2017). The Conservative government of Theresa May (2016-19) had expressed a desire to increase the levels of social mobility through education (May 2016), and the Secretary of State for Health, Jeremy Hunt (2012-18) saw the expansion in the number of undergraduate medical school places as an opportunity to attract more students from disadvantaged backgrounds (Dunne 2017).

Between 2010 and 2020, eight new medical schools opened, including; Aston, Birmingham (in 2014); Buckingham [the UK's only private medical school] (2015); Central Lancashire, Preston (2015); Anglia Ruskin, Cambridge (2018); Sunderland (2018); Lincoln (2019); Edge Hill, Ormskirk (2020); Kent and Medway, Canterbury (2020), along with ScotGEM (Dundee and St Andrew's, 2018); the Peninsula Medical School (Exeter and Plymouth university partnership) was dissolved in 2013/14, with the constituent universities being awarded their own medical school (Petty-Saphon 2008; Rossiter 2012; Gillies et al 2019; MacFarlane et al 2020; Bufton 2021; Dowling 2021; Garrud 2021).

These changes represented a 25% increase in the number of places available at UK medical schools and saw several new medical schools opened in parts of England where there was no pre-existing medical school or areas of the country where the shortage of doctors was deemed greatest, such as Lincoln, Preston and Sunderland (Taylor 2020). In another attempt for the UK to be self-sufficient in doctors by 2025, further increases in the number of new medical degrees and new medical were planned (Tovey 2020).

Table 4.2: Applicants to undergraduate medical degrees (2016-2021)

Year	First-time applicants	Per annum % change		Re-applicants	Per annum % change		Total applicants	Per annum % change
2016	17,050			2,050			20,100	
2017	16,490	-3.28		2,720	+32.68		19,210	-4.43
2018	18,250	+10.67		2,480	-8.82		20,730	+7.91
2019	19,530	+7.01		2,900	+16.94		22,430	+8.20
2020	20,670	+5.84		3,050	+5.17		23,720	+5.75
2021	24,220	+17.17		4,470	+46.56		28,690	+20.95

Source: MSC (2021); UCAS (2021)

As with all expansions of higher education since the 1960s, the main beneficiaries have been the middle-classes (Scott 2013; Ainley 2014; Southgate and Bennett 2014; Patterson and Price 2017). The number and percentage of disadvantaged students who study medicine continues to be woefully low despite decades of widening participation, widening access and outreach initiatives (Seyan et al 2004; Do et al 2006; Milburn 2009; Ferguson et al 2012; Milburn 2012;; Jones-Berry et al 2015; Steven et al 2016; Sanders et al 2021; Benson-Egglenton 2022; Jackson et al 2022; Bolton and Lewis 2023).

Several of these new medical schools and new types of undergraduate medical degrees have a specific widening participation remit (GMC 2023). Aston University (in Birmingham) aims to offer up to 40% of its UK student places to local individuals, with a preference being given to those who are on the Sir Doug Ellis Pathway to Healthcare Programme; an eighteen month outreach course designed for local students (ages 15-17 years) which they participate in alongside their A Levels (Aston University 2021). Edge Hill University's EXT degree is restricted to students who are ordinarily resident in the north-west of England (Garrud 2023). Sunderland University's selection process is slightly different to other medical schools, although A Level grades of AAA are required, unlike other medical schools it does not select only the top 20% of UCAT candidates, and contextual offers for local students are AAB, which has resulted in 47% of students coming from the local area; 27% from widening participation backgrounds; and 50% from an ethnic minority (HEPI 2022).

4.18.7 New medical schools in the twenty-first century (2020 onwards)

Since 2020, the pace of medical school expansion has slowed somewhat; so far in this decade four new medical schools have opened: Brunel University (2021); Three Counties at Worcester University (2021); Ulster University, Derry/Londonderry (2021); Chester University (2022), meeting the demand for doctors in medically *underserved* parts of the country (Bell 2021; Bufton 2021; Dowling 2021; Garrud 2021; Greer 2021; Green 2021).

Specific restrictions have been placed on these new medical schools, at least for the earliest years of their existence; the STN degree at Brunel and the GEM degree at Chester are available only to international students; the GEM degree at Worcester (initially only available to international students), seeks to prioritise places for those living in the three counties area (Worcestershire, Herefordshire and Gloucestershire), graduates of the Worcester University, NHS employees, POLAR Q1 and Q2 residents and first-in-family applicants; the GEM degree at Ulster University is the only one of the new degrees/new medical schools which has no restrictions placed on the students it can recruit (Garrud 2023) but with 75% of males and 73% of females from Northern Ireland staying in the province for their higher education, it is highly likely that the vast majority of students on this degree will be from the local area (Bain 2021).

Recently, there have been no suggestions or attempts by central government to reduce the number of medical school places, all of the discussions that have taken place have called for a very rapid expansion in numbers; in 2018, a report by the RCP, called for the doubling of incoming medical students in England, from 7,500 to 15,000 per annum (Goddard 2018). With the Medical School Council (MSC) recommending 14,500 medical graduates per annum (Reed 2021). This has formed part of Labour Party policy, and is something they have announced they will implement, should they win the next General Election, alongside opening another fifteen new medical schools (Iacobucci 2022). However, the government has estimated it costs around £230,000 for each place at medical or dental school, with undergraduate tuition fees amounting to £9,250 per annum this leaves a significant shortfall in funding (Lewis and Lewis 2023).

In June 2023, following the publication of the long-awaited NHS Long-Term Workforce Plan, which aims [once again] to put staffing on a sustainable footing and to improve patient care, there are plans to increase the incoming number of undergraduate medical students from its current 7,500 (in England) to 10,000 (2028) to 15,000 (2031) (Pritchard 2023). In the same year, plans were also announced for another new medical school at Hertfordshire University, Hatfield supported initially by St George's, London, the first cohort of students is expected in 2027 (Newlan and Higham 2023). Discussions are also underway for a new medical school at Portsmouth University, with the goal of opening in September 2024 (Wright 2022). From 2024, a new standalone medical degree will be running at North Wales Medical School, Bangor, where previously (since 2018), the university had run the C21 North Wales Medicine in conjunction with Cardiff University (Hatch 2020; Drakeford 2023).

In addition to plans to increase the number of student places at existing medical schools, the government has also announced plans to run a pilot programme of medical degree higher-level apprenticeships for 850 students from 2024/25, with the intention of training 2,000 new doctors via this route by 2031/32, making them available to those from *different backgrounds* and in medically *underserved* areas (Brennan et al 2023; Wilkinson 2023). There is evidence that places on higher-level degree apprenticeships are increasingly being taken by individuals from middle-class families, seeking a cheaper alternative to the costs of a full-time degree course, and this has somewhat diminished the impact these qualifications have had on widening participation (Cavaglia et al 2022; Mackay 2022; Filby 2023).

The introduction (or re-introduction) of medical apprenticeships is something of a *volte face*, as before the 1900s, most medical practitioners (doctors, surgeons, barber-surgeons and apothecaries but not university-educated physicians) began their working lives as an apprentice to a master, learning their trade *on-the-job* as did other skilled artisans, such as carpenters, brewers and cheesemongers (Lawrence 1988; Pelling 1994; Barry 2019; Pelling 2019; Wallis 2019). Some of the UK's most distinguished physicians, such as Elizabeth Garrett Anderson (1836-1917), the first female to qualify as a physician in the UK (1865)

was able to do so via the Licentiate of the Society of Apothecaries (LSA) because she had served a five-year apprenticeship (Loudon 1983; Elston 1986; Dyhouse 1989; Jenkinson 1991; Campbell 2022).

4.19 Medical education conclusion

Despite undergraduate tuition fees in England being some of the highest in the *developed* world (OECD 2019) and UK medical students leaving university with between £64,500 to £82,000 worth of debt (Rimmer 2015), undergraduate medical degrees are a popular choice for students, particularly for those from more affluent backgrounds, the privately educated and individuals who attended a selective state school (Millburn 2012; White 2016). However, widening access to undergraduate medical degrees (except for a small number of individuals) remains somewhat elusive (Seyan et al 2004; Mathers and Parry 2009; Harris 2010; Stephenson and Stephenson 2010; Mathers et al 2011; Curtis et al 2014; Steven et al 2016; Niven et al 2019; Curtis and Smith 2020).

Chapter five

Widening participation to higher education and medicine

5.1 Introduction

This chapter introduces the concepts of widening participation and widening access to higher education, and more specifically to undergraduate medical degrees. Its main focus is the UK, but where expedient other systems of higher education and their widening access policies will be explored in order to compare these with the UK, and to consider how effective these have been in recruiting students from the various different categories which are used to define those groups who are under-represented in higher education. The chapter concludes with a specific examination of widening participation and widening access policies in relation to undergraduate medical degrees.

5.2 Widening participation or widening access: definitions

Widening participation and widening access are two terms which are inter-related and often used interchangeably, however, although they both represent policies and initiatives to increase the number of individuals from under-represented backgrounds in higher education, their meanings are slightly nuanced but both are predicated on the belief that higher education access as it currently is in the UK is unfair as certain groups are *under-represented* in higher education institutions, particularly at elite universities and on undergraduate degrees such as medicine (Harris 2010; Leach 2013; Kirby and Cullinane 2016; Apampa et al 2019; Evans et al 2021).

5.2.1 Widening participation: definition

Widening participation aims to address discrepancies in the take-up of higher education opportunities, to reach out to all those eligible to participate (Connell-Smith and Hubble 2018). These policies follow a more traditional meritocratic *equality* of opportunity model, whereby an individual meets the entry requirements for a particular course, and is admitted in line with the principles of procedure fairness in admissions (Boliver and Powell 2021). In this type of system, an applicant is awarded a place in higher education, based solely on individual merit; they meet the academic entry requirements and are admitted, with no

account being taken of the circumstances in which their qualifications were achieved or their ethnicity, gender or social class; the opposite of arbitrary or positive discrimination (Giarelli and Webb 1980; Krause and Slomezynski 1985; Shavit et al 2007; Warikoo and Fuhr 2014; Littler 2018; Brown and James 2020; Berger 2021; Elford 2023).

An example of this type of widening participation policy, are the UK Conservative government (1979-1997) reforms to higher education in the UK in the late 1980s and early 1990s, which saw the introduction of one-year access to higher education courses for mature students, such as the Access to Medicine course at West Anglia College, Kings Lynn, which were designed to get more students into higher education (Ben and Fieldhouse 1993; Holmes 2002). Likewise the policy of the Labour government (1997-2010) to get 50% of 18-30 year olds in England into higher education [50.2% was reached in 2017/18] is an example of a widening participation policy (Blair 1999; Lunt 2008; Coughlan 2019). Although both the aforementioned policies have been criticised as providing only the appearance of a discourse of social inclusion, as they represent meritocratic *equality* of opportunity policies (Mulderrig 2009).

Because widening participation to higher education policies are more generalist than the more carefully and more narrowly targeted widening access policies, arguably they have created a situation whereby students from the middle-classes (irrespective of their gender, ethnicity, sexual orientation, disabilities or educational background) have taken a disproportionate number of the places available in recently expanded higher education systems, such as those in the UK, Australia and the USA, where significant classed differences remain in relation to the type of university individuals access (Bok and Bowen 1998; Souto-Otera 2010; Pappas and Tremblay 2010; Bathmaker et al 2013; Wheelahan 2016; Jack 2019).

5.22 Widening access: definition

Widening access aims to create a more diverse and representative student body, by enacting measures to increase the participation rates of those from carefully targeted under-

represented groups (Curtis et al 2014; Gorard et al 2018). In the UK and Ireland, this usually takes the form of holistic or contextual admissions (O'Sullivan et al 2019; Spong et al 2021; Eguiguren-Wray et al 2022; Howson et al 2022). This higher education admissions policy operates along the lines of meritocratic *equity* of opportunity, with the express aim of producing a greater degree of distributive fairness in respect of the allocation of places at university (Boliver and Powell 2021). This is particularly pertinent in respect of access to elite universities, such as Oxford (UK) or Harvard (USA) and undergraduate medical degrees, where competition for undergraduate places is intense and dominated by those from advantaged backgrounds (Arulampalam et al 2005; Nahai 2013; Jack 2016; Warikoo 2016; Gore et al 2017; Ward 2018; Hann and Dorling 2019; Alexander et al 2020; Daley 2020; Sandel 2020; Reay 2021; Arcidiacono et al 2022; Richardson 2022; Binkley 2023; Mountford-Zimdars and Grim 2023).

Generally, in the UK, in relation to access to undergraduate medical degrees, widening access has two forms; the six-year extended-entry degree, such as the one which began at King's College London (2001), where initially applicants had to attend a non-selective state secondary school in one of fifteen inner London boroughs, this has since extended to the cover whole London, Kent and Medway (Garlick and Brown 2008; Curtis and Smith 2020).

The second form of widening access (which King's College also undertakes) involves lower academic admission requirements (contextual offers) for those applicants who meet one or more pre-determined markers of disadvantage, such as growing up in a disadvantaged area (measured by IMD), had an entitlement to free school meals (eFSM) whilst at school or living in an area where few young people proceed to higher education (POLAR) after school (Garlick et al 2008; McLennan et al 2011; Ferragina et al 2013; Harrison and Hatt 2015; Taylor 2018; Bell and Burns 2021; Baines et al 2022; Moss 2023). Generally, for admission to an EXT degree a medical school will make a lower academic offer to applicants who meet their disadvantaged criteria threshold; for example, for admission to the six-year EXT degree at Dundee University (2024/25) applicants are required to obtain A Level grades of BBC, whereas admission to the five-year STN degree candidates need AAA grades (Garrud 2023).

5.3 Origins of widening access to higher education

Across the globe inequalities in applications and admissions to higher education have concerned policy makers, higher education staff, education researchers, charities and social commentators since the 1960s (Robbins 1963; Halsey 1993; Galindo-Rueda et al 2004; Graham and Donaldson 2020). The issue of who has access to higher education (and more importantly who does not) is not unique to the UK; about 25% of nations use some form of widening access policies, protocols and practices to admit disadvantaged students to higher education (Dudley-Jenkins and Moses 2014). These policies have different names in different countries; affirmative action (USA), reservations (India), alternative access (Australia and New Zealand) and positive discrimination (South Africa) (Strathdee and Engler 2012; Wilson-Strydom 2015; Leech 2016; Lett et al 2019; Prasad 2020). The common goal of each policy is to increase the presence in universities of individuals from certain under-represented backgrounds or ethnicities (Bennett et al 2016).

5.3.1 USA: 1950s and 1960s

The origins of attempts to diversify the composition of students in higher education can be traced directly to the USA Civil Rights movement of the 1950s and 1960s, when African-Americans sought to gain equal rights in law (JBHE Foundation 2001). Historians have traced the term *affirmative action* (AA) back to President Roosevelt's New Deal in the 1930s where it was adopted in several spheres, including employment and education (Bookert 1978; Pearce 2014). The AA which operated in the USA for most of the last fifty years of the twentieth century was about righting the historical wrongs of slavery and its long-lasting legacy (Leonardo and Tran 2013). The consequences of which are still with twenty-first century America; with Black-Americans experiencing higher rates of poverty and fewer opportunities for social mobility than White-Americans, and African-American enrolment at top-tier universities stalling for the last two decades despite significant increases in the numbers attending degree-awarding community colleges of higher education (Cardichon and Darling-Hammond 2017; Winship et al 2021).

Following the Civil Rights Act (1964), American colleges and universities began implementing race-sensitive or race-based affirmative admissions (AA) to provide individuals from *Under Represented Minorities* (URMs) with greater access to selective institutions and high status degrees, such as medicine and law (Bookert 1978; Lakhan 2003; Taylor 2018; Espino and Zambrana 2019). Unlike in the UK, where there is no centrally agreed legal definition of disadvantage in relation to higher education admissions, the USA was clear that the term URM (at least initially) applied to African-Americans and Native Americans (Teles 1998; Burns and Schapper 2008; Hinrichs 2012; Warikoo and Allen 2020). It has subsequently been expanded to include; Hispanics/Latinos, Alaskan Natives, Native Hawaiians, Pacific Islanders and those Americans of *multiple-races* (Mukherji et al 2017). In the UK, there is more a *laissez-faire* attitude towards widening participation and widening access policies, leaving it to individual organisation, such as the British Medical Association (BMA) and the Medical Schools Council (MSC) to determine their own responses and policies, in collaboration with universities and medical schools, without involving the blunt instrument of the state (Jones-Berry et al 2015; Garrud 2023).

5.4 Widening participation as social justice

Generally, the earlier policies of access to higher education (those from the mid-twentieth century) were informed by the social justice ideals of fairness, such as those espoused by the American philosopher John Rawls, and his principles of *Justice as Fairness* and his *Difference Principle*; that those with the least in society should benefit the most by any policy or welfare decisions (Rawls 1971; Altham 1973; Zerbe and Plotnik 1988; Rawls 1993; Oyeshile 2008; Baggio 2013; Gotoh 2014; Mabaloc 2015). The policies promoted the notions that all members in society should have equal rights and opportunities to progress to higher education, whilst simultaneously acknowledging that the *playing-field* of the university application and admissions processes was not level due to the historical and lived experiences of some groups and individuals in American society and elsewhere (Riddell 2009; Archibong and Sharps 2013; Braun et al 2014; Riddell 2016).

In the USA (but not the UK) AA took the form of quotas, which were enshrined in federal and state laws, which sanctioned some form of what became known as *positive discrimination* in employment and educational settings (Warikoo and Allen 2020) often a quota system was used, whereby a set number of *seats* (places available) on a degree course, such as medicine were reserved for URM's (Pierce 2014). Similar quotas are seen in India for *scheduled castes* and *scheduled tribes*; Norway reserves seats for Sami people and those of Sami heritage, a process which began at Bergen University's School of Medicine as early as 1963; in the ninety-six public universities in Brazil, quotas began in 2012, for *Black, Brown and Indigenous Brazilians*; New Zealand has had legislation in place since 1974, which reserves higher education places for Māori and Pacific Islanders (Iorns-Magallanes 2004; Chatterjee 2006; Gaski et al 2008; Archibong and Sharps 2013; Braun et al 2014; Toste-Daflon et al 2013).

5.5 Meritocratic approaches widening access and participation

A report for the Nuffield Trust identified two different meritocratic approaches to widening participation and university access; these are *equality* of opportunity and *equity* of opportunity (Boliver and Powell 2021).

5.5.1 Rise of the meritocracy

With the election of Margaret Thatcher as the UK's Conservative Prime Minister (1979-90) and Ronald Regan (Republican) who served as the fortieth President of the USA (1981-89), neo-liberal politics and economics came to dominate, and the age of individualism was born (Maisuria 2014). In their respective countries, these giants of right-wing political ideology deregulated and denationalised industries and the financial sector, and lowered taxes for the wealthy (Feldstein 2010). In the UK, neo-liberal policies set about the wholesale marketisation of higher education with a view turning universities into more agile, flexible and efficient commercial institutions (Molesworth et al 2011). This changed the very nature of higher education from a public to a private good, it led to the commodification of knowledge, with students reframed as consumers of a university education, particularly

following the introduction of undergraduate tuition fees in 1998 (Lunt 2008; Hall 2015; Hubble and Bolton 2018).

With its emphasis on individualism, neo-liberalism has encouraged widespread support for the ideals and beliefs of meritocracy: *talent + hard work = success* (Sandel 2020). The belief that irrespective of where you start out if you work hard you will be able to get on in life is embedded in people's psyches; this is the hegemonic narrative of the *American Dream* and the myth of the *self-made-man*, the idea that anyone who is successful in the USA (and elsewhere) has done so purely due their own innate abilities (Gorski 2010, Gorski 2012; Hansen 2014; Valentino and Vaisey 2022). Even if the reality for most people is very different and the gap between the rich and poor is widening, and social mobility appears to have stalled or to be in decline (Pitketty 2014; Appiah 2018; Exley 2019).

5.5.2 Meritocratic dystopia

A quick note needs to be added here about the origins and nature of the word *meritocracy*. According to the Oxford English Dictionary (OED) it first appeared in print in a socialist pamphlet by Alan Fox (1956); it was then popularised by the British sociologist, Michael Young (1915-2002) in his book *The Rise of the Meritocracy* (Young 1958). This was a look back from 2033, to an imaginary past where society was ruled by a meritocracy of talent, consisting of the cleverest people and one where inherited wealth and privilege no longer mattered; a past where intelligence testing became so efficient it determined an individual's role in life and their future employment, which saw the emergence of a social elite based on intelligence (Young 1958; Young 1994). Young wrote the book as a warning against a meritocratic society, which he viewed as dystopian, where education had become not a mechanism of mobility but a fortress of privilege (Appiah 2018).

From the 1990s, the meaning of the word *meritocracy* changed and has since become somewhat conflated with *merit* (Mazza and De Mari 2021). Young was highly critical of this modern usage of the word, but noted that much of what he had written in the 1950s had come to pass, with schools and universities used for *sieving people* according to a narrow

band of values and granting a select few with a seal of approval in the form of academic credentials, and relegating those it disapproves of to the *bottom streams* [in schools] *at the age of seven or before* (Young 2001).

5.6 Equality of opportunity

The higher education system can be viewed as a *par excellence* example of equality of opportunity meritocracy in action, where everyone has the same chance of getting a place at university if they reach meet the academic entry requirements (Warikoo 2018; Boliver and Powell 2021). In the equality of opportunity approach to higher education access and widening participation, there is no acknowledgement that the race to university starts from a *very* unequal place, for example parents sending their children to a private school or nursery, moving to a house within the catchment area of a high-achieving state school, paying for extra-curricular activities or for private tuition, all activities affordable for well-off families but not working-class ones (Bodovski 2010; Shin and Wong 2013; Exley 2013; Mijs 2016; Koh and Ziqi 2022; Burgess et al 2023). Equality of opportunity takes little or no account of where in the social hierarchy an individual started out in life, the familial or socio-economic circumstances of the household in which they grew up, the area in which they lived or the school they attended, it is focused purely on the end result (i.e. their academic qualifications) and not the means by which they were achieved (Littler 2018).

This form of meritocracy assumes everyone has an equal chance to succeed in life and background is irrelevant; achieving three grade As in A Level examinations and securing a place on an undergraduate degree at Oxford University can in theory be achieved by anyone (Zimdars 2010; Warikoo 2018; Hann and Dorling 2019) but a student attending a poorly-performing non-selective secondary school will have to work much harder in more difficult circumstances to achieve the same grades (McVitty and Morris 2012; Jones-Berry et al 2015; Khattab 2015). As one American researcher notes a Standard Assessment Tests (SAT) score of 1,200 [71st-80th percentile of test takers] and an A average means something different for a student in a low income household, who has been educated at a rundown [state] school (Tyson 2003).

Equality of opportunity meritocracy is particularly attractive to those from more privileged backgrounds, many of whom attend elite universities, such as Harvard or Oxford, who believe their own talent and hard work alone got them to where they are, whilst failing to acknowledge the advantageous circumstances of their background, and how this directly impacted their achievements (Clegg 2011; Warikoo and Fuhr 2014; Appiah 2018; Warikoo 2018). To achieve positions of privilege, wealth and power it helps to be born into a family which has one or more of these; for example, since the Norman Conquest (1066), surnames, such as Montgomery, Neville, Talbot and Percy, which are Norman [Anglo-French] in origin, have dominated admissions to Oxford and Cambridge universities, for nearly 800 years (Clark and Cummins 2013; Clark 2014; Barone and Mocetti 2021; Reeves et al 2017; Worth et al 2023).

The belief in equality of meritocracy chimes with the belief that intelligence is something which can be measured, is innate and inviolable, which happens to be unequally distributed throughout society (Bowles and Gintis 1972; Jones 1980; Karabel 2005; Von Stumm and Plomin 2015). In 2013, the then Conservative London mayor, Boris Johnson stated the reason people like him [educated at Eton College and Oxford University] have been able to get on in life was because people are very far from equal in raw ability (Exley 2019).

5.7 Equity of opportunity

In the UK, the main focus of widening participation and widening access to higher education has a social class dimension, rather than being ethnic/race-based as it is in the USA (Steven et al 2016; Kahlenberg 2018). Recent years have seen a shift in focus away from university admissions policies in the UK, which emphasised equality of opportunity, procedural fairness and the use of merit (i.e. academic qualifications) for the recruitment of the *brightest-and-the-best* students to a more nuanced approach which acknowledges the structural and personal disadvantages some students have had to overcome to obtain their academic qualifications (Goux and Maurin 1997; Gallacher 2006; Littler 2018; Warikoo 2018; Boliver and Powell 2021). Equity of opportunity admissions to universities, are about social justice and fairness, and a recognition that past academic achievements and

credentials may not always have a bearing on future potential and university attainment levels (Thiele et al 2016; Berger 2021; Boliver and Powell 2023).

Following a long historical legacy of racial discrimination (Apartheid), which was enshrined into law in South Africa (1948-94), post-Apartheid higher education policies have a social justice and equity of a opportunity focus, of recruiting Black South Africans into higher education, and particular to intuitions which were once *Whites-only*; although significant issues around the quality of schooling afforded these students prior to university, concerns around their preparedness for academic study and high dropout rates continue to have a negative impact on *non-traditional* student success (Sobuwa and McKenna 2019; Madikizela-Madiya 2021; Mseleku 2022; Walker 2022).

The USA too had policies of affirmative action (AA) in higher education admissions, (initially) for African and Native Americans, which like the ones in South Africa, acknowledged the history of racial discrimination has had on current schooling and educational attainment levels (Bertocchi and Dimico 2012; Reece and O'Connell 2016). So-called *race-based* AA (1963-2023) began in the USA, with the use of a quota system, reserving university places for African-American and Native-American students, when this was outlawed, race-based AA continued to be used in university admissions but could no longer be used as *the* factor in any decisions (Titus 1971; Henkin 1975; Cooper 1978; Wang 1988). This too was subject to repeated legal challenges (Edley 1996; Parker 2006; Long and Tienda 2008; Perea 2014; Kramer 2019). Finally, in 2023, the US Supreme Court ruled race could no longer be a consideration in *any* university admissions; with critics pointing out favourable admissions criteria remain in place for legacy applicants [children of alumni or staff] and athletes, which mostly benefit middle-class White Americans (Massie 2016; Jack 2019; Arcidiacono et al 2022; Binkley 2023; Chetty et al 2023; Hextrum 2023; Levitz 2023; Rothstein 2023).

In both South African and the USA, widening access initiatives are examples of *distributive fairness* in university admissions (Boliver and Powell 2021). This acknowledges individual

journeys to university do not start from the same place; and that those from disadvantaged or marginalised groups find it harder to get to higher education, in particular elite universities and high status courses such as medicine and the law (Lampl and Milburn 2019).

In the UK, equity of opportunity higher education access is probably best exemplified by the six year extended-entry undergraduate (EXT) medical degrees, which currently runs at fifteen universities in England and Scotland (Garrud 2023). Access to the EXT degrees consider the context in which examination results were achieved as part of an holistic admissions process (Curtis and Smith 2020; Garrud 2022). At King's College London the EXT degree (launched 2001) was initially restricted to students who had attended a non-selective state school in one of three inner London boroughs, it was then expanded to include 100 non-selective state schools in the fifteen most educationally deprived boroughs of inner London (Garlick and Brown 2008). By requiring lower A Level entry grades compared to the STN degree (ABB vs A*AA, respectively) and providing extra academic and pastoral support, the EXT degree at King's College, enables students based in London and the south-east of England to study medicine providing equity of opportunity where once it did not exist (Curtis and Smith 2020; Garrud 2023).

5.8 Equality of opportunity *and* equity of opportunity

Access to higher education policies in Australia balance equality of opportunity *and* equity of opportunity approaches; opportunities are available for all through open competition but with a compensatory focus for individuals from those groups in society who had previously been marginalised (Gale and Tranter 2019). Previously under-represented groups, such as those from lower socioeconomic backgrounds, Aborigines, Torres Strait Islanders, along with rural and remote students are encouraged to enter university through access-to-higher-education schemes and quotas (Leech 2016). The *Fair Chance for All* policies of the 1980s and 1990s, focused on increasing and widening participation to higher education by putting fairness and the equity of inclusion centre stage (Wilson and Strydom 2015).

5.9 Widening access, participation and social class

Widening access to higher education has been a central theme of successive UK governments at least for the past four decades, as it has in the USA, South Africa, New Zealand and Australia (Evans et al 2019). Unlike most of these countries the UK has never enshrined into law widening access policies or quotas, preferring instead to let individual higher education institutes (HEIs) determine their own (Teles 1998). Later, universities were (and still are) required to submit Access and Participation Plans (previously Access Plans) providing details of widening participation and outreach schemes to the Office for Fair Access (2004-18) and its replacement, the Office for Students (2018-to date) for scrutiny (McCaig and Adnett 2009; Harris 2010; Moore et al 2013; Connell-Smith and Hubble 2018).

Researchers trace the origins of widening access in the UK to the 1970s, when year-long Access to Higher Education courses began in London, for adult-learners who had missed out on the opportunity to go to university at the age of eighteen years (Hoare and Johnston 2011). Or they locate it in the 1980s/90s, when the higher education sector expanded rapidly and needed to move beyond recruiting from *traditional* students, i.e. White middle-class school-leavers with A Level qualifications (Dudley-Jenkins and Moses 2014).

From the 1970s to the early 1990s, widening access had a social justice focus; providing a *second chance* for those who had missed out on higher education earlier in their lives (Liasidou 2014). During these decades there was a significant increase in the number and percentage of mature students (those age twenty-one years or over) entering higher education (James 1995; Reay and Lucey 2000). A key factor in this first wave of higher education expansion (1970s and 1990s) was to widen participation to individuals from groups who were *under-represented* in universities and polytechnics, particularly those from lower socio-economic backgrounds and whose parents had not gone to university (Bachan 2014). Despite the policy intentions, the main beneficiaries of this period of higher education expansion were individuals from middle-class backgrounds (Blanden and Machin 2004; McCowan 2016; Marginson 2016).

From the late 1990s to the 2010s, widening access policies gained a social mobility focus, under the Labour government (1997-2010) with a university education being viewed firstly as the gateway for an individual to obtain a better paid professional role after graduation, coupled with an educated workforce being a means of enhancing national economic prosperity (Milburn 2009; Milburn 2012; Waller et al 2014). With the election of a Liberal Democrat-Conservative coalition (2010-15) and Conservative governments (2015-2023) widening access to higher education policies shifted away from a focus on social justice and social mobility (equity of opportunity) and more towards increasing academic attainment levels in schools and improving the aspirations, particularly those of disadvantaged and working-class students (St Clair and Benjamin 2011; Doyle and Griffin 2012; Atkins and Ebdon 2014).

In 2016, the Conservative Prime Minister Theresa May announced she *wanted Britain to be the world's great meritocracy – a country where everyone has a fair chance to go as far as their talent and hard work will allow* (May 2016). Once again, a British prime minister had conflated meritocracy and merit (Mazza and De Mari 2021) but having passed away in 2002, there was no rebuke from Michael Young, as there had been for Tony Blair (Young 2001). At the same May also endorsed the creation of a grammar school in every town in England to enable *bright-but-poor* children to receive a good education; despite much evidence to the contrary that these schools are not vehicles for social mobility (Andrews et al 2016; Cullinane 2016; Macmillan 2016; Sibiet 2016) they remain popular amongst Conservative voters, right-wing commentators and older people (Barker 2012; Hitchens 2015; Mansfield 2019).

In 2019, May's replacement Boris Johnson announced his intention to *level up opportunity* and to close the opportunity gaps in education, health and the economy (Somerville 2019). Since Boris Johnson's tenure ended in 2022, to be replaced briefly (for forty-nine days) by Liz Truss, who was rapidly replaced by Rishi Sunak (2022), the political focus has shifted towards the economy (Inman 2022). Even the Social Mobility Commission (created 2010) has shifted its gaze away from socio-economic under-representation in universities, and

elite professions such as medicine and the law (Guy et al 2022). Its annual report stated social mobility is not in decline and the UK is not a low-mobility country, but there are still room for improvements and urged that an exaggerated picture of gloom should not be the motivation for change; but it remains that individuals whose parents have a degree are far more likely to get a degree themselves (64%), than those whose parents have no qualifications (11%) (Francis et al 2023). Despite these good intentions, research suggests members of the privileged classes have little idea how to broaden opportunities for all as they lack the knowledge about the situations and aspirations of ordinary people (Exley 2019); in 2014, 36% of the Cabinet had been educated in fee-paying schools, more than five times the rate in the general population (Milburn 2014). Five years later it was reported that 29% of MPs had been educated privately, which is more than four times higher than the electorate they represent (Lampl and Milburn 2019).

Recent government concerns regarding higher education have centred on the notion that too many graduates are working in non-graduate roles (Johnson 2020). The much vaunted *graduate premium* [graduates earn more over their lifetimes than non-graduates] has led to many teenagers viewing a degree as a ticket to a better future (Blundell et al 2016). However, with the rise of credentialism, along with the UK's highly stratified education and higher education systems (Karabel 2005; Giancola and Kahlenberg 2016) which are divided largely along social class lines (Gallacher 2006; Marginson 2016; Tomlinson and Watermeyer 2020) the existence of the graduate premium has been diluted somewhat, particularly for certain groups in society, such as women, ethnic minorities, the working-class and those who attended non-elite or non-selective universities (Kemp-King 2016; Lessard-Phillips et al 2018; Mateos-González and Wakeling 2022).

In 2023, the government announced it was going to *crackdown on rip-off university degrees*, which it defines as ones which fail to deliver good outcomes for students, those courses with high drop-out rates or with poor employment/further study prospects; students are doing a poor-quality course, and they are being sold a false dream and one which does not lead to a decent job (Sunak and Keegan 2023). This neo-liberal approach to higher education is

market-driven, with outcomes measured in terms of the economic returns to the individual student and the wider economy (Stentiford and Koutsouris (2022). It takes little account of the research, which shows less affluent students are more likely to stay local for their higher education, and are less likely, than their more affluent peers to study in elite universities or elite subjects, such as medicine (Baime and Mullin 2010; Williams and Filippakou 2010; Milburn 2012; Donnelly and Gamsu 2018; Montacute and Cullinane 2018).

5.10 Widening participation conclusion

Despite the optimistic statement from the Social Mobility Commission, that the UK social mobility is in decline and the UK is *not* a low-mobility country (Francis et al 2023), research does show that social mobility is expected to stall in the 2020s, and the widening participation agenda appears to be moving away from equality of access and equity of opportunity towards equality of opportunity (Littler 2018; Boliver and Powell 2021).

Chapter six

Getting into medical school

6.1 Introduction

Medical degrees are some of the most over-subscribed, highly competitive and highly selective undergraduate degrees, with the STN course in particular requiring some of the highest A Level scores (Milburn 2012; Dilnot and Boliver 2018). For entry to the STN degree in 2024/25, science A Levels of AAA are required (ranging from ABB at the private Buckingham University to A*A*A at Cambridge University (Garrud 2023). In the UK, the number of applicants to study medicine has rise 48% (2016 to 2021) but the number of places available has remained broadly the same at 9,500 per annum (Goddard 2018; MSC 2021). For every place, there are 11.2 applications to study medicine, compared with the higher education sector average of 5.5 (Jones-Berry et al 2015). In 2022/23, the ratio of applicants per place varied from 6:1 to 21:1 for STN degrees; 4:1 to 21:1 for GEM degrees; and 7:1 to 19:1 for EXT degrees (Garrud 2023).

Until recent decades, the stereotypical UK medical student and junior doctor was a White middle-class male school-leaver who came from a managerial or professional household, and had attended a private school or a state grammar school (Rodriguez-Santana and Chalkley 2015; Aldrich 2016; Turner 2019). In 1987, 51% of those studying medicine in the UK were privately educated, by 2016 this had risen to 61% (Milburn 2016). Medical students are 5-7x as likely to come from the top three socio-economic classes (NS-SEC 1-3) as from the next four socio-economic classes (NS-SEC 4-7) (Stephenson and Stephenson 2010). Much of this is due to levels of prior academic attainment at GCSE and A Level between individuals from high/low social classes and independent/state schools, but not all of it *over-representation* can be accounted for by examination results (Bowes et al 2015; Ndaji et al 2016; Robinson and Salvestrini 2020).

However, since 1996, women have comprised the majority of students entering UK medical schools (Moberly 2018). White British students still comprise the majority of undergraduate medical students overall (65-75%) but British Indians, British Pakistanis and

British Black Africans are *over-represented* whereas British Bangladeshis and British Black Caribbeans are *under-represented* compared to the ethnic composition of the 15-24 year old UK population; with students from BAME backgrounds being the majority (65-90%) on EXT courses (Garlick and Brown 2008; Mathers et al 2011; Garrud 2018; Niven et al 2019; Curtis and Smith 2020).

6.2 Selection of medical students

The selection of students for undergraduate medical degrees remains one of the most highly contested spaces in higher education, at home and abroad; due to the large number of applicants for a limited number of student places (Ahola et al 2014; Simmenroth-Nayda and Görlich 2015; Strømme and Hansen 2017; Goddard 2018; Durst 202; Jokila et al 2021). Currently, all UK undergraduate students apply via UCAS, with universities selecting medical students via aptitude tests (such as BMAT, GAMSAT or UCAT), along with academic references from teachers, details about relevant work experience and motivations for medical studies contained in an applicant's personal statement, along with interviews for some candidates (White and Bradley 2010; Emery et al 2011; Mercer et al 2015; Kumar et al 2018; Bala et al 2022).

For decades leading universities and medical schools have been trying to diversify the composition of the medical student body and the medical profession, but the entry grades are set so high, that many students, especially those from non-selective state schools and disadvantaged backgrounds do not obtain high enough grades to be admitted (Rodríguez-Hernández et al 2020). Individuals from wealthier backgrounds, independent schools and state grammar schools are *over-represented* at medical schools and in the medical profession compared to their numbers in the general population; between 60-80% of medical students are from the highest three social classes (NS-SEC1-3) (Dangerfield et al 2004; Milburn 2012; Steven et al 2016).

Around 25-50% of medical and dental students come from independent schools but only 7% of students are educated in this type of school; with 15-25% coming from state grammar

schools, but only 5% of English 11-18 year olds are educated in these schools (Powis et al 2007; Ferguson et al 2012; Niven et al 2013; Long 2019; Danechi and Bolton 2020). Around half of all UK secondary schools do not provide a single applicant to undergraduate medical degrees, and 80% of applicants come from around 20% of schools and colleges (Jones-Berry et al 2015).

6.3 Secondary schools in the UK

The majority of children in the UK attend a state school (93%) with the greatest variety in the types of schools being found in England, with its remaining 163 grammar schools, academies and free schools (West and Wolfe 2018; Long et al 2022). With education and health policy devolved to the *home* nations there are no grammar, academy or free schools in Wales or Scotland (Craig 2016; Clark and Munn 2017). Northern Ireland retains 63 grammar schools, largely divided along sectarian grounds (Purdy et al 2023). Around 7% of the population attends an independent school but this increases to 18% for 16-18 year olds (Green 2022).

Approximately 5% of secondary-aged students in England attend a selective grammar school, with the remainder attending a comprehensive, secondary modern, free, studio, foundation or voluntary school, a university technical college or further education or sixth form college (Bolton 2012; Walford 2014; Ndaji et al 2016). The habitus and culture of school is essentially a middle-class one, most teachers come from this background, and schools themselves are set up in ways in which the involvement of middle-class parents is valued and encouraged (Bourdieu and Passeron 1977).

Although comprehensive schools cannot select students by academic ability (as grammar schools can) the schools with the highest GCSE and A Level results are usually located in more affluent areas with a more middle-class intake (Cullinane et al 2017). Most of these schools band, set or stream students by academic ability; with middle-class children disproportionately found in the higher bands (Boaler et al 2000; Hollingworth and Williams 2009; Macqueen 2013). The working-class and disadvantaged children in the lower bands

receive a lower quality of education than their middle-class peers, and teachers generally have much lower academic expectations of them (Willis 1977; Reay 2006; Jones-Berry et al 2015; Reay 2017). Students from the higher social classes are more likely to be identified by their teachers as being *more able* or *gifted and talented* than those from lower social class backgrounds, often benefitting from enrichment activities (Crozier et al 2008; Attfield 2009; Burgess et al 2020; Loft and Danechi 2020).

The *best* comprehensive schools (by academic results) also have fewer children who are entitled to Free School Meals (eFSM); a study of Welsh secondary schools found the eFSM rates differed from 10% at the *best* schools to 18% in other schools (Van der Brande et al 2019). In England, 13% of secondary-school students are eFSM but in selective grammar schools this is as low as 3% (Andrews et al 2016). Fewer than 8,500 students who were eFSM took three A Levels, and of these only 6% achieved at least AAA grades, making them eligible for entry to a Russell Group university (Piatt and Eastwood 2015).

Too often children from poorer backgrounds attend schools which are very different to mainstream secondary schools, where a full curriculum is not provided and non-specialists teach subjects such as mathematics and science; extracurricular activities are limited or non-existent; there are often teacher shortages, with less-experienced and less well-qualified staff with high staff turnover (Turhan and Stevens 2020). Many of these schools are unable to offer GCSE Triple Sciences, which are considered a vital grounding for A Levels and medical studies (Alldritt and Taylor 2015; Jones-Berry et al 2015; Kirby and Cullinane 2017). Increasingly in state schools, STEM subjects are becoming the preserve of those from middle-class backgrounds (Gorard and See 2008; Aschbacher et al 2010; Archer et al 2014).

England has 163 academically selective grammar schools, educating 11-18 year olds, in thirty-six local authorities, varying from areas such as Kent and Buckingham which are wholly selective, to Birmingham and Warwickshire which are partially selective (Danechi and Bolton 2020). Although grammar schools are ethnically diverse they are socially exclusive, with those from the most deprived backgrounds, low income families and even

those in the middle of the socio-economic (SES) distribution having very limited access; half of all places in grammar schools are taken by those from the most affluent 25% of families, and there is a positive association between SES and prior attainment (Cribb et al 2013; Holt et al 2019) with 12-20% of first year grammar schools students being educated in non-state primary schools (Sibieta 2016; Gorard and Siddiqui 2018).

The differential academic attainment levels between non-selective state schools, selective state schools and independent schools is often attributed to the value added by the school, the socio-economic background of the students, prior academic attainment and even hereditary characteristics (Bowes et al 2015; Ndaji et al 2016; Green et al 2017; Smith-Woolley et al 2018; Robinson and Salvestrini 2020). 97% of students in grammar schools obtain five GCSEs grade A*-C compared to the national average of 57% in all state-funded schools; with 90% of those at independent schools achieving these grades (ISC 2015; Bolton 2016; Cullinane 2016). Around half of independent schools and 100% of state grammar schools select students by academic ability (Ndaji et al 2016; Danechi 2020).

In the areas of England with grammar schools, a negative effect emerges in GCSE attainment levels for those students who do not attend a grammar school (Andrews et al 2016). In recent years independent schools have been accused of offering so-called *easier* International GCSEs (IGCSEs) whereas state school can only offer GCSEs, although this claim is disputed (Ryan and Sibieta 2010; Martin 2018; Oppenheim 2018; Helm 2019; Trafford 2019). Research has shown the GCSE results in independent schools [and state grammar schools] amount to students gaining academic advantages which are associated with the equivalent of two additional years of schooling by the age of 16 years (Green 2022).

With average per annum fees of £15,200 (net of bursaries and scholarships) compared to £8,000 per pupil funding in state schools (including day-to-day and capital spending), and fees varying from £14,000 (day) to £34,000 (boarding) independent schools are socially exclusive (James et al 2022; Sibieta 2023). 84% of independent school students come from the three highest social classes (NS-SEC1-3), compared to 48% in the UK population (Stuart

2014; PEPF 2022). At the very highest family income levels (top 1%) the majority of children (60%) attend a private school (Green et al 2017).

6.4 GCSE and A Levels

In 1956, the *Lancet* noted the *average boy* [sic] found it difficult to gain a scientific understanding in schools which did not have a large science department (Ellis 1956). Several more recent studies have discovered a lack of scientific equipment, specialist science teachers and GCSE Triple Sciences in some state schools, particularly those in deprived areas (Bennett et al 2011; Alldritt and Taylor 2015; Jones-Berry et al 2015; Archer et al 2017; Kirby and Cullinane 2017). There are increasing concerns that STEM subjects in schools are becoming the preserve of those from middle-class backgrounds (Gorard and See 2008; Aschbacher et al 2009; Archer et al 2014)

Independent schools are able to employ extra teachers and support staff, have better facilities, smaller class sizes, offer a greater range of GCSE and A Level subjects, along with a wide range of extra-curricular activities and individualised careers advice (Finn and Achilles 1999; Borland et al 2005; Pedder 2006; Watson et al 2013; Krassel and Heinesen 2014; Barrett and Nobel 2019). Within the independent sector, student-teacher ratios (9:1) are much lower than they are in the state sector (17:1) (De Waal et al 2015). Independent schoolteachers are more likely to have a postgraduate qualification in their subject area than state schoolteachers; 50% have a *Russell Group* degree; 1:6 went to *Oxbridge*; and 1:15 have a PhD compared to 1:40 in state schools (Kirby 2015).

Around 78% of students at independent schools proceed to sixth-form to study A Levels, compared to 60% in the state sector (Henderson et al 2020). Independent schools account for 14% of A Level entries; 30% of those who achieved the highest grade (A*) come from independent schools; 18% of candidates for A Level Physics come independent schools but account for 34% of A* grades; likewise A Level Biology 14% of candidates and 29% of A* grades; and A Level Chemistry where they are 17% of candidates and 32% of those with an A* grade (Kirby 2015). In 2015, 49% of private school A Level grades were awarded an A*

or A grade, compared to 26% nationally (King and Lenon 2016). During 2020 and 2021, when timed A Level examinations were cancelled due to the Covid-19 pandemic and teacher-assessed grades were used instead, the attainment gap between independent and state-educated students widened even further (Carr 2020; Reed et al 2020; Finn et al 2022):

Table 6.1: A Level results percentage of A* and A grades per school type (2019-2021)

School type	2021	2020	2019
Independent	70%	61%	44%
Comprehensive or middle school	39%	33%	20%

Source: Lough (2021)

During the school closures in 2020-21, students from disadvantaged backgrounds raised issues about the lack of internet access at home and the difficulties in finding quiet space within their home (Montacute 2020). The pandemic appears to have been most disruptive for students from low SES backgrounds (Bhopal and Myers 2020). Learning for students from affluent homes and independent schools was less disrupted than it was for their state school or less affluent counterparts (Green 2021; Holt-White and Cullinane 2021). Research shows high-achieving disadvantaged students in non-selective state schools routinely have their A Level grades under-predicted by their teachers, and this situation worsened during the pandemic (Wyness 2016; Kippin and Cairney 2022) with all students, particularly those at independent and state grammar schools receiving inflated grades in 2020-21 (Finn et al 2022; Leckie and Maragkou 2023). Despite the introduction of the A Level A* grade in 2010, it has become increasingly difficult for elite universities and medical schools to identify the *best* applicants to interview (Smithers 2014; Stegers-Jager 2018). By 2020, 38% of A Level candidates achieved an A* or A grade, compared to 26% in 2019 (Roberts and Danechi 2022). At Oxford University, 95% of first year undergraduates achieve A*AA grades or above; with 68% gaining at least A*A*A*; the STN degree at this university requires A*AA grades for entry in 2024/25 (Richardson 2022; Garrud 2023).

With most medical schools requiring A Level grades of at least AAA, the over-prediction of grades in 2020 and 2021, led to so many students achieving the required entry grades, that the government was temporarily forced to lift the cap on undergraduate medical and dental degrees by 9% (2020) and 5% (2021) after which the intake of medical student reverted to

9,500 per annum as they had been in 2019 (Bolton et al 2023; Garrud 2023; Lewis 2023). It is likely most of these extra places were taken by students from independent schools and state grammar, as prior to the pandemic students at these types of schools obtained average A Level grades of AAB compared to BBC for those at comprehensive schools and further education colleges (Montacute and Cullinane 2018).

Students applying to study medicine have on average higher A Level grades than those applying to non-medical degrees (Ferguson et al 2012) and independently educated students account for 23% of undergraduate medical degree applicants and 29% of accepted applicants; with students from grammar schools representing 12% of applicants and 14% of accepted applicants (Niven et al 2013). These figures vary between the different types of undergraduate medical degrees, with 26% of STN degree students come from privately-funded schools compared to 4% of those on EXT degrees (Curtis and Smith 2020).

6.5 Careers advice, information and guidance

The A Levels a student takes can also impose limitations on their post-school educational options, with many students from disadvantaged backgrounds making suboptimal choices (Codioli-Mcmaster 2017; Dilnot 2018; Henderson et al 2020). Often this can be due to a lack of good quality careers advice at school (Greenbank 2009; Browne 2010; Tate et al 2015; Niven et al 2022). Within state schools, careers advice is often on an ad hoc basis and can be classed, with middle-class children and those in the higher sets/bands being given different advice to those from working-class backgrounds who are lower down a school's hierarchy (Reay 2017; Sammons et al 2018; Reay 2020; Strand 2021). Independent schools have a much higher quality of careers advice than most state schools, with professionally qualified staff, well-resourced libraries and regular events with professionals from amongst the school's alumni and social networks (Huddleston et al 2012; Moote and Archer 2018; Smyth 2023). Research in state schools shows careers advice and school work experience placements appear to be reinforcing social class and gender stereotypes, rather than alleviating them (Archer and Yamashita 2003; Aschbacher et al 2009; Hatcher and Le Gallais 2008).

Students from working-class backgrounds tend to rely more on their peers and family members for careers advice (informal or *hot knowledge*) rather than making use of official careers guidance services (formal or *cold knowledge*) (Greenbank 2009). When it comes to preparing for medical school, first-in-family and working-class students find it more difficult to arrange relevant work experience than their well-connected middle-class peers, many of whom have medical practitioners amongst their familial and/or social networks (Magnus and Mick 2000; Hansen 2005; White et al 2012; O'Neill et al 2013; Simmenroth-Nayda and Görlich 2015; Wouters et al 2017; Knorr et al 2019).

6.6 Financial barriers

An OECD report, found average undergraduate student tuition fees in England are some of the highest in the world, second only to the USA (Walker 2015). The typical undergraduate leaves university after a three-year degree course with debts (in the form of student loan repayments) of £47,000; with students from poorer backgrounds leaving with debts of £57,000 (Bellfield et al 2017; Callender 2019). With undergraduate medical studies lasting between five to six years for the STN degree; four years for the GEM degree, in addition to three to four years of previous degree studies; and six years for an EXT degree, it was suggested that a medical student who commenced their studies in 2014 would leave university with student debts of between £64,000 and £82,000 (Ercolani et al 2015; Rimmer 2015; Garrud 2023). Until the 1990s, higher education in the UK was free and it remains so in Scotland (for Scottish students) (Anderson 2016; Riddell 2016). Following the rapid expansion and marketisation of higher education, the burden of paying for higher education shifted from the state to the individual student and their family in the form of student loans for tuition fees and maintenance (Mayhew et al 2004; Coughlan 2016; Bolton 2020). Since 2017, the maximum undergraduate tuition fees (in England) has been frozen at £9,250 per annum, but the recent high inflation rate has led to calls for the amount students can borrow to increase to cover the increased costs of rent and food (Callender and Mason 2017; Carter 2023; Lewis 2023).

The narrative of student debt as a barrier to poorer students entering higher education is a powerful one, but the evidence is more nuanced (Lynch and O’riordan 1998; Bowl 2001; Callender and Jackson 2008; Marginson 2016; Pulcini 2018; Fumagalli 2019; Pollard et al 2019). The views of students about debt are often characterised by acceptance and ambivalence, but the extent of these feelings is determined by the area they are from, their family background and the type of school or college they attend (Evans and Donnelly 2018). Debt aversion remains as a deterrent for higher education plans amongst lower-class students (Callender and Mason 2017) and often limits their choice of university to one closer to home or where living costs are lower and part-time employment opportunities are greatest (Callender and Jackson 2008; Bachan 2014; Campbell et al 2019). Students from lower socio-economic backgrounds are likely to incur the greatest student debts, as there is less family money available to support them through university (De Gayardon et al 2019).

6.7 UCAS personal statement

Middle-class parents better understand the *rules of the game* in respect of the university applications process (Jerrim 2017). They have ensured through *concerted cultivation* that their children have undertaken a range of extra-curricular activities, such as music lessons, the Duke of Edinburgh Award or team sports, and where necessary extra academic tuition (Lareau 2017; Wyness 2017; Wilson and Worsley 2021). These enable an individual to fill the 600 word personal statement section of their UCAS application form with a wide range of achievements and activities to demonstrate their suitability to university admissions staff (McGrath 2018; Faulkner and Dunn 2021).

The use of personal statements in the admissions process has been subject to criticisms that they are a proxy social, cultural and economic advantage, with those from well-off and well-connected middle-class families better able to fund high-status activities and relevant work experience (Parry et al 2009; Wright 2015; Fryer et al 2022). Research has shown that personal statements are biased towards those from independent schools and state grammar schools (Wright and Bradley 2010; Kumwenda et al 2013). The written quality of personal statements is higher in applicants from these two school types compared to those from non-

selective state schools, with the latter appearing to have received less help from teachers and parents when writing theirs (Jones 2012; Jones-Berry et al 2015; Ferguson and Griffiths 2018; Montacute and Cullinane 2018). There is evidence from UCAS and academic research that personal statements are subject to plagiarism, with some being written by third parties, such as parents and teachers or purchased online (Schwartz 2004; Wright 2015; Jenkins 2019). The use of personal statements in the university and medical schools selection process has been described as a blunt instrument and unfair tool, and one which is highly subjective and without consensus (Jones 2013; Baker 2019).

Since 2006, UK medical schools have shifted away from using personal statements and teacher references as part of the selection process, by combining the results of clinical aptitude tests (such as BMAT and UCAT) with those from Multiple Mini Interviews (MMI) to identify the potential an applicant has to become a doctor (Greatrix and Dowell 2020). For admission to the STN degree in 2024/25, one-third universities do not score personal statements as part of the selection process, with 18% ignoring them completely and a further 28% using them only as a discussion tool during interviews and not for the purposes of shortlisting applicants (Garrud 2023).

6.8 Clinical aptitude tests

Clinical aptitude tests, were introduced to the UK at the very end of the twentieth century, starting with the Graduate Medical School Admissions Test (GAMSAT) which was imported from Australia in 1999; use of the Biomedical Admissions Test (BMAT) began in 2001; followed by the UK Clinical Aptitude Test (UKCAT) in 2006, which has since become UCAT (Wright and Bradley 2010; Krieter and Axelson 2013; Kumar et al 2018). These are designed to counter the risk of potential bias by using personal statements in the selection process (McManus et al 2005; Turner and Nicholson 2011). However, as with personal statements there is a lack of clarity about what these tests are actually measuring, their predictive value, how they should be designed and employed in the medical school selection process (McManus et al 2011; McKenzie et al 2017; Tiffin et al 2019).

Biases have been found towards particular groups in some of these tests (McManus et al 2005; Coates 2008; Edwards et al 2013; Mathers et al 2016; Kumar et al 2018; Griffin et al 2020; Bala et al 2021; Davies et al 2022; Fikrat-Wevers et al 2022). Early research found UCAT favoured those from higher socio-economic backgrounds along with those who had attended selective state schools or independent schools, but a later study found it was less disadvantageous to those from lower socio-economic backgrounds than other medical school admissions tests (James et al 2010; Lievens et al 2016). Whereas male candidates and native English speakers did better than females and those with English as their second language, saw their scores decline with age (Mercer et al 2015).

The costs of preparing for and sitting medical school selections tests has led to the introduction of bursaries for students from low-income households (Stephenson and Stephenson 2010; Greatrix and Dowell 2020). For entry in 2024/25, most medical schools use UCAT as part of the selection process for the STN and EXT degrees, with GAMSAT being used for GEM degrees; BMAT is only used by six universities, and is being discontinued from 2024 (Garrud 2023).

6.9 Interviews

Selecting medical students is a complex process, often with competing priorities; the desire of admissions staff to choose the applicants most likely to succeed in the short-term at medical school and in the long-term as medical practitioners has to be balanced with political demands for the diversification of the medical student body and the medical workforce (Fielding et al 2018). Research suggests medical school selectors look for the *ideal* applicant who has positive attributes, academic ability, enthusiasm and motivation, despite these being difficult to quantify and assess during an interview, they are also classed and highly subjective (Turner and Nicholson 2011). University selectors particularly at elite universities often have a narrow definition of what constitutes *merit* and who the *best* applicants are; which centres on prior academic attainment and interview performance (Mountford-Zimdars 2016; An and Li 2021). This can result in *personal similarity bias*, where

interviewees select applicants who are most like themselves (Zimdars 2010; Razack et al 2015; Agarwal 2018; Woo et al 2023).

Selection and unconscious bias do have a part to play in the university admissions process, and this is most evident at *old* universities (Gittoes 2005; Stegers-Jager et al 2015). This has the potential to negatively impact students from under-represented backgrounds as more than half of medics are educated at independent schools and 74% came from managerial or professional households (Milburn 2012; Milburn 2016; Lampl and Milburn 2019). Research shows employers often recruit people who are like themselves and whose cultural values they believe will align with the organisation (Rivera 2012; Gray 2015; Pollard et al 2015; Chamorro-Premuzic 2020). This has yet to be tested in the medical school admissions process, however research has found women and BAME individuals are under-represented in academic medicine (Arthur and Thomas 2008; Pifer et al 2013; Penny et al 2014; Miller 2020; Sarfo-Annin 2020) and only 4% of medics come from a working-class background (Baars et al 2016; Milburn 2016; White 2016).

6.10 Multiple Mini Interviews

To counter some of the potential selector biases which can occur during interviews, Multiple Mini Interviews (MMIs) were developed at Canada's McMaster University's medical school in 2005 (Rees et al 2016; Knorr et al 2019). MMIs are used globally, including in the UK to select medical and healthcare students (Yusoff 2019). Typically, MMIs consist of six to eight different interview stations, with short 5-7 minute activities at each, designed to identify the non-cognitive and non-academic attributes considered essential to becoming a good doctor, such as good communication skills and practical science knowledge (Cleland et al 2012; Ali et al 2019; Crawford et al 2020).

Since their introduction, concerns have been raised that using MMIs as part of the medical school admissions process may prejudice individuals from groups who are under-represented at medical school and in the profession, such as those from lower socio-economic backgrounds and certain ethnic minorities (Rees et al 2016). Research in

Germany and Ireland, revealed individuals whose first language was not English had lower MMI scores than native English speakers, but gender, social class, age or coming from medical family had no impact on performance (Kelly et al 2013; Simmeroth-Nadya and Görlich 2015) but a second German study found younger females performed better than younger males (Knorr et al 2019).

MMIs have been found to be more reliable than interviews, and less susceptible to selection bias (Cleland et al 2012; Park et al 2015) but concerns have been raised that as the use of MMIs becomes more widespread, commercial coaching and tutoring companies will spot a business opportunity, which could have a negative impact on poorer students who would be unable to afford the costs of extra tuition (Kelly et al 2014). A situation which has already occurred in Finland, where university admission requires an candidate to pass the *Ylioppilastutkinto* [National Matriculation Examination] and the number of undergraduate places is limited meaning around 70% of applicants do not get a place at university (Ravitch 2013;; Kupiainen et al 2016; Kosunen 2018; Isopahkala-Bouret 2019; Jokila et al 2020; Moitus et al 2020). Academic records, MMIs, aptitude tests, situational judgement tests and selection centres are the most promising selection tools, but none are wholly reliable in terms of validity, fairness and cost-effectiveness, and further research is awaited (Wouters et al 2017; Yusoff 2019).

6.11 Contextual admissions and the deficit model

Worldwide, elite universities and medical schools are attempting to increase the diversity of their students (Milburn 2012; Jones-Berry et al 2015; Stegers-Jager et al 2015). In the UK these policies can be traced back to the higher education expansion of the 1980s and 1990s, when increasing numbers of non-traditional and mature students participated in higher education, along with those who had alternative qualifications to A Levels (Richardson 1994). Using contextual admissions, medical school selectors examine the context in which an applicant obtained their qualifications, taking into consideration their family background, the type of school they attended, where they live and their personal circumstances, such as those with disabilities or young carers (Garlick and Brown 2008; Turner and Nicholson

2011; Thiele et al 2016; Montacute and Cullinane 2018; Rees and Woolf 2020). Contextual offers are generally lower than the standard entry requirements, for example for admission to the STN degree in 2024/25, Imperial College London requires A Level grades of A*AA but the contextual offer is AAA (Garrud 2023).

Contextual admissions compensate for any perceived *deficits* an individual is deemed to have in their background which have negatively impacted their academic attainment (Dent et al 2013; Demie and Lewis 2014; McCann et al 2015; Reay 2017 Murray et al 2021). They seek to *level-the-playing-field* in admissions and attempt to move away from the meritocratic *equality* of opportunity, where all applicants are treated equally through procedural fairness and *merit* is defined as those with the highest grades, by replacing this with meritocratic *equity* of opportunity (Mullen 2011; Boliver and Powell 2021; Brookes et al 2022). Admissions staff can find it difficult to identify which students are eligible for contextual admissions as there is no standard criteria across universities and practices at individual universities vary and can lack transparency (Mountford-Zimdars 2016; Williams 2019).

Contextual admissions, the deficit model of admissions and the meritocratic *equity* of opportunity are all fraught with difficulties for admissions staff and individual university applicants by raising issues of fairness, especially in relation to undergraduate medical degrees and elite universities where places are restricted and the number of applications far exceeds the number of places available (Dilnot and Boliver 2018; Hughes and Staton 2020; Richardson 2022). It can breed resentment from those who believe they have missed out on a university place because through the use of contextual admissions policies a place was awarded to a less well-qualified applicant. It can also lead to feelings of inadequacy in recipients along with accusation of lowering academic standards from opponents (Gibbes 2003; Ip and McManus 2008; Leach 2013; Weale 2020). In the USA, resentment against the use of contextual admissions (in the form of affirmative action) has resulted in legal action being taken, against universities, beginning with the De Funis versus Odegaard case [University of Washington Law School] (1970-74) and culminating in the US Supreme Court

banning the use of race-based affirmative action in university admissions (2023) (Kramer 2019; Lee 2021; Harpalani 2022; Whitman and Jayakumar 2023).

The deficit model has the potential to stigmatise those from *under-represented* backgrounds as it holds them personally responsible for structural inequalities, such as poor quality schooling (Davis and Museus 2019; Dueñas et al 2021; Gibson Smith et al 2021). It also holds the cultural and social capitals of the middle-class as the norm and views working-class norms as deficient, thereby assuming the few working-class individuals who are admitted to elite universities or medical degrees have transgressed class boundaries to succeed (Taylor 2008; Lehmann 2009; Byrom and Lightfoot 2012; Flaherty 2015; Jack 2016; Nairz-Wirth et al 2017; Morgan et al 2022; Luczaj 2023). The deficit model also legitimises the status quo of existing social and economic hierarchies, through tacitly endorsing the myths of meritocracy, that talent and hard work alone equate to success (Hernando and Mitchell 2023).

6.12 Meritocracy in admissions

Over several decades widening access initiatives have enabled a *very* small number of individuals from *under-represented* groups to gain access to some of the country's elite universities, and to high-status undergraduate degrees such as medicine (Siraj-Blatchford 2009; Lampl 2016; Gabi and Sharpe 2021). This undoubtedly had a huge impact on these individuals but has done little to change the structural inequalities in society which ensure educational opportunities remain highly classed (Gorski 2010; Gorski 2012). Paradoxically, by promoting equal opportunities and the *success* stories of individuals who *made it against the odds* to an elite university or an undergraduate medical degree, the meritocratic myth that talent and hard work alone will result in successful outcomes is perpetuated (Warikoo and Fuhr 2014; Wakeling and Savage 2015; King and Lenon 2016; Steven et al 2016; Boliver 2017; Murray et al 2021). This belies the unequal starting points that children have in society and just how uneven the playing field is in education (Tawney 1931; Milburn 2009; Clegg 2011; Clayton 2012; Milburn 2012; Khattab 2015; Kintrea et al 2015; Martin 2018; Bayes et al 2020; Rainford 2023).

6.13 Aspirations and expectations

Studies have shown students' perceptions of medical studies and the medical profession vary between the social classes, with those from the higher social classes inspired by personal experience such as role models, and those from the lower classes relying on portrayals in the media, reinforcing their stereotypical ideas that medicine is *posh* (Bourdieu 1990; Greenhalgh et al 2004; Bouriscot and Roberts 2009; Mathers and Parry 2009; Smith et al 2013; Jones-Berry et al 2015). Research has suggested working-class children lack the academic aspirations for elite universities or medical school (Archer et al 2007; Bates et al 2009; Reay et al 2009; Bradley and Miller 2010; McGrath and Rogers 2021; Easterbrook et al 2022) but others have suggested some working-class parents do have high aspirations for their children to attend university (Archer and Yamashita 2003; Siraj-Blatchford 2009). Concerns have also been raised that the career expectations of young working-class school students do not always align with their academic capabilities (Khattab 2015; Harrison and Waller 2018; Turner 2018; Rainford 2023).

Academic aspirations are often determined by family background, school environment, teacher expectations (or lack of) and the area where an individual lives (Kenway and Hickey-Moody 2011; Kintrea et al 2015; Martin 2018; Taylor et al 2018; Baker 2019). Working-class individuals with high aspirations can improve their school achievement levels, even if teacher expectations of them are low but it takes a supreme effort and can often involve finding an alternative route to higher education or accessing university later in life (Khattab 2015; McVitty and Morris 2012). One-year *Access to Medicine* and four-year GEM degrees were designed to provide an alternative route to medical studies for those unable to access an undergraduate medical degree immediately after completing their schooling (Holmes 2002; Carter and Peile 2007). Many students and graduates have testified to the beneficial nature of the *second chance* route to medical studies provided by GEM degrees (Daly 2004; Rapport et al 2009; Sulong et al 2014; Morrison et al 2019; Kumar et al 2021; Olivarius-McAllister et al 2021).

In addition to allegedly lacking the aspirations for higher education or medical studies, evidence suggests some students from lower socio-economic backgrounds deliberately choose not to apply to elite (high-tariff) universities, preferring instead to attend a lower-tariff local institution, meaning they are often over-qualified for the degree course they enter, a process called *under-matching* (Greenhalgh et al 2004; Lampl 2004; Reay et al 2009; Bathmaker et al 2011; Campbell et al 2019). Paradoxically, this leads to these sorts of students being *missing* from elite universities, allowing less well qualified applicants (usually) from independent schools to enter instead, although the notion of *missingness* in higher education is disputed (Gorard 2008; Strathdee and Engler 2012; Allen 2015).

6.14 At medical school

In 1966, 76% of first-year medical students came from the highest two social classes (Registrar General I and II) which had risen to 77% of accepted medical and dentistry students by 1996 (Dangerfield et al 2004). By 2010, 57% of medical and dentistry students came from the highest three socio-economic backgrounds (NS-SEC 1-3) compared to 9% from the lowest three (NS-SEC 5-7) (Milburn 2012). Ten years later, 51% of the UK's three million higher education students came from the two highest socio-economic categories (NS-SEC 1-2) but medicine remains dominated by those from more affluent backgrounds (Goldacre et al 2004; Do et al 2006; Garrud 2011; Penny et al 2014; Garrud 2018; Razack et al 2020; Boliver et al 2021; Elmansouri et al 2023). Individuals from a higher managerial and professional household account for 72% of STN degree students compared to 42% of EXT degree students (Curtis and Smith 2020; HESA 2023). Medical students and the profession have become more diverse in terms gender, ethnicity and age since the 1970s, but social class diversity remains elusive (Cleland et al 2014; Jones-Berry et al 2015). Between 3-4% of medical students and practitioners come from a working-class background (White 2016; Green et al 2017).

Although the majority (51%) of medical school applicants come from state schools and colleges (Steven et al 2016) those from independent schools and affluent backgrounds are *over-represented* at medical school, with 23% of medical school applicants and 29% of

accepted applicants coming from independent schools (Moberley 2016; Niven et al 2019). Even if they obtain the same A Level grades, students from more deprived areas who attended a non-selective state school and have parents who are not in professional occupations are less likely to apply to study medicine, less likely to receive an offer and less likely to be accepted, than individuals educated at fee-paying schools (Seyan et al 2004; Brown and Garlick 2007; Ferguson et al 2012; Steven et al 2016; Patterson and Price 2017; Sullivan et al 2018; Boliver and Powell 2021; Bolton 2021; Kirkup 2021). Generally to be admitted to a Russell Group university students from state schools have to be better qualified than their privately educated counterparts in order to even receive an offer of a place (Boliver 2013).

The institutional habitus of schools and colleges has an influence on whether a student sees themselves as a *university type* and often determines the sort of university they apply to (Greenhalgh et al 2004; McHarg et al 2007; Mathers and Parry 2009; Bradley and Miller 2010; Madarasova-Geckova et al 2010; Southgate et al 2015; Brosnan et al 2016; Wouters et al 2017; Bochatay et al 2021; Holzer et al 2022; Prior and Leckie 2023). Research revealed 43% of state secondary school teachers would rarely or never advise their brightest pupils to apply to *Oxbridge*, on the grounds that they would be unlikely to be admitted and would not fit in if they did gain a place (Diver 2016). Admissions statistics do appear to reinforce this view, with 68% of Oxford's undergraduates coming from state schools (which includes academically selective grammar schools), and only 18% of Cambridge's undergraduates were educated in comprehensive schools (Abulafia 2022; Richardson 2022) despite at least 90% of UK children being educated in this type of school (Bolton 2012; Ku 2022).

However, *some* (but not all) of the differential attendance rates at university can be explained by prior attainment levels (Chowdry et al 2013; Bowes et al 2015); 28% of independently-educated students obtain A Level grades of at least AAA, compared to 27% from grammar schools; 8% from comprehensive schools and sixth-form colleges; and only 4% from further education colleges (Piatt and Eastwood 2015). Students from lower socio-economic backgrounds often underestimate their chances of being admitted to medical school and their

likelihood of success once at medical schools (Ely et al 2023). It is far easier for individuals from middle-class backgrounds to undertake the extra-curricular activities and relevant work experience necessary to seek admission to medical school, through the utilisation of parental, scholastic or friendship networks (Weetman et al 2014; Jones-Berry et al 2015; Fitzpatrick et al 2021).

The few working-class students who are admitted to elite universities and medical schools can experience a sense of social isolation, which has been described as feeling like a *fish-out-of-water* because their social, educational and cultural capitals, along with their habitus are not the same as the dominant middle-class ones (Reay et al 2010; Jerrim 2013; Franceschelli et al 2016; Clark and Hordósy 2019; Hillyard et al 2020; Herbaut 2022).

Paradoxically, several studies have found that medical students from state schools and those from comprehensive schools at Russell Group universities out-perform those who were independently educated, even if they enter with lower grades (Thiele et al 2016; Kumwenda et al 2017; Costa-Santos et al 2018). The evidence from the STN and EXT degrees at King's College London, suggests even though EXT students (who are from under-performing non-selective state schools in London, Kent and Medway) enter medical school with lower A Level grades and lower UCAT scores than their STN counterparts, their examination results at medical school are evenly distributed amongst all deciles, with more than 20% of EXT students coming in the top 20% of the whole cohort (Garlick and Brown 2008; Curtis and Smith 2020; (Rodríguez-Hernández et al 2020). Medical students from state schools are twice as likely as those from independent schools to graduate in the top 10% of their class (Kumwenda et al 2017)

Selecting applicants for undergraduate medical degrees is not a level playing field, with many from disadvantaged backgrounds unable to access relevant work experience and activities with which to enhance their UCAS personal statement (Stevenson and Stevenson 2010; Jones 2012; Wright 2015; Niessen and Meijer 2016; Fryer et al 2022). Students from lower social class backgrounds are less likely to apply to study medicine, and are less likely

to be admitted even they obtain the same A Level grades as their middle-class peers; research has also found this applies to highly-selective universities (Greenhalgh et al 2004; Brown and Garlick 2007; Mathers and Parry 2011; Ferguson et al 2012; Chambers et al 2018; Boliver et al 2022). Although some studies have shown state-educated medical and higher education students (with the same A Level grades or lower on entry) do better than their independently-educated counterparts (Thiele et al 2016; Kumwenda et al 2017).

Despite this medical school admissions staff predominantly use A Level grades to select students, particularly to STN degrees, as these remain a significant predictor of success at medical school and afterwards (McManus et al 2005; Carter and Piele 2007; Powis et al 2007; Haldane et al 2012; Adam et al 2015; Murphy and Wyness 2020). Since the beginning of the twenty-first century A Level results have been assessed alongside medical aptitude tests, such as GAMSAT (introduced in 2000); BMAT (2003); and UCAT (2006), although the predictive value of these tests has also been questioned (Coates 2008; Emery et al 2011; Mercer et al 2015; Kumar et al 2018; Bala et al 2022; Davies et al 2022; Greatrix and McAndrew 2022). The evidence does show that aptitude tests, MMIs and academic records are fairer methods of selection than tradition interviews, teacher references and personal statements (Patterson et al 2016) but the medical school admissions process itself has been accused of maintaining the access gap between the most and the least advantaged students (Wyness 2017; Kumwenda et al 2017).

6.15 Getting into medical school conclusion

Too often in the UK, the socio-economic circumstances of an individual's birth determine their educational attainment and professional opportunities (Clegg 2011; Clark 2014). High-status professions, including medicine, law, journalism and politics are dominated by individuals who attended fee-paying schools and state grammar schools, along with those who graduate from *Oxbridge* (Tawney 1964; Milburn 2009; Milburn 2012; Milburn 2019; Francis et al 2023). Although undergraduate medical degrees and the medical professional have become more diverse in terms of gender and ethnicity, significant barriers to access remain for those from low socio-economic and disadvantaged backgrounds (White 2016)

Chapter Seven

Research design and methodology

This chapter begin with a reminder of the principle research question and supplementary ones:

7.1 Research questions

7.1.1 Principle research question

Did non-standard undergraduate medical degrees widen access at British medical schools (2002-11)?

7.1.2 Supplementary research questions

1. How does the profile of applicants to the EXT, GEM and STN degrees differ between the degrees (using NS-SEC; POLAR; school type)? Has the existence of EXT and GEM degrees diversified the profile of applicants to undergraduate medical degrees? What changes can be discerned over the ten year timeframe of this research?
2. Over the ten year period of this study, has the profile of students admitted to the three different types of undergraduate medical degrees changed and in what ways has this change occurred?
3. Can EXT and GEM degrees be said to have consequently or irrefutably widened access to undergraduate medical degrees? Is the assertion that EXT and GEM degree have successfully widened access warranted or unwarranted?

7.2 Introduction

To produce a more accurate assessment of the impact the two new types of undergraduate medical degrees (EXT and GEM) have had on widening access, comparisons have been made with applications and admissions to the pre-existing standard-entry (STN) undergraduate medical degree, using the same three key variables (NS-SEC, POLAR and school type). Comparisons have been made both internally and externally within and outside the three different types of undergraduate medical degrees.

The analysis has taken place over a ten year period (2002-11), which has enabled any changes in the trends of applications and admissions to undergraduate medical degrees to be fully assessed in the short and long-term. The data used in this research was provided by the eighteen universities, which ran two or more types of undergraduate medical degrees, during the period 2002-11. It should be noted that most of eighteen universities in this non-random sample, did *not* run two or more types of undergraduate medical degrees during the entirety of this ten year period, and only *five* ran all three types of undergraduate medical degrees, at some point during this ten year timeframe.

7.3 Researcher habitus

An individual's personal background can invariably lead them to their choice of research topic and their preferred research methodology; in this instance personal and professional experience of widening participation and outreach initiatives in several Russell Group universities, led to the decision to research widening access to undergraduate medical degrees, particularly following the Social Mobility Commission's revelations that medical schools and the medical profession are dominated by individuals from wealthier backgrounds, independent schools and selective state schools (Milburn 2009; Mathers 2011; Milburn 2012). Despite these background influences, attempts have been made throughout the research to remain objective, by being aware of personal biases and values, as first suggested by the German sociologist Max Weber (Thatcher 2015), whilst also being aware that no research can be truly value free and nor can any researcher be truly detached from their research (Hammersley 2017).

Whilst this study relies entirely on a quantitative research design and methodology, the ontology and epistemology of positivism have not been whole-heartedly embraced, as these can be reductionist in practice, due to their capacity to overlook the interactions between researchers and the social phenomena being investigated (Crotty 1998; Houghton 2011; Cleland 2017). Research is mediated by the concepts used to analyse it, which is why the middle-way more usually associated with Critical Realism has been utilised; this recognises that the social sciences cannot be studied in the same way as the natural sciences, but they

can be studied scientifically (Quine 1961; Bhaskar 1978; Bhaskar 1983); in this research *scientifically* applies to the use of quantitative research methodologies, and the statistical techniques used to interrogate the data.

7.4 Positivism and quantitative research

This research has no qualitative elements, it is entirely quantitative. At no time during the course of this study was any contact made with the anonymous individuals being investigated. The subjects of this research have remained remote throughout its duration. The data were anonymised by the eighteen universities, prior to the research being undertaken, so the subjects of the study could not be identified in anyway. This has enabled the researcher to remain detached from the subjects of the research, and therefore able to produce statistically objective findings.

The origins of positivism lie with the natural laws of the Ancient Greek Stoics and the Roman Jurists (Waddicor 1970), which Christianity incorporated as divine laws or legal positivism (Oakley 1961; Waddicot 1970; Doe 2017). During the Enlightenment, philosophical and scientific advancements challenged long-held beliefs about the nature of society, particularly in post-Revolutionary France (Jones 1994; Porter 2001; Blaikie 2007; Delany and Styrdom 2010; Meek-Lange 2011; Klein and Giglioni 2012; Stanovčić 2013; Nelson 2014; Smith 2017; Bourdeau 2018; Debele 2020).

Three Frenchmen (Henri de Saint-Simon, Auguste Comte and Emile Durkheim) introduced positivism and scientific objectivity into the study of society (Outhwaite 1987; Pickering 1993; Marsonet 2003; Kushner and Sterk 2005; Hirai 2016; Paquette et al 2017; Feigl 2020). In 1897, Durkheim was one of the first sociologists to use statistics in a methodological study of social phenomena, in his study of anomie and suicide (Kushner and Sterk 2005; Gilbert and Stoneman 2015). Well into the twentieth century, positivism dominated the social sciences but its claims of value free objectivity and neutrality were increasingly challenged (Hammersley 2017). Towards the end of the century, neo-positivism became the dominant methodology in social research (Horkheimer 1972; Giddens 1974; Byrant 1985;

Turner 2008; Outhwaite 2015; Cohen et al 2018; Horgan 2018; Ayeni et al 2019; Misak 2020; Mitra 2020; Schwemmer and Wieczorek 2020; Biletzki and Matar 2021).

7.5 Big-data and positivism

Increased computational power, improved data storage methods and enhanced levels of statistical analyses have created an era of big data in the twenty-first century, where granular and aggregated or individual-level data is available, often from novel online sources (Crossley 2014; Cohen et al 2018; Lytras and Visvizi 2020; Welsh 2021). Big data also means large datasets are available, particularly in the fields of education and medical research, such as the UK Medical Education Database (UKMED) and the National Pupil Database (NPD) in England, which can be exploited to track individuals and longitudinal trends (Gale et al 2017; Jay et al 2018). The four dimensions of big data (volume, velocity, variety and veracity) means positivism will continue to be a powerful tool for social researchers in the twenty-first century and beyond (Roper 2021).

7.6 Positive epistemology and ontology

Since Plato, philosophers have been debating the nature of knowledge, but it was only in the eighteenth century that the term *epistemology* was first applied, by the German philosopher, Immanuel Kant (1724-1804) (Delanty and Strydom 2010). Positivism is one of two broad epistemology positions; the other being interpretivism (Tuli 2010; Alharahsheh and Pius 2020). Both of these epistemological positions are concerned with investigating the origin, nature, methods and limits of the ways of being (Gartrell and Gartrell 1996).

The epistemology of positivism and quantitative research assumes there is a social reality which is independent from the researcher but awaiting discovery (Guba and Lincoln 1984; Bunniss and Kelly 2010; Cohen et al 2018). It is one where the researcher remains detached from the study's participants, in order to ensure a high degree of objectivity (Roszak 1970; Roszak 1972; Sarantakos 1998; Marczyk et al 2005). Ontologically, this detachment from the subjects being studied purports to produce research which is external and independent of the participants (Dudovskiy 2016). It also makes claims to produce research and

therefore reported findings which are value-free or value-neutral (Cresswell 1994). Although the extent to which *any* research can claim to be truly value-free or value-neutral has been much debated in philosophical disciplines and social science research (Hammersley 2017).

7.7 Positive research paradigm

The American philosopher of science Thomas Kuhn (1922-96), defined a paradigm as an entire constellation of beliefs, values and techniques, which members of a given community share; these are periodically subject to fundamental changes in approach or underlying assumptions, which represent a *paradigm shift* (Kuhn 1962; Kuhn 1970). For example, until Nicolaus Copernicus (1473-1543), geocentrism was the dominant scientific ideology but he was able to demonstrate that the universe was in fact heliocentric (Carman 2018). In the social sciences paradigms encompass theories and methodologies, whereas in the natural sciences they are more usually theoretical (Cresswell 1994). Throughout this research, the former explanation of paradigms has been utilised.

7.8 Positivism

Positivism is one of five classical research paradigms; the other four being post-positivism; critical theory; constructionism and participatory (Blaikie 2007; Lincoln et al 2011). These have been condensed into three research paradigms by other philosophers; neo-positivism, interpretivism and critical realism, with positivism sitting within the broader neo-positivist paradigm (Blaikie and Priest 2016). The positive research paradigm allows researchers to make causal inferences and arrive at an approximation of reality from which generalisations can be drawn (Neuman 2003; Ulin et al 2005; Cohen et al 2018).

7.9 Deductive research strategy

The deductive research strategy is an evidence-based approach which makes certain philosophical and ontological assumptions about social phenomena, and how these can be measured (Cresswell 1994; Krauss 2005; Cresswell and Plano-Clark 2007; Paquette et al 2017). In this study a *top-down* approach was used to form a principal research question,

along with supplementary research questions; this was done *a priori* [before] the collection the data; as the research questions were used to inform the type of data which were required; this allowed for statistical tests to determine positive or negative answers to the research questions, in much the same as hypothesis testing is undertaken in scientific research (Kotarbińska 1962; Rothbart 1980; Shea 2016; Lebedev 2019). This research focused on relationships and co-relationships within the social phenomena being investigated (applications and admissions to the three different types of undergraduate medical degrees) and reduced these to the simplest elements, to produce results in numerical forms and graphical representations (Maxwell 1972; Salmon 1981; Easterby-Smith et al 2008; Hayes 2009; Maxwell 2017).

7.10 Longitudinal research design and studies

This research represents a longitudinal retrospective secondary analysis of data originally provided by individual applicants who wished to study an undergraduate medical degree, between 2002 and 2011. Applicants must apply by the 15th October, in the year *before* they wish to commence their studies (Garrud 2023). This data is then used by the Universities and Colleges Admissions Service (UCAS) as part of the application, selection and admissions process. A completed copy of the applicant's information is forwarded to the four medical schools they have chosen, for consideration (Turner and Nicholson 2011; Kelly et al 2018; Mahalingasivam et al 2020). At its most fundamental level, applicants are either accepted by a university and become a student, or they are not. The latter category does have many more connotations and permutations, which have implications for an applicant, which will be discussed later in this thesis.

7.10.1 What is longitudinal quantitative research?

According to one study, the most universal definition of longitudinal social science research incorporates *any* data which have a temporal dimension (Gayle and Lambert 2018). Generally, anything which can be measured can be used in quantitative research (Watson 2015). Longitudinal studies use continuous or repeated measures over time, allowing for the collection and analysis of data over time to measure any changes (Ruspini 1999; Caruana

et al 2015). This type of research can also be used for hypotheses testing (Letarte et al 2020). Any longitudinal research study has three components; multiple waves of data collection; a meaningful metric to measure the changes which occur over time; and an outcome which changes systematically (Singer and Willett 2003)

In the social sciences, longitudinal studies are commonly used where the focus is on measuring and analysing changes over time (Caruana et al 2015; Cockcroft et al 2019). Change can occur at different speeds, and changes over time can be both linear and non-linear, along with incremental or exponential; and longitudinal research is able to capture these (Stritch 2017). Explanatory longitudinal research seeks to identify the underlying causes of the change process through the use of one or more predictor [independent] variables, along with longitudinal mean and covariance analysis (Cockcroft et al 2019; Laher et al 2019). These types of studies collect data from multiple time points, to analyse differences and changes over time to locate social phenomena (Ruspini 1999; Letarte et al 2020).

Although the time intervals need to be determined ahead of any research taking place (Caruana et al 2015), there is no agreement on the number of time intervals required for longitudinal research (Stritch 2017). For some researchers more than one time point is sufficient (Letarte et al 2020) for others at least two different time points should be measured (Menard 2007). Whereas others have specified there should be a minimum of three time points (Cockcroft et al 2019; Laher et al 2019) but more are better (Ruspini 1999; Ployhart and Vanderberg 2010). An insufficient number of time points, does not allow for considerations of the shape of the relationship between variables or the trajectory of change because any relationship between them will be linear between two time points (Stritch 2017).

Despite these disagreements over the number of time points, the nature of longitudinal studies is often determined by time (Cockcroft et al 2019). Time is considered as a theoretical construct of interest and not just as a means of sequencing relationships amongst

the chosen variables or merely as a tool for gaining statistical advantages over a cross-sectional research design (Stritch 2017).

Cross-sectional research has limitations when testing causal relationships and determining the direction of relationships between variables through correlation, as it cannot establish causal patterns over different time in the way longitudinal studies can with their multiple time points (Stritch 2017; Cockcroft et al 2019). Due to lengthier timescales, longitudinal research can better account for contextual factors than cross-sectional analyses (Letarte et al 2020) and cohort studies, which consist of a repeated single point of data collection (Hakim 1987). Many longitudinal studies use secondary data, which has some advantages such as minimising the costs and time taken to collect data; but it can also contain some elements of risk, as secondary data analysts have no control over the data capture and how the variables they wish to examine have been coded or measured (Cockcroft et al 2019).

Strictly speaking, longitudinal studies should be limited to prospective studies, whilst retrospective longitudinal studies are quasi-longitudinal, as they do not offer the same research strengths for causal processes (Hakim 1987). However, most of the studies used in this research to explore the nature of retrospective longitudinal research treated it as entirely longitudinal, and not quasi-longitudinal (Ruspini 1999; Singer and Willett 2003; Ployhart and Vanderberg 2010; Caruana et al 2015; Stritch 2017; Cockcroft et al 2019; Letarte et al 2020).

7.10.2 Types of longitudinal research

Typically, longitudinal research is retrospective or prospective (Jivraj et al 2020). The 1970s and 1980s appear to be the era when longitudinal quantitative studies became a major research topic in the social sciences, at a time when increased computational power made the analysis of very large datasets more feasible (Wrigley 1986). For example, the first release of the Statistical Package for the Social Sciences (SPSS, now the Statistical Product and Service Solutions) took place in 1968 (Nie et al 1970). It developed throughout the 1970s, with the tenth version appearing 1983 (Bala and Bhago 2016).

Examples of prospective studies are the *British Doctors Study* (1951-2001); *Framingham Heart Study* in the USA (begun 1948 and ongoing); *Whitehall Studies I* (1967-77) and *II* (1985-88) and *BMA Cohort Study of Medical Graduates* (2006-16) (Marmot et al 1991; Caruana et al 2015; Di Cicco et al 2016; Gayle and Lambert 2018; Barrett and Noble 2019). Retrospective longitudinal studies include *The Decline and Persistence of the Old Boy: Private Schools and Elite Recruitment (1897-2016)* and *Intergenerational Mobility in the Very Long Run: Florence (1427-2011)* (Reeves et al 2017; Barone and Mocetti 2021).

7.10.3 Retrospective longitudinal studies of medical schools

Retrospective longitudinal secondary analyses of data are a common feature of many quantitative studies in medical and dentistry school applications and admissions; several previous longitudinal studies have utilised large datasets from sources as diverse as UCAS; UK Medical Education Database (UKMED); University Clinical Aptitude Test (UCAT); BioMedical Admissions Test (BMAT); Graduate Medical School Admissions Test (GAMSAT) in order to explore applications and/or admissions (Emery et al 2011; Mathers et al 2011; Mercer et al 2015; Steven et al 2016; Garrud and McManus 2018; Kumar et al 2018; Niven et al 2019; Curtis and Smith 2020; Cunningham et al 2021; Davies et al 2022).

7.10.4 Longitudinal research design

There are four basic types of longitudinal research designs: total population; repeated cross-sectional; revolving or rotating panel; and longitudinal panel design (Wrigley 1986; Ruspini 1999; Menard 2007) with time itself becoming a research lens and a construct of theoretical significance in a longitudinal research design (Stritch 2017).

Typically, longitudinal designs are observational in nature; and the launch and implementation of a longitudinal study can take a long time (Caruana et al 2015). From the outset in longitudinal studies, the clarity of the aims, objectives and research question/s or hypothesis/ses is essential (Caruana et al 2015). These then determine the operationalisation stage, where the key concepts; research design type; size and scope of the sample or the selection of participants; nature of the data to be obtained; collection of the

data; analytical tools to be used to interrogate the data; which independent variable are essential to the research and how the dependent variables will be measured; along with reliability of the findings/results (Erikson et al 2013; Watson 2015; Stritch 2017; Cockcroft et al 2019).

It is vital in longitudinal research design that the sample size is adequately large to answer the research questions; this is determined in advance by the confidence levels required (usually 95% or 0.05) (Du Prel et al 2009). The larger the sample size the greater the chances are of identifying statistically significant results; with very large samples entailing a risk that minute deviations from the null hypothesis can emerge as statistically significant, even they are of little or no practical significance to the study (Cockcroft et al 2019). A plan to deal with missing data in datasets provided for secondary analysis must be incorporated into any research design; this can be done by using the mean or mean imputation, but each represents a compromise and can negatively impact the fidelity of any findings (Wang et al 1992; Catellier et al 2005; Madley-Dowd et al 2019).

Longitudinal designs have several principle advantages over other research designs; including the ability to identify and relate events to a particular exposure and an ability to define these exposures diachronically; by establishing a sequence of events change/s can be followed over a particular timeframe and by doing so longitudinal research has the ability to correct for the cohort effect (Caruana et al 2015). Cohort effects are a variation over time in one or more characteristics amongst groups of individuals who share a common characteristic, such as place of residence or date of birth; these have the capacity to influence the outcomes of any research (Schwadel and Stout 2012; Jacob and Ganguli 2016).

Some research designs, such as cross-sectional analyses are inappropriate to study developmental patterns within cohorts because cross-sectional methodologies are static and cannot measure cause-and-effect relationships, as longitudinal methodologies can (Ruspini 1999; Caruana et al 2015). Longitudinal research allows diachronic analysis to occur by using different time points, rather than synchronic analysis, which only measures at a single

time point (Hyatt 2005). By studying two and preferably many more cohorts, longitudinal research can assist with biases related to self-selection in samples or by those which can occur when investigating a single time point (Letarte et al 2020).

As with most research designs, an analysis of temporal data can be subject to threats from omitted variable bias and endogenous regressors, likewise, observed or unobserved exogenous influences, such as omitted variables, have the potential to influence the outcome and findings of any research (Wrigley 1986; Pokropek 2016). Irrespective of which research design is being used, any research involving the analyses of secondary data (i.e. that created by another individual or organisation) is prone to errors of measurement, and to the three different types of errors (instrument, human and random) only instrument and human can be controlled for or minimised in quantitative research (Watson 2015).

Longitudinal studies are critical to understanding issues over time (Gayle and Lambert 2018) by describing and explaining patterns of change over a longer period of time than cross-sectional studies (Hyatt 2005; Cockcroft et al 2019). In addition, quantitative longitudinal studies seek to establish the direction and magnitude of change and the relationships between the variables, often focusing on the causal nature of these (Ruspini 1999; Stritch 2017). However, conducting this type of research can be demanding by placing undue temporal and financial demands on researchers (Caruana et al 2015).

This research utilises a retrospective quantitative longitudinal research design and methodologies, by analysing secondary data. It presents a whole population study, because a non-random sample was used to include applications and admissions data from each of the eighteen universities which ran two or more types of undergraduate medical degrees during the period 2002 to 2011.

7.11 System and sub-group

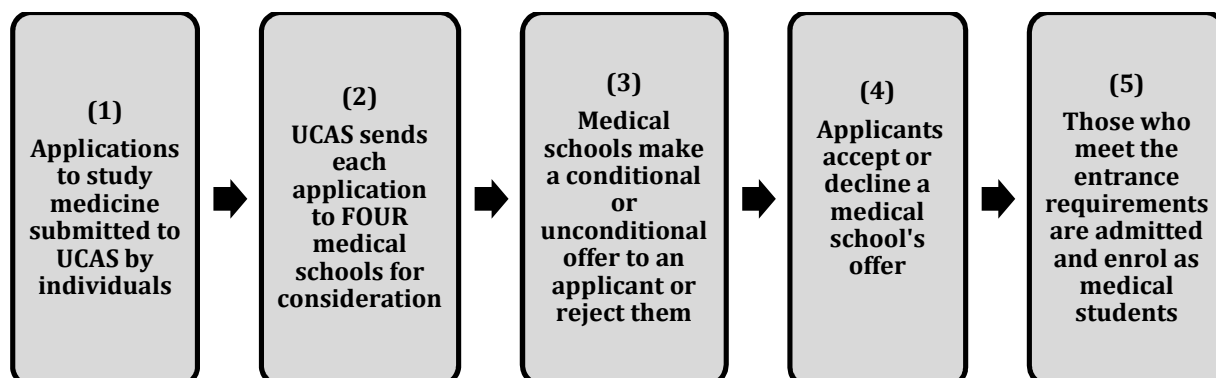
In this research the system consists of all individuals who applied to study an undergraduate degree or sub-degree qualification at a UK higher education institution via the Universities

and Colleges Admissions Service (UCAS) between 2002 and 2011 (Duta et al 2021). Within this system are a sub-group of individuals who applied for admission to an undergraduate medical degree at the thirty-one UK medical schools which ran undergraduate medical degrees in this timeframe (Petty-Saphon 2008). The focus of this research is a smaller sub-group of applicants to the eighteen universities which ran two or more types of undergraduate medical degrees during the same period. The three degrees in question are:

1. Standard-entry undergraduate medical degree (STN)
2. Graduate-entry undergraduate medical degree (GEM)
3. Extended-entry undergraduate medical degree (EXT)

In this research the eighteen universities received an individual's application form via UCAS. The UCAS applications process opens at the beginning of September each year, so for example, individuals applying for admission in 2025/26, would be able to submit their application in September 2024; most applicants can apply to five universities for admission but for would be medical students this is reduced to four (Turner and Nicholson 2011; Kelly et al 2018; Mahalingasivam et al 2020). Applications for admissions to undergraduate medical degrees (along with dentistry and veterinary sciences, and those applying to Oxford or Cambridge universities) have to be submitted by 15th October (Garrud 2023). A summary of this process is shown in the diagram below:

Table 7.1: UCAS's annual cycle for applications to undergraduate medical degrees



Source: UCAS (2022); Garrud (2023)

Notes: the key points in this cycle are (1) when an application is submitted to study medicine, by 15th October each year and (5) the start of the academic year when applicants are admitted (i.e. they enrol) at a university and officially become undergraduate medical students (UCAS 2021). These are the repeated single points of entry and exit which have been used in this retrospective cohort study.

7.12 Analysis of secondary data

Secondary data analysis is defined as the study of specific problems through the analysis of data which was collected for another purpose (Glaser 1963; Allum and Arber 2011). It can consist of qualitative and/or quantitative data (Panchenko and Samovilova 2020), this study consisted only of the latter. Researchers analysing secondary data must have a clear knowledge and understanding of the original methodology used to obtain the primary data (Hakim 1987) and have a well-developed theoretically informed research question/s capable of being answered by the data (Johnston 2014).

As with Freedom of Information (FOI) requests (which were used to obtain the data for this study), the analysis of secondary data (ASD) is a much under-used technique in many fields, including the social sciences and educational research, but it is becoming more prevalent (Smith 2008; Johnston 2014; Cave and Von Stumm 2021). However, due to its under-utilisation, there are few frameworks available to guide researchers, so one was adapted in order to conduct this study (Hudson et al 2005; Klebanoff and Snowden 2018).

Despite its potential drawbacks, ASD can be a very effective research design, at times involving large sample sizes, which would be difficult and costly to obtain by any other

means (Hofferth 2005; Renbarger et al 2019). As was the case in this research, accessing and evaluating secondary data is not straightforward (Simon et al 2007; Aponte 2010). Above all else using secondary data requires a researcher to be pragmatic (Kaushik and Walsh 2019), which proved to be the case in this study.

ASD can be improved through the use of data from other sources (Sedgwick 2014), particularly linked data; researchers in several previous studies of widening access to undergraduate medical degrees, were able to do this by linking, for example the UK Medical Education Database (UKMED) and the National Pupil Database (NPD), along with UCAS and data from individual medical schools (Chowdry et al 2013; Maher et al 2013; Crawford 2014; Mercer et al 2015; Campbell et al 2019; Jay et al 2018; Kumwenda et al 2018). It was not possible to obtain linked data in this study, but it was possible to make comparisons between applications and admissions to undergraduate medical degrees and other undergraduate degrees at one university (Birmingham). Attempts were also made to link the data provided by the Higher Education Statistics Agency (HESA) and the individual-level data provided by *some* of the eighteen universities, but this was not possible owing to the different coding systems used by HESA and UCAS.

7.13 Freedom of Information requests

Although these have been much utilised by investigative journalists, there is a general reluctance amongst academic researchers to use freedom of information requests to obtain data (Lee 2005; Brown 2009; Savage and Hyde 2014; Walby and Luscombe 2019; Clifton-Sprigg et al 2020) meaning this study has a highly novel research design within the field of education and social science research.

7.13.1 Freedom of Information Act (FOIA)

Around 100 countries across the globe have some version of a Freedom of Information Act (FOIA) or its equivalent (Worthy and Hazell 2017; Walby and Luscombe 2019), including the USA (introduced in 1966), Australia, Canada and New Zealand (1982) and Ireland (1997); the UK was a latecomer, when its FOIA was passed in the year 2000 (Savage and

Hyde 2014; Clifton-Sprigg et al 2020). In the UK, the act was designed to encourage more open and accountable government, and to stop the corrosive influence of excessive state secrecy (Blair and Clark 1997; Lee 2005). The Freedom of Information Act (2000) and the Freedom of Information (Scotland) Act (2002) came into effect on 1st January 2005 (Brown 2009). The FOIA gives the general public a right of access to *particular* information held by organisations which have been designated public authorities, which includes education establishments such as schools, colleges and universities (ICO 2009). However, some information is subject to exemptions and cannot be released; this includes details which relate to personal identifiers, commercial interests, defence or research (Brown 2009; Hawkins et al 2023).

7.13.2 Data Protection Acts and General Data Protection Regulation

During the timeframe of this research (2002-11), the type of data which could be obtained using FOIA requests was determined by the Data Protection Act (1998), which allowed for data to be made available for the *legitimate interests* of researchers, with Schedule II of the act stating the consent of individuals was not required for the release of anonymised data (ADLS 2011). Prior to 1998, it would not have been possible to obtain the data used in this research and it is questionable whether following the introduction of the General Data Protection Regulation (2016 operationalised in 2018) and the subsequent updated Data Protection Act (2018) (Clarke et al 2019) whether the detailed anonymised disaggregated (individual-level) data would be made available now, due the legitimate interests, rights and freedoms of any data subject, trumping those of interested third parties, such as academic researchers (Chico 2018).

Since 2005 (and until 2019 when the UK formally left the EU), FOI regulations have been updated by the European Union's (EU) General Data Protection Regulation (GDPR) (2016/679) effective from 2018; the GDPR ensures the privacy of EU citizens, and governs the processing and storage of personal data (Clarke et al 2019). Its incorporation into UK law via the Data Protection Act (DPA) allowed for the smooth transfer of data between the UK and the EU, in the wake of UK's departure from the EU (Diker-Vanberg and Maunick

2018). Despite the intentions of the GDPR, it has posed a major challenge to researchers using secondary data because of its treatment of anonymous and pseudonymous data (Peloquin et al 2021).

The secondary data used in this study was obtained in 2013, prior to the GDPR and the DPA being passed into law and operationalised in 2018. The anonymised data provided for this research were released by the eighteen universities on condition that they were securely stored on a non-networked and password protected computer; additionally, the data could not be released or shared with any third party individual or organisation (Walby and Luscombe 2019).

Disaggregated data were also sought from HESA and UCAS, but under the terms of the Freedom of Information (Designation as Public Authorities) Order (2011), the FOIA does not apply to UCAS in the same way as it does to other public bodies, such as universities; for UCAS the FOIA applies to *some* but not all of its functions, in part due to commercial sensitivities (McNally 2011; Holland et al 2017). Instead aggregated data were purchased from UCAS but this dataset had been so severely aggregated that it was disregarded early in the research. Likewise, admissions only data was purchased from HESA (the organisation does not hold applications data) but due to a differentiated coding system to UCAS and its rounding strategy, these data were used only as a reference tool in this research.

7.13.3 FOI requests

The data used in this research were obtained by making Freedom of Information (FOI) requests to the eighteen universities which ran two or more types of undergraduate medical degrees during the period 2002 to 2011. To obtain data via the FOIA, formal requests can be made in writing (usually via email) to the person responsible for dealing with FOI requests; most universities now have a dedicated FOI Officer (Bourke et al 2012).

Requests must contain a clear description of the data required, along with the full name and address of the person requesting the information (ICO 2009). There are twenty-three

statutory exemptions governing what types of data cannot be released, which include national security risks and the potential to identify an individual (Brown 2009; Hawkins et al 2023).

FOI requests can also be refused on the following grounds:

- The requested data have already been published or it is available via another source or similar data has previously been provided to the same individual;
- Fulfilling the request would cost more than £650 for central government departments and £450 for other public bodies, such as universities, and/or it would exceed 18 hours;
- The organisation receiving the request considers it to be vexatious (ICO 2009; Cherry et al 2013; Savage and Hyde 2014; Clifton-Sprigg et al 2020).

The release of data must take place within twenty days working days from the day *after* the FOI request was received, but the requestee can notify the requestor if the request is to be met outside this time period (Brown 2009; Savage and Hyde 2014). If data have not been supplied, the requestor has the right to ask the FOI Officer for an *internal review* (someone else within the organisation will examine the request and the processing of it); following an unsuccessful outcome to an internal review, the individual making the original FOI request can appeal to the independent Information Commissioner's Office (ICO) (Bourke et al 2012). If necessary the ICO can investigate for breaches of the FOIA (Clifton and Sprigg et al 2020).

7.13.4 Plan for obtaining data using FOI requests

Due to a shortage of research designs and frameworks which could be used to create a plan for this stage of the research, it was necessary to devise one by adapting and amalgamating those which had been used by previous researchers (Bourke et al 2012; Savage and Hyde 2014; Clarke et al 2019; Walby and Luscombe 2019; Clifton-Sprigg et al 2020):

Table 7.2: Research plan (using FOI requests)

Stages	Activity description
Stage 1	A research question was devised which could be answered using data obtained via FOI requests, whilst noting that data obtained this way cannot be used to answer why questions: did non-standard medical degrees widen access at the 18 universities which ran two or more types of undergraduate medical degree during the period 2002 to 2011, compared to the standard undergraduate medical degree. And if they did in which ways did they succeed in widening access, using three measures of socio-economic disadvantage (school type, NS-SEC and POLAR).
Stage 2	Preliminary research was then undertaken to ascertain <i>if</i> the data could be obtained from the 18 universities within the confines of the FOI or outside it. Contact was also made with organisations such as HESA and UCAS, to ask if they could do the same. The FOI does not apply in the same way to HESA and UCAS, as it does to universities, so aggregated data were purchased from these organisations, with the HESA data relating to admissions only.
Stage 3	A FOI research design plan was devised, which included the wording of FOI requests and the categories of data to be requests. A timetable for the submission and receipt of FOI requests was also devised. Along with a plan for the management of data from multiple sources, data standardisation, cleansing and integration.
Stage 4	A pilot FOI request was made to Birmingham University, which provided anonymised application and admissions data for all 600+ undergraduate courses between 2002 and 2011.
Stage 5	Following the success of the FOI request to Birmingham University, 17 further FOI requests were made to the remaining universities which had run two or more types of undergraduate medical degrees, during the same ten year period. Each of these requests was turned down, on the grounds that obtaining the data would have exceeded the 18 hour limit and the £450 determined by the FOIA.
Stage 6	Following this the FOI requests were revised and resubmitted to the remaining 17 universities. After negotiations with FOI Officers at several universities, and one internal review, data were successfully obtained from all 18 universities, but the nature, duration, categories and format varied significantly.
Stage 7	The data divided into two distinct categories of aggregated and individual-level/disaggregated data. Aggregated data could only be used for descriptive purposes, but individual-level data was used for inferential data analyses. The latter categories of data were amalgamated and converted to SPSS, producing a unique dataset of 149,789 individual records. This was triangulated using admissions data purchased from HESA.

Sources: Bourke et al (2012); Savage and Hyde (2014); Clarke et al (2019); Walby and Luscombe (2019); Clifton-Sprigg et al (2020).

7.13.5 Obtaining the data via FOI requests (stages 1-7)

As recommended by previous researchers, at the beginning of this study a pilot or test FOI request was submitted to a university, to ascertain if the request for data could or would be met via a FOI request; and to counteract any problems which might occur once the data were supplied, which would necessitate the modification of any future requests (Bourke et

al 2012; Savage and Hyde 2014 Chown et al 2018; Hawkins et al 2023). Birmingham University was chosen because at the time of commencing this study the researcher was based at the university. This initial request was successful and a raw dataset comprising 321,537 individual-level or disaggregated anonymous records were provided, detailing applications and admissions to all 639 undergraduate degrees (2002-2011). Following the success of the pilot FOI request, an identical request was sent to each of the remaining seventeen universities included in the study. All seventeen refused this request, on the grounds that obtaining the data would exceed the time limit and the costs, as outlined in the FOIA (Bourke et al 2012).

The FOI requests were reduced and revised, and a second stage of FOI requests were submitted to the remaining seventeen universities. After some protracted discussions with some of the universities, data were eventually obtained from all seventeen, but the nature, duration, quality and format quality of the data varied considerably. An internal review of the FOI request was undertaken at one university after which aggregated data were provided. Two universities provided data outside the timeframe determined by the FOIA; one by a few weeks; the other was almost six months later. However, the latter university explained that the delay was caused because the same dataset was being prepared for another (undisclosed) purpose. Discussions between the researcher and the Information Commissioner's Office (ICO) about this issue took place, but before the ICO could commence an investigation, the university had provided the requested data.

In order to obtain data from all eighteen of the universities which ran two or more types of undergraduate medical degrees (2002-11) compromises had to be made; most usually these took the form of reducing the number of years of data which a particular university provided or the university provided aggregated data (rather than disaggregated data). The issues around data quality have been identified as significant by other researchers when secondary data is obtained via FOI requests (Chown et al 2018; Hawkins et al 2023). On occasions this can result in researchers obtaining a non-representative sample (Clifton-Sprigg et al 2020). Certainly in this study, the compromises led to nine universities providing disaggregated

data; with a further nine providing aggregated data. The data analysis plan had to be revised to accommodate these two different types of datasets; which resulted in two different levels of analyses taking place, using SPSS (for individual-level data) and Excel (for group-level data). Details of the data (relating to undergraduate medical degrees) received from each of the eighteen universities are outlined in the table below:

**Table 7.3: Raw data provided by the universities (following successful FOI requests)
Disaggregated/individual-level**

University	Years	Courses	Applications	Students
Birmingham	2006-12	STN & GEM	20992	3808
Cambridge	2003-12	STN & GEM	12205	2616
Imperial	2007-11	STN & GEM	10948	1498
Keele	2008-12	STN & GEM & EXT	9310	655
King's	2002-12	STN & GEM & EXT & FNS & MAX	43748	3864
Liverpool	2002-11	STN & GEM & LANCS	22759	3423
Oxford	2006-11	STN & GEM	9489	1436
Southampton	2005-11	STN & GEM & EXT	24858	2505
St George's	2008-11	STN & GEM	8790	978
Total records (raw data)			163099	20783

Notes: for details about sources see below the aggregated table which follows.

**Table 7.4: Raw data provided by the universities (following successful FOI requests)
Aggregated/group-level**

University	Years	Courses	Applications	Students
Bristol	2002-11	STN & GEM & EXT	18903	1411
Cardiff	2002-11	STN & EXT	12014	2200
Dundee	2005-11	STN & EXT (accepted only)	0	1004
Leicester	2002-11	STN & GEM	17631	2104
Manchester	2006-12	STN & EXT	16751	4470
Newcastle	2002-11	STN & GEM	32049	2561
Nottingham	2003-11	STN & GEM (applications only)	30860	0
Queen Mary	2002-11	STN & GEM	23038	3445
Sheffield	2007-11	STN & EXT	10846	1130
Total records (raw data)			162092	18325

Notes: Standard-entry undergraduate medical degree (STN), Graduate-entry undergraduate medical degree (GEM), Extended-entry undergraduate medical degree (EXT). King's College London also provided data relating to its Foundation degree in Natural Sciences (FNS) and its *Maxillofacial* (Maxfax) graduate-entry degree (MAX). Liverpool University also provided data for the Standard-entry undergraduate medical degree it validated at Lancaster University (UCAS course code A105) from 2006/07 to 2011/12. These were removed prior to the data analysis stage, as was any data relating to the 2012/13 academic year. Aggregated data is a summary of application and admissions data, which were provided by nine universities. Disaggregated data refers to individual-level data which nine different universities provided. The term student/s has been used throughout this research to refer to a medical school applicant who has been admitted/enrolled/accepted/registered/accepted an offer from a university. Several of the universities did not provide admitted or registered/enrolled data, which necessitated a compromise; hence the term student has been used to refer to the final stage in the applications process, although not every applicant who accepts the offer of a place at medical school will necessarily become a student, as some applicants do not obtain the required academic qualifications to meet the offer/entry requirements.

Using FOI requests to obtain data for this study was a time-consuming (if financially inexpensive) process. It included the writing, submitting, re-submission and monitoring of the progress of the requests. In addition, FOI staff at several universities required further clarification about the requested data, the timeframe, the exact purposes of the data, where it would be stored and the nature of the data that could be provided. Compromises were negotiated with FOI Officers, who acted as the gatekeepers of data (Blaikie 2010). In total thirty-five FOI requests were made to the eighteen universities on three separate occasions; beginning with Birmingham University (as a pilot); followed by seventeen further requests (which were all rejected); and a further seventeen, heavily revised requests, all of which were complied with in part or fully.

7.13.6 Data obtained from FOI requests

At the end the FOI request process, all eighteen universities had provided *some* form of quantitative and qualitative data, with the latter being converted to quantitative for data analyses. All the datasets provided by the universities contained some degree of missing data, which consisted of known or unknown *missingness* (Clifton-Sprigg et al 2020). In line with the Office for National Statistics (ONS) guidelines (ONS 2006) several universities had suppressed data in categories with less than five individuals (Bourne et al 2013). Where it was appropriate, imputation was used to add a value to this missing data (Winglee et al 2001; Graham 2009; Tiffin et al 2014). From the receipt of the FOI requests, this was *unobstructive research* devoid of any human actors (Turner 2001; Walby and Luscombe 2019).

7.14 Three independent variables used in this study

Prior to the FOI requests being made, a principal and supplementary research questions were devised which used three measurements of socio-economic status (SES) to assess the impact the two non-standard undergraduate medical degrees (extended-entry and graduate-entry) had on widening access, in comparison to the standard-entry undergraduate medical degree. The three variables are:

1. National Statistics Socio-economic Classification (NS-SEC);
2. Participation of Local Areas (POLAR);
3. Last institution attended (school type).

These were chosen because they have been used extensively by organisations, governments and academic researchers to measure applications and admissions to universities and/or medical schools by individuals from under-represented groups, acting as a proxy for measuring socio-economic disadvantage (Shiner and Modood 2002; Tonks and Farr 2003; Mathers et al 2006; Chowdry et al 2008; Mathers et al 2010; Boliver 2013; Croxford and Raffe 2014; Mathers et al 2016; Garrud and McManus 2018; Mahlangu 2019; Curtis and Smith 2020; Jerrim 2021). The variables were used to better understand how undergraduate medical degree applicants and students, differed between the three types of undergraduate medical degrees (standard-entry, graduate-entry and extended-entry) and to measure trends over the decade of the research (2002-11).

7.15 National Statistics Socio-economic Classification (NS-SEC)

UCAS began using an adapted version of NS-SEC in 2002 (Niven et al 2019). The schema was devised by John Goldthorpe in the 1990s (Goldthorpe 1997) and introduced by the Office for National Statistics (ONS) in 2001, in time for the decennial UK census in the same year; it replaced the Registrar General's social class schema which had been used since 1921 (Brewer 1986; Goldthorpe 2001; Johnson 2011). The two schemas are not directly comparable (Dangerfield et al 2004) because the Registrar General classification examines the social standing of an occupation (Roberts 2020) whereas the Goldthorpe Model (NS-SEC) examines the job characteristics and employment relations of occupations, allocating a number from 1-8 (Williams 2017). For the ONS, NS-SEC 8 includes the unemployed and students but understandably, UCAS omits students from its NS-SEC8 category (Johnson 2011). The full UCAS NS-SEC schema is shown below, with examples of typical occupations in each category:

Table 7.5: UCAS NS-SEC schema

Category	Description	Occupational examples
NS-SEC1	Higher managerial and professional occupations	Doctors, architects, university lecturers
NS-SEC2	Lower managerial and professional occupations	School teachers, nurses, social workers
NS-SEC3	Intermediate occupations	Medical or dental technicians, travel agents
NS-SEC4	Small employers and own account workers	Shopkeepers, farmers, taxi-drivers
NS-SEC5	Lower supervisory and technical occupations	Bakers, plumbers, electricians
NS-SEC6	Semi-routine occupations	Traffic wardens, scaffolders, vet nurses
NS-SEC7	Routine occupations	Florists, bus drivers, bar staff
NS-SEC8	Never worked and long term unemployed	Unemployed

Source: Galobardes et al (2006); Johnson (2011); Steven et al (2016)

Notes: in official UCAS and HESA statistics, and higher education research, individuals from NS-SEC1-3 (particularly NS-SEC1-2) are considered the most socio-economically advantaged or from a middle-class background with those in NS-SEC4-7 considered to be from a lower socio-economic or working-class background (Kelly and Cook 2007; Bathmaker et al 2011; Raven et al 2012; Moore et al 2013; Rees et al 2015; Steven et al 2016; Baker 2019; Niven et al 2019). This study has followed the precedent of the previous published research with NS-SEC1-3 forming one category of SES and NS-SEC4-7 another category, with NS-SEC 8 excluded because <1% of applicants at the 18 universities came from this SES background.

In this study, NS-SEC originated as a categorical variable, but where possible it was converted to a binary variable for additional analyses. For the decade of this study (2002-11) NS-SEC was *the* measure of an individual's socio-economic status (SES) used by UCAS. NS-SEC continued to be used by UCAS to monitor the socio-economic status (SES) of applicants to university until 2017, when it was discontinued, due to increasing amounts of missing data, but it continues to be used by HESA in relation to registered/enrolled students (Best 2019).

UCAS replaced NS-SEC with a more complex measure of disadvantage; the *Multiple Equality Measure*, which combines details about gender, ethnicity, geo-demographic location, income background, entitlement to Free School Meals (eFSM), type of secondary school attended and Indices of Multiple Deprivation (IMD) to provide a more rounded measure of socio-economic disadvantage (Sundorph et al 2017; Connell-Smith and Hubble 2018; Garrud 2018; Best 2019; Farhan and Heselwood 2019; Paterson et al 2019; Mountford-Zimdars and

Moore 2020; Bell and Burns 2021; Jerrim 2021; Boliver and Powell 2021), although HESA continues to use NS-SEC to monitor admissions to universities (Nathwani et al 2021).

7.15.1 NS-SEC and Standard Occupational Classification (SOC)

Each occupation within the NS-SEC schema is allocated a five-digit *Standard Occupational Classification* (SOC) code, for example, 32120 refers to midwives and 54320 to bakers (Davies et al 2003). In this research, the SOC codes were provided by a single university (Keele), meaning it was possible to ascertain how many children of doctors (and other occupations) applied and were selected to study medicine at that university. Although only one university provided this data, it has been included in this research, as coming from a medical family is known to be a factor in admission to medical school in the UK and elsewhere (Lentz and Laband 1989; Chevalier 2002; Simmenroth-Nayda and Görlich 2015; Donnelly 2021).

7.15.2 Issues arising from the usage of NS-SEC in this research

7.15.3 Missing NS-SEC data

The major issue arising from the usage of NS-SEC in this study as an independent variable were the large volumes of missing data. This was caused because the question asking UCAS applicants about their parental or their own occupation/s was non-mandatory (Croxford and Raffe 2013). Young entrants (applicants aged twenty years and under) are asked to list their parental occupation, whereas mature students (those aged twenty-one years and over) are asked to provide details of their own occupation (Kelly and Cook 2007; Hamilton et al 2020; Hubble et al 2021).

In the course of the twenty-first century, increasing numbers of applicants chose to ignore the question relating to their own/parental SES background resulting in high levels of missing data (Hatt and Harrison 2009; Singleton 2015). It could also be *gamed* by applicants (Steven et al 2016) fearing university admissions staff were discriminating against wealthier students and those educated in the independent sector (Garner 2003; Smithers 2003; Clark

2012; Leach 2013; Barradale 2020; Around 25% of applicants did not provide any details about their NS-SEC (Thiele et al 2016).

7.15.4 NS-SEC 2008/09

Comparing NS-SEC before and after 2008/09 was another of the difficulties encountered using NS-SEC in this research. During this academic year, UCAS reworded the question relating to an applicant's NS-SEC; prior to and including 2007/08 and from 2009/10 this question read:

If you are under twenty-one, please give the occupation of your parent, step-parent or guardian who earns the most. If he or she is retired or unemployed, give their most recent occupation. If you are twenty-one or over, please give your own occupation (Irshad 2012).

For 2008/09 only:

If you are in full-time education, please state the occupation of the highest-earning family member of the household in which you live. If he or she is retired or unemployed, give their most recent occupation. If you are not in full-time education, please state just your own occupation (Irshad 2012).

The change in 2008/09 resulted in an increase in the amount of missing data and a rise in those classified as NS-SEC4-6, particularly NS-SEC6-7, along with a fall in those classified as NS-SEC1-2 (Bolton 2010). Comparability issues arose with the NS-SEC data before and after 2008/09, which means the figures can only be reliably compared for full-time young participants (18-20 year olds) because the change in the NS-SEC question had the greatest impact on mature students, those over the age of 21 years when their course began (DBIS 2010; Hubble and Bolton 2021).

From 2009/10, onwards UCAS's NS-SEC question also included a *prefer not to say option* (DBIS 2010) and around 25% of applicants choose not to complete this section of their online UCAS application form (Hatt and Harrison 2009; Thiele et al 2016).

7.15.5 NS-SEC conclusion

Unlike geo-demographic tools, such as Participation of Local Areas (POLAR) which measures local areas, NS-SEC is a more individualistic measure of SES as it is based on a single household (Harrison and McCaig 2015; Steven et al 2016; Farhan and Heselwood 2019; Bell and Burns 2021). Although UCAS ceased to use NS-SEC as a measure of socio-economic advantage (NS-SEC1-2 or 1-3) and disadvantage (NS-SEC4-7 or NS-SEC5-7) in 2017, due to high levels of *missingness* and the ability of university applicants to *game* their answer, it continues to be used by HESA and the Office for Students (OFS) as one measure to monitor the socio-economic background of students, particularly in relation to widening access initiatives (Galobardes et al 2006; Johnson 2011; Steven et al 2016; Nathwani et al 2021). Three recent studies of incoming medical students found between 72-88% or more of applicants, accepted offers and students came from the managerial and professional classes (NS-SEC1-2) (Kumwenda et al 2018; Curtis and Smith 2020).

7.16 Participation of Local Areas (POLAR)

7.16.1 POLAR introduction

POLAR was chosen as an independent variable for this research because since its introduction in 2005, it has been widely used by universities, UCAS, HESA and the Office for Fair Access/Office for Students (OFFA/OFS) to monitor higher education access, particularly by individuals from under-represented groups (Kelly and Cook 2007; Bagherli 2014; Martin 2018). Since this time there have been several iterations of POLAR; POLAR2 was used from 2008; POLAR3 followed in 2014; with the latest version [and final version] POLAR4 launching in 2017 (Harrison and McCaig 2015; Bell and Burns 2022). In March 2021, the OFS announced it would no longer be changing or updating the POLAR methodologies and there will be no POLAR5, but POLAR4 continue to be available on its website with existing and new postcodes added (OFS 2021).

The first two iterations of POLAR2-3 (POLAR1 was developmental only and was not available on general release) used *Census Area Statistic* (CAS) wards to assess how many individuals in a particular ward (geographic subdivision within a local authority area) had proceeded to higher education by the age of 18-19 years (Martin 2019). This is called the young participation rate (Bagherli 2014). CAS wards were replaced by *Middle Layer Super Output Areas* (MSOAs) for POLAR4, which are calculated by combining the latest decennial census returns [2001, 2011 and 2021] with local secondary data relating to annual school-leaver cohorts, Child Benefit data, university applications (UCAS) and university enrolments (HESA) (Bell and Burns 2021).

7.16.2 POLAR quintiles

The postcode of a university applicant is used by UCAS to determine their POLAR quintile (Q1-Q5); with Q1 indicating an individual is resident in an area where the higher education participation rates of 18-19 year olds is low; compared to quintile five (Q5) where it is at its highest (Martin 2019; HESA 2021; OFS 2021). Throughout this study POLAR2 was used as it was introduced in 2007 and not superseded until 2012 (Harrison and McCaig 2015). Where POLAR2 data were provided by the universities prior to 2007, it was applied retrospectively by staff at the individual universities in order to fulfil the FOI request.

7.16.3 Issues arising from the usage of POLAR

POLAR assumes a degree of homogeneity between geographic areas and individuals within each of the MSOAs used to calculate the quintiles (Bell and Burns 2021). This can lead to an ecological fallacy (Harrison and McCaig 2015; Williams 2017), whereby variations in environmental settings are erroneously interpreted as being variations amongst individuals in an area, even though geography may have little to do with the social problems in a given area (De Munck 2005; Rees et al 2007). POLAR is biased against some key demographic groups, such as individuals from a BAME background; 18-19 year old Londoners where a higher percentage of this age group proceed to higher education compared to the rest of the UK and there are fewer Low Participation Neighbourhoods (LPNs) than elsewhere in the country; along with individuals in remote and rural areas because POLAR is less accurate for

these areas than it is for urban areas due to MSOAs covering a wider area, whereby towns and villages with diverse socio-economic circumstances are artificially combined into a single area (Diamond et al 2018; Dorling 2019; Martin 2019; Mountford-Zimdars and Moore 2020; Bell and Burns 2021; Jerrim 2021; OFS 2021).

Individuals from low SES backgrounds who are not resident in LPNs (generally POLAR Q1 and Q2) can be over-looked making them ineligible to participate in outreach initiatives, widening participation/access schemes or be entitled to contextual admissions; with some advantaged students resident in LPNs being erroneously eligible for these opportunities (Harrison and Hatt 2010; Harrison and McCaig 2015; Bell and Burns 2021). 33% of young, full-time, first-degree higher education students in England are from NS-SEC 4-7 but only 11% are from LPNs, which has implications for widening access money from government and the allocation of student bursaries, which may not necessarily be going to those in greatest need (Whitty et al 2015; Dorling 2019).

POLARQ3 is the middle quintile but almost one-tenth of this categorisation consists of young White males who receive Free School Meals (which aside from individuals from a Gypsy, Roma or Traveller background) are the group least likely to proceed to higher education (Crawford and Greaves 2015; Harrison and Waller 2018; Best 2019; Brassington 2022; Rainford 2023). POLAR may not be *easily* comparable across the UK, as the home nations use different definitions of further and higher education (Steven et al 2016) and there are variations in the Indices of Multiple Deprivation (IMDs) used across the UK (McLennan et al 2011).

POLAR is most effective when combined with other measures of SES disadvantaged, such as secondary school attended, eFSM, NS-SEC, school type or IMD (Dorling 2019; Bell and Burns 2021). Which is why the OFS began experimental usage of *Tracking Under-representation by Area* (TUNDRA) in 2019; TUNDRA was refined in 2020 and 2021, replacing MSOAs with *Lower Layer Super Output Areas* (LSOAs), which are less aggregated than MSOAs and consist of fewer households (Bell and Burns 2021; Bolton 2021; Jerrim 2021).

7.16.4 POLAR conclusion

POLAR is one of a range of geo-demographic tools used to measure higher education participation (Harrison and McCaig 2015). It does not directly measure socio-economic status, but research shows there is a *degree* of overlap between low participation rates in higher education [POLARQ1-Q2] and the areas of most disadvantaged (Allen and Storan 2005; Martin 2019; Bell and Burns 2021) and an *association* with other measures of disadvantage in England, including NS-SEC and school achievement at Key Stage 4 [14-16 year olds] (Boliver et al 2017). There is some evidence that universities over-rely on POLAR as a proxy measure to identify socio-economically disadvantaged students (Harrison and McCaig 2015; Diamond et al 2018). The general advice appears to be that POLAR should *not* be used as the sole measure of disadvantage in university admissions, as the most disadvantaged are likely to lose out the most (Callender and Thompson 2018; Corver 2019; Bell and Burns 2022). Recent research shows around 40-50% of medical students come from POLARQ5, with around 4% coming from POLARQ1 (Dunne 2017; Curtis and Smith 2020).

7.17 Last institution attended (school type)

7.17.1 School type introduction

For UCAS, HESA and the purposes of academic and non-academic research, the term *last institution attended* (LIA) is widely used to monitor and measure access to universities (Conner et al 2001; Milburn 2009). It refers to the last educational establishment an applicant attended, and includes all types of state and independent schools; further education colleges; sixth form colleges and universities; for ease of understanding, previous studies have used the term *school type* (Britton et al 2016; Rainford 2017; Curtis and Smith 2020). This study has followed their precedent.

School type is highly relevant to university admissions as around 80% of home [UK] students are under the age of twenty-one years when they enter university (Bolton 2023) and the mean age of medical students is nineteen years [twenty-six years for those on GEM degrees] (Mathers et al 2011). The type school or college an individual attends does have a

bearing on the sort of university they apply to, and the subject/s they study at university and which type of university they apply to (Donnelly 2015; Dilnot and Boliver 2018; Prior and Leckie 2023).

Students from independent schools and selective state schools are *over-represented* at elite higher education institutions, such as the twenty-four Russell Group universities (Lehmann 2013; Wakeling and Savage 2015; Warikoo 2016; Sundorph et al 2017; Reay 2018; Farhan and Heselwood 2019; Hillyard et al 2020) but only 7% of the population are educated in independent schools, along with 5% in state grammar schools (Danechi 2020; Parkes et al 2022). Around 70% of *Oxbridge's* incoming undergraduates come from the state sector (including grammar schools) but only 18% of undergraduates at Cambridge University are educated in comprehensive schools (Stoyanova et al 2020; Abulafia 2022; Richardson 2022).

Overall between 70-75% of medical students are educated in the state sector; around 14% in academically selective state grammar schools (Ferguson et al 2012; Steven et al 2016; Niven et al 2019). In one study, 60% of STN students came from the state sector, compared to 93% of EXT students (Curtis and Smith 2020). However, EXT degrees have highly restrictive admissions criteria, which generally limit entry to students who have attended academically *under-performing*, non-selective state schools (Garlick and Brown 2008; Papachristodoulou 2010; Curtis and Smith 2020; Dueñas et al 2021; Garrud 2023).

7.17.2 Education systems and social inequality

Educational systems are central to the maintenance and reproduction of social inequalities (Bourdieu 1990). Several previous studies have identified the impact the type of school or college an individual attended can have on the qualifications they gain, their opportunities to progress to higher education, which type of university they attend, their subsequent career choices and professional trajectories (Lupton 2004; Waldfogel 2004; Green et al 2010; Bathmaker et al 2011; Dunne et al 2014; Friedman et al 2015; Smith et al 2015; Reeves et al

2017; Sundorph et al 2017; Kumwenda et al 2018; Mijs and Nieuwenhuis 2018; Sparrow 2018; Jerrim 2021; Boliver and Powell 2021).

Despite 7% of UK school children being educated in fee-paying schools and 18% of students over the age of sixteen years, individuals from these institutions dominate the elite universities and professions such as medicine, where between 50-61% of top doctors are educated outside the state sector; 22% attended state grammar schools and 16% studied at comprehensive schools (Ryle et al 2000; Milburn 2009; Zimdars 2010; Clegg 2011; Milburn 2012; Kirby 2016; Armstrong 2018; Garrud 2018; Montacute and Cullinane 2018; Mwandigha et al 2018; Ward 2018; Faragher 2019; Long 2019; Rimmer 2019; Richardson 2022; Askham 2021).

Medicine remains one of the most inaccessible professions for students from lower SES backgrounds (Munn 2017). Around 80% of applications to undergraduate medical degrees come from 20% of secondary schools; mainly grammar and independent schools; with over 50% of *accepted offers* given to students from these types of schools (Ferguson et al 2012; Tiffin et al 2014; Cleland et al 2015; Jones-Berry et al 2015; Steven et al 2016; Mwandigha et al 2018; Coyle et al 2020; MSC 2021). Despite a smaller percentage of students coming from comprehensive schools, research has shown that once at university or medical school, students from non-selective state schools tend to academically out-perform those from private schools (Henry 2013; Thiele et al 2016; Kumwenda et al 2017).

7.17.3 State school marker for monitoring widening participation

State school marker is one of HESA's eight published measures of widening participation, for the purposes of analyses the organisation sub-divides this marker between *privately-funded schools* and *state-funded school or college* (HESA 2021). Because the term *state-educated* also includes students at 232 selective state schools in England and Northern Ireland (Bolton 2013; Craig 2016; Mansfield 2019) in this study two separate analyses took place when assessing the data relating to school type:

- a) State-educated/non-state educated
- b) School types were further breakdown into nine categories:
 1. Academies (including grant maintained schools)
 2. Comprehensive schools (includes sixth form departments)
 3. Further education colleges (and technical colleges)
 4. Grammar schools (state-selective secondary schools)
 5. Higher education institutes (including universities)
 6. Independent schools (including fee-paying language schools)
 7. Other (careers and connexions service; and special schools)
 8. Sixth form colleges (standalone institutions only)
 9. UCAS (includes unknown and missing data)

This follows the examples used in previous research and publications about school types in relation to applications and access to higher education; along with undergraduate medical degrees (Steven et al 2016; Kumwenda et al 2018; Montacute and Cullinane 2018; Richardson 2020).

7.17.4 Mapping school types

The majority of children across the UK attend a comprehensive school; 88% of the 4,190 secondary schools in the country are comprehensives (Clark 2020). However, mapping secondary school types is problematic, especially in England where the education system has become increasingly messy, patchy and diverse (Courtney 2015), particularly since 2010, when the *Academies Act* accelerated the process of academisation and further diversified provision in England (Gillard 2018). Since 1999, education (and health) policy has been devolved to the home nations, which has resulted in a divergence of policies (Court 2004; Gallacher and Raffe 2012). The state secondary school systems in Scotland and Wales are fully comprehensive, with no selective schools, whereas England and Northern Ireland retain academically selective state-run grammar schools (Hitchens 2015; Craig 2016; Lewis 2016; Lampl and Milburn 2019; Henderson 2020).

7.17.5 Grant maintained schools and academies

Prior to 2010, there were few academy schools in England, and generally they were schools which had been identified by Office for Standards in Education, Children's Services and

Skills (OFSTED) as *failing*, and had been taken over by a charity or a trust (West and Wolfe 2018). Grant maintained (GM) schools operated (in England and Wales only) from 1988 to 1998; and in many ways GM schools prefigured academies because they were outside local authority control with headteachers determining their own admissions policy and funded directly by a central government grant (Walford 2000; Levinson et al 2002; West 2016). For ease of understanding throughout this research, grant maintained schools have been included in the *academy* category because these two school types share similar characteristics (Levinson et al 2002; Goodman and Burton 2012; Walford 2014)

Since 2010, the number of academies in England has increased from 55% of secondary schools in 2015; to 75% in 2019 (DfE 2015; Atkins et al 2019; Roberts and Danechi 2019). 85% of England's 163 selective state grammar schools are academies (Bolton 2015; Gee et al 2015). Also included under the umbrella term *academy* are university technical colleges (UTCs); studio schools (for ages 14-19 years only) along with free schools (Morris and Perry 2017; Mills et al 2019). Unfortunately, the use of the term *academy* in some of the datasets provided by the eighteen universities, had a deleterious impact on the findings, as it was not possible to identify a school's admissions policy by the term *academy* (where it was used in anonymous or group-level datasets).

7.17.6 Grammar schools

England has 163 selective state grammar schools, concentrated mainly in the south-east of England and educating around 25% of English secondary-aged students (Andrews et al 2016; Long et al 2018; Mansfield 2019). Northern Ireland retains sixty-nine grammar schools, mostly divided along sectarian lines; and educating 43% of secondary school children in the province (NI Direct 2021). Thirty-six of England's 152 local authorities have grammar schools, with some areas considered *highly selective* (such as Kent and Medway) and others (such as Birmingham and Warwickshire) being *partially selective* (Atkinson et al 2006; Jerrim and Sims 2019; Danechi 2020).

With entrance via a competitive academic examination (colloquially known as the 11+) the intake of grammar schools is more academic, socially and socio-economically exclusive than most state secondary schools; 97% of grammar school students achieved five GCSEs (A*-C grades) compared to 57% in all state-sector schools (Cribb et al 2013; Skipp et al 2013; Morris and Perry 2017; Gorard and Siddiqui 2018). More recently, 93% of grammar school students obtained a 9-5 pass in GCSE in English and Mathematics, compared to 44% at all state-funded secondary schools in England [equivalent to an A*-C grade] (Danechi 2020).

English grammar schools have much lower numbers of students entitled to Free School Meals (eFSM); 2.5% of students at grammar schools are eFSM, compared to 14% in all secondary schools (Cullinane 2016). Around 13% of grammar school students were educated in primary or preparatory schools outside the state sector and a higher proportion than other state secondary schools travel to school from outside the local authority area in which their school is based (Cribb et al 2013).

Grammar schools are more likely than other state secondary schools to be single-sex and be academies; around 74% of England's grammar schools are convertor academies and 82% have been rated *outstanding* by the Office for Standards in Education (OFSTED), compared to just over 20% of non-selective state schools (Bolton 2013; Carmichael et al 2017). Although grammar schools do have a higher proportion of BAME students than other secondary schools, particularly those from British-Asian and British-Chinese backgrounds (Cribb et al 2013).

7.17.7 Sixth form colleges and further education colleges

There are sixty-two, standalone sixth-form colleges (SFC) and 163 general further education (FE) colleges in England (AOC 2018; AOC 2021; GIAS 2021); 47% of 16-18 year olds in full-time education can be found in school sixth forms or standalone sixth-form colleges (Lisauskaite et al 2021). FE colleges tend to provide vocational, rather than academic courses such as A Levels; and are often located in deprived areas, attracting students with lower academic attainment levels and with higher levels of socio-economic disadvantage

than average (Smith et al 2015; Aucejo et al 2020; Tuckett et al 2021; Raven 2022). 67% of 16-18 year olds in SFCs proceed to higher education, compared to 12% of FE college students, with the latter group predominantly found in the less-selective (post-92) universities; with 19% of sixth-form students proceeding to the most selective universities (Conner et al 2004; Gartland and Smith 2015; Montacute and Cullinane 2018; Rainford 2023).

Although they apply in fewer numbers, FE students are the group least likely to receive an accepted offer from a Russell Group university, compared to those in any other education establishments (Montacute and Cullinane 2018). Only 7% of applications to undergraduate medical degrees come from students educated in FE colleges, despite 25-30 colleges running one-year *Access to Medicine* courses (Holmes 2002; Niven et al 2019; QQA 2021; Garrud 2021).

7.17.8 Higher education

Although not one of HESA's *performance indicators* for measuring widening participation (HESA 2021), higher education has been included as a separate category in this research, because all fifteen of the graduate-entry undergraduate medical degrees (GEM) require an applicant to have at least a 2:1 in their first degree or significant medical work experience with a recognised professional qualification (Garrud 2023). Around 800 graduates enter GEM degrees per annum, with a much smaller number of graduates joining the standard-entry (STN) undergraduate medical degrees (Garrud and McManus 2018).

7.17.9 Independent schools

Individuals who attended these schools play a prominent role in British society, and are found in disproportionate numbers in the upper tiers of society; around 75% of Britain's prime ministers [1721-2023] were educated at *Oxbridge*; with twenty alone being educated at one school, Eton College [independent-boarding only boys school with average fees of £46,000 per annum in 2023/24] (Nelson 2016; Roberts 2021; Oxford University 2022; Lampl 2022; Fitzgerald and Butcher 2023). Recent research has revealed 71% of senior

judges; 53% of senior diplomats; 43% of newspaper columnists; 33% of Members of Parliament; and 51% of the most influential doctors in the profession attended fee-paying schools, compared to around 7% of the UK population; although this increases to 18% for students between the ages of 16-18 years (Milburn 2009; Green et al 2010; Hensher 2012; Milburn 2012; Jones-Berry et al 2015; Andrews et al 2016; Boliver 2016; Steven et al 2016; Montacute and Cullinane 2018; Heselwood 2019; Lampl and Milburn 2019; Mansfield 2019; Boliver and Powell 2021). Like state grammar schools, independent schools are heavily concentrated in the south east of England (Long 2019; Parkes et al 2022).

Students educated in independent schools disproportionately attend elite universities, such as *Oxbridge*, and the remaining twenty-two Russell Group universities; overall students who attended fee-paying schools comprise around one-quarter of applications to undergraduate medical degrees (Ferguson et al 2012; Piatt and Eastwood 2015; Boliver and Wakeling 2016; Steven et al 2016; Monacute and Cullinane 2018; Richardson 2020; McGrath and Rogers 2021). They appear to be better qualified and better prepared for university admissions than their state-educated peers (Gorard 2008; Hoare and Johnston 2011; O'Leary and Kendall 2011; Dunne et al 2014; Donnelly 2015; Wright 2015; Jones 2016; Wyness 2017; Sosu et al 2018; Vidal-Rodeiro 2019; Boliver and Powell 2021). Although once at university or medical school, students from private schools tend to be out-performed academically by those educated in non-selective state schools even when allowing for their higher grades on entry (Henry 2013; Thiele et al 2016; Kumwenda et al 2018).

7.17.10 Other and UCAS

In this research these comprise two separate categories; with *other* consisting of non-school establishments, including the careers and connexions service; special schools, such as the Royal National Institute for Blind People (RNIB) schools; Pupil Referral Units (PRUs); and prisons. In the *UCAS category* are applicants for whom the data specified *apply online* and no *school type* details were provided by the university. Also placed into the *UCAS category* are missing data, as all applications for admissions to undergraduate degrees and sub-degree

courses from UK-based applicants are submitted via UCAS (Edgar 2023). In previous research, *school type* data were *missing/unknown* for around 26% of applicants to medical school and 19% of accepted applicants (Thiele et al 2016) but this varies between 4% of EXT degree students and 14% of STN degree students (Curtis and Smith 2020). As students entering GEM degrees do so after completing an undergraduate degree, *school type* data is more difficult to ascertain for these students (Haldane et al 2012; Garrud and McManus 2018; Olivarius-McAllister et al 2021). Of the seventeen UK medical schools running GEM degrees in 2024/25, just under 50% require A Levels for entry (Garrud 2023).

7.17.11 School type (raw data)

The raw data provided by the 18 universities included the following *last institution attended* [school type] categories:

Table 7.6: School type (categories of raw data provided by 18 universities)

No	School/college type	UCAS code	Code used in this study
1	Academy	State	Academy (1)
2	Adult college and centre	State	Further education (3)
3	Agricultural college	State	Further education (3)
4	Agricultural and horticulture college	State	Further education (3)
5	Art design and performing arts college	State	Further education (3)
6	Blank	Other	UCAS (9)
7	Careers and connexions service	State	Other (7)
8	City technology college	State	Further education (3)
9	Comprehensive school	State	Comprehensive (2)
10	Further education college	State	Further education (3)
11	Grammar school	State	Grammar (4)
12	Grant maintained (formerly independent)	State	Academy (1)
13	Grant maintained secondary (state)	State	Academy (1)
14	Grant maintained special school	State	Academy (1)
15	Higher education	State	Higher education (5)
16	Independent school	Independent	Independent (6)
17	International school	Other	Other (7)
18	Language school	Other	Other (7)
19	Not applicable	State	UCAS (9)
20	Other	Other	Other (7)
21	Other maintained	Other	Other (7)
22	Other secondary school	Other	Other (7)
23	Other UK institution	Other	Other (7)
24	Overseas school	Other	Other (7)
25	Prison service	Other	Other (7)
26	Scottish schools	Other	Other (7)
27	Sixth form centre	State	Sixth form (8)
28	Sixth form college	State	Sixth form (8)
29	Special school	State	Other (7)
30	Technical college	State	Further education (3)
31	Tertiary college	State	Further education (3)
32	Unknown	Other	UCAS (9)
33	Welsh schools	Other	UCAS (9)

Notes: Scottish and Welsh schools term was used only by Dundee and Sheffield universities. In this instance international refers to Britons educated abroad, for example at Sha Tin College, Hong Kong. Grant Maintained schools were reclassified as academies. Where possible, sixth form centres have been reclassified according to the entry requirements of the school or college where they are based. For example a sixth form centre at a grammar school has been re-categorised as a grammar school. Sixth form colleges are standalone state colleges which are not attached to a secondary school, such as the Sixth Form College, Farnborough. Sixth form colleges in the independent sector, such as Cardiff Sixth Form College have been included in the independent schools category. Changing the allocated categories for schools and colleges was only possible where the university provided the name of an educational institution, and this could be cross-referenced with Edubase/Get Information About Schools Service (GIAS).

7.17.12 School type conclusion

Multiple studies have explored the impact the school an individual attends can have on their self-belief, motivations to study, academic progress, teacher expectations, the nature of

extent of support they receive during the university applications process; and whether they and others view themselves as university material or future doctor material; this is of particular relevance to disadvantaged students who can lack peer or familial or even teacher support throughout their school years (Greenhalgh et al 2004; Powis et al 2007; Mathers and Parry 2009; Reay et al 2009; Hoare and Johnston 2011; Boliver 2013; Jones-Berry et al 2015; Franceschelli et al 2016; Gayne 2016; McCowan 2016; Steven et al 2016; Thiele et al 2016; Vignoles and Murray 2016; Reay 2017; Sparrow 2018; Farhan and Heselwood 2019; Niven et al 2019). To counter the impact an individual's scholastic and/or their socio-economic background has had on their academic potential, at the beginning of the twenty-first century, EXT and GEM degrees were launched, to provide an alternative route to undergraduate medical studies, for those who would not be eligible for entry to an STN degree due to their A Level results (EXT degree) and those who were unable to chose to study medicine immediately after school/college (GEM degree) (Daly 2004; James et al 2008; Garrud 2011; Garrud and McManus 2018; Olivarius-McAllister et al 2021).

7.18 Sampling

7.18.1 Non-random sample

The data obtained for this study represents a non-random or non-probability sample (Blaikie 2010) of the eighteen universities which ran two or more types of undergraduate medical degrees during the period 2002-11. It therefore represents a whole population of all the university-based medical schools which ran two or more types of undergraduate medical degree during the ten-year timeframe of this research. This sampling framework was chosen in order to facilitate comparisons between individuals and groups applying and selected for admission to the two types of non-standard undergraduate medical degrees (EXT and GEM) and the standard-entry undergraduate medical degree (STN) over a decade. This non-random sample represents a sub-set or sub-population of applications and admissions to the thirty-one medical schools which ran undergraduate medical degrees during the period of this research (Petty-Saphon 2008; Wilson 2014).

7.18.2 Sub-population and sub-group

The term *sub-population* describes a specific group of individuals with a common characteristic, such as age, ethnicity or gender; whereas a sub-group describes the analysis of a subset of participants, such as individuals with *specific* characteristics (Whitlock et al 2017). In this study the sub-group being studied is those UK/home individuals who applied for admission to an undergraduate medical degree; which comprise a smaller cohort of the *whole* population comprising all individuals who applied to study at university (2002-11). Within this sub-group of undergraduate medical applicants and students are a smaller subset comprising those who applied and were admitted to the EXT or GEM or STN undergraduate medical degrees. Within each of the three different types of undergraduate medical degrees (EXT, GEM and STN) sub-populations, consisting of individuals with common characteristics (NS-SEC, school type and POLAR) have been explored in greater detail.

This research concentrates on the eighteen universities which ran two or more types of undergraduate medical degrees (2002-11). These represent a sub-population of all of the medical schools in the UK, some of which did not run undergraduate medical degrees or only run one type of undergraduate medical degree during this decade, for example Warwick and Swansea universities only ran GEM courses (Carter and Peile 2007; Petty-Saphon et al 2008; Griffith 2014; Garrud 2023). Since 2017, the number of individuals applying to study medicine has increased significantly but the number of places available (to home students) has remained at 9,500 per annum (apart from 2020 and 2021 when the number of places available was raised temporarily due to so many applicants obtaining their *offer* grades, following the use of teacher-assessed grades when examinations were cancelled during the pandemic). By 2021, applications to Medicine and Dentistry courses comprised 4% of total undergraduate applications (Torjensen 2016; Devlin 2020; Rimmer 2020; Haynes 2021; UCAS 2021).

Table 7.7: List of the universities and the raw data provided

University	Original years	Raw data (apps)	Courses	Data provided	Data format
Birmingham	2002-11	321537	SEM & GEM	Individual-level	Excel spreadsheet
Bristol	2006-12	18893	SEM & GEM & EXT	Aggregate	Pivot tables
Cambridge	2003-11	12205	SEM & EXT	Individual-level	Excel spreadsheet
Cardiff	2003-11	13518	SEM & EXT	Aggregate	Excel tables
Dundee	2005-11	1033	SEM & EXT	Aggregate	Excel tables
Imperial	2007-11	11149	SEM & GEM	Individual-level	Excel spreadsheet
Keele	2008-12	9310	SEM & GEM & EXT	Individual-level	Excel spreadsheet
King's College	2002-12	43748	SEM & GEM & EXT	Individual-level	Excel spreadsheet
Leicester	2002-11	17651	SEM & GEM	Aggregate	Excel spreadsheet
Liverpool	2000-11	22795	SEM & GEM	Individual-level	Excel spreadsheet
Manchester	2006-11	16751	SEM & EXT	Aggregate	PDF
Newcastle	2002-11	32049	SEM & GEM	Aggregate	Excel tables
Nottingham	2003-12	30860	SEM & GEM	Aggregate	Excel tables
Oxford	2003-12	9489	SEM & GEM	Individual-level	Excel spreadsheet
Queen Mary	2007-11	23038	SEM & GEM	Aggregate	Excel tables
Sheffield	2007-11	10907	SEM & EXT	Aggregate	Excel tables
Southampton	2005-11	24858	SEM & GEM & EXT	Individual-level	Excel spreadsheet
St George's	2008-11	8790	SEM & GEM	Individual-level	Excel spreadsheet
Total		628581			

Notes: Birmingham the total number is for applications to all undergraduate courses. Dundee includes data which has been imputed by the researcher. King's College includes data for five undergraduate medical degrees. Liverpool includes data for an undergraduate medical degree at Lancaster University, which was validated by former university. Nottingham the total number includes data which has been imputed by the researcher. Sheffield total number includes data which has been imputed by the researcher. Two courses at King's College (Foundation Studies in Natural Science and Medicine Maxfax Entry degree) were excluded from further analyses.

7.19 Aggregated and disaggregated data

Within the non-random sample of eighteen universities, two sub-sets each consisting of nine universities emerged with specific characteristics; the differentiator being the type and

nature of the data provided (Kadam and Bhalerao 2010). One dataset comprised anonymised individual-level or disaggregated data; with the other comprising group-level or aggregated data (Haneuse and Bartell 2011). The former group were analysed using SPSS, and the latter using Excel.

7.19.1 Aggregated dataset (nine universities)

Aggregated data is defined as group-level data, which is a summary of available data in which group rather than individual differences are identified (Fisher et al 2018). Many of the highest impact publications in medicine and the social sciences are based on aggregated datasets as these allow for large samples (Bergemann et al 2021). Within the education sector, aggregated datasets often comprise data which began life from individual students (Richter and Brorsen 2006). Organisations such as HESA and UCAS, compile aggregated data to provide publically available statistics from original primary data sources, without identifying any individual participants (Holland et al 2017). The aggregated data used in this study originated with individuals applying to study medicine, at nine universities: Bristol; Cardiff; Dundee; Leicester; Manchester; Newcastle; Nottingham, Queen Mary, London; and Sheffield. In total the number of applications from these datasets amounted to 140,305 records.

7.19.2 Disaggregated dataset (nine universities)

Disaggregated or individual-level data is defined as aggregated data which can be broken down into smaller parts to find underlying trends and patterns (Ritcher and Brorsen 2006). It is the opposite of aggregated or group-level data (Fisher et al 2018). Using this type of data enables researchers to study a sub-population or target population in greater granularity than aggregated datasets, allowing differential findings to be made (Galloway 2005; Cole 2010; Avendano et al 2018). The universities which provided this type of data were: Birmingham; Cambridge; Imperial College; Keele; King's College London; Liverpool; Oxford; Southampton and St George's London. This data was amalgamated to form a single dataset for each of the three different types of undergraduate medical degrees (EXT, GEM and STN) by transferring the data from Excel to SPSS. Comprising 149,790 individual-level

anonymous application records, this sample is large enough to avoid major sampling errors (Biau et al 2008; Nayak 2010).

7.20 Exclusions from the non-random sample

Inevitably, samples of secondary data will contain a degree of selection bias (Forster 2001; Rofsall et al 2006). This is especially true of the data used throughout this research, which was obtained following FOI requests to each of the eighteen universities that have been included. By choosing to examine applications and admissions at the eighteen medical schools which ran two or more types of undergraduate medical degrees (2002-11), data were not obtained from the remaining thirteen medical schools, which only ran one type of undergraduate medical degree during the same period (Petty-Saphon 2008). Most of the UK's medical schools are located in England (Garrud 2023); in this non-random sample only one Scottish medical school (Dundee) and one Welsh medical school (Cardiff) were included, with none from Northern Ireland. Also absent are universities, such as Swansea Warwick and Hull-York because they only ran one type of undergraduate medical degree during 2002-11 (Petty-Saphon 2008).

It *might* be the case that the medical schools, which ran and continue to run standalone STN or GEM courses and not both (there were and still are no universities which only run EXT degrees) attract a different type of applicant and students to those who ran two or more types of undergraduate medical degrees (Garrud 2023). Previous research suggests this is unlikely, as studies of applications and admission to STN, EXT and GEM degrees, show they share similar characteristics irrespective of where the degree runs; EXT degrees generally recruit more students from disadvantaged backgrounds than either the GEM or STN degrees (Mathers et al 2011; Ferguson et al 2012; Croxford and Raffe 2014; Niven et al 2019). There is some evidence to suggest that medical students who study at longer-established medical schools, such as Oxford (founded 1313); Edinburgh (1720) and Imperial (1834) come from more advantageous backgrounds than those at medical schools with more recent foundation dates, such as East Anglia (founded 2000); Hull York (2001) and Keele (2004); the same findings have also been uncovered at *older* and *newer* universities (Petty-Saphon 2008;

Bathmaker et al 2013; Crawford 2014; White 2019; McManus et al 2020; Bolton and Lewis 2023).

The implications for the generalisability of the findings in this study, following the use of a non-random sample are well-established, and it is acknowledged here that this could be *potentially* problematic (Gorard 2006; Tyrer and Heyman 2014) but the disaggregated datasets are large, consisting as they do of 149,790 individual-level anonymous application records, and is therefore large enough to avoid major sampling errors (Biau et al 2008; Nayak 2010).

7.21 Preparing the data for analyses

Prior to the datasets (aggregated and disaggregated) being analysed they had to be cleansed, with outliers removed, fields condensed, categories amalgamated/separated and extensive recoding, for example where possible categorical, alpha and alpha-numerical data were converted to numerical codes, and new binary numerical categories were also created, such as state school/independent school. The aggregated datasets were then converted to Excel and analysed using Excel. The disaggregated datasets were merged together from Excel spreadsheets and migrated from Excel to SPSS for analyses. Three distinct datasets were created for each of the different of undergraduate medical degrees (STN, GEM and EXT).

7.21.1 Removal of outliers

Outliers have been removed because they have the potential to skew the data analyses, particularly when using collinearity and regression modelling (Dormann et al 2012) and their inclusion can have a negative impact on the research findings (Hoare and Aitchison 2009 ; Creswell 2014). The sections below explain the removal of outliers in specific detail.

7.21.2 Academic years

Several of the universities provided data which was outside the range of this study and these were not included in this research, as guided by previous research (Gorard 2003). Where data were provided prior to the 2002/03 academic year and after the 2011/12 academic,

they were removed prior to analyses taking place. In this study the term *year* refers to the academic year an applicant commenced their undergraduate medical degree, and *not* the academic year they applied, for example 2002/03 becomes 2002. Several universities, including Liverpool and Oxford, provided raw data which gave details of both the academic year in which an individual applied to study medicine and the year in which they commenced their studies, where both categories of data were provided the year of entry has been used to provide a commonality with other universities.

7.21.3 Other undergraduate medical degrees

Several universities provided course data that had not been requested, such as the Natural Sciences Foundation [one-year] course and the four-year graduate-entry Medicine Maxfax Entry Programme at King's College London, and the standard-entry medical degree (course code A105) which ran at Lancaster University and was validated by Liverpool University (2006-11). The raw data (n=321,537) from Birmingham University comprised all applications and admissions to 639 different undergraduate degrees (2002-11), extracting data relating to the STN and GEM degrees resulted in the creation of two smaller datasets of 16,148 disaggregated application records for the STN degree and 4,843 for the GEM degree.

7.21.4 Age ranges

Where possible applications from individuals aged ≤ 16 years and those > 50 years old have been excluded from the sample. The former age range was excluded because NHS Trusts are unable to accommodate students under the age of 18 years on medical placements within hospitals and other healthcare settings (MSC 2021). Therefore, medical students are expected to reach the age of 18 years by the beginning of November in the first year of their studies, in order to be old enough to undertake the clinical-training (Cambridge University 2023). Generally, in the non-random sample of data used in this research, the youngest age of admittance to STN and EXT degrees is 17 years of age. Although a solitary 16 year old applicant to a single STN degree has been included because they were admitted. For GEM degree applicants, those < 20 years were also excluded from the datasets, as these degrees are intended for graduates only, who may already have a degree or will have obtained a

degree by the time they enter the GEM degree or those with significant professional experience and professional qualifications (Garrud 2023). Eliminating under-age applicants from the samples used for statistical analyses in this research resulted in a reduction in the sample size of approximately 1.9%.

Although there is no upper age limit to studying medicine in the UK, the lengthy post-degree training period; two years foundation training programme (F1 and F2), followed by between 3-8 years or longer for speciality medical training (NHS Health Careers 2020) appears to deter students older than their forties. In the non-random sample used in this research, the oldest student to be admitted was a 50 year old (to a GEM degree). The oldest age of enrolment at other universities varied from 35 years (Cambridge) and 46 years (King's College). Previous studies show the mean age of GEM students is 25-26 years; compared to 21 years for EXT degrees; and 19-20 years for STN degrees, although this varies between medical schools, with long-established medical schools recruiting much younger students than newer medical schools (Mathers et al 2011; Garrud and McManus 2018). Eliminating *over-age* applicants from the dataset used for analyses resulted in a reduction in the sample size of approximately 0.3%.

7.21.5 Numerical coding

Several universities used a numerical code to indicate the number of individuals who applied or were admitted to each undergraduate medical degree. Leicester University grouped together applicants with the same characteristics, which resulted in the dataset comprising part aggregated and part disaggregated data. This was resolved by placing Leicester in the aggregated dataset for analyses. Several universities used a binary code during the application process, for example indicating a '1' or '0' in each separate column where an application had been rejected, withdrawn, insurance choice not take up, offer declined or accepted. Where these were used the binary code was converted to text and recoded according to the schema for this research (0=not selected and 1=selected).

7.21.6 Home postcode and area

Only two universities (Birmingham and King's College London) provided some postcode information which could be used in the non-random samples of this research. An applicant's home postcode area was identified using the first two digits of their postcode via the *look-up* feature on the Royal Mail website (<https://www.royalmail.com/>). For example, postcode *CV* refers to addresses in Coventry and Warwickshire, with *S* relating to Sheffield. In the datasets provided it is not apparent whether the postcode provided refers to an applicant's term-time address or their familial home; in accordance with previous studies utilising an applicant's home postcode to identify educational and/or socio-economic disadvantages, it has been assumed the postcode provided is their home address (Singleton 2010; Irshad 2012; Theile 2015; Holland et al 2017). The use a postcode to identify an applicant's term-time/home-time address has more relevance to GEM applicants, some of whom apply for admission to the GEM degree in the final year of their undergraduate studies (Garrud 2023).

7.21.7 Ethnicity

Although ethnicity is not one of the independent variables used in this study, previous research has established a significant intersectionality between ethnicity and socio-economic background in the UK (Bhopal and Preston 2012; Strand 2014). In this study the original twenty-six ethnic categories used for UK/home applicants by UCAS and individual universities which provided data have been condensed into five:

Table 7.8: New coding for ethnicity categories (UK/home applicants only)

No	Description	Includes
11	Asian	Bangladeshi; Chinese; Indian; Other; Pakistani
22	Black	African/Caribbean/Other
33	Mixed and Other	White/Black African; White/Black Caribbean; White/Asian; Other Mixed Background; Other Ethnic Background
44	Unknown	Unknown; missing; unavailable; not given; information refused
55	White	White British/Irish/Scottish/Welsh; Other; Gypsy; Roma; Traveller

The five new ethnic categories are used throughout this study to illustrate the impact socio-economic and educational disadvantages have in respect of applications and admissions to the three different types of undergraduate medical degrees. Previous studies have shown that the majority of medical students are White British, but certain ethnic groups, such as British Black Africans, British Indians and British Chinese are *over-represented* on undergraduate medical degrees when compared with the percentage they comprise in the general population (Mathers et al 2011; Ferguson et al 2012; Garrud and McManus 2018; Niven et al 2019). BAME students are especially prevalent on EXT degrees; comprising 91% of EXT students at King's College London, compared to 50% of STN students (Garlick and Brown 2008) and at (Norwich, King's College and Southampton) BAME students account for 65% of EXT students and 42% of STN students (Curtis and Smith 2020). Certain British ethnic groups remain *underrepresented* at university and on undergraduate medical degrees, such as White working-class boys and girls, Black Caribbean boys, and Gypsy, Roma and Travellers boys and girls (Halfron et al 2021; Brassington 2022; Madriaga 2022).

7.21.8 A Level grades

Advanced Levels (A Levels) were introduced in 1951, grades A to E were first used in 1965, and the A* grade was added in 2010 (Smithers 2014) to permit greater discrimination of applicants at the upper range of ability, which is particularly pertinent for medical school admissions staff (Tiffin et al 2014). Admission to a UK medical school has always been competitive; in 1985, 28% of undergraduate medical students achieved A Level grades of AAA and by 1993 this had increased to 33% (Arulampalam et al 2002). Ten years later (2003-05), 45% of applicants and 62% of those admitted to undergraduate medical degrees gained AAA grades (McManus et al 2008). The majority of universities require at least AAA grades for admission to the STN degree in 2024/25 (although contextual offers are available for those from disadvantaged backgrounds) whereas EXT degrees require BBB grades (ranging from ABB to BBC grade) (Garrud 2023).

During the course of this research UCAS used several different tariff scoring systems to allocate a numerical value to A Level grades, which were re-coded as follows:

Table 7.9: A Level tariff table

A Level grades	UCAS tariff (previous)	UCAS tariff (current)	Recoded for this research
A*	140	56	12
A	120	48	10
B	100	40	8
C	80	32	6
D	60	24	4
E	40	16	2

Source: Tiffin et al (2014); UCAS (2020)

Only two universities (Birmingham and King's College) provided details about A Level grades, where these were available they have been converted into a single score. For example ABC grades = 24 points (10+8+6). A* grades were only available for the last two years (2010 and 2011) of this research. Where data analyses have taken place of the A Level scores of applicants and selected applicants, the term ≥ 30 points has been used as this includes grades AAA (30 points) to A*A*A* (36 points) and enabled comparisons to be made throughout the decade of this research (2002-11).

7.21.9 Home students (UK only)

The submitted FOI requests to the eighteen universities included in the non-random sample used throughout this study, requested data about applications relating *home/UK* students only (to the exclusion of international applicants and students). Since 1993, international students have comprised only 7.5% of incoming undergraduate medical degrees (Brearley 1993; Li et al 2023).

When an individual applies for admission to an undergraduate degree they are asked to provide details of their permanent residence (UCAS 2020). Home student status is defined as:

those students who are eligible to pay home fees domicile data in the form of postcodes (UK, Guernsey, Jersey and the Isle of Man domiciled students) are mapped to counties, unitary authorities and UK nations using the Office for National Statistics Postcode Directory (HESA 2020).

The assumption in this study has been that the data provided relates to *home* students only, as the data about international applicants was not sought in the original FOI requests. However, an interrogation of the data provided by Liverpool University suggests a small number of international applicants who are ordinarily resident in the UK are therefore *likely* to have been included in the datasets provided by the remaining universities. The dataset provided by Liverpool University (2002-2011) revealed *home* applicants included 123 different nationalities (excluding British) although British nationals accounted for 81-82% of applicants and 93% of admitted students (to STN and GEM degrees). A summary of the findings has been presented here as this has implications for the aggregated and disaggregated datasets used in this research, and on the findings.

7.21.10 Applications, offers, accepted, admitted, registered and enrolled

During the period of this research (2002-11) applications received one of the following four communications from a university/medical school regarding their application (as per information received from Cardiff, Manchester and Sheffield universities, following FOI requests):

Conditional offer (C)	Applicant will have to meet certain criteria before being admitted
Unconditional offer (U)	Applicant has already met the admissions criteria
Rejected(R)	University has chosen not to make an offer to an applicant
Withdrawn (W)	Candidate has withdrawn their application or the course has been cancelled

Applicants who received a conditional or unconditional offer then chose one of the following four options:

Accept offer (A)	Applicant selects the offer a university has made to them (see C and U above)
Decline offer (D)	Applicant declines the offer that a university has made to them
Firm choice (F)	Applicant makes the university that offers them a place their number one choice
Insurance choice (I)	Applicant's second choice, in case they do not meet the criteria of their first choice

In the raw data provided by the 18 universities, there were 19 different statuses relating to the final stage of the applications process, including *accepted*, *accepted offer*, *admitted*,

enrolled, *firm offer* and *registered*. Each of these confers a slightly different status on an individual at a specific stage in the application process (Hayton and Paczuska 2003). Generally, an applicant will only be *accepted* onto a medical degree if they meet or have already met the admissions criteria specified by the university, this usually includes specific examinations results, relevant work experience or meeting certain widening participation characteristics (Garrud 2023).

In the data provided by Manchester University, *offer* is the final stage of the application process, whereas at Birmingham University it was *admitted*. Queen Mary University provided a unique (aggregated) dataset which included data for *accepted* and *enrolled* applicants. A detailed examination of this data revealed a discrepancy between the *accepted* and *enrolled* categories; with 20% of applicants to the STN degree being accepted and 16% enrolled; for the GEM degree the figures were 5% for *accepted* and *enrolled*. This has been included in this chapter in order to demonstrate the impact this is likely to have had on the results and the research findings.

As *offer*, *accepted*, *admitted* and *enrolled* have specific meanings in relations to undergraduate admissions (Hayton and Paczuska 2003) the decision was taken to use the term *student* to refer to the *final* stage of the application process at each of the 18 universities in this study. This decision was arrived at as it assisted with the analyses and the writing up of the research findings. The term *non-selected* was used to refer to applicants who had been *rejected* by university, had *withdrawn* their application, did not take up an *insurance choice* or *declined* an offer made by a university. This status was then recoded using a binary format: selected (1) and not-selected (0).

7.22 Data analyses

This section begins with a quick reminder of the research question and details about the three types of undergraduate medical degrees that are part of this study.

7.22.1 Research question

Did non-standard undergraduate medical degrees widen access at British medical schools (2002-2011)?

7.22.2 Supplementary research questions

1. How does the profile of applicants to the EXT, GEM and STN degrees differ between the degrees (using NS-SEC; POLAR; school type)? Has the existence of EXT and GEM degrees diversified the profile of applicants to undergraduate medical degrees? What changes can be discerned over the ten year timeframe of this research?
2. Over the ten year period of this study, has the profile of students admitted to the three different types of undergraduate medical degrees changed and in what ways has this change occurred?
3. Can EXT and GEM degrees be said to have consequently or irrefutably widened access to undergraduate medical degrees? Is the assertion that EXT and GEM degree have successfully widened access warranted or unwarranted?

7.22.3 Non-standard undergraduate medical degrees

Non-standard undergraduate medical degrees were introduced into the UK at the beginning of the twenty-first century; graduate-entry (GEM) degrees were launched in 2000 at St George's London and Warwick-Leicester Medical School at Warwick University (Haldane et al 2012) and the extended-entry (EXT) degree began at King's College London in 2001 (Garlick et al 2008). Both new degrees were designed to widen access to medical education, to attract a different type of student than those enrolled on the standard-entry (STN) degree and thereby reduce the social exclusivity of the medical profession (Milburn 2012; Jones-Berry et al 2015; Garrud and McManus 2018; Curtis and Smith 2020).

7.23 Data analysis

This section begins with a discussion about data cleansing the raw data provided by eighteen universities and the creation of two distinct datasets; one aggregated or group-level dataset (nine universities) and other a disaggregated individual-level dataset (nine

universities). The issue of missing data, how this was dealt with during the research, and the impact this has had on the research findings and their generalisability is also discussed.

7.23.1 Data cleansing

Data cleansing is a vital and significant part of the research methodology (Salkind 2010), and had to be undertaken before analyses could take place, especially for the individual-level dataset. It was undertaken to improve the quality of data by correcting inaccurate records (Allen 2017) in order to minimise the impact these had on the validity of the research findings (Van den Broeck et al 2005; Salkind 2010). Researchers have debated whether data cleansing is a subset of the data preparation stage or an entirely separate stage (Gorard 2003; Salkind 2010), irrespective of where it sits in the design stage process, data cleansing was an integral [and time consuming] element of this research.

7.23.2 Missing data

Most large public datasets have some element of missing data (Gorard 2010; Walani and Cleland 2015). Those used in prospective longitudinal education, psychology and epidemiology research almost invariably contain some form of missing data, due to participants dropping out of studies (Berchtold 2019; Madley-Dowd et al 2019; Gorard 2020). In retrospective longitudinal quantitative studies (as this is) participant attrition is less of an issue than it is in prospective studies, as the secondary data was collected annually, once new medical students had completed the enrolment process at their respective university medical school but missing categorical data was an issue in relation to certain variables, especially NS-SEC (Ployheart and Vandenberg 2010; Caruana et al 2015). All the eighteen of the raw datasets used in this study, did contain elements of missing data, which was examined prior to analyses to establish the nature, volume and likely impacts of the data being unavailable (Little and Rubin 1989).

7.23.3 Categories of missing data

Missing data can be one of three categories; *Missing Completely at Random* (MCAR), *Missing at Random* (MAR) or *Missing Not at Random* (MNAR), with each making an assumption

about the nature of the missingness; MCAR assumes the missing and observed data (in this case the data provided by the eighteen universities) have a similar distribution; MAR assumes there *might* be systematic differences between the missing and observed values; if the missing data are neither MAR or MCAR they are MNAR; data in this category are problematic because the distribution of the missingness depends on the observed and the unobserved values (Rubin 1976; Rubin 1996; Raykov 2011; Kang 2013; Bhaskaran and Smeeth 2014; Galimard et al 2018; Mack et al 2018; Madley-Dowd et al 2019). However, the practical meaning of MAR, MCAR and MNAR is elusive (Graham 2009), particularly in relation to the analysis of secondary data, where the researcher either did not design the original study or does not have access to the primary data (Wang et al 1992). There are three parameters of missing data; univariate, monotone or arbitrary; in the latter category the pattern of missingness can occur on any variable for any participant randomly (Dong and Peng 2013) as was the case in this research.

The missing data in this study is *likely* to be an item non-response; either because a university applicant omitted an answer to a question on their (UCAS) application form or their answer could not be allocated a categorical value by UCAS (Winglee et al 2001; Harrison and Hatt 2009; Berchtold 2019).

7.23.4 Acceptable levels of missingness

Missing data has the potential to introduce biases into the research and reduce statistical power, thereby impacting the research findings (Kang 2013). Although missing data rates of 15-20% are common in educational research (Enders 2010), there is no general agreement about acceptable levels of missing data; with some authors stating less than 5% is inconsequential (Schafer 1999; Madley-Dowd et al 2019) with anything above 10% likely to negatively bias the research findings (Bennett 2001). The levels of missingness in this research varies from 1-15% of data is missing on the each of the three key variables (NS-SEC, POLAR2 and school type); with the levels of missingness being greatest on the NS-SEC variable due to item-level missing data (Berchtold 2019).

7.23.5 Dealing with missing data

It is important to understand the reasons and mechanisms for the missing data before it can be effectively dealt with (Graham 2009; Catellier et al 2005; Gorard 2020). Missing data should be explicitly responded to (Berchtold 2019) and the researcher must have a common approach to dealing with it (Kang 2013). There are various ways of dealing with missing data in social science research; with many researchers ignoring it completely (Wang et al 1992) whilst others try to compensate for missing values through the use of statistical techniques. One of the most complex but widespread ways doing this is by using imputation (Little and Rubin 1989; Arteaga and Ferrer-Riquelme 2009), which takes many forms including single, multiple and average (Berchtold 2019). Imputation replaces missing values with estimated ones which enables cases to be included in data analyses, rather than being deleted as in *Complete Case Analysis* (Van Buuren 2007; Kang 2013) However, imputation can result in pseudo-complete datasets with the potential to introduce biases into the research findings (Catellier et al 2005)

Complete Case Analysis (CCA) is a widely used alternative to imputation, and is the default option in SPSS (Kang 2013). This is one of the most widely used techniques in social science research for dealing with missing data, as it removes cases where there are *any* missing data (Thiele et al 2016). CCA risks introducing biases into the sample (Gorard 2020). As an alternative to CCA, *Available Case Analysis* (ACA) can be used (Berchtold 2019). The latter strategy was used in this study, because using CCA would have reduced the sample size by around one-quarter. Although CCA was used with a small sample (c. 14,000 records), details of which can be found at the end of the research findings chapter.

7.23.6 NS-SEC missing data

The default values in this category of data were informed by the pre-existing codes used by UCAS for the assignment of missing data. Between 2001 and 2017, UCAS used an adapted version of the NS-SEC schema, with NS-SEC1-8 referring to the socio-economic status or background of the university applicant and an extra category NS-SEC 9 referring to data which was *blank*, *unknown*, *unclassified*, *unclassifiable* or *missing* (Erikson and Goldthorpe

1992; Hatt and Harrison 2009; Williams 2017). This policy was used throughout this study in relation to NS-SEC. The missing data for this independent variable varies from 65% (STN applicants) to 68% (GEM applicants) and 86% (EXT applicants). In 2017, NS-SEC ceased to be used by UCAS to monitor the socio-economic background of university applicants, due to the high volumes of missing data, but it continues to be used by HESA as one of its *performance indicators* for admissions to higher education (Nathwani et al 2021).

7.23.7 POLAR missing data

The data provided by the eighteen universities used the second iteration of POLAR which consisted of five quintiles (Q1-Q5) and is obtained from a university applicant's home postcode (HEFCE 2012). Far fewer cases were missing than for the other two output variables used in this research, and where were missing UCAS used the code '*' to indicate it. For the purposes of this research the UCAS code has been converted to '6' to allow analyses to take place. Of the three variables explored in this research, POLAR had the least amount of missing data; 6% (STN applicants); 2.0% (GEM applicants); 0.8% (EXT applicants).

7.23.8 School type missing data

Handling the missing data in this categorical variable was more problematic than NS-SEC and POLAR2. There was no pre-existing UCAS code for *school type* and the schools data (or more correctly *last institution attended*) provided was alphabetical (rather than numerical as was the case with NS-SEC and POLAR2). Instead an nine point schema was devised, with the missing data being incorporated into the final category '9' [UCAS and other] thereby treating it as an additional category (Gorard 2012). Missing school type data was greatest for GEM applicants (52.7%) as almost all of the applicants have a degree (Garrud 2022). 17.4% of school type data was missing for STN applicants, and 15% of EXT applicants.

7.24 Triangulation

The very notion of triangulation is positivistic (Silverman 1985). Throughout this study, the data obtained from universities was triangulated with applications and admissions data provided by Birmingham University, for all of its undergraduate degrees between 2002 and

2011, together with admissions (only) data provided by HESA for the 18 universities included in this research. Obtaining data from multiple sources boosts confidence in the research findings through triangulation and cross-referencing (Johnston 2014) and overcomes any potential problems using data from a single source, thereby improving validity and reliability (Miles and Huberman 1994).

7.24.1 Birmingham University dataset (2002-11)

The whole-population sample from Birmingham University, consisted of all of the university's (anonymised) applications to undergraduate degrees between 2002 and 2011. In its raw state this amounted to 321,537 individual applicant records, but this included for example, test data and dummy course titles. Removing these from the dataset reduced the number of individual records to 320,929 (which includes 20,944 applications to the two different types of undergraduate medical degrees). Using this dataset enabled the three independent variables (NS-SEC, POLAR2 and school type) to be explored in relation to applications and admissions to the two undergraduate medical degrees (GEM and STN) and the other (636) undergraduate degree courses at the same university. Because this dataset was so large the findings can be more readily generalised beyond this particular study (Bryman 1990; Cresswell 1994; Polit and Beck 2010; Ayeni et al 2019). Although it should be noted generalisations in the social sciences are always hazardous (Humphreys 2003). This dataset was used primarily for triangulation purposes, although comparisons have been made between STN, GEM and other undergraduate applications and accepted applicants at Birmingham.

7.24.2 Higher Education Statistics Agency (HESA) dataset (2002-11)

The HESA dataset amounted to 49,831 admitted (only) records. However, HESA employs a rounding methodology with 0-2 being rounded down to zero and all other numbers rounded to the nearest multiple of five, averages of ≤ 7 individuals are suppressed, as are percentages of < 22.5 individuals (Richardson 2020). Along with its rounding strategy from 2002 to 2019, HESA used *principle subject codes* to identify undergraduate academic subjects:

A = Medicine and Dentistry (Pigden and Garford-Moore 2019).

These courses were broken down further using a four-digit Joint Academic Coding System (JACS) to determine subject of a course:

A100 or A1 = Preclinical Medicine

A300 or A3 = Clinical Medicine (HESA 2012)

Although HESA used three different versions of JACS between 2002 and 2018, the *principle subject codes* remained the same for undergraduate medical studies throughout. However, JACS was superseded by Higher Education Classification of Subjects (HECoS) in 2019 (HESA 2022).

Attempts were made to breakdown these subject codes (A100 and A300) into the three types of undergraduate medical degree (EXT, GEM and STN). Although the HESA data did contain a field headed *course title*, correspondence with HESA confirmed it was not compulsory for university staff to include a course name when making statistical returns to HESA. The dataset did contain a diverse range of course titles, such as *BM5 Medicine*, *Graduate-entry Medicine*, *MBBS* and *Fast-track Medicine* which had been used interchangeably with the JACS codes A100 and A300 (Hobbs 2012).

It should also be noted that HESA's use of A100 is incompatible with UCAS's use of A100. The latter usage denotes a standard-entry undergraduate (STN) medical degree and the former indicate pre-clinical medical courses, which could be an undergraduate medical degree but could also refer to other medically-related undergraduate courses such as a *BSc Clinical Epidemiology* or *BA Medical Humanities*. Where possible the latter category of undergraduate degrees has been removed from the HESA dataset prior to analyses taking place.

Triangulating the admissions data from the 18 universities with the admissions data obtained from HESA was invaluable, to compare trends and patterns. Although the HESA dataset rarely concurred numerically with the aggregated or disaggregated datasets used in this study, similar patterns relating to admissions did emerge.

7.25 Data analysis scheme

Despite being such a valuable research tool, there is a lack of literature to define a specific process for secondary data analysis (Johnston 2014). For the purposes of this research, one has been adapted from a mixed-methods schema devised by John Hitchcock and Anthony Onwuegbuzie (Ross and Onwuegbuzie 2010; Onwuegbuzie et al 2011; Hitchcock and Onwuegbuzie 2020):

Level 1: Descriptive analyses

Mean, median and mode.

Used with 18 universities 9 of which provided aggregated data.

Level 2: Univariate analyses

Standard deviation, correlation, one way analysis of variance, covariance, regression and t-tests.

Used with 9 universities that provided individual-level data.

Level 3: Multivariate analyses

Multiple analysis of variance and co-variance.

Used with 9 universities that provided individual-level data.

7.25.1 Level one analysis (group-level data)

Using this lower level of analysis, it was possible to explore data from all eighteen of the universities involved in this study. For this basic level of data analysis all for the data provided by the universities was converted to group-level or aggregated data. This level of analyses has been used to track trends over the ten year period of this research (2002-11) at individual medical schools and between universities, to explore if the two new types of undergraduate medical degrees succeeded in widening access, using the three independent variables (NS-SEC, POLAR and school type). A full list of the universities including the undergraduate medical degrees they ran and the number of applications received is below:

Table 7.10: Full list of the 18 universities (level one analyses)

University	Raw data (level)	Dates	Degree type	Applications
Birmingham University	Disaggregated	2002-11	STN	16128
Birmingham University	Disaggregated	2002-11	GEM	4820
Bristol University	Aggregate	2006-11	STN	15072
Bristol University	Aggregate	2006-11	GEM	2684
Bristol University	Aggregate	2006-11	EXT	1137
Cambridge University	Disaggregated	2003-11	STN	9404
Cambridge University	Disaggregated	2003-11	GEM	1548
Cardiff University	Aggregate	2002-11	STN	12835
Cardiff University	Aggregate	2002-11	EXT	680
Dundee University (accepted only)	Aggregate	2005-11	STN	997
Dundee University (accepted only)	Aggregate	2005-11	EXT	36
Imperial College, London	Disaggregated	2007-11	STN	8557
Imperial College, London	Disaggregated	2007-11	GEM	2591
Keele University	Disaggregated	2008-11	STN	6050
Keele University	Disaggregated	2008-11	GEM	749
Keele University	Disaggregated	2008-11	EXT	491
King's College, London	Disaggregated	2002-11	STN	26043
King's College, London	Disaggregated	2002-11	GEM	9331
King's College, London	Disaggregated	2002-11	EXT	2407
Leicester University	Aggregate	2003-11	STN	13525
Leicester University	Aggregate	2002-10	GEM	3529
Liverpool University	Disaggregated	2002-11	STN	16899
Liverpool University	Disaggregated	2003-11	GEM	4191
Manchester University	Aggregate	2006-11	STN	13178
Manchester University	Aggregate	2006-11	EXT	1732
Newcastle University (combined)	Aggregate	2002-11	STN & GEM	32049
Nottingham University (applications only)	Aggregate	2003-11	STN	19878
Nottingham University (applications only)	Aggregate	2003-11	GEM	9233
Oxford University	Disaggregated	2006-11	STN	5627
Oxford University	Disaggregated	2006-11	GEM	1292
Queen Mary, London	Aggregate	2002-11	STN	15434
Queen Mary, London	Aggregate	2003-11	GEM	7604
Sheffield University	Aggregate	2007-11	STN	9876
Sheffield University	Aggregate	2007-11	EXT	980
Southampton University	Disaggregated	2005-11	STN	15404
Southampton University	Disaggregated	2005-11	GEM	7103
Southampton University	Disaggregated	2005-11	EXT	2351
St George's University	Disaggregated	2008-11	STN	4724
St George's University	Disaggregated	2008-11	GEM	4054

N= 310,223 applications

The nature of the data provided by nine of the 18 universities, means the first stage of data analyses consisted of simple data analyses and common descriptive statistics, such as deviations, frequencies, mean, median, mode (Gorard 2003; Hitchcock and Onwuegbuzie 2020), along with variability and frequency, which generated summaries about samples and measurements (Neo 2020).

Where appropriate mean substitution was used where there were smaller amounts of missing data (Wang et al 1992; Kang 2013; Berchtold 2019). For example, where undergraduate medical degrees admitted very few applicants, such as the EXT degrees at Cardiff, Dundee and Sheffield, the raw data from the universities indicated <5 applicants mean substitution was used in order that findings relating to all 18 universities could be included. It was not possible to explore causal relationships between the variables using the aggregated dataset (Kapur 2017) but these were undertaken with the individual-level dataset consisting of nine universities. Univariate analyses (level one) were possible for all 18 universities, but bivariate, multivariate analyses and variance (levels two and three) were only possible where individual-level data had been provided by nine universities (Hitchcock and Onwuegbuzie 2020).

7.25.3 Level two to three analyses (individual-level data)

Data from the nine remaining universities was cleansed, and merged to form one dataset, to allow for higher levels of data analyses to take place in SPSS. A summary of the data fields is shown below:

Table 7.11: Dataset transferred to SPSS for levels two and three analyses

Fields	Birmingham	Cambridge	Imperial	Keele	King's College	Liverpool	Oxford	Southampton	St George's	Notes/categories
Year	✓	✓	✓	✓	✓	✓	✓	✓	✓	2002-11
Gender	✓	✓	✓	✓	✗	✓	✓	✓	✓	Male/female/blank
Age	✓	✓	✗	✓	✓	✗	✓	✓	✓	17-50 years
Home postcode (partial)	✓	✗	✗	✗	✗	✗	✗	✗	✓	e.g. CV34
Home postcode area	✓	✗	✗	✗	✗	✗	✗	✗	✓	e.g. Coventry
POLAR	✓	✓	✗	✓	✓	✓	✓	✓	✓	Quintiles 1-5
Socio-economic description	✓	✓	✓	✓	✓	✗	✓	✓	✓	NS-SEC description
Socio-economic code	✓	✓	✓	✓	✓	✗	✓	✓	✓	NS-SEC 1-9
Ethnicity description (British only)	✓	✓	✓	✓	✓	✓	✓	✓	✓	e.g. Asian Indian
Ethnicity code	✓	✓	✓	✓	✓	✓	✓	✓	✓	11-55
Course title	✓	✓	✓	✓	✓	✓	✓	✓	✓	EXT/GEM/STN
Course code	✓	✓	✓	✓	✓	✓	✓	✓	✓	A100/A101/A102
Qualifications	✓	✗	✗	✓	✓	✗	✗	✗	✗	e.g. A Levels/BTEC
A Level grades	✓	✗	✗	✓	✓	✗	✗	✗	✗	A* to E
A Level scores	✓	✗	✗	✓	✓	✗	✗	✗	✗	e.g. 2-12 points
Last institution name	✓	✗	✗	✗	✓	✗	✗	✗	✗	School/college
Last institution postcode (partial)	✓	✗	✗	✗	✓	✗	✗	✗	✗	e.g. CF17
Last institution postcode area	✓	✗	✗	✗	✓	✗	✗	✗	✗	e.g. Cardiff
Last institution type	✓	✓	✓	✗	✓	✓	✓	✓	✓	e.g. comprehensive
Last institution code	✓	✓	✓	✗	✓	✓	✓	✓	✓	1-8
Outcome	✓	✓	✓	✓	✓	✓	✓	✓	✓	e.g. accept/decline
Selected/not selected	✓	✓	✓	✓	✓	✓	✓	✓	✓	1 or 2

N= 149,790 applicants

The data were interrogated to assess the impact the introduction of these two new types of undergraduate medical degrees (GEM and EXT) had on widening access, in terms of applications and selections over the first decade of their existence. The three independent

variables (NS-SEC, POLAR and school type) were used to explore applicants to all three of the undergraduate medical degrees (STN, GEM and EXT). Comparisons were made with the pre-existing undergraduate medical degree (STN) which was used as a control group (Moore et al 2013) to assess the impact the introduction of the two new types of undergraduate medical degrees had on widening access and participation in relation to the pre-existing undergraduate medical degree at the university.

These analyses are more complex than level one analysis, and incorporate statistical techniques, such as correlation, regression and analysis of variance (Hitchcock and Onwuegbuzie (2020). Data could be examined in greater detail to explore relationships and interactions between the three independent variables (NS-SEC, POLAR and school type) and selection for admission to the three different types of undergraduate medical degree. Correlation and regression were used to establish if there were relationships between the variables and the strengths of the association (Bewick et al 2003).

Analysis of variance was used to test the differences between groups (Gaddis 2008; Lakens 2013) by comparing the mean values of each (Schober and Vetter 2020). This higher level of data analyses enabled the individual-level (disaggregated) data to be interrogated to a greater granularity than the group-level (aggregated) data, with the interactions of independent and dependent variables examined in more detail and confounders controlled for through the application of more advanced statistical techniques. The research questions were explored in much greater detail, resulting in a more comprehensive understanding of the extent to which the two non-standard undergraduate medical degrees widened access during the first decade of their existence.

7.25.4 Statistical techniques used in levels two and three analyses

Each of the statistical techniques used in the more advanced stages of data analyses with the dataset comprising the nine universities which provided individual-level or aggregated data are discussed briefly below.

7.25.5 Effect sizes

Effect sizes were used to calculate the statistical power of the data used in this research (Schäfer and Schwarz 2019). They were also used to determine the size of the differences (Lakens 2013) between applicants and students selected for admissions to the two new types of undergraduate medical degrees (EXT and GEM) and the pre-existing (STN) undergraduate medical degree through standard deviation measures and Cohen's *d* to represent the magnitude of differences between these different groups (Salkind 2010; Croxford and Raffe 2014).

Pearson's *r* correlation was used to provide a measure of the strength of the linear association between applicants and students who were selected for admission to the three different types of undergraduate medical degrees (Sedgwick 2012). Zero means there is no correlation, a strong negative relationship (indicated by -1) and a strong positive relationship (shown by +1) and zero indicating there is no correlation, with 'r' stating the direction of the correlation (Akoglu 2018).

7.25.6 Logistic regression

The central mathematical concept that underlies logistic regression is the logit or natural logarithm of an odds ratio (Peng et al 2002). This type of analysis was used to describe and evaluate the relationship between categorical/predictor variables (Ranganathan 2017) such as NS-SEC, POLAR2 and school type, to predict the probability of an applicant being selected to study medicine on each of the three different types of undergraduate medical degrees (EXT, GEM and STN) at each of the nine universities, which provided individual-level data.

7.25.7 Linear regression

Linear regression analysis was used in this research to provide a complimentary addition to the logistic regression analyses. This type of analysis is one of the most widely used techniques for analysing multi-factorial data in continuous measurements, such as age (Montgomery et al 2012). Linear regression was used in this research to measure the association between two variables; the independent variables (*x*) and dependent variables

(y) and to analyse the strength of the association between the key independent variables (NS-SEC, POLAR2 and school type) and dependent variables, such as year of application and type of undergraduate medical degree (Kumari and Yadav 2018).

7.25.8 Correlation and Causation

All research begins with the identification of a social phenomenon (Cohen et al 2018) and asks what is going on and why (De Vaus 2001). Establishing causal relationships is at the heart of explanatory research (Leedy and Ormrod 2001; Kettley 2007) such as this study. However, causality does not equal correlation (Goldthorpe 2001), and correlation implies specific types of association but not causation; conversely causation implies association, but not correlation (Altman and Krzywinski 2015).

7.25.9 Causal studies

All social science research consists of *warranted assertions* (Johnson and Onwuegbuzie 2004) and the reliability of the findings is vital (Williams 2007). In the case of causal studies such as this research, claims of causality are validated by correlation, using statistical tests (Goldthorpe 2001). Patterns have been established in two or more variables (Cresswell 2002) to causally explain the social phenomena (Kitell 2006) of applicants and students admitted to the three different types of undergraduate medical degrees. In this research relationships and associations have been inferred rather than observed (De Vaus 2001) because of the nature of data. These factors are likely to be associated, but should not be confused with causality (Puga et al 2015) as co-variance is not enough to assert variables are causally related, as two variables can be correlated but not causally related (Blaikie and Priest 2018).

7.26 Limitation of this research

By its very nature medical school application and admission data is historical; individuals apply to study medicine in the October *prior* to the academic year in which they wish to commence their studies (Hubble and Bolton 2020). Throughout the academic year, UCAS does make data available at various points through the release of *Applicant Cycle Reports*

(UCAS 2021) but admissions data is only available once applicants have successfully met the entry criteria, usually following the publication of the A Level results in August, and subsequently enrolled on their chosen undergraduate medical degree (Higginbotham 2021). This study was also limited by the quality and quantity of the secondary data provided by the universities and its wide ranging variability.

7.27 Research design and methodology conclusion

This chapter has provided a summary of the main features of the design and methodology used in this study. Rationales for the research design and research methodologies have been provided, together with an outline of the research processes, along with details about obtaining data using FOI requests, and the processes for managing and using secondary data for research purposes. The following chapters provide detailed accounts of the research findings and explore if the two non-standard undergraduate medical degrees did succeed in widening access.

Chapter Eight

Research findings

8.1 Introduction

This chapter presents the research findings in relation to the research question: did non-standard undergraduate medical degrees widen access between 2002 and 2011? Immediately before 2002, two new types of non-standard undergraduate medical degrees were introduced; four-year graduate-entry (GEM) degree in 2000 and six-year extended-entry (EXT) degrees in 2001 (Angel and Johnson 2000; Carter and Peile 2007; Garlick and Brown 2008). The two new medical degree formats were designed to widen access to undergraduate medical degrees, by attracting more socially diverse students than the well-established standard-entry (STN) medical degree (Curtis et al 2014).

This quantitative research study, uses data provided by eighteen British universities, along with HESA and UCAS, seeks to establish an answer to the research question/s by exploring the nature of applicants and accepted applicants to the three different types of undergraduate medical degrees (EXT, GEM and STN) by employing three independent variables: the National Statistics Socio-economic classification (NS-SEC); Participation of Local Areas (POLAR) and Last Institution Attended (LIA or school type). These variables have been used to explore the demography of applicants and accepted applicants to the non-standard undergraduate medical degrees over a ten year timeframe, and to compare these with those applying and being accepted onto the STN degree at the same university. This research has been undertaken to establish if the non-standard degrees (EXT and GEM) succeeded in widening access (compared to the STN degrees) and to what extent. The data were analysed using Excel and SPSS v27.

8.2 The data

The data used in this research was obtained from the eighteen universities using Freedom of Information (FOI) requests. In total thirty-five FOI requests were made, with Birmingham University as a (successful) pilot. Based on the data provided by the FOI Officer at that university, requests were sent to the remaining seventeen universities, and each was

refused. Requests were reworded, reduced and resubmitted, resulting in data being provided by every university which ran two or more types of undergraduate medical degree during this period (2002-11). Although the quality and quantity of the data provided varies greatly, as will be outlined in the findings. The eighteen universities in this study, which provided data are show in the table below:

Table 8.1: Universities in this study

University	Dates	STN degree applications	GEM degree applications	EXT degree applications	Original Data type	Analysis
Birmingham	2002-11	16124	4794		Disaggregated	SPSS
Bristol	2006-11	15076	2689	1138	Aggregated	Excel
Cambridge	2003-11	9396	1536		Disaggregated	SPSS
Cardiff	2002-11	12875		680	Aggregated	Excel
Dundee	2005-11	197		36	Aggregated	Excel
Imperial	2007-11	8557	2591		Disaggregated	SPSS
Keele	2008-11	6046	741	491	Disaggregated	SPSS
King's	2002-11	26125	9162	2405	Disaggregated	SPSS
Leicester	2002-11	24826	7634		Aggregated	Excel
Liverpool	2002-11	16899	4191		Disaggregated	SPSS
Manchester	2006-11	13178		1732	Aggregated	Excel
Newcastle	2002-11	32049			Aggregated	Excel
Nottingham	2003-11	19842	9233		Aggregated	Excel
Oxford	2006-11	5655	1284		Disaggregated	SPSS
Queen Mary	2002-11	15434	7604		Aggregated	Excel
Sheffield	2007-11	9876		988	Aggregated	Excel
Southampton	2005-11	15404	7103	2351	Disaggregated	SPSS
St George's	2007-11	4720	4024		Disaggregated	SPSS
Total		252279	53353	9821		

Notes: Cardiff University's data for the EXT degree was for the years 2005-11 but for the STN degree (2003-11). Dundee University provided accepted applicant data only and that for the EXT degree has been imputed. Imperial College provided STN data from 2007-11 and GEM from 2008-11. King's College London provided data from 2002 to 2011 for the STN and EXT degrees but GEM degree data from 2002-11. Liverpool University's data for the STN degree is for 2002-11 but the GEM degree data is for the years 2003-11. Newcastle University combined STN and GEM applications data into a single dataset, which is shown above (and throughout this research) in the STN field. Nottingham University provided applications data only. Queen Mary University supplied data for the STN degree from 2002 to 2011, and for the GEM degree from 2003 to 2011. St George's University's STN and GEM data spans 2008-11.

8.2.1 University datasets

Almost all of the data were provided as Excel tables or spreadsheets, and where possible this has been exported to SPSS. The data obtained for this study, fell into two different categories; aggregated or group-level data and disaggregated or individual-level data. The nine universities which provided aggregated data were Bristol, Cardiff, Dundee, Leicester,

Manchester, Newcastle, Nottingham, Queen Mary, and Sheffield. This usually took the form of Excel tables and spreadsheets. Basic level statistical techniques were used to analyse these datasets. The datasets provided by Birmingham, Cambridge, Imperial, Keele, King's, Liverpool, Oxford, Southampton and St George's universities were exported from Excel to SPSS, enabling more complex data analyses to take place.

8.3 Three independent variables

The three independent variables used to explore applications and accepted applicants to the STN, GEM and EXT degrees are NS-SEC, POLAR and Last Institution Attended/School Type.

8.3.1 NS-SEC

NS-SEC was introduced by the *Office for National Statistics* in time for the decennial census (2001) to replace the Registrar-General's social class (I-V) schema (Pevalin and Rose 2002; Seyan et al 2004). Since 2002, UCAS and HESA have used an adapted version of NS-SEC to monitor applications and admissions to universities, with NS-SEC9 referring to missing/unknown/unclassified data rather than students/retired and unemployed as it does in national statistics (Harrison and McCaig 2015; Lambert and Moy 2013; Strand 2021). The full list of NS-SEC categories used in this research is outlined below:

Table 8.2: NS-SEC categories used in this research

NS-SEC	NS-SEC analytical classes	Typical occupations (illustrative only)
NS-SEC1	Higher managerial and professional occupations (HMP)	Medical practitioners; university lecturers
NS-SEC2	Lower managerial and professional occupations (LMP)	Nurses; paramedics; school teachers
NS-SEC3	Intermediate occupations (IO)	Medical secretaries; ambulance staff
NS-SEC4	Small employers and own account workers (SME)	Farmers; product designers; taxi cab drivers
NS-SEC5	Lower supervisory and technical occupations (LST)	Train drivers; bakers; electricians
NS-SEC6	Semi-routine occupations (SRO)	Dental nurses; traffic wardens; housekeepers
NS-SEC7	Routine occupation (RO)	Butchers; cleaners; building site labourers
NS-SEC8	Never worked or long-term unemployed (UNP)	
NS-SEC9	Data unknown, missing or unclassified (missing)	

Source: Drever et al (2004)

A single university (Bristol) provided data using the Registrar-General's (RG) classification (I-V), which has been mapped to NS-SEC using a previous schema as guidance (Croxford and Raffe 2013) but with the absence of NS-SEC4 and NS-SEC8, as the RG schema could not be easily mapped to NS-SEC for these two newer categories.

Several issues pertinent to this research and its findings arose in respect of using NS-SEC as one of the key variables. For UCAS and HESA, parental occupation is used to identify a young university applicant's NS-SEC for students aged 18-20 years, for applicants aged 21 years and over, their own occupation determines their NS-SEC category (Kelly and Cook 2007).

In 2008/09, UCAS changed the wording of the question which elicited an applicant's NS-SEC category which led to a greater proportion of applicants being classified as NS-SEC4-7 and NS-SEC9 (HESA 2023). After which it reverted to what it had been prior to 2008 and continued to be used until the volume of missing data (NS-SEC9) increased to such an extent that its use was discontinued by UCAS (Sundorph et al 2017). It continues to be used by HESA to monitor admissions to higher education via linked administrative data from official statistics (HESA 2023). In this study, the new NS-SEC question in 2008/09 does not appear to have negatively impacted the findings but the proportion of STN applicants identifying as NS-SEC1 more than halved between 2002 and 2011, whilst the percentage of unknowns (NS-SEC9) more than doubled.

Table 8.3: Universities providing NS-SEC data (2002-11)

University	Years	Undergraduate medical degrees	Data type	Analysed using
Birmingham	2002-11	STN, GEM	Disaggregated	SPSS
Bristol	2006-11	STN, GEM, EXT	Aggregated	Excel
Cambridge	2007-11	STN, GEM	Disaggregated	SPSS
Cardiff	2002-11	STN, EXT	Aggregated	Excel
Dundee	2005-11	STN, EXT	Aggregated	Excel
Imperial	2007-11	STN, GEM	Disaggregated	SPSS
Keele	2008-11	STN, GEM, EXT	Disaggregated	SPSS
King's	2002-11	STN, GEM, EXT	Disaggregated	SPSS
Leicester	2003-11	STN, GEM	Aggregated	Excel
Manchester	2006-11	STN, EXT	Aggregated	Excel
Newcastle	2002-11	STN, GEM	Aggregated	Excel
Oxford	2006-11	STN, GEM	Disaggregated	SPSS
Sheffield	2008-11	STN, EXT	Aggregated	Excel
Southampton	2005-11	STN, GEM, EXT	Disaggregated	SPSS
St George's	2008-11	STN, GEM	Disaggregated	SPSS

Notes: Bristol University used the Registrar General's social class schema, which has been converted to NS-SEC. Cardiff University (applications data only); Dundee University (accepted applicants only). Newcastle University combined data for STN and GEM degree, which has been included in STN analyses.

8.3.2 NS-SEC units of analysis used in this research

Previous studies of university applications and admissions have regarded NS-SEC1-2 or NS-SEC1-3 as higher socio-economic and NS-SEC4-7, as lower SES (Harrison and Hatt 2010; Chetwynd and Diggle 2013). Both NS-SEC1-2 and NS-SEC1-3 have been used because many relatively low-level and insecure roles, such a call-centre staff are categorised as NS-SEC3 (Wiggans 2010). The usage of NS-SEC1-2 enables measurements of the very highest social classes to take place. This study uses NS-SEC4-7 and NS-SEC 4-8 as a measure of socio-economic disadvantage. In total (using the disaggregated and aggregated datasets) there were thirty-three applicants from NS-SEC8, comprising 0.020% of STN applicants; 0.003% of GEM applicants; and 0.191% of EXT applicants; of the thirty-three applicants only eleven were accepted with most (82%) of these at King's College, London with the remainder at Southampton University.

8.3.3 NS-SEC conclusion

The difficulties of accurately capturing the NS-SEC of applicants and accepted applicants has been noted in several previous studies (Ferguson et al 2012; Steven et al 2016; Kumwenda et al 2018; Lambe et al 2018) and this study did have high volumes of missing NS-SEC data,

particularly that relating the GEM degree. Throughout this research NS-SEC has been used as a proxy for social class, with the terms socio-economic and social class being used interchangeably.

8.3.4 School type/last institution attended

Both UCAS and HESA use the last education institution attended (LIA) an applicant attended to monitor applications and admissions to universities and other higher education providers, with *state school marker* being employed as one of HESA's key performance indicators in admissions (Bateman et al 2021). At a fundamental level HESA allocates admitted students to one of three categories: (1) privately funded school; (2) state-funded school or college; (3) unknown school type (HESA 2021). To further advance an understanding of applications and accepted applicants to the eighteen university-based medical schools included in this research, the last institution attended (LIA) or school type data was further broken down into nine categories for analytical purposes. These are outlined below:

Table 8.4: Last Institution Attended/school or college attended prior to university

LIA code	School type/LIA	Details about LIA
1	Academy	Grant Maintained (GM) schools and academies (sponsored and convertor).
2	Comprehensive	Non-selective state schools (11-18 years) usually stream/set/band by academic ability often with academically selective sixth-forms.
3	Further education college (FE)	16-19 or 16-99 years provision, associated with vocational qualifications rather than A Levels.
4	Grammar	Academically selective state schools for students ages 11-18 years often single sex.
5	Higher Education institutions (HE)	Universities and specialist higher education providers, such as music, art and drama colleges.
6	Independent schools	These can be academically selective or non-selective, often single sex with both day and boarding students.
7	Other providers	Careers and connexions services, prison service and other miscellaneous types of education providers or advice services.
8	Sixth form colleges	State colleges with provision for 16-18/19 year olds, mostly running A Level courses with academic selection based on GCSE results.
9	UCAS	Data were unknown or applications were made directly via UCAS and not via a school, college or university.

8.3.5 Individual schools and colleges

In addition to providing details about the type of school or college an applicant attended, two universities (Birmingham and King's College) also provided the name and/or code number of individual educational institutions. Between 2002 and 2011, HESA allocated a unique five digit code to identify individual LIAs, for example, Coleg Glan Hafren, Cardiff was coded 10782 and Warwickshire College, Leamington Spa was code number 40153 (Martin 2013). Using the data provided by Birmingham and King's College it was possible to cross-reference the school name and/or LIA code number with *Department for Education* databases *Edubase* 2001-2017 and its replacement *Get Information about Schools (GIAS)* 2017 to date) to determined the admissions policy of state and independent schools (National Archives 2006; DfE 2017). In this research schools type/LIA data was provided by seventeen universities:

Table 8.5: Schools data (provided by 17 universities)

No	University	Years	Medical degrees	Data type	Analysed
1	Birmingham	2002-11	STN, GEM	Disaggregated	SPSS
2	Bristol	2006-11	STN, GEM EXT	Aggregated	Excel
3	Cambridge	2003-11	STN, GEM	Disaggregated	SPSS
4	Cardiff	2002-11	STN, EXT	Aggregated	Excel
5	Dundee	2005-11	STN, EXT	Aggregated	Excel
6	Imperial	2007-11	STN, GEM	Disaggregated	SPSS
7	Keele	2008-11	STN, GEM, EXT	Disaggregated	SPSS
8	King's	2002-11	STN, GEM, EXT	Disaggregated	SPSS
9	Leicester	2002-11	STN, GEM	Aggregated	Excel
10	Liverpool	2002-11	STN, GEM	Disaggregated	SPSS
11	Manchester	2006-11	STN, EXT	Aggregated	Excel
12	Newcastle	2002-11	STN, GEM	Aggregated	Excel
13	Oxford	2006-11	STN, GEM	Disaggregated	SPSS
14	Queen Mary	2003-11	STN, GEM	Aggregated	Excel
15	Sheffield	2007-11	STN EXT	Aggregated	Excel
16	Southampton	2005-11	STN, GEM, EXT	Disaggregated	SPSS
17	St George's	2008-11	STN, GEM	Disaggregated	SPSS

Note: Nottingham University was the only medical school which did not provide any schools data. The data provided by Newcastle University combined the STN and GEM degrees, and it shown throughout this research in the STN category. Disaggregated data was analysed using IBM's SPSS v27.

8.3.6 Information about the *academy* category

Created by the Labour government (1997-2010) academies were initially limited largely to urban schools serving disadvantaged communities which were deemed by OSTED to be educationally *failing* and they were required to become *sponsored* academies (Walford

2014; Andrews et al 2017; Eyles and Machin 2019). Since the current Conservative government passed the *Academies Act* (2010) an increasing number of schools have elected to become *convertor* academies, i.e. headteachers and boards of governors chose to become self-governing, controlled and funded directly by central government rather than their local authority, and able to determine their own admissions policy, which has led to the creation of new types of provision, such as free and studio schools in England (West and Wolfe 2018; Roberts and Danechi 2019). With education policy devolved in the home nations, there are no academies in Wales, Scotland or Northern Ireland (Walford 2000; Dauncey 2018; West 2023). Around 80% of England's secondary schools are academies, along with 86% of its 163 grammar schools (Bolton 2016; Long et al 2023; National Statistics 2023).

The inclusion of the category *academies* has compromised the findings of this research somewhat, as it encompasses a broad range of state school provision including comprehensive and grammar schools, along with sixth-form colleges. In this research where possible, by using Edubase and GIAS databases academies have been recategorised according to their admissions policy but this was only possible with the datasets where individual LIA were named. Information about the increase in the percentage of applicants whose LIA was an academy is shown in the table below:

Table 8.6: Percentage of academies as per total annual applications (2002 and 2011)

Medical degree	Academy (2002)	Academy (2011)
Standard-entry (STN)	1.0%	9.3%
Graduate-entry (GEM)	0.0%	8.2%
Extended-entry (EXT)	6.1%	12.5%

Notes: the existence of academies, particularly since 2010, has had the greatest impact on the EXT and STN degrees as most students join these degrees immediately after completing school or college. Most GEM applicants in this study would have already been at university (studying their first degree) in 2010 when the Academies Act was passed allowing many more schools to convert to academy status.

8.3.7 School type units of analysis used in this research

This research explores the LIA/school type of applicants and accepted applicants to the three different undergraduate medical degrees (STN, GEM and EXT, using a analytical schema of nine different categories (see above). A binary dummy variable was created to explore applications and accepted applicants from grammar/independent schools and all

other school types, as previous research has shown that students from the former school types are *over-represented* at medical school, especially on STN degrees (Steven et al 2016; Niven et al 2019; Curtis and Smith 2020).

8.3.8 School type/LIA conclusion

The use of the category *academy* has compromised some of the research findings in this study, particularly during 2010 and 2011. However, the school type findings in this research are robust.

8.4 Participation of Local Areas (POLAR)

Created by HEFCE in 2001, and launched in 2005 as POLAR2 (HEFCE 2012), POLAR ranks the 2001 *Census Area Statistical* wards (CAS) by the number of young people in these small local areas who participate in higher education by the age of 18-19 years (Thiele et al 2016; Curtis and Smith 2020; Murray et al 2021). It is used by universities and UCAS to identify individuals who *may* be entitled to participate in widening access initiatives, and by the OFS and HESA as a performance indicator (Bell and Burns 2021). In 2012, POLAR3 replaced POLAR2 (Bagherli 2014). POLAR4 was launched in 2017 (Austin 2018). By 2021, the OFS announced that there would be no further versions of POLAR, but the postcode look-up function remains on its website, enabling individuals to check which POLAR quintile they reside in (OFS 2021). Throughout this research POLAR2 was used (2002-11). For the years 2002-04, the information about an applicant's POLAR quintile was applied retrospectively by staff at each of the universities which provided POLAR data for this research.

8.4.1 POLAR quintiles

The POLAR taxonomy has five quintiles (Q1-Q5) which measure the higher education participation rates of young people (18-19 year olds) in a given area. The 20% of areas with the lowest higher education participation rates for this age group are designated Quintile One (Q1) with the areas where participation rates are highest being Quintile Five (Q5) (Martin 2019; Smart 2019). Just as NS-SEC4-7 is used to denote a lower socio-economic background, POLAR Q1 and Q2 are termed *Low Participation Neighbourhoods* (LPNs)

(Boliver et al 2015; Whitty et al 2015; Boliver et al 2017). In this study both LPNs and POLAR Q1-Q5 have been utilised to explore applications and accepted applicants to the three different types of undergraduate medical degrees.

8.4.2 POLAR data for this study

Although datasets were provided by eighteen universities, only eight provided POLAR data and these are shown below:

Table 8.7: Eight universities which provided POLAR data (2002-11)

No	University	Years	Medical degree	Data type	Analysed
1	Birmingham	2002-11	STN, GEM	Disaggregated	SPSS
2	Bristol	2006-11	STN, GEM, EXT	Aggregated	Excel
3	Cambridge	2005-11	STN, GEM	Disaggregated	SPSS
4	King's	2002-11	STN, GEM, EXT	Disaggregated	SPSS
5	Liverpool	2002-11	STN, GEM	Disaggregated	SPSS
6	Oxford	2009-11	STN	Disaggregated	SPSS
8	Southampton	2005-11	STN, GEM, EXT	Disaggregated	SPSS

Notes: Disaggregated/individual-level data has been analysed using SPSS v27. The total number of applicants (n) with POLAR data = 143,426 (107,441 STN degree; 29,102 GEM degree; 6,883 EXT degree). Each the universities listed above provided applicant and selected applicant data, apart from Sheffield which only provided details about applicants.

8.4.3 POLAR conclusion

As with NS-SEC, individuals from the two highest POLAR quintiles (Q4 and Q5) dominate applications and admissions to medical school (Dunne 2017; Murray et al 2021). This study explores applications and accepted applicants to the three different types of undergraduate medical degrees (STN, GEM and EXT) by utilising LPNs as a binary dummy variable (consisting of Q1/ Q2 and Q3-Q5) in addition to analysing all five POLAR quintiles separately. Where it was provided by the universities, POLAR had the lowest volumes of missing data of the independent variables.

8.5 Data analyses scheme for this research

In total eighteen universities provided data for this research. The data from all eighteen has been analysed using Excel. More complex analyses using SPSS were possible using the disaggregated data provided by nine universities: Birmingham, Cambridge, Imperial, Keele, King's, Liverpool, Oxford, Southampton and St George's.

8.5.1 Applications and accepted applicants (NS-SEC)

Overall, applicants to all three types of undergraduate medical degrees (STN, GEM and EXT) come from the highest social classes, whatever NS-SEC criteria are deployed to measure with, whether NS-SEC1-2 or NS-SEC1-3 is used. Likewise accepted applicants from the highest two or three categories of NS-SEC dominate STN and GEM degrees, not the EXT degrees included in this study. However the highest social classes are measured, whether NS-SEC1-2 or NS-SEC1-3 is used, applicants are dominated by individuals from the most affluent backgrounds. This also applies to accepted applicants on the STN and GEM degrees, but not on the EXT degrees. Full details about the distribution of NS-SEC1-9 in relation to applications and accepted applicants to the three different types of undergraduate medical degrees are contained in the table below:

Table 8.8: Applications and accepted applicants (STN, GEM and EXT), NS-SEC1-9

NS-SEC category	NS-SEC description	STN apps	GEM apps	EXT apps	NS-SEC category	NS-SEC description	STN select	GEM select	EXT select
NS-SEC1	HMP	18.6%	9.0%	4.0%	NS-SEC1	HMP	36.9%	10.4%	8.5%
NS-SEC2	LMP	13.1%	7.3%	8.4%	NS-SEC2	LMP	20.1%	7.1%	14.9%
NS-SEC3	IO	5.1%	3.0%	3.5%	NS-SEC3	IO	8.2%	3.2%	7.6%
NS-SEC4	SME	2.0%	0.6%	1.2%	NS-SEC4	SME	3.1%	0.5%	3.5%
NS-SEC5	LST	1.5%	0.4%	1.5%	NS-SEC5	LST	1.9%	0.5%	1.7%
NS-SEC6	SRO	3.5%	3.6%	3.8%	NS-SEC6	SRO	4.6%	3.9%	9.5%
NS-SEC7	RO	1.0%	0.5%	0.9%	NS-SEC7	RO	1.4%	0.3%	3.5%
NS-SEC8	UNP	0.5%	0.0%	0.1%	NS-SEC8	UNP	0.1%	0.0%	0.8%
NS-SEC9	Missing	54.9%	75.7%	76.7%	NS-SEC9	Missing	23.0%	74.2%	50.0%

Notes: NS-SEC9 is missing, unknown, unclassified or unclassifiable data. The following universities provided NS-SEC data: Birmingham (STN and GEM); Bristol (STN, GEM and EXT); Cambridge (STN and GEM); Cardiff (STN and EXT) applications only; Dundee (STN and EXT) selected only; Imperial (STN and GEM); Keele (STN, GEM and EXT); King's (STN, GEM and EXT); Leicester (STN and GEM); Liverpool (STN and GEM); Manchester (STN and EXT); Newcastle (combined STN and GEM) select only; Nottingham (STN and GEM); Oxford (STN and GEM); Sheffield (STN and EXT) applications only; Southampton (STN, GEM and EXT); St George's (STN and GEM).

As can be ascertained from the above table, missing data (NS-SEC9) has the potential to have a significant impact on the research findings, but even with NS-SEC9 included individuals from the highest three socio-economic backgrounds (NS-SEC1-3) dominate applications and accepted applicants to STN, GEM and EXT degrees, apart from EXT accepted applicants. Almost 37% of STN accepted applicants and over 10% of GEM accepted applicants come from NS-SEC1, but the largest SES group of EXT accepted applicants is NS-SEC2 (15%) followed by NS-SEC6 (10%), with NS-SEC6 representing semi-routine occupations, such as dental nurses and traffic wardens (Drever et al 2004).

A note of caution needs to be introduced at this stage because the NS-SEC data used in this research contains high volumes of missing data (NS-SEC9) which increased by almost three times between 2002 and 2011. This arose because a growing number of university applicants declined to provide an answer to the voluntary question on the UCAS application form, which asked for details of their parental occupation (those aged 17-20 years) or their own occupation (those aged 21 years and over) (Do et al 2006; Hamilton et al 2020). Although an applicant's NS-SEC code never formed part of the university or medical school selection process (it was applied retrospectively by UCAS and HESA for monitoring purposes) many students felt they might be discriminated against for coming from an affluent background or an independent school (Garner 2003; Smithers 2003; Kelly and Cook 2007; Williams 2019). In addition to the growing percentage of missing NS-SEC data relating to STN and EXT degrees, individuals applying to GEM degrees (for which a first degree is a condition of entry at most universities) have a socio-economic status which may not reflect that of the household in which they grew up (Hatt and Harrison 2009; Haldane et al 2012; Olivarius-McAllister et al 2021; Garrud 2023). The table below recalibrates the distribution of NS-SEC by omitting missing data (NS-SEC9) to include only *known* data (NS-SEC1-8).

Applications and accepted applicants (STN, GEM and EXT), NS-SEC1-8

Table 8.9: Applications (NS-SEC1-8)

Medical degree	NS-SEC1	NS-SEC2	NS-SEC3	NS-SEC4	NS-SEC5	NS-SEC6	NS-SEC7	NS-SEC8
Standard-entry	41.6%	29.2%	11.3%	4.4%	3.4%	7.8%	2.2%	0.0%
Graduate-entry	37.1%	30.1%	12.4%	2.3%	1.5%	14.6%	2.0%	0.0%
Extended-entry	17.1%	35.9%	15.1%	5.2%	6.0%	16.3%	3.9%	0.5%

Table 8.10: Accepted applicants (NS-SEC1-8)

Medical degree	NS-SEC1	NS-SEC2	NS-SEC3	NS-SEC4	NS-SEC5	NS-SEC6	NS-SEC7	NS-SEC8
Standard-entry	46.6%	27.7%	10.7%	4.2%	2.6%	6.2%	2.0%	0.1%
Graduate-entry	41.0%	27.2%	12.3%	1.9%	1.7%	14.6%	1.2%	0.0%
Extended-entry	16.4%	21.6%	30.2%	3.4%	3.4%	23.9%	0.4%	0.7%

Manchester STN and EXT applications and accepted applicants (2006-11); Newcastle STN and GEM accepted applicants (2002-11); Oxford STN and GEM applications and accepted applicants (2006-11); Sheffield STN and EXT applications and accepted applicants (2007-11); Southampton STN, GEM and EXT applications and accepted applicants (2005-11); St George's STN and GEM applications and accepted applicants (2008-11). Bristol University's data included the Registrar General's (RG) occupational classifications, which were used by UCAS and HESA prior to the introduction of NS-SEC (2002). For the purposes on this research these have been mapped to NS-SEC but the RG data could not be mapped directly to NS-SEC4 and NS-SEC8. The information provided by Leicester University consisted of partial aggregated and disaggregated data. Mean imputation was used in EXT accepted applicant data provided by Dundee and Sheffield universities. The data from Newcastle University combines STN and GEM results which are shown in STN findings throughout this research. The GEM accepted applicants (but not applicants) at Keele University were listed as NS-SEC9. Liverpool University did not provide NS-SEC data for STN or GEM degrees.

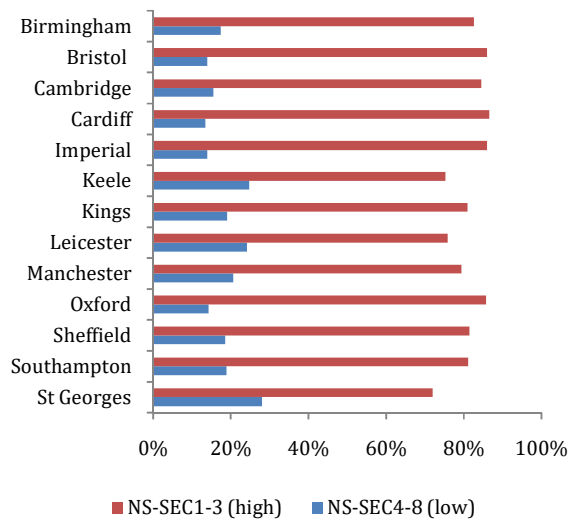
Omitting NS-SEC9 (unknown or missing data) provides more nuanced findings relating to the NS-SEC of applicants and accepted applicants, and reveals the extent to which individuals from higher SES backgrounds (NS-SEC1-3) dominate undergraduate medical degrees: 82.1% of STN applicants come from NS-SEC1-3, along with 85% of accepted applicants; GEM applicants (79.6%) and accepted applicants (80.5%) are slightly lower than those for the STN degrees. A much lower percentage EXT applicants (68.1%) and accepted applicants (68.3%) come from NS-SEC1-3, but they are still the majority of EXT applicants and accepted applicants. The graphs below illustrate comparisons between NS-SEC1-3 and NS-SEC4-8 for applications and accepted applicants to the three different types of undergraduate medical degrees at the universities included in this non-random sample of universities which ran two or more types of undergraduate medical degrees between 2002 and 2011, which provided NS-SEC data.

8.5.2 Applications and accepted (STN, GEM and EXT), high and low SES background

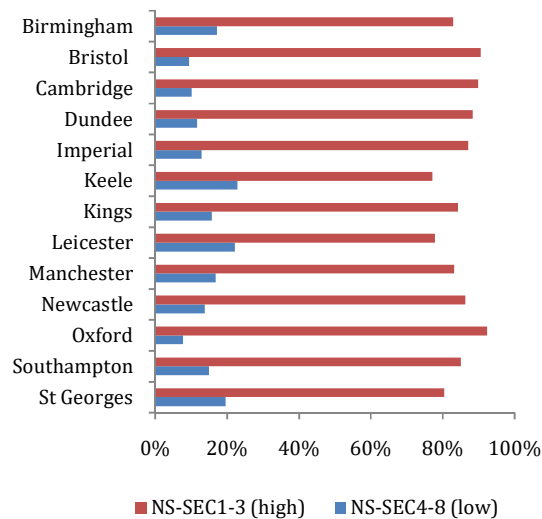
The following graphs map NS-SEC1-3 (high) and NS-SEC4-8 (low), with applications and accepted applicants shown alongside one another to enable comparisons to be made between the percentages of applicants and accepted applicants from a high-low SES background at each of the universities which provided NS-SEC data. These are shown in the graphs below, with commentary about the individual undergraduate medical degrees provided underneath the relevant graphs:

Table 8.11 STN high and low SES backgrounds (applications and accepted applicants)

STN applications



STN accepted applicants



Sources: Birmingham (STN and GEM); Bristol (STN, GEM and EXT); Cambridge (STN and GEM); Cardiff (STN and EXT) applications only; Dundee (STN and EXT) accepted only; Imperial (STN and GEM); Keele (STN, GEM and EXT); King’s (STN, GEM and EXT); Leicester (STN and GEM); Manchester (STN and EXT); Newcastle (combined STN and GEM) accepted only; Nottingham (STN and GEM); Oxford (STN and GEM); Sheffield (STN and EXT) applications only; Southampton (STN, GEM and EXT); St George’s (STN and GEM). Percentages for these graphs have been rounded to the nearest whole number.

8.5.3 STN applications and accepted applicants

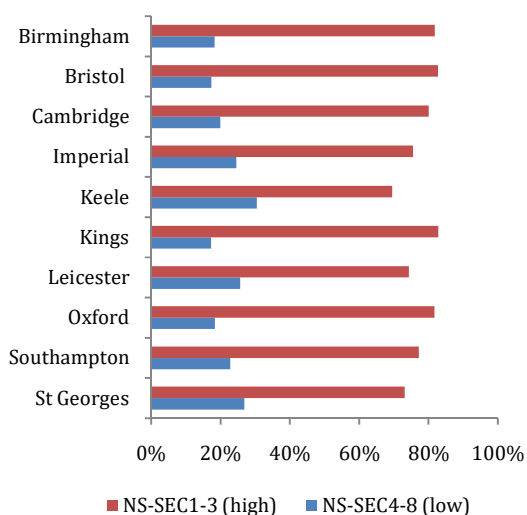
Comparisons between NS-SEC1-3 and NS-SEC4-8 for applications and accepted applicants to At each of the universities individuals from NS-SEC1-3 (high) dominate STN applications and accepted applicants. Overall, in this sample 82.1% for STN applicants came from NS-SEC1-3; the lowest percentage (72%) was at St George’s University (London) and the

highest (86.6%) was Cardiff University. 80% or more of STN applicants at Birmingham, Bristol, Cambridge, Imperial, King's College (London), Oxford, Sheffield and Southampton came from a high SES background with less than 20% coming from a low SES background (NS-SEC4-8) at all the universities, apart from Manchester (20.6%); Leicester (24.1%); Keele (24.7%); and St George's (28%).

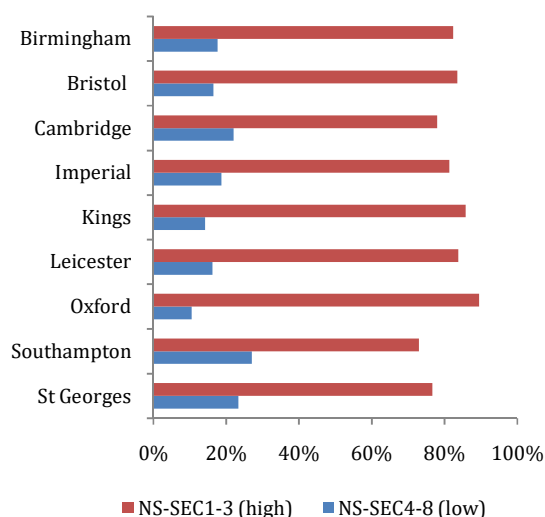
The percentage of STN accepted applicants who came from a high SES background (NS-SEC1-3) is higher than those for applicants; overall 85% came from these social classes, ranging from 77.1% at Keele to 92.3% at Oxford. Two universities from the English Midlands had the lowest percentage of accepted applicants from NS-SEC1-3; Keele (77.1%) and Leicester (77.8%). The remaining universities saw between 80-89% of their accepted STN applicants coming from the three highest NS-SEC categories aside from Bristol (90.5%); Cambridge (89.9%); and Oxford (92.3%).

Table 8.12 GEM high and low SES backgrounds (applicants and accepted applicants)

GEM applications



GEM accepted applicants



Sources: Birmingham (STN and GEM); Bristol (STN, GEM and EXT); Cambridge (STN and GEM); Cardiff (STN and EXT) applications only; Dundee (STN and EXT) accepted only; Imperial (STN and GEM); Keele (STN, GEM and EXT, no GEM applications NS-SEC1-8); King's (STN, GEM and EXT); Leicester (STN and GEM); Manchester (STN and EXT); Newcastle (combined STN and GEM) accepted only; Nottingham (STN and GEM); Oxford (STN and GEM); Sheffield (STN and EXT) applications only; Southampton (STN, GEM and EXT); St George's (STN and GEM). Percentages for these graphs have been rounded to the nearest whole number.

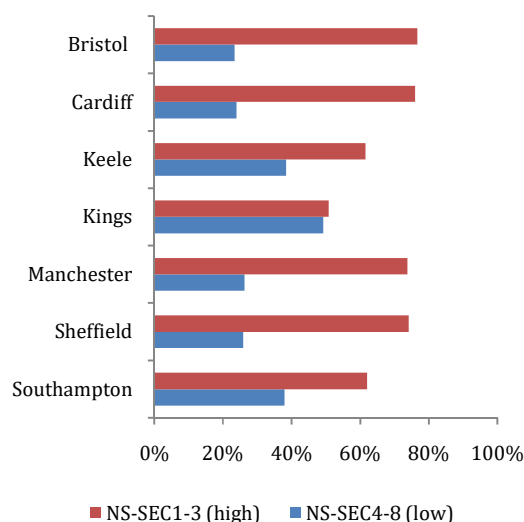
8.5.4 GEM applications and accepted applicants

Overall, 79.6% of applications to the GEM degrees in this sample came from the highest three SES backgrounds, compared to 82.1% of STN applicants. The lowest percentage of GEM applicants from NS-SEC1-3 was at Keele (69.6%) and the highest (81.7%) was at Bristol and King's, with the range for STN applicants being 77.1% to 92.3%. The mean for STN applicants from NS-SEC4-7 is 18.6% compared to 22.2% for GEM applicants. These findings suggest that the GEM applicants in this sample come from more diverse socio-economic backgrounds than their STN counterparts.

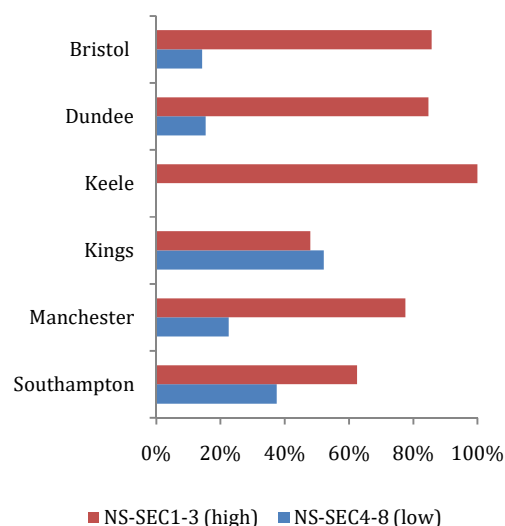
Accepted applicants from NS-SEC1-3 account for 80.5% of selected GEM applicants, with the percentages varying from 73% (Southampton) to 89.5% (Oxford). With the exception of Cambridge (78%); Southampton (73%) and St George's (76.6%) the remaining universities (Birmingham, Bristol, Imperial, King's, Leicester, Oxford) recruit more than 80% of their GEM accepted applicants from the highest three SES backgrounds (NS-SEC1-3).

Table 8.13 EXT high and low SES backgrounds (applicants and accepted applicants)

EXT applications



EXT accepted applicants



Sources: Birmingham (STN and GEM); Bristol (STN, GEM and EXT); Cambridge (STN and GEM); Cardiff (STN and EXT) applications only; Dundee (STN and EXT) accepted only; Imperial (STN and GEM); Keele (STN, GEM and EXT); King's (STN, GEM and EXT); Leicester (STN and GEM); Manchester (STN and EXT); Newcastle (combined STN and GEM) accepted only; Nottingham (STN and GEM); Oxford (STN and GEM); Sheffield (STN

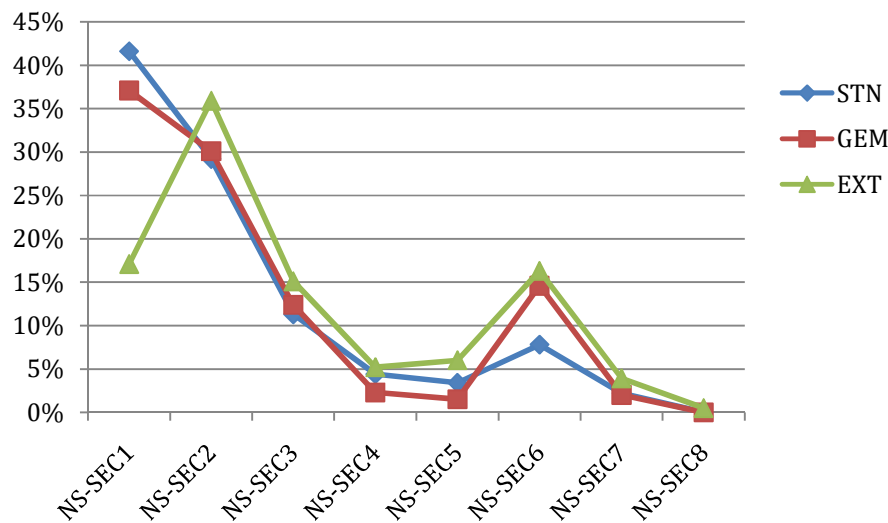
and EXT) applications only; Southampton (STN, GEM and EXT); St George's (STN and GEM). Percentages for these graphs have been rounded to the nearest whole number.

8.5.5 EXT applications and accepted applicants

In this non-random sample of universities which ran two or more types of undergraduate medical degrees (2002-11) far fewer universities ran EXT degrees than STN or GEM degrees, as these six-year degrees are more costly and labour-intensive to run than STN or GEM degrees (Papachristodoulou 2010; Curtis et al 2014; Gibson Smith et al 2021). As with STN and GEM applicants, the majority of EXT applicants (68.1%) came from NS-SEC1-3, but this figure is much lower than the 82.1% of STN applicants and the 79.6% of GEM applicants, and unlike STN and GEM applicants where the majority come from NS-SEC1, applicants to EXT degrees are more likely to come from NS-SEC2 than any other SES background (35.9%) but they are also more evenly spread amongst most of the NS-SEC categories, with 31.9% coming from NS-SEC4-8; King's received 24.9% of its EXT applications from individuals whose social class was NS-SEC6 and overall more EXT applicants came from NS-SEC6 (16.3%) than NS-SEC3 (15.1%).

As with STN accepted applicants (85%) and GEM accepted applicants (80.5%) the majority of EXT accepted applicants (68.3%) came from NS-SEC1-3, ranging from 47.9% (King's) to 100% (Keele). Bristol (14.3%) and Dundee (15.4%) had the lowest percentages of accepted applicants from NS-SEC4-8, but the course intake of EXT degrees is much smaller than either STN or GEM degrees. The data from individual universities, shows accepted EXT applicants are more evenly spread across NS-SEC1-8 than those on STN or GEM degrees. The majority of King's EXT accepted applicants (52.1%) came from NS-SEC4-8 with 50% from NS-SEC6 alone with 11.5% of Dundee's coming from NS-SEC5; 29.2% of Southampton's EXT accepted applicants came from NS-SEC6 along with 11.4% of Bristol's. The diagrams below show applications and accepted applicants to the three different types of undergraduate medical degrees:

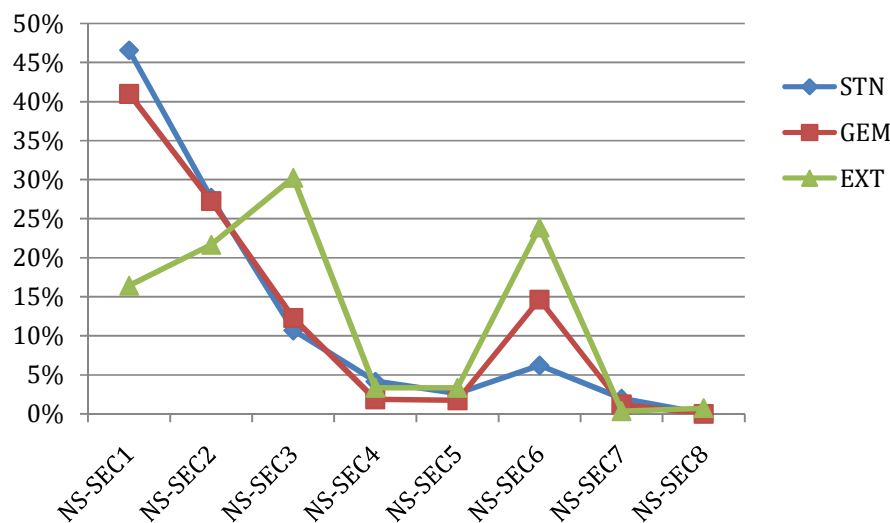
Table 8.14: Applications (STN, GEM and EXT) and NS-SEC



Source: Birmingham (STN and GEM); Bristol (STN, GEM and EXT); Cambridge (STN and GEM); Cardiff (STN and EXT) applications only; Dundee (STN and EXT) accepted only; Imperial (STN and GEM); Keele (STN, GEM and EXT); King's (STN, GEM and EXT); Leicester (STN and GEM); Manchester (STN and EXT); Newcastle (combined STN and GEM) accepted only; Nottingham (STN and GEM); Oxford (STN and GEM); Sheffield (STN and EXT) applications only; Southampton (STN, GEM and EXT); St George's (STN and GEM).

The graph above illustrates the extent to which applicants from the higher social classes (NS-SEC1-3) dominate the STN and GEM degrees, both of which show similar patterns of distribution between NS-SEC1-8. One notable exception to this is applications from individuals whose SES background is NS-SEC6 (semi-routine occupations) which show a marked spike amongst all three different types of undergraduate medical degrees, especially STN and GEM degrees. This has also been found by previous studies of medical school applications and admissions (Milburn 2012; Steven et al 2016) and NS-SEC6 is the largest single occupation category in the country (Stuart 2014). The graph also illustrates how few EXT applicants come from the highest social class (NS-SEC1) with the greatest percentage coming from NS-SEC2, unlike STN and GEM applicants where NS-SEC1 dominates.

Table 8.15: Accepted applicants (STN, GEM and EXT) and NS-SEC



Sources: Birmingham (STN and GEM); Bristol (STN, GEM and EXT); Cambridge (STN and GEM); Cardiff (STN and EXT) applications only; Dundee (STN and EXT) accepted only; Imperial (STN and GEM); Keele (STN, GEM and EXT); King's (STN, GEM and EXT); Leicester (STN and GEM); Manchester (STN and EXT); Newcastle (combined STN and GEM) accepted only; Nottingham (STN and GEM); Oxford (STN and GEM); Sheffield (STN and EXT) applications only; Southampton (STN, GEM and EXT); St George's (STN and GEM).

As with the previous applications graph, the above accepted applicants one illustrates the extent to which accepted applicants from the higher social classes dominate STN and GEM degrees. Once again, as previously, accepted applicants to all three degree types show a pronounced spike at NS-SEC6. Whereas the greatest percentage of EXT applicants came from NS-SEC2, for accepted applicants NS-SEC3 (Intermediate Occupations, such as medical secretaries and non-paramedic ambulance staff) is the dominate SES background (Drever et al 2004). Six universities running EXT degrees provided NS-SEC data relating to the NS-SEC of accepted applicants (Bristol, Dundee, Keele, King's, Manchester and Southampton). At Dundee the greatest percentage of EXT accepted applicants came from NS-SEC1 (34.6%); whereas NS-SEC2 comprised the largest percentage of accepted applicants at three universities (Bristol, Keele and Manchester). At Southampton more accepted applicants came from NS-SEC2 than any other category (50%) and at King's this was NS-SEC6 (50%). King's College has one of the largest medical school intakes in the UK (OFS 2020). In this study 35% of all EXT accepted applicants were from King's, along with 73.4% of NS-SEC6 accepted applicants.

8.5.6 NS-SEC and A Level results (accepted applicants only)

Two universities (Birmingham and King's) provided the A Level grades of applicants and accepted applicants (2002-11). The data from Birmingham University related to STN and GEM degrees; with that from King's College relating to STN, GEM *and* EXT degrees.

**Table 8.16: Mean A Level grades (12-36 points)
STN, GEM, EXT applicants and accepted applicants (NS-SEC1-9)**

NS-SEC no	NS-SEC description	STN apps	STN accept	GEM apps	GEM accept	EXT apps	EXT accept
1	Higher managerial and professional (HMP)	AAA	AAA	BBB	ABB	BBB	BBB
2	Lower managerial and professional (LMP)	AAB	AAA	BBB	BBB	BBB	BBB
3	Intermediate Occupations (IO)	AAB	AAA	BBB	ABB	BBB	ABB
4	Small employers and own account workers (SME)	AAB	AAB	BBB	AAA	BBB	ABB
5	Lower supervisory and technical occupations (LST)	AAB	AAB	BBC	AAA	BBB	BBB
6	Semi-routine occupations (SRO)	AAB	AAB	BBB	AAB	BBB	BBB
7	Routine occupations (RO)	AAB	AAB	BCC	AAA	ABB	ABB
8	Never worked or long-term unemployed (UMP)	AAB	AAA			AAB	AAB
9	Missing or unknown (UNK)	AAB	AAB	BCC	ABB	BBC	BBB
Total	Indicative A Level grades (mean)	AAB	AAA	BBB	ABB	BBC	BBB

Note: using SPSS was possible to calculate the mean A Level scores for each NS-SEC1-9 category by converting A Level grades into a numerical score (A* =12; A=10; B=8; C=6; D=4; E=2), so for example AAA grades = 30 points and CCC = 18 points), a schema which has utilised in previous research (McManus et al 2008; Haldane et al 2012; McManus et al 2020). The scores shown in the table are *indicative* of the type of A Level scores and are not the grades achieved by individual accepted applicants. For example 20 points can equate to grades AA or ABE or BBD or BCC et al. Data without A Level scores and for alternative qualifications such as International Baccalaureate (IB), Scottish Higher Qualifications (Highers), National Vocational Qualifications (NVQs) and Business and Technology Education Council (BTEC) have been excluded. A Level grades below CDE (12 points) were excluded. This cut off point was chosen because it was the lowest grade a student was admitted with to the EXT degree at King's (Garlick and Brown 2008). For the years 2010 and 2011, A Level grades above AAA (30 points) were possible following the introduction of the A* grade in 2010 (Smithers 2014). Meaning the maximum grades available in these two years was A*A*A* (36 points). 31-36 points does not apply to GEM applicants and accepted applicants as A* grades were only introduced in 2010 (Smithers 2014) when these individuals would have already graduated or still be at university (2002-11). Mean A Level scores have been rounded so they easily convert to a recognisable grade, for example 29 points becomes 30 points (AAA grades). A Level grades were provided by Birmingham University and King's College London only.

8.5.7 STN applicants and accepted applicants (12-36 points)

The mean A Level scores for STN applicants varied from 30 points (AAA) for NS-SEC1 to 28 points (AAB) for NS-SEC2-9. There is likely to have been so little variation in the A Level scores and grades of STN applicants as AAA grades have been required by medical schools since the mid to late 2000s (Curtis and Smith 2020) with this being a minimum requirement at most medical schools for entry to STN degrees in 2024/25 (Garrud 2023). The mean A Level scores for STN applicants ranged from 27 to 29 points (n=30126 applicants with a SD of 4.094) with the overall mean (NS-SEC1-9) being 28 points (AAB grades)

As with applicants to the STN degree, accepted applicants show little variation between their SES background and their A Level scores. Again the highest three NS-SEC categories (NS-SEC1-3) had mean A Level scores of 30 points (AAA grades). Accepted applicants in NS-SEC4-7 and NS-SEC9 (unknown or missing data) amassed a mean of 28 points (AAB grades). During much of the time of this study (2002-11) AAB grades were considered to be the minimum entry requirements for admissions to undergraduate degrees at any of the twenty-four Russell Group universities, which includes most of the medical schools in this research (Hemsley-Brown and Oplatka 2015; Piatt and Eastwood 2015). Accepted applicants from NS-SEC8 (never worked or long-term unemployed) had a mean A Level score of A*AA grades (32 points) slightly bettering those in NS-SEC1-3, however there were only six of these individuals, compared to 2,009 (NS-SEC1); 1,030 (NS-SEC2); and 453 (NS-SEC3). The overall mean A Level score for STN accepted applicants was 29 points with 4,600 accepted STN applicants (SD = 3.476) and a range of 28 to 31 points (AAB to A*AA grades).

8.5.8 GEM applicants and accepted applicants (12-36 points)

The mean A Level scores for GEM accepted applicants are lower than those of STN accepted applicants, as A Level grades do not form part of the admissions criteria for most GEM degrees, for which a first degree (2:1 or higher) is required (Garrud 2023)

The distribution of the mean A Level points for GEM applicants reveals a similar pattern to that for STN applicants, with the highest points being obtained by individuals from NS-SEC

1-3 (23-24 points, equivalent to BBB grades) this compares to AAA-AAB grades for STN applicants. Individuals from NS-SEC6 (semi-routine occupations) also obtained a mean A Level score of BBB (24 points) with the remainder of applicants from NS-SEC5 (lower supervisory and technical occupations) having a mean score of BBC grades (22 points) and NS-SEC7-9 obtaining mean A Level grades of BCC (20 points). There were no GEM applicants from NS-SEC8. Overall, the mean A Level score of GEM applicants was 23 points (BBB grades), ranging from 21.9 to 23.8 points, for 3,088 applicants (SD=5.046).

Accepted GEM applicants come from a narrower range of SES backgrounds than STN accepted applicants, with only NS-SEC1-3, NS-SEC6 and NS-SEC9 being represented. Once again, as with the STN and EXT degree, there is a marked increase in the mean A Level grades of GEM applicant and accepted applicants (BBB-ABB). There is some slight variation between the highest three SES categories; with individuals from NS-SEC1 and NS-SEC3 having mean A Level grades of ABB (26 points) and those from NS-SEC2 obtaining a mean of BBB (24 points). Three individuals from NS-SEC4-5 and NS-SEC7 achieved a mean A Level score of 30 points (AAA grades) but there were only three with those from NS-SEC6 gaining a mean score of 26 points (AAB) with those whose NS-SEC details were unavailable (NS-SEC9) also obtaining ABB (26 points). Overall, the mean A Level scores of accepted applicants to the GEM degrees in this study was 25 points (ABB grades) with 198 individuals included (SD=4.947) in the range of 24-30 points (BBB-AAA).

Therefore, GEM accepted applicants do appear to be entering medical school with slightly lower mean A Level grades and scores than their STN counterparts, fulfilling some of their remit to diversify the medical student population (James et al 2008; Garrud and McManus 2018).

8.5.9 EXT applicants and accepted applicants (12-36 points)

A solitary university (King's College London) provided data relating to the A Level grades of applicants and accepted applicants (2002-11). The mean A Level grades for EXT applicants it was BBB grades (24 points) for individuals from NS-SEC1-6. For NS-SEC7 applicants it was 26 points (ABB grades); for NS-SEC8 it rose to 28 points (AAB grades) but there were only

nine applicants. Applicants whose SES background was unavailable (NS-SEC9) had mean A Level grades of BBC (22 points). The overall mean A Level grade for 1,807 EXT applicants was 22 points (BBC grades) varying from 22-28 points (BBC-AAB grades) with SD = 5.045.

EXT accepted applicants from NS-SEC1-2, NS-SEC5-6 and NS-SEC9 had mean A Level scores of BBB grades (24 points). Accepted applicants from NS-SEC3-4 and NS-SEC7 obtained mean A Level grades of ABB (26 points). The highest mean A Level scores for EXT accepted applicants was 28 points (AAB grades) which were achieved by NS-SEC8 but there were only seven accepted applicants from this SES background. Overall the mean A Level grades in this sample varied from 24-28 points (24-26 points) with BBB grades being the mean A Level grades (24 points) for 361 accepted applicants, SD = 4.092.

8.5.10 NS-SEC1-8 applications and accepted applicants (Chi-squared tests)

Chi-squared tests were undertaken for the STN, GEM and EXT degrees, to compare the observed results with expected results, to ascertain if these occurred by chance or due to a relationship between the variables (Bergh 2015). The universities included in these three separate Pearson's Chi-squared tests were carried out assess if there was a relationship between the socio-economic background (NS-SEC1-8) of an applicant and them becoming a selected applicant:

Table 8.17: NS-SEC1-8 applications and accepted applicants (Chi-squared test)

Degree	Chi-squared test ($\chi^2=$)	df	P-value	Valid cases (n)
STN	122.842	7	p < 0.001	37681
GEM	20.866	7	p < 0.001	7322
EXT	167.091	7	p < 0.001	761

Notes: university data obtained from Birmingham (STN and GEM); Cambridge (STN and GEM); Imperial (STN and GEM); King's (STN, GEM and EXT); Oxford (STN and GEM); Southampton (STN, GEM and EXT); St George's (STN and GEM).

More detailed findings relating to the tests for association (Pearson's Chi-squared) are outlined in the table below where each of the NS-SEC1-8 socio-economic categories have been examined individually (within group):

Table 8.18: Results of Chi-squared tests NS-SEC1-8 (STN, GEM and EXT degrees)

NS-SEC	STN (%) accepted within NS-SEC applications	GEM (%) accepted within NS-SEC applications	EXT (%) accepted within NS-SEC applications
NS-SEC1	4614.6 (29.4)	424.1 (16.7)	15.9 (5.3)
NS-SEC2	2640.4 (26.0)	311.6 (13.1)	34.0 (4.4)
NS-SEC3	1106.4 (26.2)	141.6 (15.2)	18.9 (48.7)
NS-SEC4	476.1 (22.9)	30.2 (12.0)	18.0 (0.0)
NS-SEC5	232.7 (22.7)	12.4 (22.0)	5.5 (6.1)
NS-SEC6	834.9 (22.4)	159.5 (15.5)	29.5 (30.5)
NS-SEC7	259.9 (23.3)	25.5 (9.5)	10.7 (0.0)
NS-SEC8	5.9 (40.9)	0.2 (0.0)	1.7 (20.0)
Total (NS-SEC 1-8)	10171 (27.0)	1105 (15.1)	127 (16.7)

Notes: NS-SEC1-8 data provided by Birmingham, Cambridge, Imperial, King's, Oxford, Southampton, St George's universities. NS-SEC9 consists of missing, unknown, unclassified and direct applicant data. Selected as a percentage of applicants within each NS-SEC category (expected count)

As the above tables indicate, the association between an individual applying to study an undergraduate medical degree (STN, GEM or EXT) and them becoming an accepted applicant is strongest the higher their socio-economic background (NS-SEC1-8) particularly for the STN degree.

8.5.11 Cramer's V test and NS-SEC1-8

In these tests, as with the Pearson's Chi-squared (above), missing data (NS-SEC9) have been removed and the Cramer's V test has been run using only *known* SES data (NS-SEC1-8). This test has been applied to three separate databases using the three separate datasets (STN, GEM and EXT degrees). The Cramer V test compliments the Chi-squared test, by measuring the strength of the association between the independent variables (NS-SEC background and becoming an accepted applicant). This additional test was deployed due to the large sample sizes of the datasets, particularly that relating to the STN degree, and enabled the detection of relationships that are considered strong enough to be meaningful (Raouafi et al 2017).

STN degree: $V = 0.057, p < 0.001$ (n=37, 681 applications)

GEM degree: $V = 0.053, p < 0.001$ (n=7,322 applications)

EXT degree: $V = 0.047, p < 0.001$ (n=761 applications)

The results of the Cramer V test indicate there is a relatively strong association between the NS-SEC background of STN and GEM applicants and them becoming an accepted applicant. This is followed by a moderately strong association between the SES background of an EXT applicant and them becoming an accepted applicant. However, there are far fewer higher SES applicants (NS-SEC1-3) to EXT degrees than to STN or GEM degrees in this sample. Unless they can demonstrate personal or academic circumstances which have disadvantaged them, individuals from higher SES backgrounds and non-selective state schools are not usually eligible for entry to EXT degrees (Curtis et al 2014; Garrud 2023).

As a supplementary addition to NS-SEC, one university (Keele) provided details about the Standard Occupational Classification codes (SOC2000) for applicants and accepted applicants for its STN, GEM and EXT degrees (2008-11). These are explored in the next section of this chapter.

8.5.12 Standard Occupational Classification codes (SOC2000)

In addition to utilising NS-SEC as a variable to answer the research questions, it was also possible to use Standard Occupational Classification codes (SOC2000) to explore in more detail the nature of the socio-economic (SES) background of accepted applicants to the three different types of undergraduate medical degrees at a single university (Keele) between 2008 and 2011. Using the four digit SOC2000 codes (where they had been provided) it was possible to translate these into an occupation, using a guide which was produced and made available online by *National Statistics*, for example medical practitioners = 2111; nurses = 3211; care assistants and home carers = 6115 (Elias et al 1999; Davies et al 2003). Overall, Keele received 7,259 applications to study medicine (STN, GEM and EXT) of these 534 became accepted applicants (14 applicants per place); 496 were accepted to the STN degree (12 applicants per place); 12 were accepted to the GEM degree (62 applicants per place); along with 26 to the EXT degree (19 applicants per place).

The SOC2000 data from Keele University contained exceptionally high rates of missing data in relation to applicants (ranging from 90.8% for STN applicants; to 93.7% for EXT applicants; 96.8% for GEM applicants; 91.6% overall). For accepted applicants the rates of missing data were much lower, overall for the three undergraduate medical degrees they were 19.3% (17.9% STN degrees; 50.0% GEM degrees; and 30.8% EXT degrees). SOC2000 occupational codes were known for 431 accepted applicants across all three undergraduate medical degrees at Keele. The tables below show the top ten occupations for applicants and accepted applicants (where SOC2000 data is known):

Table 8.19 Applicants (STN, GEM and EXT) with known SOC2000 occupational codes

Rank	NS-SEC	SOC2000	Occupation	%
1	NS-SEC1	2211	Medical practitioners	12.8%
2	NS-SEC2	2314	Secondary education teaching professionals	6.7%
3	NS-SEC2	1239	Managers & proprietors in other services	4.9%
4	NS-SEC1	4122	Accountants/wage clerks/book keepers and other financial officers	3.3%
5	NS-SEC2	3211	Nurses	2.6%
6	NS-SEC6	8125	Metal worker machine operatives	2.3%
7	NS-SEC1	2132	Software professionals	2.1%
8	NS-SEC6	6115	Care assistants & home carers	2.0%
9	NS-SEC1	1132	Marketing & sales managers	1.8%
=10	NS-SEC1	2112	Biological scientists and biochemists	1.6%
=10	NS-SEC5	5241	Electricians and electrical fitters	1.6%
=10	NS-SEC3	3312	Police officers (sergeant and below)	1.6%
=10	NS-SEC4	8214	Taxi/cab drivers and chauffeurs	1.6%

Source: Keele University (2008-11)

Applicants from a parental background (known SOC2000 codes only) which included a medical practitioner (code 2111) represented the largest single occupational category for STN applicants and accepted applicants; and the second largest occupation category for GEM and EXT applicants and accepted applicants (jointly with other occupations). There were 1.9x as many STN applicants from the children of medical practitioners as the next occupational category which was secondary school teachers. Applicants from this university with *known* SOC2000 and *known* NS-SEC data (which excludes NS-SEC9) shows 75.2% of STN applicants came from the highest socio-economic backgrounds (NS-SEC1-3) compared to 70.8% of GEM applicants and 74.5% of EXT applicants, which includes medical practitioners (NS-SEC1). The children of medical practitioners also dominated accepted applicants, where data were available:

Table 8.20 Accepted applicants (STN, GEM and EXT) with known SOC2000 occupational codes

No	NS-SEC	SOC2000	Occupation	%
1	NS-SEC1	2211	Medical practitioners	15.1%
2	NS-SEC2	2314	Secondary education teaching professionals	6.5%
3	NS-SEC2	1239	Managers & proprietors in other services	5.3%
4	NS-SEC1	4122	Accountants/wage clerks/book keepers and other financial officers	3.9%
5	NS-SEC2	3211	Nurses	2.6%
6	NS-SEC6	6115	Care assistants & home carers	2.3%
=7	NS-SEC1	1132	Marketing & sales managers	2.3%
=7	NS-SEC3	3312	Police officers (sergeant and below)	2.3%
9	NS-SEC6	8125	Metal worker machine operatives	2.1%
=10	NS-SEC1	2112	Biological scientists and biochemists	1.9%
=10	NS-SEC1	2132	Software professionals	1.9%

Source: Keele University (2008-11)

The SOC2000 accepted applicant data provided by Keele University contains far less missing data than that for applications (17.9% STN degrees; 50.0% GEM degrees; and 30.8% EXT degrees). As with applications data relating to SOC2000, if missing data is excluded, the children of medical practitioners account for 15.5% of STN accepted applicants; 16.7% of GEM accepted applicants; and 5.6% of EXT selected applicants. They represent the largest occupational category of STN accepted applicants (63 individuals) followed by secondary school teachers (27 individuals). On the GEM degree, they are the joint highest occupational category, along with five other professions. Likewise on the EXT degree, medical practitioner offspring are the joint largest occupational category, along with 17 other occupations, including nursing auxiliaries and care assistants.

Using only known NS-SEC data (which excludes NS-SEC9) 77.1% of STN accepted applicants at Keele come from the highest three SES backgrounds (NS-SEC1-3); along with 100% of GEM accepted applicants; and 66.7% of applicants accepted to the EXT degree. Overall, 65 applicants had a parent who was a medical practitioners became accepted applicants to one of the three undergraduate medical degrees at Keele, this was 2.3x more than the next largest occupational category (secondary school teachers) and almost 3x as many as the third occupational category (managers and proprietors in other services). There were almost 6x as many accepted applicants with a medical practitioner parent than there were from those whose head of household had a nursing SES background.

There are 1.2 applicants per accepted applicant from individuals whose SOC2000 code indicates one of their parents is a medical practitioner along with parental occupations such as care assistants and home carers. For the children of nurses (or mature students who have a nursing background themselves) there are 1.45 applicants per accepted applicant at Keele. The application/acceptance rate compares to 1.3 for those from NS-SEC1; 1.5 from NS-SEC2; 1.3 from NS-SEC3; 1.6 from NS-SEC4; 1.7 from NS-SEC5; 1.5 from NS-SEC6; 1.6 from NS-SEC7. Overall at Keele there are 14 applicants for each accepted applicant to an undergraduate medical degree, which varies from 12:1 (STN); 62:1 (GEM); 19:1 (EXT). In part these figures can be explained because the GEM and EXT courses at Keele have a much smaller intake than the STN degree, with Keele University being one of the smaller medical schools in England (OFS 2022).

Although SOC2000 data was only provided by a single university (Keele) the findings in these analysis indicates there is a degree of intergenerational occupational transmission amongst applicants and accepted applicants who come from household headed by a medical practitioner. This has been observed by other researchers, along with the advantages that those from *medical families* can accrue when arranging pre-university medical work experience, during the medical school applications process and once at medical school (Lentz and Laband 1989; Neittaanmäki et al 1993; Magnus and Mick 2000; Dhalla et al 2002; Arulampalan et al 2005; O'Neill et al 2013; Simmenroth-Nayda and Görlich 2015; Donnelly 2021; Lo Bello and Morchio 2022).

In this research, individuals from professional homes (NS-SEC1-3) dominate accepted applicants on the GEM and EXT degrees at Keele. The 2022/23 entry requirements for the EXT degree specified that applicants must have attended a non-selective state school for their GCSEs and A Levels, and preferably a school with a below average *Attainment 8 score* or an above national average percentage of eFSM students or the school is located in a POLARQ1 area (Keele University 2022). Therefore, it is possible that students from professional households, such as those headed by a doctor or surgeon could qualify for admission to the EXT degree if they met any or all of these schools-related criteria (Garrud 2022). This suggests some refinements need to be made to the EXT admissions criteria.

8.5.13 NS-SEC and SOC2000 conclusion

Although an individual's socio-economic background never formed part of the medical school admissions process, many believed their application would be looked at less favourably if they came from a higher NS-SEC category, so omitted to answer the self-reported question relating to their parental occupation (for school-leaver applicants) or their own profession (for mature applicants) (Garner 2003; Lambe et al 2018). This led to a significant decline in the volume of missing SES data, which UCAS coded NS-SEC9 (Harrison and Hatt 2009; Bolton 2010). By 2017, the issue of missing NS-SEC data had become so acute UCAS discontinued its usage in relation to university applicants, but NS-SEC continues to be used by HESA (via linked administrative ONS data) to monitor admitted students (Holland et al 2017; Kernohan 2021). Nevertheless, despite the growing volume of missing NS-SEC data during the period of this research (2002-11) it has been possible to reach valid conclusions about the nature of medical school applicants and accepted applicants in relation to their NS-SEC background, particularly if the SES background of applicants and accepted applicants is calculated using only *known* data (NS-SEC1-8).

Despite the creation of GEM and EXT degrees to widening access (Carter and Peile 2007; Garlick and Brown 2008), overall at the medical schools included in this research, the majority of applicants and accepted applicant to the STN, GEM and EXT degrees continue to come from the highest SES backgrounds (NS-SEC1-3). 82% of STN applicants came from NS-SEC1-3, with half of them at Cambridge, Imperial and Oxford universities coming from NS-SEC1 alone. The SES pattern for GEM applicants was similar to that of the STN degrees, with 80% coming from NS-SEC1-3; with 37% of GEM applicants coming from NS-SEC1 and 30% coming from NS-SEC2, compared to 42% and 37% respectively for STN applicants. Compared to STN and GEM applicants, fewer EXT applicants came from NS-SEC1-3, but these still comprised the majority (68%) with only 17% coming from NS-SEC1. Unlike STN and GEM applicants, where NS-SEC1 dominated, the greatest percentage of EXT applicants came from NS-SEC2 (36%), followed by NS-SEC1 (17%) and NS-SEC6 (16%). Is it therefore possible to conclude (using NS-SEC1-8) that applicants to the EXT degrees included in this research do come from a broader range of SES backgrounds than those applying to the STN

and GEM degrees, but a surprisingly high percentage came from higher SES backgrounds, given the widening access remit of these degrees.

The SES background of accepted applicants to the STN and GEM degrees, shows a remarkable similarity to that for applicants, with 85% (STN) and 81% (GEM) accepted applicants coming from NS-SEC1-3. Once again, Cambridge, Imperial and Oxford universities have more than 50% of their STN accepted applicants coming from NS-SEC1 alone. In total, 47% of STN accepted applicants come from NS-SEC1; with 28% coming from NS-SEC2. The pattern of accepted GEM applicants is very close to that for STN accepted applicants, with 81% coming from NS-SEC1-3; with 41% from NS-SEC1 and 27% from NS-SEC2. Almost half of GEM accepted applicants came from NS-SEC1 at Birmingham (49%); Oxford (49%) and Imperial (48%) with 50% at King's College. Although GEM accepted applicants from NS-SEC1 only accounted for 28% (Leicester); 34% (St George's); and 36% (Southampton) and more than double the percentage of GEM accepted applicants came from NS-SEC6 (15%) compared to STN (6%). This suggest generally GEM degrees have widened access a little when compared to STN degrees, but perhaps not as much as was expected when they were launched in the year 2000 (Haldane et al 2012).

As with STN and GEM accepted applicants, those from NS-SEC1-3 dominate EXT degrees, with 68% coming from NS-SEC1-3. However, far fewer EXT accepted applicants come from NS-SEC1 (16%) compared to 41% of GEM accepted applicants and 47% of STN accepted applicants. EXT accepted applicants are much more evenly spread amongst the NS-SEC categories (NS-SEC1-8) with the largest group (30%) coming from NS-SEC3; followed by NS-SEC6 (24%); and NS-SEC2 (22%). The EXT degrees included in this research do appear to have widened access further than the STN and GEM degrees. However, the number of accepted applicants to EXT degrees in this (NS-SEC1-8) sample is small, especially when compared to STN degrees. There were 16,721 accepted STN applicants (at thirteen universities), compared to 1,325 accepted GEM applicants (nine universities) but only 268 accepted EXT applicants (six universities). Therefore, whilst becoming an EXT accepted applicant is of great significance to those individuals who might not otherwise have had the

opportunity to study medicine, overall EXT degrees can only have a minimal (but important) impact of widening access to undergraduate medical degrees.

Although restricted to *known* occupations only, the examination of the SOC2000 data provided by Keele University (2008-11) was an interesting adjunct to the NS-SEC data. It allowed further exploration of the occupational backgrounds of applicants and accepted applicants. SOC2000 information was available for around 10% of applicants and just over 80% of accepted applicants. The extent to which individuals with a medical practitioner parent or guardian dominate admissions to medical schools has been known about for some decades (Magnus and Mick 2000; Arulampalan et al 2005; Hansen 2005; O'Neill et al 2013; Wouters et al 2017; Donnelly 2021; Shahriar et al 2022) so it was not a surprise to find that they accounted for 12.8% of applicants and 15.1% of accepted applicants (with SOC2000 data) at Keele. The extent to which those from managerial and professional backgrounds (as identified by their SOC2000 and NS-SEC codes), such as chartered accountants, university lecturers and medical practitioners were included amongst EXT applicants and accepted applicants was a surprise finding, as these are not usually occupations associated with socio-economic disadvantage.

8.6 Last institution attended/school type

Previous research has revealed the extent to which applicants to study medicine and medical students, have been educated in fee-paying schools and academically selective state schools, such as grammar schools (Milburn 2012; Steven et al 2016; Mwandigha et al 2018; Niven et al 2019; Rees et al 2022). The next section of this chapter will explore the educational background of applicants and accepted applicants in greater detail by using *last institution attended* (LIA) or schools type data provided by sixteen universities, the details of which are contained in the table below:

Table 8.21: Universities which provided educational background data (STN, GEM and EXT)

University	Years	Medical degrees	Data	Notes
Birmingham	2002-11	STN, GEM	SPSS	Applications and accepted applicants
Bristol	2006-11	STN, GEM, EXT	Excel	Applications and accepted applicants
Cambridge	2002-11	STN, GEM	SPSS	Applications and accepted applicants
Cardiff	2002-11	STN, EXT	Excel	Applications only
Dundee	2005-11	STN, EXT	Excel	Accepted applicants only
Imperial	2002-11	STN, GEM	SPSS	Applications and accepted applicants
King's	2002-11	STN, GEM, EXT	SPSS	Applications and accepted applicants
Leicester	2003-11	STN, GEM	Excel	Applications and accepted applicants
Liverpool	2002-11	STN, GEM	SPSS	Applications and accepted applicants
Manchester	2006-11	STN, EXT	Excel	Applications and accepted applicants
Newcastle	2002-11	STN, GEM	Excel	Applications and accepted applicants
Oxford	2006-11	STN, GEM	SPSS	Applications and accepted applicants
Queen Mary	2002-11	STN, GEM	Excel	Applications only
Sheffield	2007-11	STN, EXT	Excel	Applications only
Southampton	2006-11	STN,GEM, EXT	SPSS	Applications and accepted applicants
St George's	2008-11	STN, GEM	SPSS	Applications and accepted applicants

Notes: Keele University (2008-11) provided schools data but this has been excluded from the analyses because it was listed as missing/unknown. Newcastle University (2002-11) combined STN and GEM data, which is shown within the STN category. The data from Dundee (2005-11) and Sheffield (2007-11) universities has been imputed.

8.6.1 School type/LIA categories

At the highest level schools data was analysed using three categories:

1. State
2. Independent
3. Other

The term state-educated applies to those who were educated in comprehensive schools, further education colleges, grammar schools, sixth form colleges and academies. These are

defined as schools which are funded by a local authority or directly by central government, they are free for students to attend (Day et al 2022). Whereas independent schools, are those which charge a fee for students to attend, around 7% of the population are educated in this type of school (Ndaji et al 2016). In this three category schema, the *other* category refers to educational establishment which are not independent schools or state schools, and therefore includes universities, careers services, the prison service and corporate organisations along with those applicants who applied directly via UCAS and not via an educational establishment (these were mostly mature students who were applying to the GEM degrees).

8.6.2 Sub-categories of school types

Nine data categories were created to analysis the type of school or last educational institution that an applicant attended. These are:

1. Academy
2. Comprehensive
3. Further Education
4. Grammar
5. Higher Education
6. Independent
7. Other
8. Sixth Form
9. UCAS

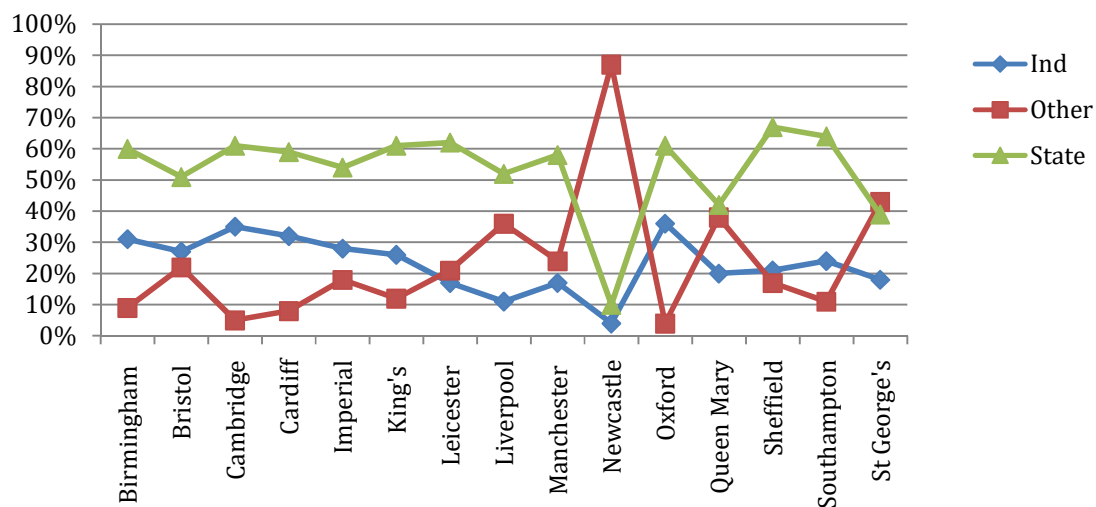
8.6.3 State and independent schools

The binary educational categorisation *state/independent* is one of HESA's performance indicators used for monitoring undergraduate admissions, with around 9% of undergraduates coming from independent schools and 91% from state schools (HESA 2023). Research shows students from independent schools are *over-represented* at highly-selective universities and on degrees such as medicine (Milburn 2012; Boliver et al 2017; Montacute and Cullinane 2018; Abulafia 2022; Jha and Wharton 2023) along with those who attended academically selective state schools, such as grammar schools (Dilnot and Boliver 2018).

8.6.4 Applications and school types (independent/other/state)

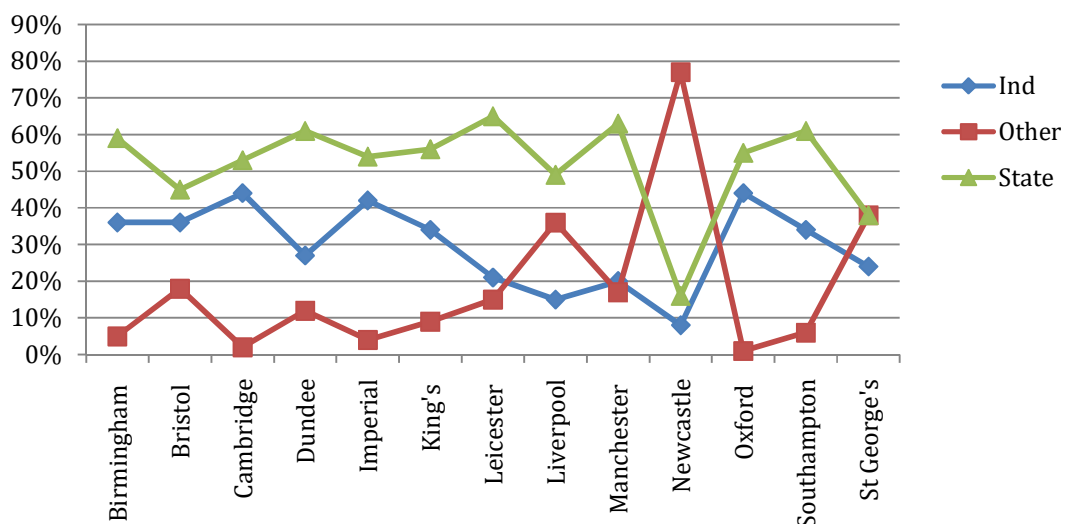
The graphs below illustrate the tripartite divide in STN, GEM and EXT applicants and accepted applicants. These provide clear pictorial evidence of state school dominance, but also show the extent of independently-educated applicants and accepted applicants on the STN degree, and at the most elite universities:

Table 8.22: STN applications (by school type)



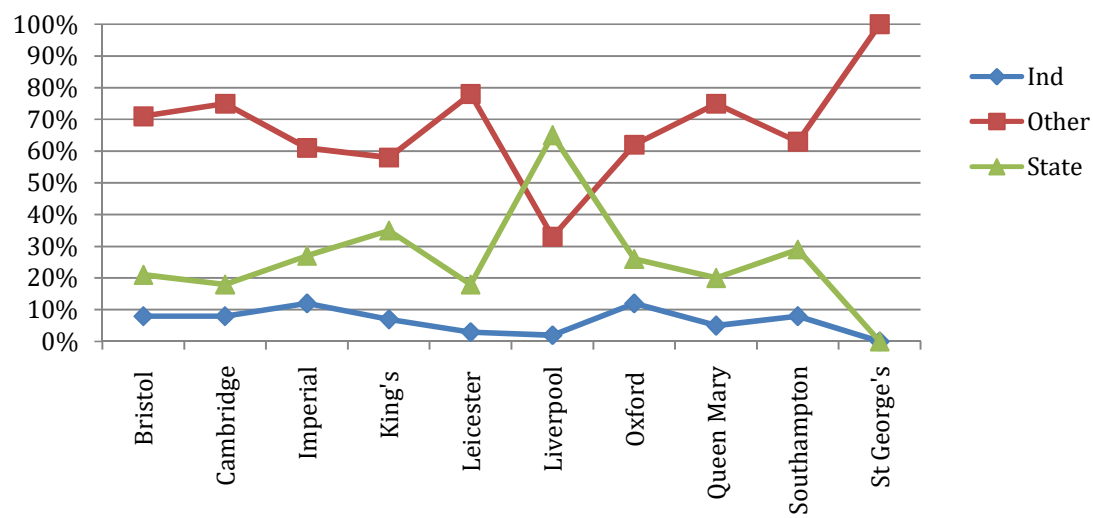
Notes: for details about the data used to compile this chart see the note under the final chart in this section.

Table 8.23: STN accepted applicants (by school type)



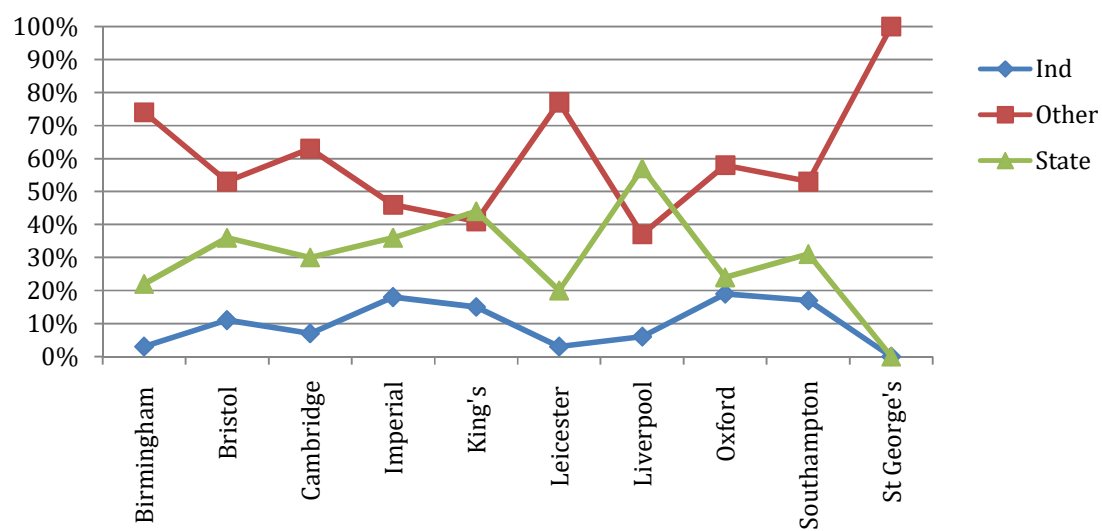
Notes: for details about the data used to compile this chart see the note under the final chart in this section.

Table 8.24: GEM applications (by school type)



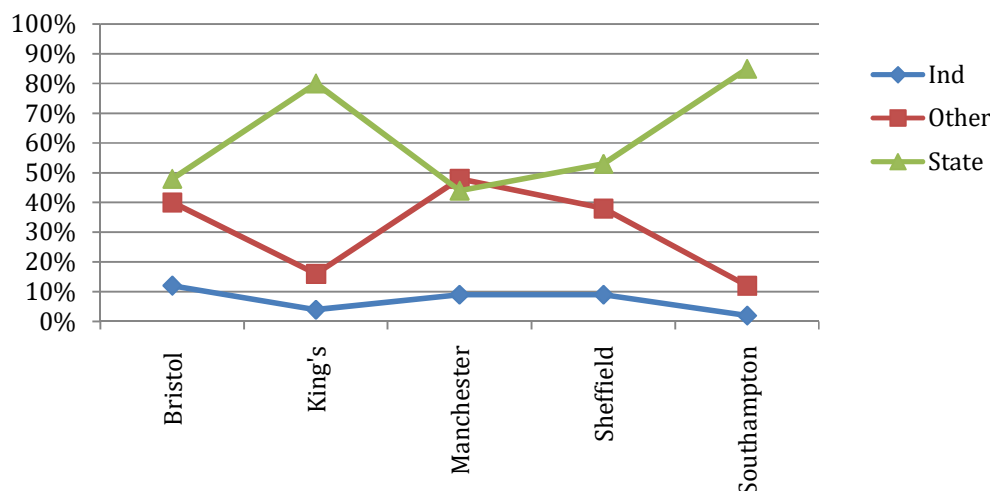
Notes: for details about the data used to compile this chart see the note under the final chart in this section.

Table 8.25: GEM accepted applicants (by school type)



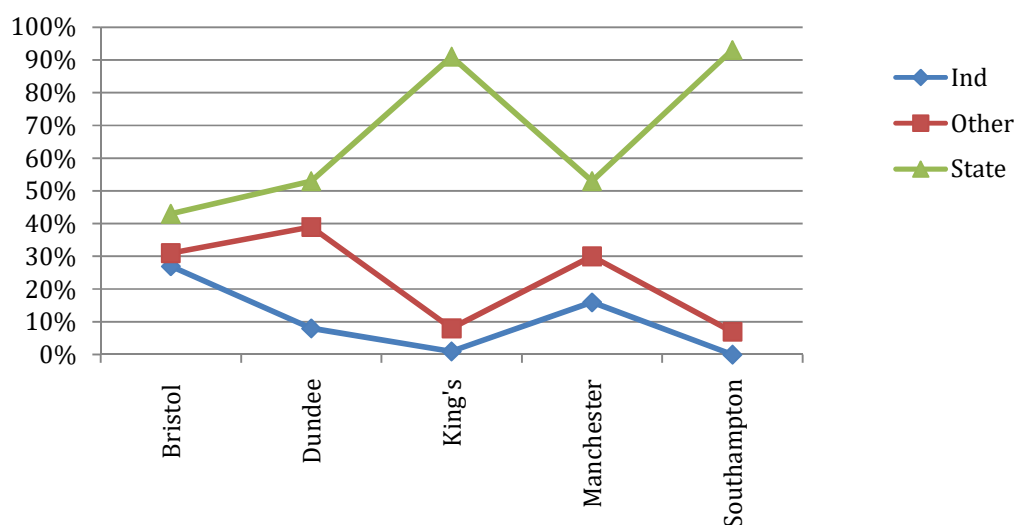
Notes: for details about the data used to compile this chart see the note under the final chart in this section.

Table 8.26: EXT applications (by school type)



Notes: for details about the data used to compile this chart see the note under the final chart in this section.

Table 8.27: EXT accepted applicants (by school type)



Notes: These tables compare the overall percentage of applicants from the independent and state school sectors. The following categories are included in the state sector: academies, comprehensive schools, further education colleges, grammar schools and sixth form colleges. Applicants and accepted applicants from individuals in higher education institutes, other establishments, unknown and missing data have been excluded from the calculations used to comprise these tables. Sixteen of the eighteen universities provided school data for the STN degree; Bristol, Birmingham, Cambridge, Cardiff, Dundee, Imperial, King's, Leicester, Liverpool, Manchester, Newcastle, Oxford, Queen Mary, Sheffield, Southampton, St George's). The data from Newcastle University combined STN and GEM degrees, this has been included with calculations for the STN degree throughout this research, because recruitment to GEM degrees accounts for 10% of incoming undergraduate medical students per annum (Haldane et al 2012). In total there were 205,597 applicants (with schools data) to the STN degree of whom 31,753 applicants were selected. Between 2002 and 2011, there were 55,719 applications to the GEM degrees in this research and 9,984 selected applications at ten universities which provided schools data (Birmingham, Bristol, Cambridge, Imperial, King's, Leicester,

Liverpool, Oxford, Southampton and St George's). The data shown in the table above excludes St George's University, because the data provided was only listed under the categories *higher education* and *other*. There were 18,859 applications to EXT degrees, with 992 accepted applicants. Cardiff, Queen Mary and Sheffield universities provided applications data only. Eight universities provided data for the EXT degrees (with schools data); Bristol, Cardiff, Dundee, Keele, King's, Manchester, Sheffield and Southampton. Dundee University provided only selected applicant data, whilst Cardiff, Sheffield and Queen Mary provided only details of applicants.

Condensing the data provided by academies, comprehensives, FE colleges, grammar schools and sixth form colleges, created a single dummy variable; *state educated* which was used to analyse applications and accepted applicants from the state sector and independent sector. The dichotomous variable (state/independent) shows the odds ratio (OR) for an applicant from an independent school becoming an accepted applicant on each of the three different types of undergraduate medical degrees in this study are:

Table 8.28: Odds ratio for independent school applicants/accepted applicants

Medical degree	Odds ratio (OR)	95% CI (lower)	95% CI (upper)	Valid cases (n)	Missing data (%)
STN	1.558	1.500	1.618	89,924	17.4
GEM	1.517	1.280	1.799	13,550	61.8
EXT	.103	.033	.326	4,462	15.0

Notes: The anonymous disaggregated individual-level data used in this researched (analysed using SPSS v27) was provided nine of the eighteen universities: Birmingham, Cambridge, Imperial, Keele, King's, Liverpool, Oxford, Southampton and St George's.

The odds ratio comparing the selection rates for independently-educated and state educated applicants suggests independently-educated applicants are more likely to become accepted applicants on the STN and GEM degrees than state-educated applicants, but are much less likely to become accepted applicants on the EXT degrees. Admissions criteria for EXT degrees indicate students who attended high-performing state schools and independent schools are not ordinarily eligible for admission (Garlick and Brown 2008; Curtis et al 2014; Garrud 2023).

Combining the aggregated and disaggregated datasets, there were more than 2x as many applicants to the STN degrees from the state sector as there were from the independent sector; with GEM degrees having 4.4x as many applications from the state sector as from the independent sector. Applications to the GEM degree, showed similar patterns to the EXT

degree, where there were 4.8x as many applicants from the state sector as from the independent sector. The findings appear to concur with previous studies of applications and admissions to undergraduate medical degrees, which found between 20-30% came from independent schools (Powis et al 2007; Steven et al 2016; Niven et al 2019).

Table 8.29: Accepted applicants (independent/state educated)

Accepted applicants	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Independent (STN)	13.6%	24.5%	18.1%	10.8%	11.3%	19.7%	17.9%	20.6%	17.3%	16.2%
State (STN)	86.4%	75.5%	81.9%	89.2%	88.7%	80.3%	82.1%	79.4%	82.7%	83.8%
Independent (GEM)	30.0%	25.0%	13.0%	17.0%	15.1%	54.8%	55.0%	55.6%	68.2%	28.7%
State (GEM)	70.0%	75.0%	87.0%	83.1%	85.0%	45.3%	45.0%	44.4%	31.8%	71.3%
Independent (EXT)	0.0%	0.0%	16.7%	2.0%	7.3%	4.8%	5.3%	5.7%	7.1%	1.4%
State (EXT)	100%	100%	83.3%	98.0%	92.7%	95.2%	94.8%	94.4%	92.9%	98.6%

Notes: see the notes under the previous table for further information about the universities that were included and excluded from these two tables. The variations between the years can be accounted for by the volume of missing, other or unknown data, which varied greatly year-by-year in the datasets provided by the universities, which has been excluded from these tables. The category state school includes accepted applicants who previously attended one of the following education institutions: academy, comprehensive, FE college, grammar school or sixth-form college.

8.6.5 GEM degrees

The findings in this research suggest there is almost a 50/50 split between accepted applicants from the independent and state sectors (47% and 53% respectively) but the dataset from the universities running GEM degrees has high volumes of missing data in relation to the secondary educational experience of an individual. Therefore (with some caveats) GEM degrees *could* be said to be widening access, especially when compared to STN degrees at the same universities. However, measuring the school type of a GEM applicant or accepted applicant attended is confounded because there were high degrees of missing data in this study.

A literature review located no previous studies of the secondary-level educational background of GEM students. Although several studies have suggested GEM students were high academic achievers throughout their schooling (Carter and Peile 2007; Bodger et al 2011) and a strong positive correlation was found between higher A Level grades and attainment levels on GEM degrees (Haldane et al 2012 ; McManus et al 2013; Garrud and

McManus 2018). In this research A Level data were provided by two universities; Birmingham (2002-11) and King's College (2002-11). This data (where *actual* A Level grades were given) indicates 78% of STN accepted applicants achieved AAA grades (30 points) or more, with 57% alone obtaining AAA grades. The data relating to GEM accepted applicants at these two universities, reveals only 25% obtained AAA grades. However, the A* grade (12 points) was only introduced in 2010 (Smithers 2014) meaning the GEM applicants in this study would have already completed their secondary schooling prior to its launch, so the highest A Level grade they could have obtained was AAA (30 points).

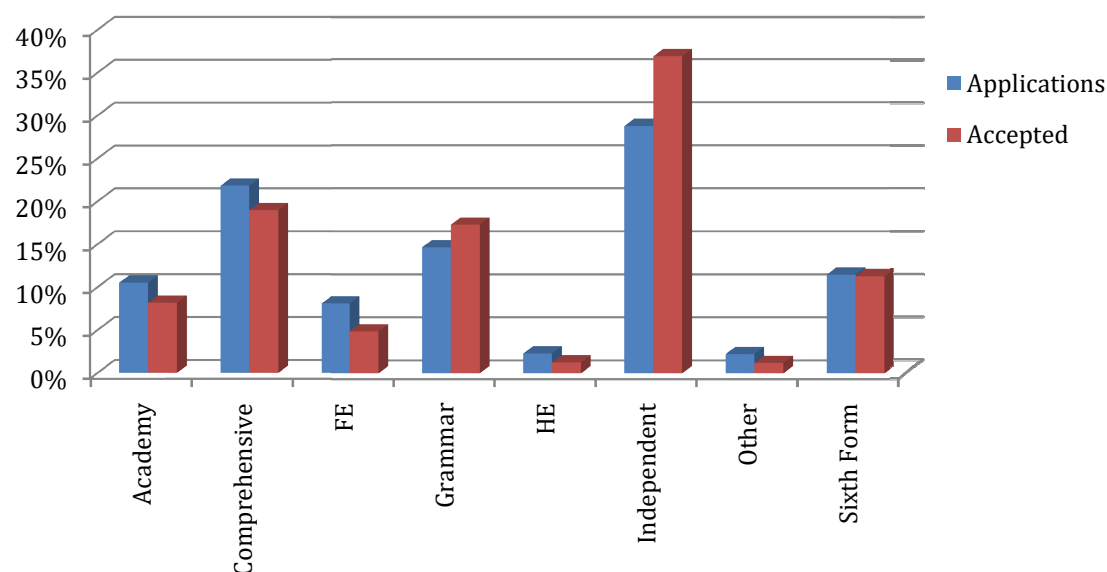
8.6.6 EXT degrees

Very few of the applicants to the EXT degrees from independent schools actually become accepted applicants. This is due in part to high volumes of missing school-type data and the likelihood they might not meet the entry requirements. When *known* last institution attended (LIA) data is explored, this indicates 4.8% of EXT accepted applicants came from independent schools, compared to 95.2% from state schools. Of the three types of undergraduate medical degrees in this study, the EXT degrees probably have the most comprehensive contextual entry requirements, designed to ensure individuals who have experienced the *least* advantages in their lives are able to benefit the most by this opportunity to study medicine (Garlick and Brown 2008; Boliver et al 2017; Curtis and Smith 2020; Garrud 2023).

8.6.7 Applications and accepted applicants to undergraduate medical degrees

The graphs below show the percentage of applicants to the three different types of undergraduate degrees at the universities (which provided school type or LIA data), using all nine of the school type categories. In this context, UCAS refers to missing/unknown data or where individuals made their medical school application directly via UCAS and not via an educational establishment, which is the norm, especially for the majority of undergraduates who proceed to university at the age of 18-19 years (Bolton 2022). To facilitate comparisons between the last institution attended (LIA) by an applicant, those for whom this data was not available have been excluded.

Table 8.30: STN degree (applications and accepted applicants)



Notes: schools data were provided by the following universities: Birmingham (STN and GEM) 2002-11; Bristol (STN, GEM and EXT) 2006-11; Cardiff (STN and EXT, applications data only) 2005-11; Dundee (STN and EXT, accepted applicants only); Imperial (STN and GEM) 2002-11; King's (STN, GEM and EXT) 2020-11; Leicester (STN and GEM) 2002-11; Liverpool (STN and GEM) 2002-11; Manchester (STN and EXT) 2006-11; Newcastle (STN and GEM combined, included with STN results) 2002-11; Oxford (STN and GEM) 2006-11; Queen Mary (STN and GEM, applications only) 2002-11; Sheffield (STN and EXT, applications only) 2007-11; Southampton (STN and GEM) 2002-11; St George's (STN and GEM) 2020-11. Data where the school type was unknown has been excluded from the samples used to compile the graph; this amounted to 17.4% of total STN applications; 52.7% of total GEM applications; and 15.0% of EXT total applications.

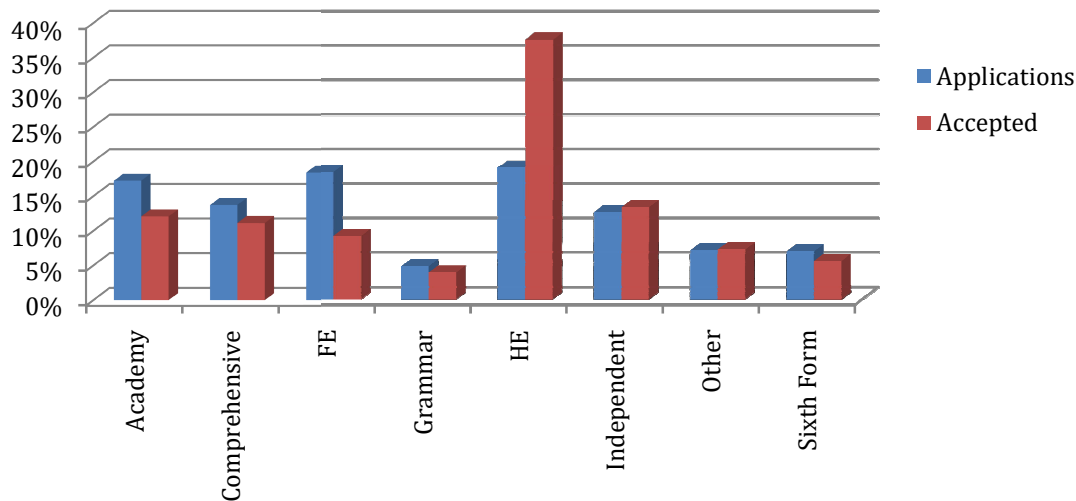
As can be seen from the above graph, applicants from independent schools comprise the largest percentage of applicants to the STN degree (28.8%), closely followed by comprehensive schools (21.8%) and some way behind grammar schools (14.7%). Applicants from independent and (state) grammar schools can be said to be *over-represented* in this sample, given that only 7% and 5% respectively of the population are educated in such establishments (Milburn 2009; Danechi 2020). Whereas those who attended a comprehensive school can be considered to be *under-represented* as 90% of the UK population attend this type of educational institution (Green and Kynaston 2019). However, a significant proportion of the *over-presentation* of those who attended independent schools can be accounted for by their A Levels grades and scores, with those educated in state schools and colleges (including grammar schools) having a mean A Level score of 20 points (equivalent to BCC grades) and those at independent schools obtaining 22 points (equating to BCC grades).

In total data about the LIA of applicants and accepted applicants was known for 29,871 STN applicants, of these 16,170 obtained A Level grades of AAA (30 points) or more (hereafter 30+ points) with 33.6% of independent schools applications obtaining these grades; compared to 25.7% from comprehensive schools; 24.7% from grammar schools; 10.1% from sixth form colleges; and 4.5% of further education college applicants. Previous studies have also indicated those who attended an independent school achieve higher A Level grades than their state educated counterparts (Gorard 2008; Dilnot and Boliver 2018; Kernohan 2023).

Despite educating around 7% of the UK population (Milburn 2009) in this sample individuals from independent schools accounted for 38.8% of accepted applicants; with 24.6% coming from grammar schools; 22.6% from comprehensive schools; 10.0% from sixth form colleges; 3.4% from FE colleges (the remainder came from academies, HE and other organisations). The A Level grades which accepted applicants obtained show more disparities than those for applicants, with 74.8% of those (with known LIA) from state grammar schools obtaining 30+ points; compared to 68.3% from sixth form colleges; 63.7% of students educated in fee-paying schools had 30+ points; 63.3% of comprehensive school alumni; dropping to 51.2% of those who attended a further education (FE) college.

Whilst the percentage of STN applicants from academies has risen from 1.1% (2002) to 14.7% (2011) as the number of schools in England converting to academy status increased, especially from 2010 onwards (West and Wolfe 2018) those for FE colleges fell from 17.5% (2002) to 4.9% (2011). STN applicants from grammar, independent and comprehensive schools remained fairly constant during this period, along with those from sixth form colleges. STN accepted applicants from academies saw a tenfold increase in their numbers between 2002 and 2011, with FE college numbers declining by five times. Individuals from independent schools comprised just over one-third of accepted STN applicants throughout this time period, with those from sixth-form colleges accounting for between 10-13%. The percentage of STN accepted applicants from comprehensive schools fluctuated between 17-23%; and grammar schools between 14-20%.

Table 8.31: GEM degree (applications and accepted applicants)

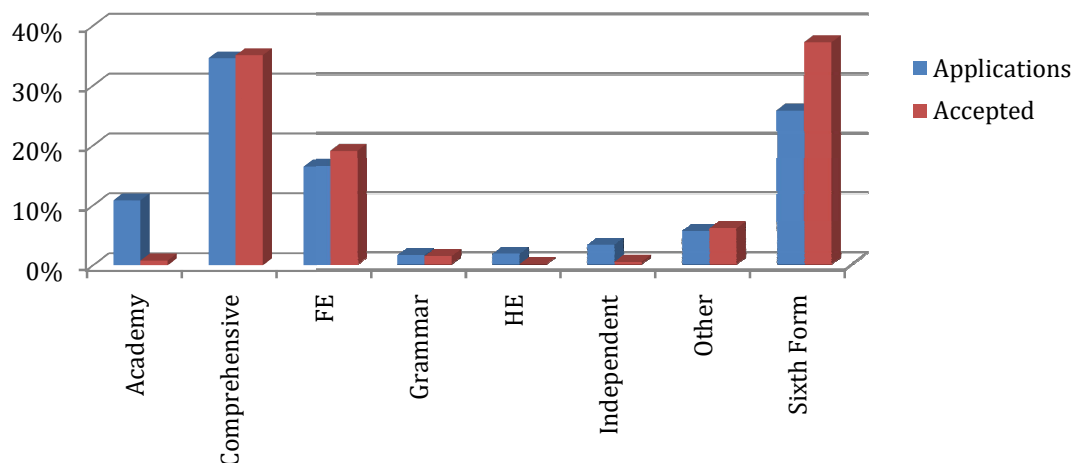


Notes: schools data were provided by the following universities: Birmingham (STN and GEM) 2002-11; Bristol (STN, GEM and EXT) 2006-11; Cardiff (STN and EXT, applications data only) 2005-11; Dundee (STN and EXT, accepted applicants only); Imperial (STN and GEM) 2002-11; King's (STN, GEM and EXT) 2020-11; Leicester (STN and GEM) 2002-11; Liverpool (STN and GEM) 2002-11; Manchester (STN and EXT) 2006-11; Newcastle (STN and GEM combined, included with STN results) 2002-11; Oxford (STN and GEM) 2006-11; Queen Mary (STN and GEM, applications only) 2002-11; Sheffield (STN and EXT, applications only) 2007-11; Southampton (STN and GEM) 2002-11; St George's (STN and GEM) 2020-11. Data where the school type was unknown has been excluded from the samples used to compile the graph; this amounted to 17.4% of total STN applications; 52.7% of total GEM applications; and 15.0% of EXT total applications.

With the exception of the GEM degree at Newcastle University (which it is possible to enter with professional healthcare qualifications and post-qualification work experience), the academic entry requirements are an undergraduate degree (Garrud 2023). This is reflected in the higher percentage of GEM applicants and accepted applicants whose LIA is a university or higher education institute (HE). This compares to 2.3% of applicants and 1.3% of accepted applicants for the STN degree who were from HE; and 1.7 of EXT applicants, there were no accepted EXT applicants from HE. Almost 40% of GEM applicants came from HE and FE colleges, this is as expected because many FE colleges, such as the College of West Anglia, Norfolk run *Access of Medicine* courses, and applicants to certain GEM degrees, such as the one at Cardiff University must have graduated from a *Feeder Stream* [science degrees] at one of four Welsh universities (Holmes 2002; Haldane et al 2012; Garrud 2023).

Despite comprising 18.4% of GEM applicants, individuals from FE colleges only accounted for 9.2% of accepted GEM applicants, whereas HE attendees comprised 19.1% of GEM applicants and 37.6% of GEM accepted applicants. Individuals from comprehensive and independent schools, account for fewer than 15% of GEM applicants and accepted applicants; with grammar schools and sixth forms accounting for between 3.9% and 7.2% of applicants and accepted applicants. Applicants and accepted applicants to GEM degrees from *other* backgrounds accounted for 7.1% and 7.2% respectively; compared to fewer than 1-2% of STN applicants and accepted applicants; and 5.6% and 6.0% respectively for EXT degrees. Where exact details of an individual's LIA were provided, it does appear a significant number of EXT and GEM applicants and selected applicants made use of standalone careers services, such as the Connexions [2001-12] to support their medical school application (Maragkou 2021). Fewer STN applicants and accepted applicants utilised these services, as they were likely supported by staff at their school or college, throughout the UCAS applications process (Hoare and Johnston 2011; Jones 2013).

Table 8.32: EXT degree (applications and accepted applicants)



Notes: schools data were provided by the following universities: Birmingham (STN and GEM) 2002-11; Bristol (STN, GEM and EXT) 2006-11; Cardiff (STN and EXT, applications data only) 2005-11; Dundee (STN and EXT, accepted applicants only); Imperial (STN and GEM) 2002-11; King's (STN, GEM and EXT) 2020-11; Leicester (STN and GEM) 2002-11; Liverpool (STN and GEM) 2002-11; Manchester (STN and EXT) 2006-11; Newcastle (STN and GEM combined, included with STN results) 2002-11; Oxford (STN and GEM) 2006-11; Queen Mary (STN and GEM, applications only) 2002-11; Sheffield (STN and EXT, applications only) 2007-11; Southampton (STN and GEM) 2002-11; St George's (STN and GEM) 2020-11. Data where the school type was unknown has been excluded from the samples used to compile the graph; this amounted to 17.4% of total STN applications; 52.7% of total GEM applications; and 15.0% of EXT total applications.

The educational background of EXT applicants and accepted applications differs markedly from those on the STN and GEM degrees, with direct comparisons between EXT and GEM degrees being complicated by the age range of GEM applicants and accepted applicants. Therefore, this section will emphasise the nature of EXT applicants and accepted applicants in relation to those on STN degrees. Introduced at King's College, London in 2001, with admissions criteria which seek to include only those who have experienced personal and/or educational disadvantage (Garlick and Brown 2008) the number of universities running this type of six-year undergraduate medical degree has increased to fourteen for entry in 2024/25, with a further six running one-year medical degree foundation courses which led directly to admission to a STN degree (Garrud 2023). In this study six universities provided LIA data for applicants (Bristol, King's, Manchester, Sheffield and Southampton) and accepted applicants (Bristol, Dundee, King's, Manchester and Southampton).

At the universities included in this non-random sample of eighteen medical schools which ran two or more types of undergraduate medical degrees between 2002 and 2011, the sort of educational background EXT degree applicants and accepted applicants came from does appear to be markedly different to those of STN and GEM degrees, particularly the STN degrees. The majority of EXT applicants (60.5%) came from state schools, especially comprehensive schools (34.6%) and sixth-form colleges (25.9%). Whereas the greatest percentage of STN applicants came from independent schools (28.8%) and comprehensive schools (21.8%) with 14.7% coming from grammar schools and 11.5% from sixth-form colleges. Very few EXT applicants came from grammar schools (1.6%), which is much lower than the percentage of GEM applicants (4.8%) and STN applicants (14.7%) which come from this type of state school. Both EXT (16.5%) and GEM degrees (18.4%) attract more applicants from FE colleges, than the STN degrees (8.1%). This is a category of applicant and accepted applicant which is known to be *under-represented* at the twenty-four *Russell Group* universities (Piatt and Eastwood 2015; Montacute and Cullinane 2018) of which fourteen of the universities include in this study are members, only Dundee, Keele, Leicester and St George's universities are not.

Where LIA data were available, EXT degrees drew the greatest percentage of applicants from state schools and colleges; sixth-form colleges (37.3%); comprehensive schools (35.1%); and further education colleges (19.0%). The greatest percentage of GEM applicants came from higher education institutions (37.6%); independent schools (13.3%) with academies (12.1%); and comprehensive schools (11.2%). Whereas STN accepted applicants came from independent schools (36.9%); comprehensive schools (19.0%); state grammar schools (17.3%); and state sixth-form colleges (11.3%). Only 0.4% of EXT accepted applicants came from independent schools. Accepted applicants from *other* educational backgrounds, were greatest on GEM degrees (7.2%) and EXT degrees (6.0%) with very few STN degree accepted applicants (1.2%) having to find an alternative route by which to complete their UCAS application. It does appear from the university data (where an individual's LIA was provided) that the EXT degrees are succeeded in widening access, particularly in relation to the educational background of applicants and accepted applicants, and when compared to the STN degrees, with almost doubled the percentage of accepted applicants coming from comprehensive schools.

In addition to the information provided previously, regarding the educational background of applicants and accepted applicants to the three different types of undergraduate medical degrees, the following tables provided a useful insight to the variability of this at the eighteen medical schools which have been included in this study.

8.6.8 STN degrees and school type

The following tables and graphs provided detailed analyses of the school type of STN applicants and accepted applicants, at each of the universities which provided this data:

Table 8.33: Applications to STN degrees by (known) school types only (2002-11)

	Academy	Comprehensive	FE	Grammar	HE	Independent	Other	Sixth form
Birmingham (2002-11)	0.0%	27.6%	5.4%	19.6%	2.0%	33.0%	0.6%	11.8%
Bristol (2006-11)	0.0%	31.3%	6.3%	13.3%	0.3%	34.7%	0.1%	14.2%
Cambridge (2002-11)	0.0%	25.9%	4.4%	22.6%	0.0%	34.8%	4.0%	8.3%
Cardiff (2002-11)	0.0%	35.3%	0.1%	11.3%	0.1%	32.3%	8.0%	12.8%
Imperial (2007-11)	32.4%	13.3%	3.2%	5.7%	0.1%	34.3%	0.2%	10.8%
King's (2002-11)	0.0%	24.8%	13.8%	19.8%	4.6%	28.3%	0.8%	7.9%
Leicester (2002-11)	0.0%	32.4%	8.8%	18.4%	0.2%	21.4%	0.3%	18.5%
Liverpool (2002-11)	26.6%	12.9%	10.2%	10.6%	1.0%	17.0%	1.8%	19.9%
Manchester (2006-11)	8.5%	27.1%	5.6%	15.5%	0.5%	22.7%	1.3%	18.8%
Newcastle (2002-11)	8.9%	27.6%	7.6%	14.0%	0.1%	28.6%	0.2%	12.9%
Oxford (2006-11)	0.0%	26.9%	4.4%	20.4%	0.0%	36.3%	1.8%	10.2%
Queen Mary (2003-11)	0.0%	29.5%	6.5%	13.2%	0.3%	32.3%	0.3%	17.8%
Sheffield (2007-11)	8.4%	30.2%	7.6%	11.1%	1.8%	22.9%	3.2%	14.8%
Southampton (2005-11)	28.8%	15.5%	6.5%	4.7%	0.2%	25.4%	7.1%	11.8%
St George's (2008-11)	0.0%	30.7%	6.9%	0.0%	17.0%	25.8%	0.2%	19.5%

Notes: The data provided by Newcastle combined STN and GEM, and has been shown throughout this study within the STN category. This decision was taken because GEM students account for around 10% of incoming medical students per annum (Haldane et al 2012). The findings relating to Newcastle should be interpreted accordingly. The information provided by Leicester comprised aggregated and disaggregated datasets for STN and GEM degrees. Cardiff, Queen Mary and Sheffield provided applications data only. The information from Dundee relates only to STN accepted applicants. Manchester provided applications data but its accepted offer refers only to firm offer, and not to accepted, enrolled or registered students. Throughout this research firm offer was interpreted as meaning accepted applicant, because it represented the final stage of the applications process in the data Manchester provided. The data provided by St George's has very high levels of STN applicants and accepted applicants categorised as coming from a higher education institute, with zero coming from grammar schools. Missing or unknown data has been removed, as has data which relates to applications made directly via UCAS and not via an educational institution. Percentages have been rounded up or down to one decimal place accordingly.

Independent schools are the single largest LIA/school type at nine universities (Birmingham, Bristol, Cambridge, Imperial, King's, Newcastle, Oxford and Queen Mary) with 27-36% of STN applicants coming from this educational background. At Cardiff, Leicester, Manchester, Sheffield and St George's universities, comprehensive schools are the single largest category; with academies being the single largest category at Liverpool and Southampton. Many of the universities where state schools are the majority of STN applicants are known to attract fewer independently educated undergraduates than other comparable universities (Thiele et al 2016; Montacute and Cullinane 2018). With the

exception of Birmingham and Newcastle universities, those with the largest percentage of independently educated STN applicants are located in London and the south of England.

State educated individuals (academies, comprehensives, FE colleges, grammar schools and sixth-form colleges) comprise the majority of STN applicants (68% overall), ranging from 80.2% at Liverpool and 78.1% at Leicester to 59.5% at Cardiff and St George's (57.1%); with STN applicants from state schools accounting for 61.9% of those at Oxford and 61.2% at Cambridge. If grammar schools are removed from the state educated category, then the percentage of STN applicants from state schools falls to just over half (54.1%) ranging from 38.6% at Cambridge and 41.5% at Oxford, up to more than 60% at Sheffield, Southampton and Liverpool. Creating a single category consisting of state grammar and independent schools (IAG), individuals who attended these socially exclusive schools (Andrews et al 2016; Green and Kynaston 2019) account for more than 50% of STN applicants at Cambridge (57.4%); Oxford (56.7%); and Birmingham (52.6%) and 40% or more at King's, Bristol, Queen Mary, Cardiff, Newcastle and Imperial. More than one-third of STN applicants came from IAG at Leicester, Manchester, Sheffield and Southampton. Only Liverpool and St George's had lower rates of IAG (27.6% and 25.8% respectively). With around 12% of the UK population educated in grammar schools and independent schools (Milburn 2012; Danechi 2020), STN applicants from these backgrounds can be said to be *over-represented* at the fifteen universities included in this sample of STN applications.

Table 8.34: Accepted applications to STN degrees by (known) school type (2002-11)

School type	Academy	Comprehensive	FE	Grammar	HE	Independent	Other	Sixth form
Birmingham (2002-11)	0.1%	24.0%	2.8%	22.7%	0.2%	37.8%	0.2%	12.2%
Bristol (2006-11)	0.0%	29.3%	4.7%	11.1%	0.2%	44.3%	0.1%	10.3%
Cambridge (2002-11)	0.0%	19.5%	2.5%	24.1%	0.0%	44.3%	2.1%	7.4%
Dundee (2005-11)	0.6%	51.2%	3.1%	10.2%	2.2%	29.3%	1.5%	2.0%
Imperial (2007-11)	33.6%	8.4%	1.6%	5.7%	0.1%	43.7%	0.1%	6.8%
King's (2002-11)	0.0%	19.1%	9.6%	24.5%	3.6%	36.4%	0.7%	6.0%
Leicester (2002-11)	0.0%	31.2%	5.7%	18.3%	0.1%	24.0%	0.5%	20.2%
Liverpool (2002-11)	12.0%	17.3%	7.2%	13.4%	0.3%	22.7%	1.2%	26.0%
Manchester (2006-11)	9.7%	25.0%	4.5%	14.5%	0.1%	23.6%	1.7%	20.9%
Newcastle (2002-11)	8.6%	29.2%	4.4%	12.5%	0.3%	33.1%	0.0%	11.8%
Oxford (2006-11)	0.0%	21.4%	3.5%	20.3%	0.0%	44.4%	0.9%	9.5%
Southampton (2005-11)	27.5%	14.8%	5.7%	4.3%	0.1%	34.3%	3.8%	9.6%
St George's (2008-11)	0.0%	29.1%	3.5%	0.0%	18.3%	31.6%	0.2%	17.3%

Notes: The data provided by Newcastle combined STN and GEM, and has been shown throughout this study within the STN category. This decision was taken because GEM students account for around 10% of incoming medical students per annum (Haldane et al 2012). The findings relating to Newcastle should be interpreted accordingly. The information provided by Leicester comprised aggregated and disaggregated datasets for STN and GEM degrees. Cardiff, Queen Mary and Sheffield provided applications data only. The information from Dundee relates only to STN accepted applicants. Manchester provided applications data but its accepted offer refers only to firm offer, and not to accepted, enrolled or registered students. Throughout this research firm offer was interpreted as meaning accepted applicant, because it represented the final stage of the applications process in the data Manchester provided. The data provided by St George's has very high levels of STN applicants and accepted applicants categorised as coming from a higher education institute, with zero coming from grammar schools. Missing or unknown data has been removed, as has data which relates to applications made directly via UCAS and not via an educational institution. Percentages have been rounded up or down to one decimal place accordingly.

At all of the universities in this sample, from independent schools are the single largest group of STN accepted applicants, at all but two universities (Dundee and Liverpool), where 51.2% of accepted applicants at Dundee are from comprehensive schools, and 26.0% at Liverpool are from sixth-form colleges. More than 40% of STN accepted applicants at Bristol, Cambridge, Imperial and Oxford are from independent schools. Grammar schools are also prominent amongst accepted applicants at Birmingham, Cambridge, King's and Oxford. Individuals educated in state schools and colleges, account for more than 50% of accepted applicants at all fifteen of the universities in this sample, with the highest percentage of state-educated (75% or more) being found at Leicester, Liverpool and

Manchester. If grammar schools are removed from the category *state* educated, the percentage of accepted applicants falls to 29% at Cambridge; 34% at Oxford; 35% at King's; and 39% at Birmingham; and more than 50% at the remaining universities. Combining independent schools and state grammar schools (IAG) results in more than 30% of accepted applicants coming from these type of schools at all the universities. The greatest percentage of IAG accepted applicants can be found at King's and Birmingham (61%); 65% at Oxford; and 68% at Cambridge.

Some of the high percentages of IAG accepted applicants can be accounted for because half of all fee-paying schools are academically selective, along with all 163 English state grammar schools (Andrews et al 2016; Henderson et al 2019; Green 2022). The mean A Level scores for STN applicants is 27.42 points (standard deviation 4.995) which equates to AAB grades, for applications and 28.79 points for accepted applicants (standard deviation 3.476) which equates to AAA/B grades.

Table 8.35: Mean A Level scores for known school types (2002-11)

STN applicants

School type	Mean A Level points	Equates to A Level grades	SD
Academy	22.29	BBC	0.756
Comprehensive	27.08	AAB/ABB	5.125
FE	25.07	ABB/BBB	6.215
Grammar	28.10	AAB	4.446
HE	24.07	BBB	6.088
Independent	27.82	AAB	4.821
Other	26.91	AAB/ABB	6.261
Sixth Form	27.84	AAB	3.809
Total	27.42	AAB/ABB	4.955

n=29,871 applicants

STN accepted applicants

School type	Mean A Level points	Equates to A Level grades	SD
Academy	22.00	BBC	0.000
Comprehensive	28.21	AAB	4.733
FE	26.25	AAB/ABB	6.051
Grammar	28.80	AAA/AAB	4.358
HE	22.73	BBB	6.214
Independent	28.41	AAA/AAB	4.332
Other	27.50	AAB	6.389
Sixth Form	28.89	AAA/ABB	2.783
Total	28.41	AAB	4.421

n=4,660 accepted applicants

Notes: includes A Level grades 2-36 points with data provided by Birmingham University and King's College London

The mean A Level score tables for STN applicants and accepted applicants illustrate the extent to which those in state grammar schools and sixth-form colleges, along with independent schools achieve the highest A Level grades. Individuals from most types of schools show an increase in their mean A Level scores between application and becoming an accepted applicant, the exception being higher education institutes, but most of the

applicants from this background will be applying to STN degrees, with a degree or about to obtain a degree. The grades shown in the table above are indicative, and relate to the A Level points scored, and not to the actual grades an individual received.

8.6.9 GEM degrees and school type

Four-year GEM degrees began in the UK at St George's and Warwick universities in the year 2000, in an attempt to diversify the medical student population, by providing a *second chance* to those who chose not to enter a STN degree immediately after completing their A Levels, or did not achieve the required entry grades (Daly 2004; Haldane et al 2012).

Table 8.36: Applications to GEM degrees by (known) school type (2002-11)

School type	Birmingham (2002-11)	Bristol (2006-11)	Cambridge (2003-11)	Imperial (2007-11)	King's (2002-11)	Leicester (2002-11)	Liverpool (2002-11)	Oxford (2006-11)	Queen Mary (2003-11)	Southampton (2005-11)	St George's (2008-11)
Academy	0.0%	0.0%	0.0%	26.3%	0.0%	0.0%	69.2%	0.0%	0.0%	21.1%	0.0%
Comprehensive	21.6%	33.4%	8.1%	16.5%	13.7%	33.4%	6.2%	19.6%	23.2%	17.7%	0.0%
FE	9.9%	10.9%	9.7%	9.1%	33.7%	19.7%	10.1%	9.3%	9.6%	15.3%	0.0%
Grammar	8.2%	8.4%	3.4%	5.1%	5.9%	10.5%	2.2%	8.5%	7.2%	3.0%	0.0%
HE	36.1%	7.4%	0.0%	0.0%	29.0%	5.4%	2.8%	0.0%	6.1%	6.0%	99.0%
Independent	10.5%	25.5%	10.2%	30.1%	11.9%	14.5%	3.3%	19.4%	19.2%	19.8%	0.0%
Other	6.2%	0.8%	66.5%	0.0%	2.1%	0.6%	1.3%	38.5%	0.6%	0.5%	1.0%
Sixth form	7.5%	13.6%	2.2%	12.9%	3.7%	16.0%	5.0%	4.7%	34.2%	16.6%	0.0%

Notes: There were no GEM courses at Cardiff, Dundee, Manchester or Sheffield universities. STN and GEM data from Newcastle University was combined, and the results are shown in the previous two STN tables.

The datasets provided by the eleven universities which ran GEM degrees alongside STN degrees, between 2002 and 2011, contained much higher volumes of missing school type data, than either the STN or EXT datasets. Therefore LIA comparisons between the GEM applicants and accepted applicants, and more problematic than between STN and EXT degrees, with most students entering GEM degrees at the age of 21 years or later, with an undergraduate degree (Bodger et al 2011; Garrud and McManus 2018).

Individuals from independent schools accounted for 20-30% of GEM applicants, at Bristol, Imperial, Oxford, Queen Mary and Southampton. Applicants educated in state comprehensive schools, are the single largest category at Bristol and Leicester (33%); and account for almost one-quarter at Queen Mary. Liverpool has an unusually high number of GEM applicants from (state) academy schools (69%), which given the 2002-11 timeframe of this research is likely to include grant maintained schools, which were the forerunners of today's academies (West and Woolfe 2019). Compared to applicants to the STN degrees, there are far fewer GEM applicants from grammar schools, with Leicester having the highest percentage (10.5%), which most likely reflects the high numbers of grammar school educated students who access undergraduate medical degrees, immediately after their A Levels (Niven et al 2019). The volumes of missing LIA GEM applicant data are significant (53%), which has distorted the mean A Level scores (5.02) therefore comparisons are made only between STN and EXT applicants and accepted applicants.

Table 8.37: Accepted applicants to GEM degrees by (known) school type (2002-11)

School type	Birmingham (2002-11)	Bristol (2006-11)	Cambridge (2003-11)	Imperial (2007-11)	King's (2002-11)	Leicester (2002-11)	Liverpool (2002-11)	Oxford (2006-11)	Southampton (2005-11)	St George's (2008-11)
Academy	0.0%	22.5%	0.0%	29.2%	0.0%	0.0%	61.0%	0.0%	22.2%	0.0%
Comprehensive	29.2%	4.9%	9.0%	18.0%	16.8%	35.3%	11.0%	16.5%	11.4%	0.0%
FE	7.3%	2.8%	18.8%	4.5%	35.9%	19.1%	5.8%	7.6%	12.0%	0.0%
Grammar	4.5%	0.0%	6.3%	3.4%	9.9%	6.6%	4.1%	10.1%	3.2%	0.0%
HE	34.3%	12.0%	0.0%	0.0%	9.2%	8.8%	2.9%	0.0%	2.5%	98.9%
Independent	7.9%	0.0%	9.7%	33.7%	22.9%	12.5%	9.3%	31.6%	34.2%	0.0%
Other	6.7%	7.7%	51.4%	0.0%	2.3%	0.0%	0.6%	27.8%	0.0%	1.1%
Sixth form	10.1%	50.0%	4.9%	11.2%	3.1%	17.6%	5.2%	6.3%	14.6%	0.0%

Notes: Queen Mary did not provide any accepted applicant data. There were no GEM courses at Cardiff, Dundee, Manchester or Sheffield universities. STN and GEM data from Newcastle University was combined, and the results are shown in the previous two STN tables.

Given the high volumes of missing data it is difficult to effectively assess the educational background of GEM accepted applicants compared to the STN and EXT degrees and to reach

a satisfactory conclusion regarding the impact GEM degrees have had on widening access based on the type of school attended. But as with STN accepted applicants, a significant percentage of GEM accepted applicants come from independent schools; 32% at Oxford; 34% at Imperial and Southampton. One half or more of GEM accepted applicants at Bristol come from sixth-form colleges; and the *other* category at Cambridge attracted more than 50% of accepted applicants. Liverpool, again had more than 60% of GEM accepted applicants who had attended an academy.

8.6.10 EXT degrees and school type

During the course of this research, seven universities ran EXT degrees alongside STN degrees, only four of these (Bristol, Keele, King's and Southampton) ran STN, GEM *and* EXT degrees. Six-year EXT degrees were launched at King's College, London in 2001 to provide an alternative route to a medical degree, to those whose schooling or family background had had a negative impact on their A Level results (Garlick and Brown 2008). Although the EXT degree at Manchester, has a widening access remit, it differs from the others included in this study because is it only available to those with arts and humanities A Levels (Mahalingasivam et al 2020). Some of the EXT such as that at King's College have a residency requirement, which restricts access to those living in certain geographical area (Curtis and Smith 2020). EXT degrees generally have lower academic entry requirements than STN degrees (Garrud 2023). A table showing the mean A Level scores of EXT applicants and accepted applicants is shown below:

Table 8.38: Mean A Level scores for by (known) school type (2002-11)**EXT applicants**

School type	Mean	Equates to A Level grades	SD
Academy			
Comprehensive	19.56	BCC	8.137
FE	12.38	DDD	10.297
Grammar	17.73	BCD	7.414
HE	12.53	CDD	11.961
Independent	15.03	CCD/CDD	11.337
Other	2.67	D/E	6.532
Sixth Form	18.68	BCC/CCC	7.974
Total	16.81	BBB/C	9.645

n=2,405 applicants

Notes: includes A Level grades 2-36 points

Data provided by King's College

EXT accepted applicants

School type	Mean	Equates to A Level grades	SD
Academy			
Comprehensive	22.05	BBC	8.307
FE	13.97	CDD	11.541
Grammar	18.80	BCC/D	10.640
HE			
Independent	12.00	DDD	16.971
Other			
Sixth Form	20.45	BBC/BCC	9.426
Total	20.17	BCC	9.670

n= 435 accepted applicants

Notes: includes A Level grades 2-36 points

Data provided by King's College

Despite the issues arising from the datasets, when the mean A Level scores of EXT applicants and accepted applicants are contrasted with those of the STN degrees, the former does have a much broader range of A Level grades, being one to two grades lower for each applicant or accepted applicant. The table below shows the mean A Level grades for STN and EXT applicants and accepted applicants. Data relating to the GEM degree has been excluded because A Level results are not part of the admissions process for most GEM degrees (Garrud 2023):

Table 8.39: School type/last institution attended (STN and EXT degrees only)

School type/LIA	STN apps	EXT apps		STN accept	EXT accept
Academy	BBC			BBC	
Comprehensive	AAB/ABB	BCC		AAB	BBC
FE	ABB/BBB	DDD		AAB/ABB	CDD
Grammar	AAB	BCD		AAA/AAB	BCC/D
HE	BBB	CDD		BBB	
Independent	AAB	CCD/CDD		AAA/AAB	DDD
Other	AAB/ABB	D/E		AAB	
Sixth form	AAB	BCC/CCC		AAA/ABB	BBC/BCC
Total	AAB/ABB	BBB/BBC		AAB	BCC

Notes: STN data provided by Birmingham University and King's College (2002-11) with EXT data provided by King's College only (2002-11).

Previous research has shown, in the early years of the EXT degree at King's College, the standard A Level entry requirements were CCC grades (18 points) but applicants who showed *potential* were admitted with lower grades (Garlick and Brown 2008). Between 2007 and 2011, the EXT entry grades at King's were AAB-BCC. During the same timeframe, the STN entry requirements were AAB/C (2007); AAB/B (2008); AAA/B (2009) and AAA from 2010. By 2012, the entrants to the EXT needed AAB-BBC (Curtis and Smith 2020). The variability in the A Level entry between the STN and EXT degrees (2002-11) included in this sample, is reflected in the table, and the findings concur with previous studies. For entry in 2024/25, King's College's STN degree requires A*AA grades (32 points) compared to AAB (28 points) for admission to the EXT degree (Garrud 2023).

Table 8.40: Applications to EXT degrees by (known) school type (2002-11)

Applications (EXT)	Bristol (2006-11)	Cardiff (2002-11)	King's (2002-11)	Manchester (2006-11)	Sheffield (2007-11)	Southampton (2005-11)
Academy	0.0%	0.0%	15.5%	16.6%	17.8%	6.5%
Comprehensive	29.1%	24.7%	31.8%	1.4%	24.2%	38.4%
FE	24.4%	0.0%	11.0%	0.9%	14.8%	21.8%
Grammar	7.9%	5.9%	0.8%	8.0%	7.3%	2.3%
HE	1.4%	0.0%	2.5%	33.6%	6.2%	1.0%
Independent	19.7%	22.4%	4.1%	13.7%	13.3%	2.5%
Other	0.1%	27.1%	5.8%	9.6%	4.2%	5.5%
6th form	17.3%	20.0%	28.5%	16.4%	12.2%	21.9%

Notes: There were no EXT degrees at Birmingham, Cambridge, Imperial, Leicester, Liverpool, Newcastle, Nottingham, Oxford, Queen Mary and St George's. Dundee did not provide EXT applicant data, only accepted applicant data. Sheffield and Cardiff provided EXT applicant data but not accepted applicant data.

Unlike STN applicants, where the largest single LIAs were independent schools (29%), closely followed by comprehensive schools (26%) and sixth-form colleges (14%), EXT applicants come mainly from comprehensive schools (25%) and sixth-form colleges (19%). The percentage of EXT applicants from independent schools just exceeds those from further education colleges (12.6% and 12.2% respectively). At Bristol and Cardiff universities, individuals from independent schools account for 20-22% respectively of EXT

applicants. One can only assume they met *some* of the contextual admissions criteria (Curtis and Smith 2020), despite attending a fee-paying school because at Bristol, they accounted for 19.7% of EXT applicants and 37.1% of EXT accepted applicants.

Table 8.41: Accepted applicants to EXT degrees by (known) school type (2002-11)

School type	Bristol (2006-11)	Dundee (2005-11)	King's (2002-11)	Manchester (2006-11)	Sheffield (2007-11)	Southampton (2005-11)
Academy	0.0%	9.4%	2.1%	10.9%	17.8%	0.0%
Comprehensive	25.7%	3.1%	27.3%	31.5%	24.2%	41.2%
FE	8.6%	28.1%	7.8%	5.4%	14.8%	26.9%
Grammar	11.4%	0.0%	1.1%	10.9%	7.3%	1.6%
HE	2.9%	40.6%	0.0%	1.1%	6.2%	0.0%
Independent	37.1%	6.3%	1.1%	22.8%	13.3%	0.0%
Other	0.0%	12.5%	6.7%	1.1%	4.2%	5.7%
Sixth form	14.3%	0.0%	53.9%	16.3%	12.2%	24.6%

Notes: There were no EXT degrees at Birmingham, Cambridge, Imperial, Leicester, Liverpool, Newcastle, Nottingham, Oxford, Queen Mary and St George's. Dundee did not provide EXT applicant data, only accepted applicant data. Sheffield provided EXT applicant data but not selected applicant data as did Cardiff.

Individuals educated in state schools and colleges (academies, comprehensives, further education colleges, grammar schools and sixth form-colleges) account for between 41% to 94% of EXT accepted applicants at Dundee and Southampton, respectively. Dundee was the only university where the greatest percentage of EXT accepted applicants came from outside the state sector (41% from higher education institutes), otherwise the percentages from these types of establishments was less than 7%. Fewer than 12% of EXT accepted applicants came from grammar schools, ranging 0% at Dundee to 10.9% at Manchester, and 11.4% at Bristol. This perhaps reflects the lack of this type of school in Scotland along with smaller concentrations in the south-west and north-west of England (Gorard and Siddiqui 2018; Long et al 2023).

Overall, there were almost 3x the percentage of EXT accepted applicants from further education colleges than grammar schools (13% compared to 5%) which differs markedly from STN accepted applicants, where the situation was almost reversed, with 5% coming from FE colleges, and 14% from grammar schools. The pattern of distribution between EXT and STN accepted applicants for independent schools varied, with 13% of EXT accepted applicants coming from this type of school, compared to 29% of STN accepted applicants. Comprehensively educated accepted applicants to the EXT and STN degrees were almost identical, 25.5% and 24.6% respectively. A summary of the schools types, applications and accepted applicants is presented in the table below:

Table 8.42: School type/last institution attended (STN, GEM and EXT degrees)

School type/LIA	STN apps	GEM apps	EXT apps		STN accept	GEM accept	EXT accept
Academy	7.6%	10.6%	9.4%		7.1%	13.5%	6.7%
Comprehensive	26.1%	17.6%	24.9%		24.6%	15.2%	25.5%
FE	6.5%	12.5%	12.2%		4.5%	11.4%	15.3%
Grammar	13.3%	5.7%	5.4%		14.0%	4.8%	5.4%
HE	1.9%	17.4%	7.5%		2.0%	16.9%	8.5%
Independent	28.7%	14.9%	12.6%		34.6%	16.2%	13.4%
Other	2.0%	10.7%	8.7%		1.0%	9.8%	5.0%
Sixth form	14.0%	10.6%	19.4%		12.3%	12.3%	20.2%

Notes: The data provided by Newcastle combined STN and GEM, and has been shown throughout this study within the STN category. This decision was taken because GEM students account for around 10% of incoming medical students per annum (Haldane et al 2012). The findings relating to Newcastle should be interpreted accordingly. The information provided by Leicester comprised aggregated and disaggregated datasets for STN and GEM degrees. Cardiff, Queen Mary and Sheffield provided STN applications data only. The information from Dundee relates only to STN and EXT accepted applicants not applicants. Manchester provided EXT and STN applications data but its accepted applications refers only to firm offer, and not to accepted, enrolled or registered students. Throughout this research firm offer was interpreted as meaning accepted applicant, because it represented the final stage of the applications process in the data Manchester provided. The data provided by St George's has very high levels of STN applicants and accepted applicants categorised as coming from a higher education institute, with zero coming from grammar schools. Missing or unknown data has been removed, as has data which relates to applications made directly via UCAS and not via an educational institution. There were no GEM courses at Cardiff, Dundee, Manchester or Sheffield universities. There were no EXT degrees at Birmingham, Cambridge, Imperial, Leicester, Liverpool, Newcastle, Nottingham, Oxford, Queen Mary and St George's. Percentages have been rounded up or down to one decimal place accordingly.

Collectively, EXT degrees in this study appear to have succeeded in recruiting applicants and accepted applicants from more diverse educational backgrounds, especially compared to STN degrees, and to a lesser extent GEM degrees. However, the GEM dataset contains high levels of missing data because the school or college an applicant attended and the A

Level grades they obtained do not generally form part of the application and admission process for most GEM degrees (Garrud 2023). The EXT degrees at Keele, King's and Southampton universities appear to have been the most successful at attracting students from non-selective state schools and colleges; at Bristol over one-third of EXT accepted applicants (35%) came from independent and grammar schools; whilst at Manchester these school types accounted for 25% of EXT accepted applicants. However, the number of accepted applicants to the EXT degrees is small, especially in comparison to those entering STN degrees.

8.6.11 Individual schools and colleges

20% of secondary schools in the UK provide 80% of applicants to undergraduate medical degrees, and between 2009 and 2011, half of all UK secondary schools did not provide a single applicant (Jones-Berry et al 2015). The extent to which individual schools and colleges dominate applications and admissions, especially to elite universities and specifically undergraduate medical degrees has been an ongoing concern since the beginning of the twenty-first century (Jary and Thomas 2000; Ryle et al 2000; Milburn 2009; Reeves et al 2017; Atkinson et al 2018; Askham 2021).

The data obtained from HESA for this research, gives details of the 4,819 different LIAs from which 49,831 students were admitted to undergraduate medical degrees at the eighteen universities included in this research (2002-11); 79% of these had fewer than ten students admitted to an undergraduate medical degree and 29% only had one student admitted to these degrees. Unfortunately, because of how the data were compiled it is not possible to differentiate between the three different types of undergraduate medical degrees:

Table 8.43: Top ten educational institutions attended by first-year undergraduate medical students at 18 universities (HESA data 2002-11)

Last education institution	School type	Students	Percent
Greenhead College, Huddersfield	State sixth-form	279	0.56%
Peter Symonds College, Winchester	State sixth-form	208	0.42%
Hills Road Sixth Form College, Cambridge	State sixth-form	154	0.31%
College of West Anglia, King's Lynn, Norfolk	State FE college	150	0.30%
Winstanley College, Wigan	State sixth-form	145	0.29%
Wyggeston and Queen Elizabeth I College, Leicester	State sixth-form	135	0.27%
Manchester Grammar School	Independent (boys)	124	0.25%
Royal Grammar School, High Wycombe	State grammar (boys)	114	0.23%
Henrietta Barnett School, London	State grammar (girls)	112	0.22%
Woodford County High School, London	State grammar (girls)	108	0.22%
Total undergraduate medical students admitted		49,831	

Notes: Students whose last educational institution (LIA) was a university have been excluded from the table. HESA employs a rounding strategy with records of <5 entries showing as zero.

There was a surprising degree of *localism* amongst admitted medical students in this (HESA) dataset, with most of the eighteen universities drawing the highest number of admitted students from their local area, for example individuals from Greenhead College, Huddersfield (state sixth-form college) were amongst the largest group of students admitted to undergraduate medical degrees at the northern universities of Leicester, Liverpool, Manchester, Newcastle, Nottingham and Sheffield; whereas students from Peter Symonds College, Winchester (state sixth-form college) could be found in greater numbers at Bristol, Cardiff, Nottingham, Oxford and Southampton universities. The universities based in London, Scotland and Wales all recruited extensively from within their geographic region. The majority of young people stay local for university (56%), attending one which is less than fifty-five miles from their home address, particularly disadvantaged students; travelling to a more distant university remains the preserve of White, middle-class, privately-educated students (Donnelly and Gamsu 2018; Turham and Stevens 2020).

8.6.12 Comparison of school types on STN, GEM and EXT degrees

Two of the eighteen universities included in this research (Birmingham and King's College) provided details about the last educational institution (LIA) an applicant and selected applicant attended. King's College was the only medical school included in this non-

random sample of eighteen medical schools, which ran all three types of undergraduate medical degrees *and* provided the school name an individual attended prior to applying to study medicine.

Table 8.44: Applications (top ten institutions only) King's College (2002-11)

STN school name	No	%	GEM school name	No	%	EXT school name	No	%
King's College London (HE)	352	1.3	Queen Mary University, London	174	1.9	Christ The King Sixth Form College, London (RC)	189	7.9
Queen Mary University, London	230	0.9	King's College London (HE)	118	1.3	St Angela's Ursuline School, London (girls comprehensive)	98	4.1
Seven King's High School, London (mixed comprehensive)	202	0.8	Kingston University	88	1.0	Lambeth College, Clapham Centre, London (FE)	96	4.0
St Dominic's Sixth Form College, London (RC)	198	0.8	University of Westminster	63	0.7	Newham Sixth Form College, London	83	3.5
Henrietta Barnett School, London (girls' grammar)	197	0.8	University of Leeds	60	0.7	Tower Hamlets College, London (FE)	70	2.9
The Latymer School, London (mixed grammar)	169	0.6	Brunel University, London	53	0.6	Leyton VI Form College, London	56	2.3
Woodford County High School, London (girls' grammar)	168	0.6	University of Surrey, Guildford	51	0.6	Mulberry School for Girls, London (comprehensive)	53	2.2
Woodhouse College, London (state sixth-form)	157	0.6	University of the West of England, Bristol	39	0.4	Grey Coat Hospital, London (CofE girls comprehensive)	42	1.7
Tiffin School, Kingston upon Thames (boys' grammar)	144	0.6	London South Bank University	37	0.4	St Francis Xavier VI Form College, London	41	1.7
Haberdashers' Aske's Boys' School, Elstree (independent non-selective)	131	0.5	Hammersmith and West London College (FE)	33	0.4	Haberdashers' Aske's Hatcham College, London (comprehensive)	40	1.7

Notes: There were 26,125 applicants to the STN degree, with missing data amounting to 13.3% of total applicants. The GEM degree received 9,162 applicants and 53.8% of data were missing. 2,405 individuals applied to the EXT degree and missing data equated to 9.8% of total applications.

In terms of the schools and colleges that applicants come from, the EXT degree at King's College attracts a far more diverse range than either the STN or the GEM schools or independent schools amongst the education institutions which provide the greatest number of applicants to EXT degree (as seen in the above table). As expected, the greatest number of applicants to the GEM degree came from universities.

Table 8.45: Accepted applicants (top ten institutions) King's College (2002-11)

STN school name	No	%	GEM school name	No	%	EXT school name	No	%
King's College London (HE)	51	1.9	Hammersmith and West London College (FE)	3	1.5	Christ The King Sixth Form College, London (RC)	52	12.0
Henrietta Barnett School, London (girls' grammar)	25	0.9	Brunel University, London	2	1.0	St Angela's Ursuline School, London (RC girls comprehensive)	24	5.5
The Latymer School, London (mixed grammar)	24	0.9	College of West Anglia, Kings Lynn (FE)	2	1.0	Lambeth College, London (FE)	20	4.6
Woodford County High School, London (girls' grammar)	24	0.9	Hills Road Sixth Form College, Cambridge	2	1.0	St Francis Xavier VI Form College, London (RC)	18	4.1
Queen Elizabeth's School, Barnet (girls' non-selective)	22	0.8	Rugby School (boys independent selective)	2	1.0	Grey Coat Hospital, London (CofE girls comprehensive)	16	3.7
Haberdashers' Aske's School for Girls, Elstree (independent selective)	21	0.8	Southwark College, London (FE)	2	1.0	Haberdashers' Aske's Hatcham College, London (comprehensive)	14	3.2
Bancrofts School, Woodford Green, Essex (independent mixed)	20	0.7	Wellington College, Crowthorne (independent mixed since 2005)	2	1.0	La Retraite Roman Catholic Girls' School, London (comprehensive)	13	3.0
Ilford County High School, Essex (boys grammar)	18	0.7	Wycombe High School, High Wycombe (girls grammar)	2	1.0	Mulberry School for Girls, London (comprehensive)	13	3.0
Seven Kings High School, London (mixed comprehensive)	18	0.7				Tower Hamlets College, London (FE)	13	3.0
The Tiffin Girls School, Kingston upon Thames (girls grammar)	18	0.7				Newham Sixth Form College	12	2.8
Wallington High School For Girls, London (grammar)	18	0.7				Cardinal Vaughan Memorial RC School, London (boys comprehensive)	10	2.3

Notes: The STN degree had 2,685 accepted applicants, with missing data accounting for 9.9% of the total. 196 GEM applicants were selected, 32.7% of these applied directly via UCAS, which suggests they were not enrolled at an educational institution at the time of their application and 15.3% of data were missing. Below Wycombe High School in relation to the GEM degree were 85 different institutions which had a single accepted applicant to the GEM degree. 435 applicants were selected for the EXT degree with missing data amounting to 1.4%.

The state schools that are represented amongst the ones which send the greatest number of applicants and have the highest number of accepted applicants to the STN degree are a mixture of selective and non-selective state schools, three are single-sex (girls) and one is boys only (GIAS 2022). Their rates of students entitled to Free School Meals (eFSM) vary from 3.8% to 26.1%; the eFSM national average for England is 22.5% (GIAS 2022; McRae and Westwater 2022). There are more public schools represented amongst the schools and colleges which have the greatest number selected for the GEM degree. The non-selective state girls' school *Grey Coat Hospital, London* had 16 students amongst accepted applicants for the EXT degree, and has an eFSM rate of 17.3% (GIAS 2022).

The EXT degree at King's College has succeeded in widening access to a much broader range of state schools and colleges than either the STN or the GEM degree. This is likely to be because although the range of London boroughs has been repeatedly extended since the

degree launched in 2001, the eligibility criteria have been repeatedly refined throughout the ten year period of this research (2002-11) to ensure that only those attending non-selective state schools since the age of eleven years are eligible to apply, particularly those who have attended low attaining state schools (Garlick and Brown 2008; Curtis and Smith 2020).

There are significant differences between the state schools having the highest number of accepted applicants to the STN and EXT degrees at King's College. All of the LIAs sending the greatest number of students to both degrees are rated *good* or *outstanding* by OFSTED but the rates of eFSM vary with a mean of 9.2% for STN degree (ranging from 3.6% to 17.5%) and mean of 28.8% for the EXT degree (ranging from 15.3% to 47.7%) (GIAS 2023). The national average eFSM rate for England is 23.8% (ONS 2023). Rates of students achieving a grade five (equivalent to a B/C grade) in GCSE Mathematics and English ranges from a mean for the STN degree of 92% (ranging from 64-100%) to a mean of 65% (ranging from 53% to 77%) for the EXT degree, with English national average being 45% (GIAS 2023). Using only this small sample, the EXT degree can be said to have successfully widened access to undergraduate medical degrees to King's College, but there were only 435 accepted applicants to the EXT degree compared to 2,685 to the STN degree (2002-11) meaning any impact would be limited, although highly significant to the individuals involved.

8.6.13 LIAs at Birmingham University (2002-11)

Birmingham University was the only other university which provided the name of the LIA an applicant had attended. The dataset from this university included applications and admissions to all undergraduate degrees between 2002 and 2011. Therefore comparisons can be made between the STN degree, GEM degree and other undergraduate degrees at the university:

Table 8.46: Applications (top ten institutions) Birmingham University (2002-11)

All undergraduate degrees	No	%	STN school name	No	%	GEM school name	No	%
King Edward VI College, Stourbridge, West Midlands (sixth form)	3643	1.1	King Edward VI Camp Hill School for Girls, Birmingham (grammar)	162	1.0	Queen Mary University, London	52	1.1
Sixth Form College Solihull, West Midlands	3155	1.0	King Edward VI College, Stourbridge, West Midlands (sixth form)	149	0.9	Leeds University	46	1.0
Sutton Coldfield College, West Midlands (FE)	2576	0.8	Manchester Grammar School for Boys (independent selective)	148	0.9	King's College London (HE)	43	0.9
Cadbury Sixth Form College, Birmingham	2400	0.7	Wyggeston and Queen Elizabeth I Sixth Form College, Leicester	122	0.8	Newcastle University	36	0.7
Joseph Chamberlain Sixth Form College, Birmingham	2218	0.7	King Edward's School, Edgbaston, Birmingham (independent selective boys)	117	0.7	Wolverhampton University	33	0.7
Wyggeston and Queen Elizabeth I Sixth Form College, Leicester	1906	0.5	King Edward VI Camp Hill School for Boys Birmingham (grammar)	108	0.7	Birmingham University	30	0.6
Halesowen College, West Midlands (FE)	1865	0.6	King Edward VI Handsworth School for Girls, Birmingham (grammar)	101	0.6	Kingston University	23	0.5
Hills Road Sixth Form College, Cambridge	1436	0.4	King Edward VI High School for Girls, Edgbaston, Birmingham (independent selective)	97	0.6	Sheffield University	20	0.4
Peter Symonds College, Winchester (sixth-form)	1424	0.4	Nottingham High School for Girls (independent selective)	96	0.6	University of Wales Institute Cardiff (UWIC)	19	0.4
Solihull College, West Midlands (FE)	1310	0.4	King Edward VI Five Ways School, Birmingham (mixed grammar)	92	0.6	University of the West of England, Bristol	19	0.4
						Brunel University, London	19	0.4

Notes: Birmingham University data (2002-11). There were 320,929 applications to undergraduate degrees at the university (including the STN and GEM degrees). Along with 16,120 applications to the STN degree; and the GEM degree received 4,820 applications.

In total Birmingham University received 320,929 applications for admission to 636 undergraduate degree courses from individuals at 4,686 different educational institutions and other organisations. King Edward VI College, Stourbridge (selective state sixth-form college) had the greatest number of applicants (n=3,639) with 724 LIAs (16%) having only a solitary applicant during the ten year period of this research (2002-11). With the exception of colleges in Leicester, Cambridge and Winchester, local sixth-form and further education colleges in Birmingham and the West Midlands area have the largest number of applicants to undergraduate degrees at the university.

The STN degree at Birmingham University received 16,120 applications from individuals at 2,194 different educational institutions and other organisations, with 670 LIAs (31%)

having only one applicant to the STN course. The STN degree receives the largest number of applicants for any course at the university, comprising 5.1% of total undergraduate applications to the university (2002-11). The LIA of applications to the STN degree are somewhat different to those of undergraduate degrees at Birmingham University, with academically selective schools in the state and independent sectors dominating. Aside from independent schools and sixth form colleges in Leicester, Manchester and Nottingham, the LIAs sending the highest of applicants to the STN degree at Birmingham are almost all state grammar schools from the local area. Unlike applications to undergraduate degrees, none of the top ten LIAs by number of applicants to the STN degree are from further education colleges. This is a group which is known to be *under-represented* at elite universities and on undergraduate medical degrees (Niven et al 2019; Lisauskaite et al 2021). The GEM degree is dominated by applicants from universities, as access to this degree type is generally restricted to those who already have obtained or are about to obtain at least a 2:1 (upper second) in their undergraduate degree (Garrud 2023).

Table 8.47: Accepted applicants (top ten institutions) Birmingham University (2002-11)

All undergraduate degrees	No	%	STN school name	No	%	GEM school name	No	%
King Edward VI College, Stourbridge, West Midlands (sixth form)	1073	2.2	King Edward VI Camp Hill School for Girls, Birmingham (grammar)	62	1.8	De Montfort University, Leicester	16	3.9
Sixth Form College Solihull, West Midlands	615	1.2	Manchester Grammar School for Boys (independent selective)	52	1.5	Leeds University	15	3.7
Cadbury Sixth Form College, Birmingham	467	0.9	King Edward VI College, Stourbridge, West Midlands (sixth form)	45	1.3	Beauchamp College, Oadby Leicester (non-selective secondary school)	5	1.2
Joseph Chamberlain Sixth Form College, Birmingham	422	0.9	King Edward VI High School for Girls, Edgbaston, Birmingham (independent selective)	39	1.1	Birmingham University	4	1.0
Sutton Coldfield College, West Midlands (FE)	362	0.7	King Edward VI Camp Hill School for Boys Birmingham (grammar)	37	1.1	Kingston University	4	1.0
JFS (non-selective Jewish secondary school, Harrow)	353	0.7	King Edward's School, Edgbaston, Birmingham (independent selective boys)	37	1.1	Solihull Sixth Form College, West Midlands	4	1.0
Halesowen College, West Midlands (FE)	297	0.6	Nottingham High School for Girls (independent selective)	36	1.1	University of Wales Institute Cardiff (HE)	4	1.0
Hills Road Sixth Form College, Cambridge	289	0.6	King Edward VI Five Ways School, Birmingham (mixed grammar)	33	1.0	Abbey Tutorial College, Birmingham (independent sixth form college)	3	0.7
Peter Symonds College, Winchester (sixth-form)	264	0.5	King Edward VI Handsworth School for Girls, Birmingham (grammar)	33	1.0	Coleg Meirion-Dwyfor, Pwllheli, Wales (FE)	3	0.7
Worcester Sixth Form College	248	0.5	Colyton Grammar School, Devon (mixed)	30	0.9	Queen Mary University, London	3	0.7

Notes: in total 49,255 applicants were accepted to undergraduate degrees at the university. The LIA was missing or unknown for 5.9% of accepted applicants. There were 3,064 different LIAs which had at least one accepted applicant to the university. 3,397 accepted applicants to the STN degree came from 986 different LIAs, of these 752 had fewer than three accepted applicants with missing data amounting to 4.3% of total accepted applicants. There were 407 accepted GEM applicants, coming from 114 different LIAs, but of these 104 had fewer than two accepted applicants but levels of missing data are high for the GEM degree, with 56.3% of data missing or unknown (including via UCAS).

As with applications to undergraduate degrees, the LIAs of accepted applicants is dominated by educational establishments located in Birmingham and the West Midlands area, only three institutions in the top ten are located outside the immediate area (Harrow Cambridge and Winchester). JFS is the only non-selective secondary school to be included in the top ten of STN accepted applicants, where only 4.2% of students are eFSM (compared to a national average in England of 23.8%) and 82% of students achieve a grade five (equivalent to a B/C grade) in GCSE Mathematics and English (compared to 45% in England) (GIAS 2023; ONS 2023). The LIAs with the greatest number of selected applicants are all selective schools or colleges in the state or independent sectors. With the exception of Colyton Grammar School

(Devon) all were listed amongst the LIAs which had the greatest number of STN applications. With the exception of three schools in Manchester, Nottingham and Devon, all are located in Birmingham or the West Midlands, most within the city of Birmingham itself.

The LIAs with the greatest number of STN accepted applicants are all selective state grammar schools, independent schools or sixth form colleges, most are from Birmingham or the West Midlands, with the exception of Manchester Grammar School for Boys, Nottingham High School for Girls and Colyton Grammar School, Devon. All of the grammar schools have been rated *outstanding* by OFSTED, and have below average rates of eFSM for England (23.8%) ranging from 4.4% at Colyton Grammar School to 21.9% at King Edward VI Camphill School [grammar] for Girls; 93-100% of students achieve a grade five (equivalent to a B/C grade) in GCSE Mathematics and English, which is more than double the schools in their local area and England as a whole (GIAS 2023). Six of the LIAs who had the highest number of accepted applicants to the GEM degree came from universities with three colleges/schools and one independent sixth form college.

8.6.14 Chi-squared tests (school types)

By comparing the observed results with expected results, an attempt has been made to establish if this occurred by chance or is due to a relationship between the variables (Bergh 2015). Three Chi-squared tests were undertaken, one each for the STN, GEM and EXT degrees, using the school type variable. These tests used data provided by Birmingham (STN and GEM); Cambridge (STN, GEM); Imperial (STN, GEM); Keele (STN, GEM, EXT); King's (STN, GEM, EXT); Liverpool (STN, GEM); Oxford (STN, GEM); Southampton (STN, GEM, EXT); St George's (STN, GEM). There were 108,926 applicants to the STN degrees; 35,426 applicants to the GEM degrees; and 5247 applicants to the EXT degrees at these nine universities. The results of the tests are shown below:

STN degree: $\chi^2(8) = 1369.843, p < 0.001$
GEM degree: $\chi^2(8) = 763.207, p < 0.001$
EXT degree: $\chi^2(8) = 260.875, p < 0.001$

Detailed findings relating to the tests for association are outlined in the tables below:

Table 8.48: Results of Chi-squared tests/school type (STN, GEM and EXT degrees) within school type

School type	STN (%) accepted within school type applications	GEM (%) accepted within school type applications	EXT (%) accepted within school type applications
Academy	1049 (12.3)	174 (5.7)	71 (1.2)
Comprehensive	2923 (13.7)	139 (6.6)	227 (16.7)
Further education	1088 (9.5)	186 (4.1)	108 (19.0)
Grammar	1962 (18.6)	48 (6.6)	10 (14.3)
Higher education	311 (8.7)	193 (16.1)	11 (0.0)
Independent	3851 (20.2)	127 (8.7)	21 (2.1)
Other	302 (8.5)	72 (8.3)	37 (17.7)
Sixth form	1537 (15.5)	70 (6.5)	169 (23.7)
UCAS	2828 (10.6)	1125 (4.1)	115 (4.5)
Total (selected)	16211 (14.9)	2133 (6.0)	770 (17.7)
Total (applications) (n)	108926	35426	5247

Notes: The above table excludes the universities which provided data in a format which could not be transferred to SPSS for analyses. It includes data provided by schools data provided by Birmingham, Cambridge, Imperial, Keele, King's, Liverpool, Oxford, Southampton and St George's. In this table the UCAS category has been included, which consists of details for applicants where the LIA was missing or not known but the application had been made via UCAS, which applies to all UK domiciled applicants. This was deemed expedient to permit comparisons between the three different medical degree types.

The educational background of STN applicants and accepted applicants, indicates those from independent schools, state grammar schools and sixth form colleges, had the highest selection rates (within each individual school type). This compares to higher education institutions, independent schools and other educational providers for the GEM degrees. Sixth form colleges dominate the EXT degrees, followed by comprehensive schools and grammar schools. The patterns of school types differ significantly for the GEM and EXT degrees, when compared to the STN degrees in this research.

Table 8.49: Results of Chi-squared tests/school type (STN, GEM and EXT degrees) applications and accepted applicants within outcome

School type	STN applications within outcome (%)	STN selected within outcome (%)	GEM applications within outcome (%)	GEM selected within outcome (%)	EXT applications within outcome (%)	EXT selected within outcome (%)
Academy	9470 (8.7)	1409 (7.2)	2891 (8.2)	174 (7.8)	485 (9.2)	71 (0.8)
Comprehensive	19639 (18.0)	2923 (16.6)	2303 (6.5)	139 (7.2)	1544 (29.4)	227 (33.5)
Further education	7311 (6.7)	1088 (4.3)	3087 (8.7)	186 (5.9)	737 (14.0)	108 (18.2)
Grammar	13180 (12.1)	1962 (15.1)	804 (2.3)	48 (2.5)	70 (1.3)	10 (1.3)
Higher education	2089 (1.9)	311 (1.1)	3200 (9.0)	193 (24.2)	78 (1.5)	11 (0.0)
Independent	25876 (23.8)	3851 (32.3)	2112 (6.0)	127 (8.6)	145 (2.8)	21 (0.4)
Other	2027 (1.9)	302 (1.1)	1187 (3.4)	72 (4.6)	249 (4.7)	37 (5.7)
Sixth form	10332 (9.5)	1538 (9.9)	1166 (3.3)	70 (3.6)	1154 (22.0)	170 (35.9)
UCAS	19002 (17.4)	2828 (12.5)	18676 (52.7)	1125 (35.7)	785 (15.0)	115 (4.5)
Total	108926	16211	35426	2133	5247	770

Notes: Data provided by Birmingham, Cambridge, Imperial, Keele, King's, Liverpool, Oxford, Southampton, St George's. UCAS includes missing, unknown, unclassified and direct applicant data. In this context outcome is a dichotomous variable, and refers to applicants which have been selected or not selected.

8.6.15 Cramer's V tests (school type)

To test the veracity of these findings, a second test of association was conducted, and the Chi-squared tests were followed up by Cramer's V test, to measure the strength of the association between the variables. This elicited the following results from the same datasets:

STN degree: $V = 0.112$, $p < 0.001$ ($n=108,926$ applications)

GEM degree: $V = 0.147$, $p < 0.001$ ($n=35,426$ applications)

EXT degree: $V = 0.223$, $p < 0.001$ ($n=5,247$ applications)

The results of the Cramer V test indicate there is a strong association (>0.15) between the school or college STN and EXT applicants and accepted applicants attended; whereas the association between school type and GEM applicants and accepted applicants is considered moderate (>0.10).

8.7 A Level grades and points

Two universities (Birmingham and King's College) provided details about the A Level grades of applicants and accepted applicants for each of the years 2002-11. During this period Birmingham ran the STN and GEM degrees, whereas King's College ran the STN, GEM and EXT degrees. From the original datasets provided by these universities, a new

was created which included only those who had obtained A Levels CCC to A*A*A* grades (18-36 points). With AAA grades (30 points) being the highest possible grade, until the A* grade was introduced in 2010 (Smithers 2014). This cut off point was chosen because CCC grades were the lowest entry requirements for King's College's EXT degree, in the earliest years after the degree was launched in 2001 (Brown and Garlick 2007). The table below shows the distribution of A Level scores between applicants and accepted applicants for the three different degree types (STN, GEM and EXT)

Table 8.50: A Levels (18-36 points) STN, GEM and EXT Applications and accepted applicants

Degree with indicative grades	18 CCC	20 BCC	22 BBC	24 BBB	26 ABB	28 AAB	30 AAA	32 A*AA	34 A*A*A	36 A*A*A*
STN applicants	2.0%	3.3%	4.5%	7.1%	10.1%	15.9%	49.2%	3.5%	2.3%	2.0%
STN accepted	0.9%	1.5%	2.2%	4.4%	7.3%	14.9%	59.7%	3.4%	3.3%	2.4%
GEM applicants	9.1%	11.9%	14.6%	19.5%	15.9%	11.5%	17.6%			
GEM accepted	5.6%	6.1%	8.9%	15.6%	17.8%	15.6%	30.6%			
EXT applicants	16.1%	15.3%	16.3%	18.1%	13.4%	11.3%	8.2%	0.8%	0.1%	0.3%
EXT accepted	7.3%	11.6%	14.0%	21.2%	18.3%	13.7%	12.5%	0.9%	0.0%	0.6%

Notes: data provided by Birmingham University and King's College (2002-11). Birmingham STN and GEM. King's STN, GEM and EXT. Total applicants (n) = 33,397 (STN = 29,311; GEM = 2636; EXT = 1450). The A Level grades indicated are indicative rather than the actual grade an applicant or accepted applicant obtained.

The A Level scores of STN applicants coalesce around 26-30 points (equivalent to ABB-AAA grades) with 75.2% gaining these grades and points, including 49.2% who gained the maximum AAA grades (30 points) until the A* grade was introduced in 2010 (Smithers 2014). The A Level grades and points of GEM applicants are more evenly spread with the majority achieving between 18-24 points (55%). Although one-fifth of GEM applicants (19.5%) achieved 24 points (BBB grades); with 18% gaining 30 points (AAA grades); and 16% being awarded 26 points (ABB grades). Previous research has suggested GEM students were high academic achievers throughout school and university (Carter and Peile 2007; Rapport et al 2009; Haldane et al 2012).

The EXT applicant and accepted applicants are a sample from King's College. Here there are marked difference between the grades and points EXT applicants achieved and STN applicants. Only 1.2% of EXT applicants achieved 30 points or more (AAA or more) in 2010

and 2011, compared to 7.8% of STN applicants. Almost half of EXT applicants (48%) were awarded 18-22 points (CCC-BBC grades) compared to just under one-tenth (9%) of STN applicants. The largest single group of EXT applicants achieved 24 points (BBB grades) compared to almost half of STN applicants (49.2%) who achieved 30 points (AAA grades).

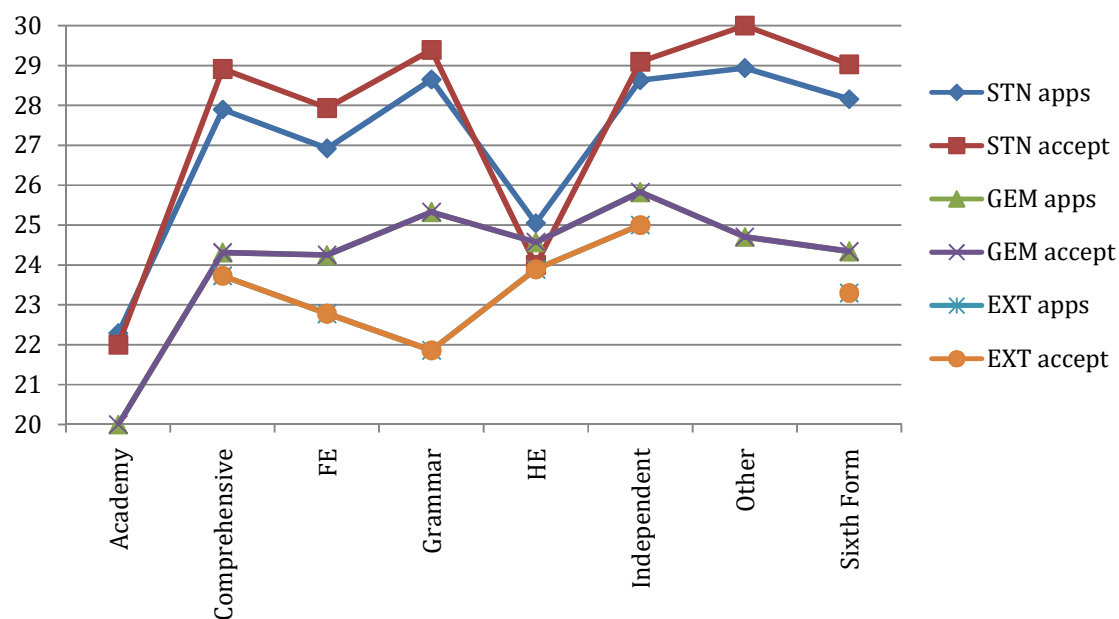
Almost two-thirds of STN accepted applicants (59.7%) obtained 30 points (AAA grades), with 68.8% obtaining 30-36 points (AAA-A*A*A* grades). After AAA grades the second largest category was the 14.9% of STN accepted applicants who achieved 28 points (AAB grades); followed by the 7.3% who were awarded 26 points (ABB grades). 83.7% of STN accepted applicants achieved 28 points or more (AAB-A*A*A* grades). Grades of 28-30 points or more (AAB and above) were once considered essential for entry to one of the twenty-four Russell Group universities, of which Birmingham and King's College are members (Hemsley-Brown 2015; Piatt and Eastwood 2015). Fewer than 10% of STN accepted applicants were awarded 18-24 points (CCC-BBB grades).

Just over one-third of GEM accepted applicants obtained what for them would have been the maximum AAA grades (30 points). Almost half of GEM accepted applicants (46%) achieved 28 points or more (AAB to AAA grades); with almost 80% being awarded 24 points or more (BBB-AAA grades). The largest single group of GEM accepted applicants was the 31% who obtained AAA grades (30 points); followed by 18% who achieved 26 points (ABB grades) and the 15.6% who each gained 24 (BBB grades) and 28 points (AAB grades). Far more GEM accepted applicants (21%) achieved 18-22 points (CCC-BBC) than STN accepted applicants, where 4.6% obtained these grades.

Although far exceeding the minimum entry requirements for King's College (of CCC grades) (Curtis and Smith 2020). 12.5% of EXT accepted applicants obtained 30 points (AAA grades) but the greatest percentage 21.2% gained 24 points (BBB grades); followed by 22 points (BBC grades) which 18.3% were awarded. Almost one-third of EXT accepted applicants achieved 18-22 points (CCC-BBC grades) compared to fewer than 5% of STN accepted applicants. 1.5% of EXT accepted applicants. Despite A* grades only being available from 2010 (Smithers 2014) 1.5% of EXT accepted applicants and 9.1% of STN

accepted applicants achieved more than 30 points (A*AA-A*A*A* grades). The graph below show the distribution of the mean A Level points for each LIA/school type for applicants and accepted applicants to the STN, GEM and EXT degrees at Birmingham University and King's College London:

Table 8.51: Distribution of mean A Level points and last institution attended STN, GEM and EXT applications and accepted applicants (2002-11)



Notes: STN and GEM data were provided by Birmingham University (2002-11) with King's College London providing STN, GEM and EXT data (2002-11). The lowest mean A Level points was 20 points (BCC grades) and highest was 30 points (AAA grades). Missing and unknown data has been excluded, along with direct applications via UCAS. There were no A Level points available for EXT applicants and accepted applicants from the *academies* and *other* categories. Total number of applicants (n) = 33,399 of which 5,100 were accepted.

The above graph was compiled using data shown in the tables below, which illustrates the mean A Level scores (points) for the eight different school types (last institution attended):

Table 8.52: School types and mean A Level scores (18-36 points) with indicative grades (applications)

School type	STN apps mean	STN apps grades	STN apps SD	GEM apps mean	GEM apps grades	GEM apps SD	EXT apps mean	EXT apps grades	EXT apps SD
Academy	22	BBC	0.756	20	BCC	0.000			
Comprehensive	28	AAB	3.708	24	BBB	3.711	24	BBB	3.854
FE	27	AAB	3.676	24	BBB	3.939	23	BBB	3.541
Grammar	29	AAA	3.271	25	ABB	3.441	22	BBC	3.371
HE	25	ABB	4.940	25	ABB	3.750	24	BBB	3.526
Independent	29	AAA	3.105	26	ABB	3.355	25	ABB	3.933
Other	29	AAA	2.739	25	ABB	3.504			
Sixth Form	28	AAB	3.138	24	BBB	3.850	23	BBB	4.078
Total	28	AAB	3.450	25	ABB	3.782	23	BBB	3.864

Notes: STN and GEM data were provided by Birmingham University (2002-11) with King's College London providing STN, GEM and EXT data (2002-11). The lowest mean A Level points was 18 points (CCC grades) and highest was 30 points (AAA grades). Missing and unknown data has been excluded, along with direct applications via UCAS. There were no A Level points available for EXT applicants and accepted applicants from the *academies* and *other* categories. A Level points have been rounded up or down, for example 25 points become 26 points, in order that a realistic A Level grade can be allocated. The A Level grades shown in the table are indicative only and not the actual grades an applicant or accepted applicant was awarded. This process undertaken due to the multiple combinations of A Level grades available for each point, for example 20 points here is shown as BBC grades, but could also include AA; A*B; ACD; ABE; BBD et al. Total number of applicants (n) = 33,399 of which 5,100 were accepted.

Further analyses of the same datasets used to produce the above graph and table reveals the 49.2% of STN applicants achieved 30 points (AAA grades). This was the single largest category of A Level points for the main educational establishment types in this sample; with 45.0% of applicants from comprehensives obtaining 30 points; along with 36.3% from further education (FE) colleges; 54.0% from grammar schools; 51.1% from independent schools; and 51.5% for sixth-form colleges.

Making comparisons of the A Level points of GEM applicants and accepted applicants is not as straightforward as those between the STN and EXT degrees, because generally A Level results do not form part of the admissions process for GEM degrees (Garrud 2023). Despite the majority of STN applicants and accepted applicants obtaining 30 points, the A Level points of their GEM counterparts are more varied with 19.5% achieving 24 points (BBB

grades) and 17.1% gaining 30 points (AAA grades). The greatest percentage of comprehensive educated GEM applicants (24.3%) obtained 24 points (BBB grades); along with 20.5% of those from further education (FE) colleges, and 23.1% of sixth-form college students; 20% of GEM applicants who previously attended grammar schools were awarded 30 points, along with 23.9% of independently educated individuals.

Overall, the A Level points of EXT applicants and accepted applicants were much more diverse than either the STN or GEM degrees; with the largest group of applicants (18.1%) obtaining 24 points (BBB grades); followed by 16.3% who gained 22 points (BBC grades); and 16.1% who obtained 18 points (CCC grades). Only 2.0% of STN applicants were awarded 18 points (CCC grades), along with 9.1% of GEM applicants. The greatest percentage of comprehensive EXT applicants (19.7%) obtained 24 points (BBB grades) as did 20.7% of those from FE colleges, and 100% of individuals from independent schools; with 50% of grammar school EXT applicants gaining 22 points (BBC grades); and 25% of sixth-form college applicants being awarded 26 points (ABB grades).

The greatest percentage of comprehensive EXT applicants (18.1%) obtained 24 points (BBB grades), with 20.7% of those from FE colleges being awarded 22 points (BBC grades). 19.9% of individuals from sixth-form colleges had the lowest grades, with gaining 18 points (CCC grades) along with 28.6% of those from grammar schools. EXT applicants from independent schools were equally divided between 22 and 24 points (BBC and BBB grades respectively) at 25.0% each, but there were 40x fewer EXT applicants from independent and grammar schools than there were from comprehensives, FE colleges and sixth-form colleges, in part because during the course of this research (2002-11), the EXT degree at King's College was generally only available to those who had attended a poorly performing non-selective state school in three inner London areas (Papachristodoulou 2010) which has since been extended to all greater London boroughs, along with Kent and Medway (Curtis and Smith 2020).

Table 8.53: School types and mean A Level scores (18-36 points) with indicative grades (accepted applicants)

School type/LIA	STN accept mean	STN accept grades	STN accept SD	GEM accept mean	GEM accept grades	GEM accept SD	EXT accept mean	EXT accept grades	EXT accept SD
Academy	22	BBC	0.000						
Comprehensive	29	AAA	3.093	24	BBB	3.468	25	ABB	3.762
FE	28	AAB	3.267	25	ABB	3.927	23	BBB	3.456
Grammar	29	AAA	2.882	26	ABB	4.000	24	BBB	1.915
HE	24	BBB	4.807	25	ABB	4.504			
Independent	29	AAA	2.648	29	AAA	1.915	24	BBB	0.000
Other	30	AAA	2.828	24	BBB	3.127			
Sixth Form	29	AAA	2.400	26	ABB	3.919	25	ABB	3.395
Total	29	AAA	2.852	26	ABB	3.658	25	ABB	3.674

Notes: STN and GEM data were provided by Birmingham University (2002-11) with King's College London providing STN, GEM and EXT data (2002-11). The lowest mean A Level points was 18 points (CCC grades) and highest was 30 points (AAA grades). Missing and unknown data has been excluded, along with direct applications via UCAS. There were no A Level points available for EXT applicants and accepted applicants from the *academies* and *other* categories. A Level points have been rounded up or down, for example 25 points become 26 points, in order that a realistic A Level grade can be allocated. The A Level grades shown in the table are indicative only and not the actual grades an applicant or accepted applicant was awarded. This process undertaken due to the multiple combinations of A Level grades available for each point, for example 20 points here is shown as BBC grades, but could also include AA; A*B; ACD; ABE; BBD et al. Total number of applicants (n) = 33,399 of which 5,100 were accepted.

Amongst STN accepted applicants overall 59.7% obtained 30 points (AAA grades) including 56.3% from comprehensives; 54.1% from FE colleges; 65.5% from grammar schools; 57.1% from independent schools; and 59.7% from sixth-form colleges. Despite the high percentage of accepted applicants from each school type which obtained 30 points, the greatest number of accepted applicants with these points/grades came from independent schools (1757 individuals); followed by grammar schools (1119 individuals); and comprehensives (1025 individuals).

Overall, 30.6% of GEM accepted applicants gained 30 points (AAA grades) followed by 17.8% who obtained 26 points (ABB grades). The greatest percentage of accepted GEM applicants from comprehensive schools (27.8%) were awarded 24 points (BBB grades); those from FE colleges (27.3%) gained 24 and 30 points (BBB and AAA grades); with 40%

from grammar schools obtaining 28 points (AAB grades); with individuals from independent schools gaining 30 points (AAA grades).

The greatest percentage of EXT accepted applicants (21.2%) were awarded 24 points (BBB grades). The same points were achieved by 20.5% of those from comprehensive schools; and 23.8% of those educated in further education colleges; and 100% of those who attended an independent school. 50% of those from grammar schools were awarded 22 points (BBC grades) but 25% of those from sixth-form colleges obtained 26 points (ABB grades). Unlike STN accepted applicants, where majority 63% come from state grammar schools (25%) and (38%) from independent schools, accepted applicants from these two types of schools only account for 1% of the EXT degree, with 63% coming from comprehensive schools; 23% from sixth-form colleges; and 12% from FE colleges. The differences between the school types and A Level scores of the three different types of undergraduate medical degrees included in this sample, can also be examined by exploring those who obtain the very highest grades, which until 2010 was 30 points (AAA grades) after which 36 points (A*A*A* grades) was the highest (Smithers 2014). The table below restricts comparisons to 30 points, as GEM applicants and accepted applicants would have sat their A Levels prior to 2010.

Table 8.54: Percentage of applications and accepted applicants obtaining 30 points (by principle school types)

School type/LIA	STN apps	STN accept		GEM apps	GEM accept		EXT apps	EXT accept
Comprehensive	45.0%	56.3%		15.5%	11.1%		9.0%	14.4%
FE	36.3%	54.1%		18.0%	27.3%		5.2%	9.5%
Grammar	54.0%	65.5%		20.0%	20.0%		0.0%	0.0%
Independent	51.5%	57.1%		23.9%	50.0%		12.5%	0.0%
Sixth Form	51.5%	64.5%		20.0%	25.0%		9.6%	10.0%
Total	49.2%	59.7%		17.6%	30.6%		8.2%	12.5%

Notes: STN and GEM data were provided by Birmingham University (2002-11) with King's College London providing STN, GEM and EXT data (2002-11). Only those categories which apply to all STN, GEM and EXT applicants have been included in this table, to allow for comparison to be made. Those applying from higher education institutes, via UCAS and *other* organisations have been excluded. As with the previous tables in this section of this study, this sample of applicants and accepted applicants who scored 30 points (AAA grades).

The above table illustrates the extent to which those with the highest academic attainment levels dominant undergraduate medical degrees, with almost two-thirds of STN accepted applicants obtaining 30 points (AAA grades) and almost one-third of GEM accepted applicants also gaining this grade, despite A Levels not forming part of the GEM selection process at most medical schools (Garrud 2023). The data used to compile this table does appear to show that the GEM and EXT degrees are succeeding in widening participation and access to medical studies, with fewer applicants and accepted applicants obtaining the very highest grades, leading to a diversity of A Level attainment levels, especially amongst EXT accepted applicants.

8.8 School type conclusion

During the decade of this research (2002-11) individuals from independent schools and state-grammar schools continued to dominate applications and accepted applicants to the STN degree, despite the existence of contextual admissions offers and outreach schemes for disadvantaged students (Jones-Berry et al 2015). With individuals seeking admission to GEM degrees, it is difficult to assess their educational background, as almost all of them apply *after* they have graduated or during the final year of their undergraduate studies, with the mean age of GEM accepted applicants in this study being 25 years, compared to 19 years for STN and EXT accepted applicants.

From the data presented in this research, the EXT degrees at least can be said to be successfully widening access in terms of the educational background of accepted applicants, with significant numbers being admitted to these degrees from non-selective state schools and colleges, particularly from further education colleges, a group known to *under-represented* on undergraduate medical degrees (Niven et al 2019).

For all three types of undergraduate medical degree included in this sample (STN GEM and EXT) and where the educational background of applicants and accepted applicants is known, those educated in state schools and colleges are the majority, comprising 63% of accepted applicants on STN degrees; 57% on GEM degrees; and 73% on EXT degrees. Given the 7% they represent in the general population (Ndaji et al 2016) those accepted

applicants from independent schools are *over-represented* on all three types of the undergraduate medical degrees in this sample, comprising 35% of STN accepted applicants; 16% of GEM accepted applicants; and even 13% of EXT accepted applicants.

The *over-representation* of accepted applicants from (state) grammar schools is not as pronounced as that for independent schools, with 5% of English students educated in these academically selective schools (Danechi 2020), individuals from these schools account for 14% of STN accepted applicants; 4.8% of GEM accepted applicants; and 5.4% of EXT accepted applicants. However, part of this *over-representation* by individuals from state grammar schools and independent schools, can be explained by their higher A Level grades in this research.

Very few STN accepted applicants appear to be entering this degree from higher education institutes and non-educational establishments, such as the careers services but by comprise 27% of GEM accepted applicants; and 14% of EXT accepted applicants are. With STN accepted applicants achieving 28 points (AAB grades) overall; their GEM counterparts gaining 25 points (ABB grades); and those of EXT degree being awarded 23 points (BBB grades), EXT degrees are likely to available to candidates who obtain lower A Level grades than the STN degrees included in this research. EXT degrees have a lower range of A Level grades for accepted applicants from 23-25 points; compared to 24-29 points for GEM degrees; and 22-30 for STN degrees.

The conclusions that can be drawn from the school type/last institution attended data used in this research, is that EXT degrees are successfully recruiting more accepted applicants from non-selective state schools, than STN or GEM degrees, but it is not clear from the data how educationally disadvantaged many of the accepted applicants actually are. It is more difficult to reach any definitive conclusion about the how successful GEM degrees have been in widening access in relation to the educational background of accepted applicants.

8.9 POLAR findings

Participation of Local Areas (POLAR) was created by HEFCE and launched in 2005 with POLAR2 (Corver 2009). Further refinements of POLAR saw the introduction of POLAR3 (2012) and POLAR4 (2017) with the latter becoming the final version (Bagherli 2014; Austin 2018). Throughout this study, POLAR2 has been used (hereafter POLAR unless otherwise indicated by a numerical suffix). For datasets covering the years 2002-04, staff at the eighteen universities included in this study applied it retrospectively, prior to fulfilling the FOI requests which were used to obtain the data for this study. POLAR uses ward-level data to assess the number of 18-19 year olds in a given area who participate in higher education (Thiele et al 2016; Curtis and Smith 2020; Murray et al 2021). Each of these areas is allocated a POLAR quintile (Q1-Q5); with Q1 having the lowest rate of young people participation in higher education ($\leq 20\%$) up to Q5 with the highest rates ($>50\%$) (Fleet 2012; Martin 2019; Smart 2019). In same way that NS-SEC4-7 are used as a measure of socio-economic disadvantaged, POLAR Q1 and Q2 are considered to be a *Low Participation Neighbourhoods* (LPN) (Boliver et al 2015; Boliver et al 2017). Throughout this study POLAR Q1-Q5 and LPNs have been utilised to explore applications and accepted applicants to the three different types of undergraduate medical degrees.

8.9.1 Interpreting the findings using POLAR

Before proceeding to the data analyses a degree of caution needs to be sounded regarding the usage of POLAR to identify individuals who come from an area which is seen as educationally underprivileged (as measured by the percentage of young people who participate in higher education in a given geo-demographic area). POLAR only captures higher education participation by young people (Smart 2019) therefore, the research findings, particularly those relating to the GEM degrees should be understood and interpreted accordingly. Urban areas can often have large numbers of areas which are classed as POLAR Q5 (Martin 2019) which is perhaps what some of the EXT data provided for this research (by Bristol, King's and Southampton universities) has captured. Paradoxically, in sparsely populated rural areas POLAR unites quite disparate areas into the same quintile (Harrison and Hatt 2015). Many of the most socio-economically

disadvantaged can be found outside LPNs, with the socio-economically advantaged residing inside a LPN (Harrison and McCaig 2015; Best 2019).

8.9.2 POLAR generation and dealing with missing data

Using UCAS to apply for admission to university, an individual's POLAR quintile is generated automatically using the postcode of their home address (Bagherli 2014). This resulted in the POLAR data used throughout this study containing far fewer missing data than either the NS-SEC or school type datasets; amounting to 3.1% of applicant data and 1.9% of accepted applicant data; compared to 69.1% of NS-SEC applicant data and 49.1% NS-SEC accepted applicant data. With 25.7% of school type/last institution attended (LIA) applicant data missing; and 14.7% for accepted applicants. Where it was deemed expedient (as with the treatment of NS-SEC and LIA missing data) a dummy POLAR variable (Q6) was created but the level of missingness in the POLAR data, are well below the rates (15-20%) which are considered common in educational research (Dong and Peng 2013; Berchtold 2019).

The earlier results in this section present the research findings involving all eight of the universities which provided POLAR data (Birmingham, Bristol, Cambridge, King's, Liverpool, Oxford and Southampton). These are largely of a descriptive nature, because the data provided by Bristol could not be transferred to SPSS for more complex analyses. However, the decision was taken to include the findings from these relatively low-level analyses (Hitchcock and Onwuegbuzie 2020) because Bristol University was one of the few universities in this non-random sample of medical schools (2002-11), which ran all three types of undergraduate medical degrees (STN, GEM and EXT).

8.9.3 POLAR datasets

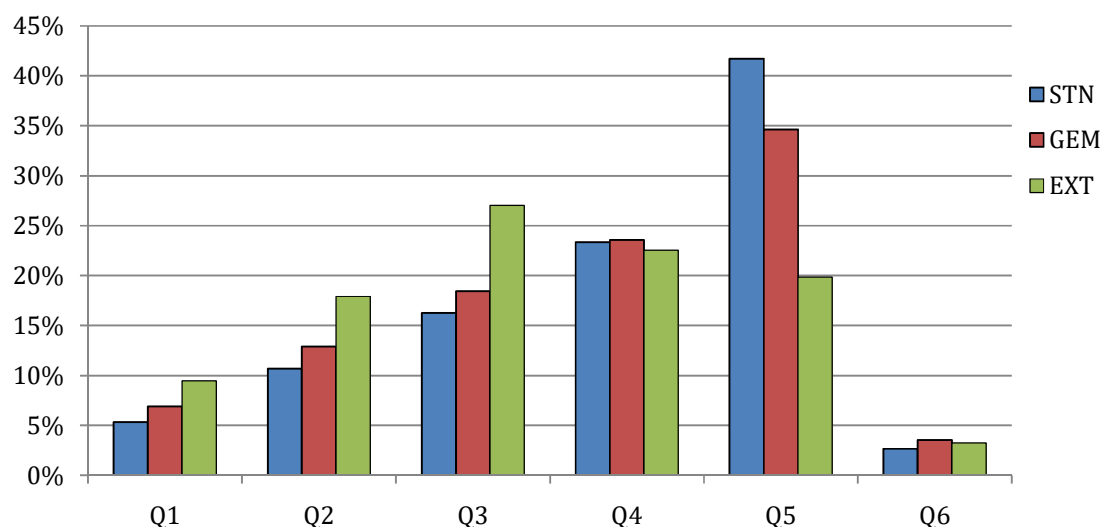
The eight universities which provided POLAR data, and the nature of the data they provided are shown in the table below:

Table 8.55: Eight universities which provided POLAR data

No	University	Years	Medical degree	Data type	Records (n)	Analysed
1	Birmingham	2002-11	STN, GEM	Disaggregated	16124	SPSS
2	Bristol	2006-11	STN, GEM, EXT	Aggregated	15076	Excel
3	Cambridge	2005-11	STN, GEM	Disaggregated	7492	SPSS
4	King's	2002-11	STN, GEM, EXT	Disaggregated	26125	SPSS
5	Liverpool	2002-11	STN, GEM	Disaggregated	16899	SPSS
6	Oxford	2009-11	STN	Disaggregated	3128	SPSS
8	Southampton	2005-11	STN, GEM, EXT	Disaggregated	15404	SPSS

Notes: aggregated/group-level data were analysed using Excel, with disaggregated/individual-level data being analysed using SPSS v27. Each the universities listed above provided applicant and selected applicant data. Records (n) refers to the number of applicant records each university provided.

The research findings presented in the next section were generated utilising data provided by these eight universities. They illustrate the extent to which individuals who reside in each of the POLAR quintiles apply to the three different types of undergraduate medical degrees:

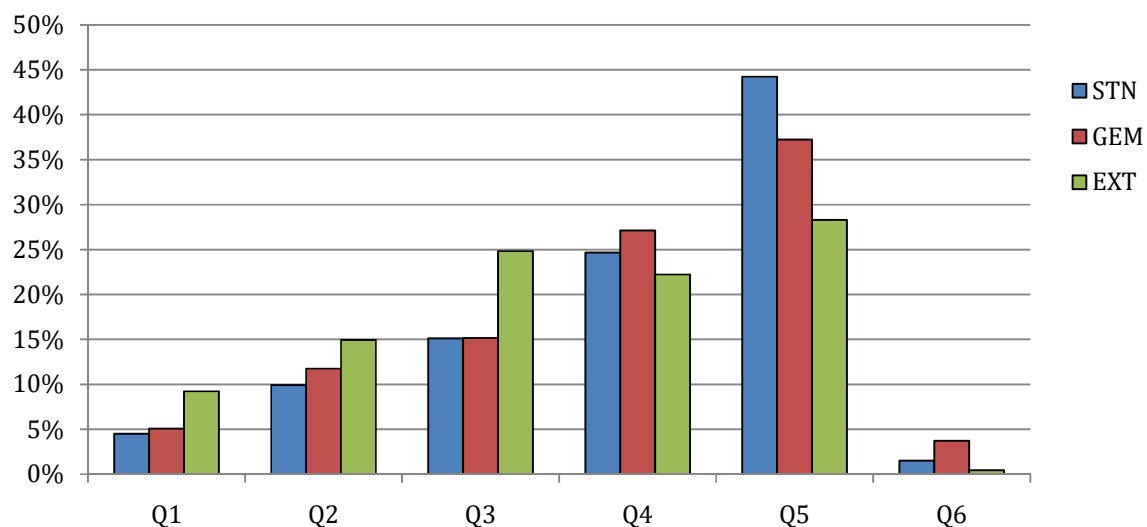
Table 8.56: POLAR quintiles and percentage of applicants STN, GEM and EXT degrees

Notes: the applicant data used to compile this graph was provided by Bristol, STN, GEM, EXT (2006-11); Birmingham STN, GEM (2002-11); Cambridge STN, GEM (2005-11); King's STN, GEM, EXT (2002-11); Liverpool STN, GEM (2002-11); Oxford STN (2009-11); Southampton STN, GEM, EXT (2005-11). Total applicants 139335 = STN 100248; GEM = 33191; EXT = 5894. Q6 refers to missing or unknown data. All percentages rounded up or down accordingly.

The findings indicate (as expected) that those individuals who reside in a geo-demographic area where a higher percentage of young people (18-19 year olds) proceed to higher

education dominate applications to the three different types of undergraduate medical degrees. Overall 21% of applicants came from a Low Participation Neighbourhood (LPN); 16% of STN applicants; 20% of GEM applicants; 27% of EXT applicants. If this is compared to NS-SEC4-7 (which like LPN) is used as a measure of disadvantage (Harrison and Hatt 2015) then there are a far greater percentage of undergraduate medical degree applicants from a LPN than from a lower social class (NS-SEC4-7). In this research only 8% of STN applicants came from NS-SEC4-7 compared to 16% of STN applicants who came from a POLAR Q1 and Q2 (LPN); 20% of GEM applicants came from a LPN compared to 5% from who were from NS-SEC4-7; with 7% of EXT applicants coming from NS-SEC4-7 compared to 27% who came from a LPN.

Table 8.57: POLAR quintiles and percentage of accepted applicants STN, GEM and EXT degrees



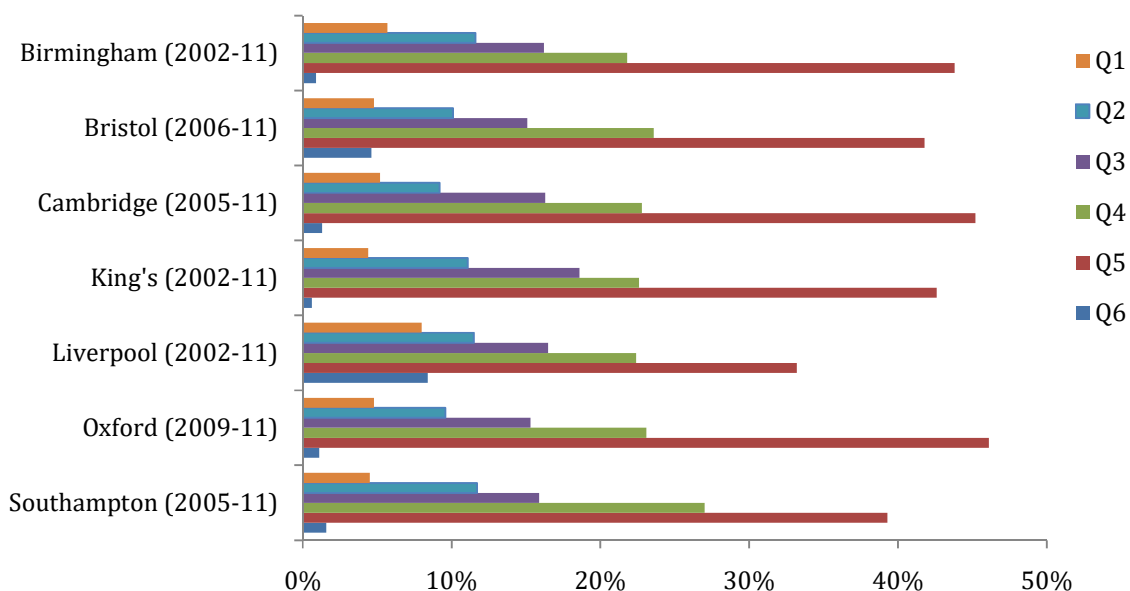
Notes: the accepted applicant data used to compile this graph was provided by Bristol, STN, GEM, EXT (2006-11); Birmingham STN, GEM (2002-11); Cambridge STN, GEM (2005-11); King's STN, GEM, EXT (2002-11); Liverpool STN, GEM (2002-11); Oxford STN (2009-11); Southampton STN, GEM, EXT (2005-11). Total accepted applicants 16406 = STN 14136; GEM = 1487; EXT = 783. Q6 refers to missing or unknown data. All percentages are rounded up or down accordingly.

Only 6% of total accepted applicants came for the lowest POLAR quintile (Q1); 5% of STN accepted applicants; whereas 9% of EXT accepted applicants did. This compares with 1.4% of STN accepted applicants who came from the lowest social class (NS-SEC7); 0.30% of GEM accepted applicants; and 3.5% of EXT accepted applicants. Overall, 15% of STN

accepted applicants came from a LPN; compared to 17% of GEM applicants; and 24% of EXT accepted applicants.

The following tables are a pictorial representation of the descriptive data analyses which were undertaken using the aggregated and disaggregated datasets supplied by the seven universities which provided POLAR data for this research. They show the POLAR quintiles of applicants and accepted applicants at each of the universities:

Table 8.58: STN applications and POLAR quintiles (by university)

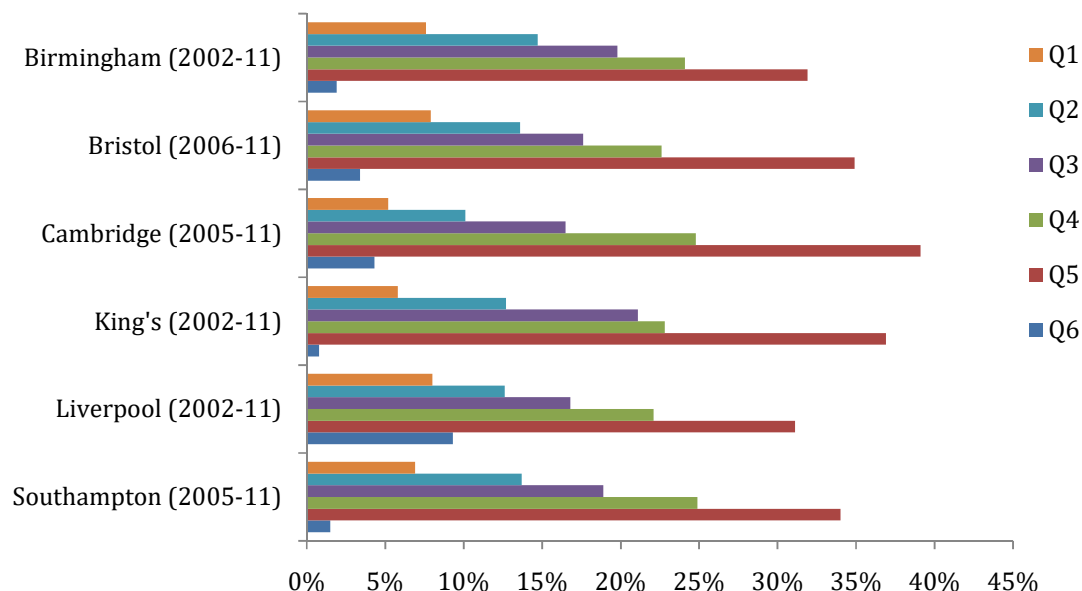


Notes: total STN applications = 100248. Q6 refers to missing or unknown data. All percentages rounded up or down accordingly.

As with NS-SEC and school type, where Oxford and Cambridge universities have far higher concentration of those from the highest social classes (NS-SEC1-3) and more especially from the highest social class (NS-SEC1) along with those who attended an independent school, the POLAR research findings show 45% of Cambridge's STN applicants resided in Q5, along with 46% of Oxford's. STN applicants who reside in Q5 are above 40% at all of the universities apart from Liverpool and Southampton, where they are 33% and 39% respectively. The distribution of Q2, Q3 and Q4 show little variation between the different universities, but Liverpool has 1.5-2x the percentage of Q1 STN applicants than the other remaining seven universities. This reflects Liverpool's reputation for having a higher

intake of students from LPNs and NS-SEC4-7 than other Russell Group universities (Thiele et al 2016):

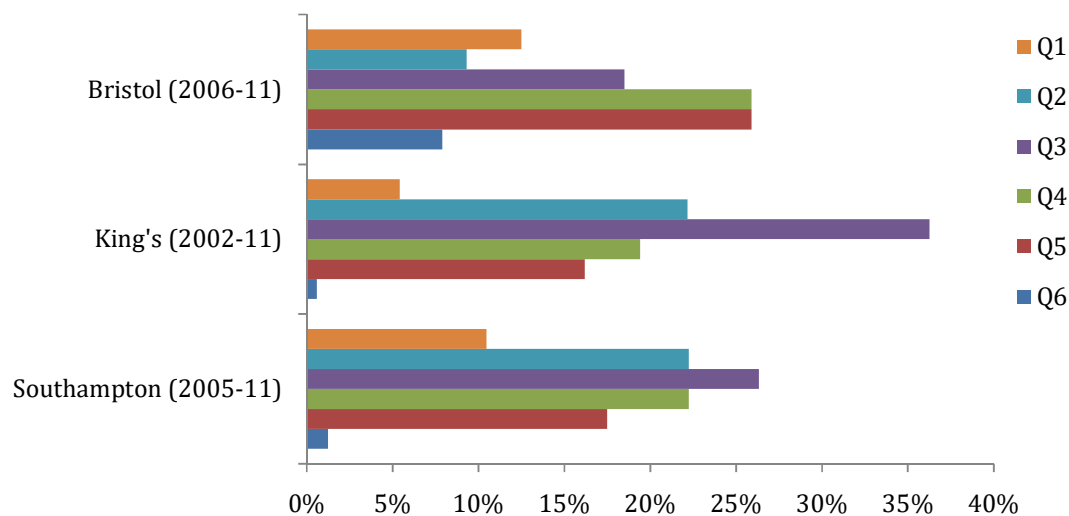
Table 8.59: GEM applications and POLAR quintiles (by university)



Notes: total GEM applications = 33191. Q6 refers to missing or unknown data. All percentages rounded up or down accordingly.

Although Oxford University provided STN application and accepted applicant data it did not provide GEM data, because the POLAR of GEM applicants is not recorded by the university. Therefore, the GEM findings presented here relate to six universities. From the data provided the percentages of GEM applications from Q5 is around 10% lower than that for STN applications; 35% and 42% respectively; with all of the universities receiving more than 30% of their GEM applications from individuals who reside in Q5. Cambridge has the highest percentage of Q5 residents (39%). Overall applications to the STN and GEM degrees from Q2 to Q4 are remarkably similar varying from 11 to 13% (Q2); and 16 to 19% (Q3); along with 23-24% (Q4). At the lowest POLAR quintile, 5% of STM applicants were resident in Q1, as were 7% of GEM applicants; with 8% of Bristol and Liverpool's GEM applicants coming from these areas.

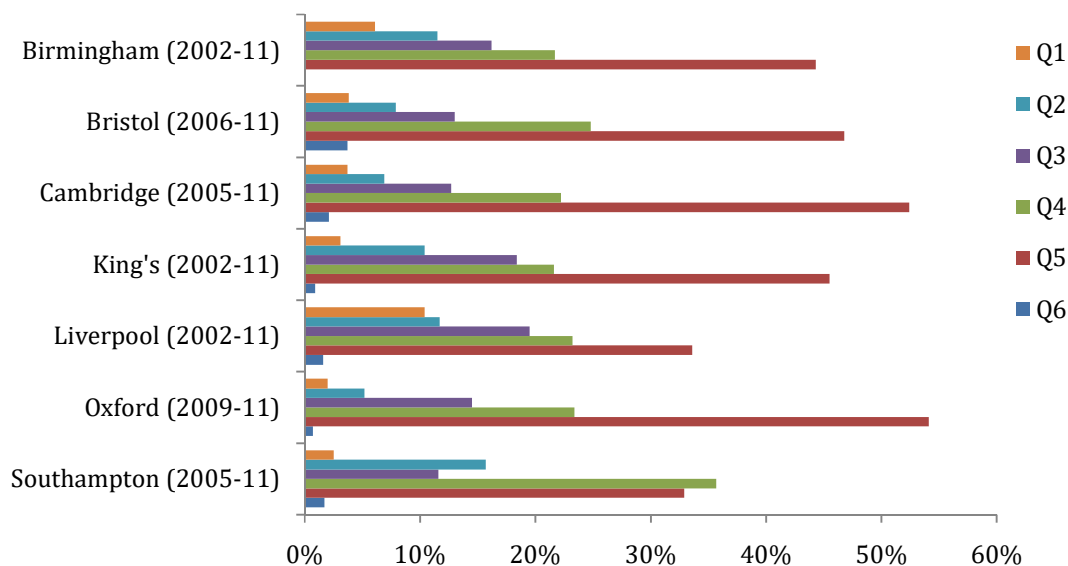
Table 8.60: EXT applications and POLAR quintiles (by university)



Notes: total EXT applications = 5894. Q6 refers to missing or unknown data. All percentages rounded up or down accordingly.

Far fewer universities run EXT degrees than STN or GEM degrees, as they are more costly and labour-intensive to run than either STN or GEM degrees (Gibson Smith et al 2021). In this study only three of the universities running EXT provided POLAR data. Again, as with applicants to the GEM degrees, far fewer EXT applicants reside in Q5 areas, with the overall amount being 20%, compared to 42% of STN applicants and 35% of GEM applicants. Over half of Bristol EXT applicants come from Q4 and Q5, but 13% come from Q1; but this EXT degree has a much smaller intake than that at King's College or Southampton University.

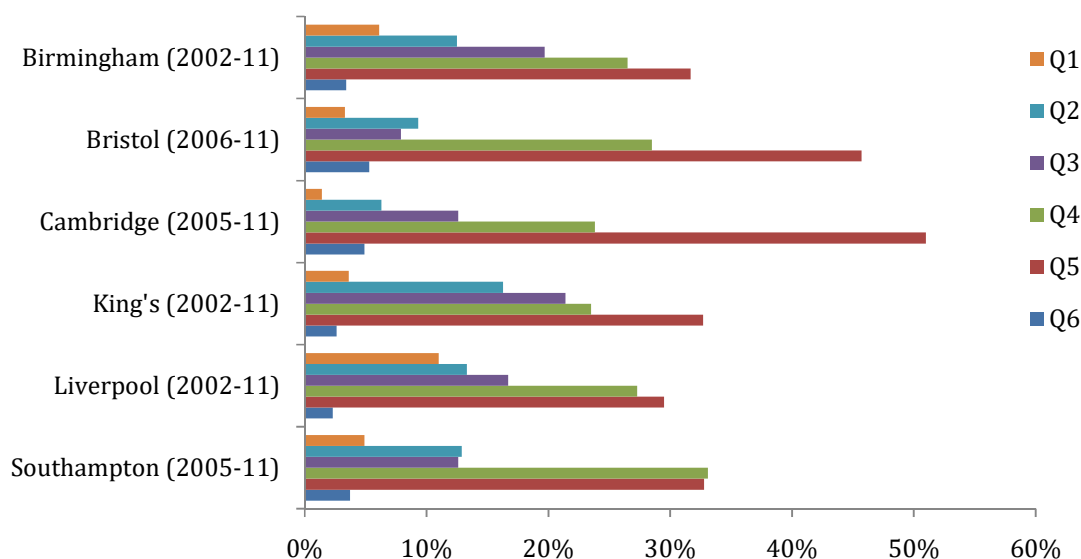
Table 8.61: STN accepted applicants and POLAR quintiles (by university)



Notes: total STN accepted applicants = 14136. Q6 refers to missing or unknown data. All percentages rounded up or down accordingly.

More than half of STN accepted applicants at *Oxbridge* come reside in Q5 areas but overall this category comprises 44% of STN accepted applicants. Once again, as with STN applications, Liverpool (34%) and Southampton (33%) have the lowest percentage of STN accepted applicants from Q5. Previous research has shown both universities take a higher percentage of disadvantaged students and those educated in the state sector, than most of the country's leading universities (Thiele et al 2016; Montacute and Cullinane 2018). Almost 70% of STN accepted applicants come from the highest two POLAR quintiles (Q4 and Q5) with 22% coming a LPN (Q1 and Q2). Liverpool also has the highest percentage coming from Q1 (10%) with Oxford having the lowest (2%). Overall, 5% of STN accepted applicants come from the lowest quintile (Q1).

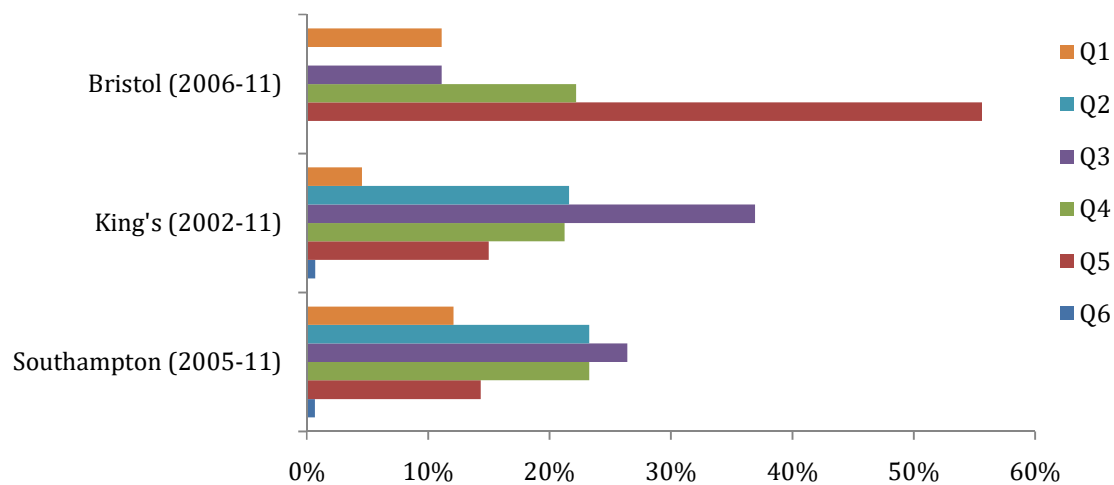
Table 8.62: GEM accepted applicants and POLAR quintiles (by universities)



Notes: total GEM accepted applicants = 1487. Q6 refers to missing or unknown data. All percentages rounded up or down accordingly.

37% of GEM accepted applicants live in one of the areas of the country which has the highest percentage of young people participating in higher education (Q5), this is slightly lower than STN accepted applicants (42%) but much higher than EXT accepted applicants (20%). More than 50% of Cambridge's GEM accepted applicants come from Q5, with Liverpool having only one-third of GEM accepted applicants from these areas. Overall, 5% of GEM applicants come from the lowest quintile (Q1); with Cambridge having the lowest percentage of GEM accepted applicants from Q1 (1%) and Liverpool having the highest (11%). This compares to 64% of GEM accepted applicants who come from the highest two quintiles (Q4 and Q5).

Table 8.63: EXT accepted applicants and POLAR quintiles (by universities)



Notes: total EXT accepted applicants = 783. Q6 refers to missing or unknown data. All percentages rounded up or down accordingly.

Overall 28% of EXT accepted applicants resided in a Q5 area; with the highest percentage being at Bristol University (56%) otherwise the percentage of Q5 at King's and Southampton was below 20%. 11% of Bristol's EXT accepted applicants came from a LPN, compared to 35% at Southampton; and 27% at King's.

These findings suggest the EXT degrees in this sample (and to a lesser extent GEM degrees) have succeeded in widening access to include a significant percentage of accepted applicants who come from (LPN) areas where the higher education participation of young people is at its lowest.

Hereafter in the research findings outlined in this chapter, were obtained through the utilisation of SPSS, and are restricted to complete case analyses (CCA), including only those applicants and accepted applicants with complete or known POLAR data (Q1-5) (Madley-Dowd et al 2019). These more complex analyses exclude the data provided by Bristol University (STN, GEM and EXT) which could not to transferred to SPSS.

8.9.4 POLAR and A Level scores

Part of the explanation for the lack of educationally or socio-economically disadvantaged individuals on undergraduate medical degrees (Steven et al 2016) centres around the A Level grades they are predicted to or actually obtain (Mangan et al 2010; Jones-Berry et al 2015; Murphy and Wyness 2020). This section of this chapter explores the mean A Level grades of each of the five POLAR quintiles, using *known* data only (Q1-Q5) amongst applicants and accepted applicants to each of the three different undergraduate medical degree types (STN, GEM and EXT).

The mean A Level grades shown in this section of the research findings are indicative, for example BBB grades equates to 24 points, but it could capture grades AAD; A*AE; AAD et al. A rounding strategy has been deployed to translate mean A Level points into grades, whereby, for example 25 points is rounded up to 26 points (ABB grades).

Table 8.64: Mean A Level scores (STN degree)

POLAR quintile	Apps mean score	Indicative A Level grades applications	Apps SD	Accept Mean score	Indicative A Level grades accepted	Accept SD
Q1	26.39	AAB	5.245	27.27	AAB	5.441
Q2	26.30	ABB	5.479	27.30	AAB	5.168
Q3	26.92	AAB	5.196	28.31	AAB	4.148
Q4	27.54	AAB	4.831	28.48	AAB	4.301
Q5	27.87	AAB	4.770	28.76	AAA	4.261
Total	27.39	AAB	4.995	28.40	AAB	4.447

Notes: STN data provided by Birmingham (2002-11) and King's College (2002-11). Available A Level grades from 2-36 points. Total applications data within these variables (n) = 30650.

The largest group of STN applicants (in this section of the research comparing POLAR quintiles and the mean A Level scores obtained AAA grades (30 points), account for 48% of all applicants; followed by 32% who gained 28 points (AAB grades). With 58% of STN accepted applicants being awarded AAA grades (30 points).

The (indicative) mean A Level scores of STN applicants are almost identical, with applicants from Q1 gaining AAB, along with those in Q5. However, the data relating to STN accepted applicants show far more from Q5 gained 30 points (AAA grades) than from any other POLAR quintile.

39% of STN applicants from Q1 obtained AAA grades (30 points); followed by 38% from Q2; 42% from Q3; 47% from Q4; and 51% from Q5. For STN accepted applicants 55% from Q1 were awarded AAA grades (30 points); along with 46% from Q2; 57% from Q3; 56% from Q4; and 61% from Q5.

Table 8.65: Mean A Level scores (GEM degree)

POLAR quintile	Apps mean score	Indicative A Level grades applications	Apps SD	Accept Mean score	Indicative A Level grades accepted	Accept SD
Q1	13.40	CDD	10.173	19.36	BCC	10.698
Q2	13.17	CDD	10.268	13.25	CDD	11.101
Q3	14.14	CDD	10.411	14.30	CDD	10.797
Q4	14.29	CDD	10.469	12.89	CDD	10.677
Q5	14.73	CCD	10.542	15.98	CCD	11.314
Total	14.21	CDD	10.445	14.54	CDD	10.986

Notes: GEM data provided by Birmingham (2002-11) and King's College (2002-11). Available A Level grades from 2-36 points. Total applications data available within these variables (n) = 3311.

Calculating the A Level grades and points awarded to GEM applicants and accepted applicants is not as straightforward as it is for those of the STN and EXT degrees, because A Levels do not form part of the GEM selection process at most universities (Garrud 2023). In this sample, 22% of GEM applicants obtained 24 points (BBB grades) with 15% of GEM accepted applicants gaining 26 points (ABB grades). Unlike the STN A Level grade/POLAR calculations in this section of the research findings, the majority of GEM applicants and accepted applicants appear to have obtained fewer than 12 points (DDD grades) or data being excluded because it was <2 points.

The results of the mean A Level scores and POLAR quintiles in the table above show little differences between the POLAR quintiles and GEM applicants; but GEM accepted applicants from Q1 have the highest mean A Level score of 19 points (equivalent to BCC grades).

Table 8.66: Mean A Level scores (EXT degree)

POLAR quintile	Apps mean score	Indicative A Level grades applications	Apps SD	Accept Mean score	Indicative A Level grades accepted	Accept SD
Q1	20.15	BCC	6.980	26.89	AAB	5.395
Q2	19.49	BCC	6.086	24.33	BBB	4.352
Q3	20.55	BBC	6.121	24.84	ABB	3.935
Q4	19.66	BCC	6.262	23.54	BBB	4.843
Q5	20.00	BBC	6.135	23.60	BBB	5.292
Total	20.04	BBC	6.197	24.36	BBB	4.648

Notes: EXT data provided King's College (2002-11). Available A Level grades from 2-36 points. Total application data (n) within these variables = 944

The POLAR/mean A Level scores show that the mean points for STN and EXT applicants and accepted applicants from LPNs are broadly similar to those from quintiles 3-5. However, there are far fewer applicants and (therefore) accepted applicants from the lower POLAR quintiles (Q1-2) than there are from the higher ones, especially from Q5. The application and accepted applicant data from the STN degree, suggest that whilst a significant percentage of Q1 applicants (39%) obtained the highest mean A Level points (30) this compares to 51% from Q5; likewise 55% of Q1 accepted applicants gained these points, as did 61% from Q5. However, there were more than x10 as many STN applicants and 11x accepted applicants from Q5 than there were from Q1. A distribution pattern which is similar to that for the socio-economic background of STN applicants in this particular sample, where there were 18x times as many applicants from the highest (NS-SEC1) than the lowest (NS-SEC7) category, and 21x as many STN accepted applicants

Chi-squared tests for association were run for each of the three different types of undergraduate medical degrees (STN, GEM and EXT) to assess if there was a relationship between two categorical variables; POLAR quintile (1-5) and an applicant becoming an accepted applicant. The findings are presented in three separate tables below:

Table 8.67: STN applications and accepted applicants/POLAR

POLAR quintile	% of applications from each quintile	% accepted within each quintile	% accepted within outcome	Applications expected count	Accepted expected count
Q1	5.6%	15.1%	5.5%	4668.0	718.2
Q2	11.5%	15.1%	11.2%	9512.0	1463.4
Q3	17.3%	14.5%	16.4%	14411.0	2217.1
Q4	23.8%	15.8%	24.4%	19798.0	3045.9
Q5	41.7%	15.6%	42.4%	34679.0	5335.4
Total	100.0%	15.4%	100.0%	83068.0	12780.0

Notes: STN data provided by Birmingham (2002-11); Cambridge (2005-11); King's (2002-11); Liverpool (2002-11); Oxford (2009-11); Southampton (2005-11). Total STN applicants with POLAR data (n) = 83068.

As the above tables indicate, the association between an individual applying to one of the STN degrees at these universities is strongest the higher their POLAR quintile. The Chi-squared test result was: $\chi^2(4)$, 12.965, $p = .011$. Cramer's V test was also applied to the same categorical variables, to measure the strength of the association; with 4 degrees of freedom this test recorded a value of 0.12, indicating a moderate/medium association between an applicant's POLAR quintile and the likelihood they would become an accepted STN applicant.

Table 8.68: GEM applications and accepted applicants/POLAR

POLAR quintile	% of applications from each quintile	% accepted within each quintile	% accepted within outcome	Applications expected count	Accepted expected count
Q1	6.9%	4.3%	5.9%	1778.0	88.9
Q2	13.6%	4.8%	13.1%	3484.0	174.2
Q3	19.9%	4.4%	17.5%	5113.0	255.7
Q4	24.3%	5.9%	28.6%	6233.0	311.7
Q5	35.4%	4.9%	34.9%	9085.0	454.4
Total	100.0%	5.0%	100.0%	25693.0	1285.0

Notes: GEM data provided by Birmingham (2003-11); Cambridge (2005-11); King's (2003-11); Liverpool (2003-11); Southampton (2005-11). Total GEM applicants with POLAR data (n) = 25693.

As the information in the above table indicates, GEM degrees have the lowest applicant/accepted applicant rates for each of the three different types of undergraduate medical degrees included in this study. In part this can be accounted for by the small number of students admitted to GEM degrees each year; 10% of UK undergraduate medical students are enrolled on GEM courses (Kumwenda et al 2018) with courses receiving between 4-27 applicants per place available (Garrud 2023).

A Chi-squared test investigated the association between GEM applicants and accepted applicants and their POLAR quintile: $\chi^2(4)$, 16.478, $p = .002$. The results from this test were supported by usage of Cramer's V test to measure the strength of the association. This test recorded 4 degrees of freedom and a value of 0.25, suggesting a very strong/large association between POLAR quintiles, GEM applicants and accepted applicants.

Table 8.69: EXT applications and accepted applicants/POLAR

POLAR quintile	% of applications from each quintile	% accepted within each quintile	% of accepted from each quintile	Applications expected count	Accepted expected count
Q1	5.4%	10.0%	4.6%	130.0	15.5
Q2	22.3%	11.6%	21.8%	533.0	63.5
Q3	36.5%	12.2%	37.2%	872.0	103.9
Q4	19.5%	13.1%	21.4%	467.0	55.7
Q5	16.3%	11.1%	15.1%	389.0	46.4
Total	100.0%	11.9%	100.0%	2391.0	285.0

Notes: EXT data provided by King's (2002-11. Total EXT applicants with POLAR data (n) = 2391.

Unlike the information contained in the previous two tables, where multiple universities provided details about the POLAR quintiles of STN and GEM applications and accepted applicants, only one university (King's College, London) provided POLAR data alongside EXT degree applications and accepted applicants. Therefore, the research findings should be interpreted accordingly and their generalisability to other EXT degrees should only be made with an appropriate degree of caution, as each EXT degree in the UK has admissions criteria which are unique to that institution, and some of these degrees have very small per annum student intakes (Garrud 2023). For example, admission to the EXT degree at King's College is only available to those residents of London, Kent and Medway, who attended an academically poorly performing non-selective state school (Curtis and Smith 2020).

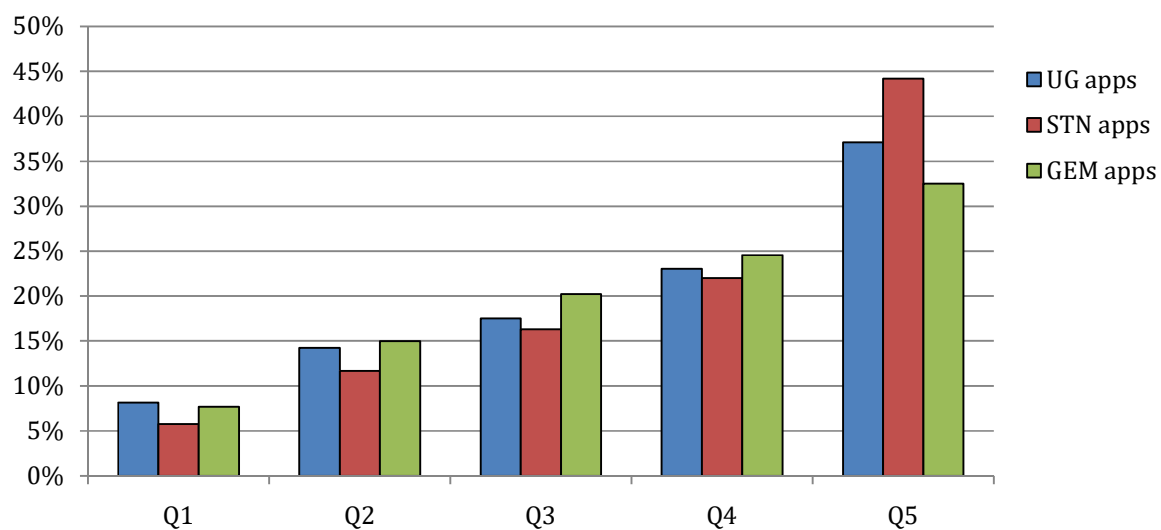
The Chi-squared test results for the EXT degree are $\chi^2(4)$, 1.403^a, $p = .844$ for an association between applicants, accepted applicants and their POLAR quintile. In addition to this test of association, Cramer's V test measured the strength of the association. The latter test with 4 degrees of freedom = 0.24; at this level, it indicates a large/very strong association between the POLAR quintile of an EXT applicant and them becoming an accepted applicant.

Unlike STN and GEM degree applicants and accepted applicants, where the greatest percentages come from Q4 and Q5, most EXT applicants and accepted applicants come from Q2 and Q3. Previous research suggests this is likely to be because of a deliberate strategy and policy in place at King's College London (and other universities), to ensure individuals from disadvantaged backgrounds are able to access undergraduate medical studies via the EXT degree (Garlick and Brown 2008; Papachristodoulou 2010; Gibson Smith et al 2021).

8.9.5 Comparing the POLAR quintiles of STM and GEM degrees with undergraduate degrees at Birmingham University (2002-11)

One university (Birmingham) provided application and accepted applicant data for each of its 636 different undergraduate degrees (which includes the STN and GEM degrees). The large dataset of 320,929 individual applicant records, of which 0.9 were the dummy POLAR variable Q6. These have been removed to allow further analyses using SPSS to take place, reducing the dataset to 317,934 individual applicant records (POLAR Q1-Q5 only). The graph below shows the distribution of the POLAR quintiles amongst applicants and accepted applicants to all undergraduate degrees at Birmingham (including STN and GEM degrees) and those to the STN and GEM degrees:

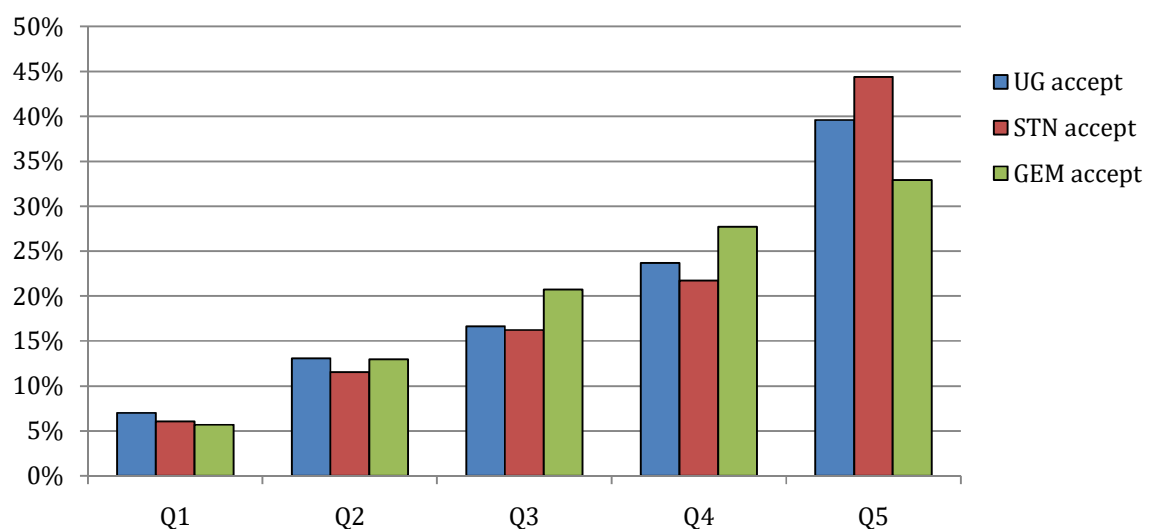
Table 8.70: Birmingham University applications and POLAR quintiles (2002-11)



Notes: Undergraduate applications with POLAR (1-5) quintile data (n) = 317,934 (including STN and GEM applications).

The STN degree at Birmingham receives the largest number of applicants, amounting to 15% of total undergraduate applications; and 21% of accepted applicants. Fewer STN applicants (17%) came from a Lower Participation Neighbourhood (LPN) than undergraduate applicants (22%) or GEM applicants (23%). At lowest level (Q1) 6.8% of STN applicants came from Q1; compared to 7.7% of GEM applicants and 8.1 of STN applicants. At the other end of the POLAR quintile scale, between 23-25% of all undergraduate, STN and GEM applicants came from Q4. However, there significant differences emerged at Q5, with 37.1% of undergraduate applicants coming from these geo-demographic areas; compared to 32.5% of GEM applicants and 44.2% of STN applicants.

Table 8.71: Birmingham University accepted applicants and POLAR quintiles (2002-11)



Notes: Undergraduate accepted applicants with POLAR (1-5) quintile data (n) = 48739 (including STN and GEM accepted applicants).

Overall, 20% of undergraduate accepted applicants at Birmingham University come from a LPN; compared to 18% of STN accepted applicants; and 19% of GEM applicants. Amongst STN accepted applicants there were 7x as many accepted applicants from Q5 than Q1; in contrast to 6x amongst undergraduate and GEM accepted applicants. Two-thirds of STN accepted applicants come Q4 and Q5; along with 63% of undergraduate applicants; and 61% of GEM accepted applicants.

Table 8.72: Birmingham University (STN and GEM) and POLAR (2002-11)

POLAR	UG apps	STN apps	GEM apps		POLAR	UG accept	STN accept	GEM accept
Q1-Q2 (high)	22.4%	17.4%	22.7%		Q1-Q2 (high)	20.1%	17.6%	18.7%
Q3-Q5 (low)	77.6%	82.6%	77.3%		Q3-Q5 (low)	79.9%	82.4%	81.3%

Notes: Undergraduate applications with POLAR (1-5) quintile data (n) = 317934 (including STN and GEM applications). Undergraduate accepted applicants with POLAR (1-5) quintile data (n) = 48739 (including STN and GEM accepted applicants).

In the tables above Q1-Q2 equates to LPNs, these illustrate the extent to which those who reside in the higher POLAR quintiles are present amongst applicants and accepted applicants at this single university. There appears to be very little variation between applicants and accepted applicants, particularly in relation to the STN degree.

8.9.6 POLAR conclusion

This research used POLAR as one of its independent variables (alongside NS-SEC and school type/LIA) to answer the research question: did non-standard undergraduate medical degrees, such as the GEM and EXT degrees widen access to undergraduate medical degrees, between 2002 and 2011? In what ways did they do this? And how did they do this in relation to STN applicants and accepted applicants?

Overall, the very few applicants or accepted applicants to the STN, GEM or EXT degrees in this sample, come from the lowest POLAR quintile (Q1). The STN and GEM degrees at Liverpool appear to be the only instance where Q1 applicants exceed 10%. Both Oxford and Cambridge derive around 50% of STN applicants and accepted applicants from the highest POLAR quintile (Q5). Compared to STN degrees, where applicants and accepted applicants are heavily concentrated in the top two POLAR quintiles (Q4-5), GEM degrees have fewer applicants and accepted applicants from these quintiles. Like GEM degrees, the EXT degrees attract more applicants and accepted applicants from lower POLAR quintiles (Q2-3) than STN degrees, but just under 5% of EXT accepted applicants are from the lowest quintile (Q1).

Drawing definitive conclusions in relation to using POLAR to explore widening access to undergraduate medical degrees, is fraught with difficulties as it measures the higher

education participation of young people in a given area (Best 2019; Bell and Burns 2021) and can be problematic, particularly when it is used to explore GEM applicants and accepted applicants, who may no longer be resident in the area in which they grew up (Harrison and McCaig 2015). It appears from the data that the GEM and EXT degrees are attracting applicants and accepted applicants from more diverse POLAR quintiles than the STN degrees, *but* this does not appear to have permeated as low as Q1 at most universities, with Liverpool as the exception amongst those running STN degrees.

8.10 Binary logistic regression analyses

To conclude this research findings chapter, binary logistic regression (BLR) analyses (using SPSS) were conducted for each of the three different types of undergraduate medical degrees (STN, GEM and EXT). This was used to evaluate the relationship between the three independent categorical variables used throughout this research (POLAR, NS-SEC and school type) and the continuous variable A Level points, against the binary/dichotomous outcome of becoming an accepted applicant on each of the three different types of undergraduate medical degrees. The findings are presented in the tables below, with commentary after the final table:

Table 8.73: Binary Logistic Regression model for STN accepted applicants (2002-11)
King's College London and Birmingham University
Model One (no A Level scores) and Model Two (with A Level scores)

Predictor variable and reference category	Model 1 no A Level scores	95% CI (Lower)	95% CI (Upper)	Model 2 with A Levels scores	95% CI (Lower)	95% CI (Upper)
SES background						
Higher managerial & professional	1.229	.968	1.562	1.071	.841	1.365
Lower managerial & professional	1.120	.877	1.431	1.036	.809	1.327
Intermediate occupation	1.182	.912	1.532	1.079	.831	1.402
Self-employed	1.180	.887	1.571	1.122	.840	1.497
Lower supervisory & technical	1.093	.776	1.538	1.060	.751	1.498
Semi-routine occupations	.967	.736	1.271	.911	.691	1.200
Routine occupations	1.00			1.00		
POLAR						
POLAR Q1	1.00			1.00		
POLAR Q2	.962	.782	1.184	1.078	.898	1.295
POLAR Q3	1.083	.891	1.316	1.019	.894	1.161
POLAR Q4	1.004	.831	1.214	1.110	.995	1.238
POLAR Q5	.042	.092	.209	.996	.903	1.098
School type						
Comprehensive	1.00			1.00		
Academy	2.376	.396	14.242	3.952	.650	24.019
Further Education	.625	.507	.771	.571	.454	.716
Grammar (state)	1.590	1.425	1.776	1.332	1.159	1.531
Higher Education	.109	.054	.222	.099	.048	.203
Independent	1.537	1.392	1.697	1.296	1.138	1.477
Other	.501	.248	1.011	.379	.187	.770
Sixth-form college (state)	1.173	1.023	1.345	.862	.751	.990
Academic year						
2002	1.00			1.00		
2003	.978	.797	1.200	.959	.781	1.178
2004	.693	.582	.824	.698	.586	.832
2005	1.437	1.210	1.707	1.377	1.158	1.638
2006	1.366	1.142	1.633	1.253	1.046	1.501
2007	1.626	1.363	1.939	1.452	1.215	1.735
2008	1.405	1.172	1.684	1.245	1.037	1.495
2009	1.622	1.353	1.945	1.373	1.142	1.650
2010	1.845	1.499	2.271	1.684	1.365	2.077
2011	1.406	1.122	1.762	1.236	.985	1.552

Notes: the data used to compile these tables was provided by Birmingham University and King's College London (2002-11) as these were the only two universities which provided data relating to A Levels. The A Level grades were converted to points, with A*=12 points, A=10; B=8; C=6; D=4; E=2. Only those applicants with 18-30 points (grades AAA-CCC) have been included these analyses, as the A* grade was unavailable to GEM applicants, and CCC grades were the lowest grades accepted for admission to the King's College EXT degree during the earlier years of this study. The NS-SEC categories included NS-SEC1-7 only, which NS-SEC8 (long-term unemployed or never worked) removed. NS-SEC8 amounted to 0.02% of the full dataset of STN, GEM and EXT applications (n=148,838). This was done to facilitate comparisons between the employed categories of the NS-SEC schema. Complete Case Analysis (CCA) was used for the BLR analyses, reducing the original dataset to 14,878 individual applicant records.

Table 8.74: Binary Logistic Regression model for GEM accepted applicants (2002-11)

King's College London and Birmingham University

Model One (no A Level scores) and Model Two (with A Level scores)

Predictor variable and reference category	Model 1 with no A Levels scores	95% CI (Lower)	95% CI (Upper)	Model 2 with A Level scores	95% CI (Lower)	95% CI (Upper)
SES background						
Higher managerial & professional	<5	.000	.000	<5	.000	.000
Lower managerial & professional	<5	.000	.000	<5	.000	.000
Intermediate occupation	<5	.000	.000	<5	.000	.000
Self-employed	<5	.000	.000	<5	.000	.000
Lower supervisory & technical	<5	.000	.000	<5	.000	.000
Semi-routine occupations	<5	.000	.000	<5	.000	.000
Routine occupations	1.00			1.00		
POLAR						
POLAR Q1	1.00			1.00		
POLAR Q2	<5	.000	.000	<5	.000	.000
POLAR Q3	<5	.000	.000	<5	.000	.000
POLAR Q4	<5	.000	.000	<5	.000	.000
POLAR Q5	<5	.000	.000	<5	.000	.000
School type						
Comprehensive	1.00			1.00		
Academy	0.000	0.000	0.000	0.000	0.000	0.000
Further Education	2.842	.961	8.399	3.170	1.050	9.570
Grammar (state)	.299	.036	2.503	2.368	.224	25.026
Higher Education	.751	.212	2.667	2.547	.260	24.915
Independent	1.119	.312	4.014	1.977	.221	17.670
Other	1.011	.248	4.114	0.000	0.000	0.000
Sixth-form college (state)	2.190	.647	7.415	3.154	.349	28.470
Academic year						
2003	1.00			1.00		
2004	1.838	.353	9.566	2.020	.384	10.632
2005	1.838	.353	9.566	1.873	.352	9.962
2006	4.722	1.048	21.272	4.754	1.044	21.660
2007	.000	.000	.000	.000	.000	.000
2008	2.784	.688	11.261	2.978	.717	12.379
2009	1.545	.298	8.004	1.456	.275	7.710
2010	4.359	.972	19.555	4.322	.938	19.924
2011	1.744	.336	9.061	1.503	.278	8.117

Notes: the data used to compile these tables was provided by Birmingham University and King's College London (2002-11) as these were the only two universities which provided data relating to A Levels. The A Level grades were converted to points, with A*=12 points, A=10; B=8; C=6; D=4; E=2. Only those applicants with 18-30 points (grades AAA-CCC) have been included these analyses, as the A* grade was unavailable to GEM applicants, and CCC grades were the lowest grades accepted for admission to the King's College EXT degree during the earlier years of this study. The NS-SEC categories included NS-SEC1-7 only, which NS-SEC8 (long-term unemployed or never worked) removed. NS-SEC8 amounted to 0.02% of the full dataset of STN, GEM and EXT applications (n=148,838). This was done to facilitate comparisons between the employed categories of the NS-SEC schema. Complete Case Analysis (CCA) was used for the BLR analyses, reducing the original dataset to 14,878 individual applicant records.

Table 8.75: Binary Logistic Regression model for EXT accepted applicants (2002-11)

King's College London

Model One (no A Level scores) and Model Two (with A Level scores)

Predictor variable and reference category	Model 1 no A Level scores	95% CI (Lower)	95% CI (Upper)	Model 2 with A Level scores	95% CI (Lower)	95% CI (Upper)
SES background						
Higher managerial & professional	1.160	.399	3.374	1.121	.378	3.321
Lower managerial & professional	1.482	.586	3.750	1.286	.499	3.315
Intermediate occupation	1.224	.433	3.456	1.045	.362	3.015
Self-employed	.720	.239	2.174	.638	.207	1.964
Lower supervisory & technical	.720	.148	3.501	.581	.114	2.958
Semi-routine occupations	1.468	.554	3.887	1.312	.487	3.531
Routine occupations	1.00			1.00		
POLAR						
POLAR Q1	1.00			1.00		
POLAR Q2	.894	.262	3.055	.859	.246	2.993
POLAR Q3	.682	.212	2.192	.596	.181	1.961
POLAR Q4	.643	.186	2.221	.645	.183	2.273
POLAR Q5	1.210	.311	4.701	1.194	.298	4.784
School type						
Comprehensive	1.00			1.00		
Academy	0.000	0.000	0.000	0.000	0.000	0.000
Further Education	.815	.355	1.873	.786	.336	1.838
Grammar (state)	<5	0.000	0.000	<5	0.000	0.000
Higher Education	.000	.000	0.000	0.000	0.000	0.000
Independent	.131	.012	1.484	.096	.008	1.161
Other	.000	.000	0.000	.000	.000	0.000
Sixth-form college (state)	1.189	.591	2.392	1.186	.584	2.408
Academic year						
2004	1.00			1.00		
2005	2.000	.500	7.997	2.053	.503	8.381
2006	3.333	.753	14.757	3.824	.833	17.549
2007	.939	.272	3.246	1.027	.287	3.674
2008	.536	.180	1.596	.616	.196	1.938
2009	1.619	.461	5.682	1.892	.509	7.038
2010	.538	.182	1.586	.635	.202	1.998
2011	.831	.267	2.591	1.020	.292	3.565

Notes: the data used to compile these tables was provided by Birmingham University and King's College London (2002-11) as these were the only two universities which provided data relating to A Levels. The A Level grades were converted to points, with A*=12 points, A=10; B=8; C=6; D=4; E=2. Only those applicants with 18-30 points (grades AAA-CCC) have been included these analyses, as the A* grade was unavailable to GEM applicants, and CCC grades were the lowest grades accepted for admission to the King's College EXT degree during the earlier years of this study. The NS-SEC categories included NS-SEC1-7 only, which NS-SEC8 (long-term unemployed or never worked) removed. NS-SEC8 amounted to 0.02% of the full dataset of STN, GEM and EXT applications (n=148,838). This was done to facilitate comparisons between the employed categories of the NS-SEC schema. Complete Case Analysis (CCA) was used for the BLR analyses, reducing the original dataset to 14,878 individual applicant records.

8.10.1 Commentary on BLR findings

Irrespective of the year or the medical degree to which an individual applies, the odds of them becoming an accepted applicant have fluctuated compared with the reference category (2002 for STN degree; 2003 for GEM degree; 2004 for EXT degree). There does not appear to be a consistent pattern, unless A Levels are taken in consideration, especially in respect of the STN degree.

Whether the model includes A Level scores or not, those applicants from the higher social classes are more likely to become an accepted applicant than those from the lower social classes, when compared with the lowest social class (NS-SEC7) on the STN degree. However, applicants to the EXT degree, from NS-SEC6 (semi-routine occupations) have almost 1.5x the odds of becoming an accepted applicant on the EXT degree, but their odds are much lower than those from NS-SEC7 on the STN degree, where fewer applicants become accepted applicants (<1x).

STN applicants from the POLAR quintiles Q3 and Q4 (using the lowest quintile Q1 as the reference category) have similar odds of becoming an accepted applicant, with or without the consideration of their A Level scores. The odds for those from Q5 increase significantly when their A Level scores are part of the model, as do those from Q2. Applicants to the EXT degree, from the highest POLAR quintile (Q5) have 1.2x the odds of becoming an accepted applicant, compared to those from Q1, both with and without modelling their A Level scores.

STN applicants from academies have 2.4x odds of becoming an accepted applicant than those who attended a comprehensive school (reference category) if A Levels are not modelled which increases to almost 4.0x if they are. With or without A Levels, applicants from academically-selective state grammar schools and fee-paying independent schools have the best odds of becoming an accepted STN applicant, with those from further education colleges and the *other* category being the least likely. Those from further education colleges and sixth-form colleges had 2.8x and 2.2x the odds (respectively) of becoming an accepted applicant, compared to those from comprehensive schools, these

increase significantly to 3x if A Level scores are considered. On the EXT degree, all of the school types fare badly, with the odds of applicants becoming accepted applicants very low for all school types (compared to comprehensive schools) apart from state sixth-form colleges, where the odds are almost the same with or without A Level scores.

8.11 Conclusion to the findings chapter

Against a backdrop of an expansion in the number of medical schools, the number of places at those medical schools and a diversification in the types of undergraduate medical degrees available between 2002-11 (Petty-Saphon 2008; Mathers 2011) the research findings outlined in this thesis have sought answer the research question: did the existence of non-standard undergraduate medical degree widen access to medical school, at the eighteen universities which ran to or more type of undergraduate medical degrees during the period 2002 to 2011? Using three key variables; NS-SEC, POLAR and school type, this research has sought to uncover *if* and to what extent access was widened to the two non-standard undergraduate medical degrees (four-year GEM degrees and six-year EXT degrees) over the ten year timeframe, and in comparison to the STN degree running at the same university, and across the sector.

As previous studies have outlined (Steven et al 2016; Niven et al 2019), the STN degree in particular continues to be dominated by those from more affluent backgrounds (using NS-SEC), who reside in local areas (as measured using POLAR), who attended fee-paying independent schools, academically selective grammar schools and highly selective state sixth-form colleges (school type/LIA). It is more problematic to make a full assessment of the success GEM degree has had in widening access in terms of the socio-economic background, POLAR and the type of school an applicant or accepted applicant attended, as (the data from St George's University) showed more than 98% of accepted applicants listed *higher education* as the last institution attended. However, it does appear from the research conducted on the data provided by the universities which ran GEM degrees alongside STN degrees (and in some instances EXT degrees as well) that these have not widen access as much as expected.

Therefore, any conclusions about the success the GEM degrees included in this study have had on widening access to those from socio-economically disadvantaged backgrounds, those who attended non-selective state schools and colleges; or who resided in areas where there is a low uptake of higher education by young people, would have to conclude (in the vernacular) that they are; *more of the same but later* i.e. the demographics of GEM applicants and accepted applicants are broadly similar to those of the STN degree in this non-random sample. The one area where the GEM degrees did successfully widen access was in relation to the age of applicants and accepted applicants, when compared to the STN and EXT degrees. The GEM degrees in this sample, had a mean applicant age was 25.5 years and 25.3 years for accepted applicants; which compares to 19.2 years and 18.8 years, respectively for the STN degree; and 19.8 years and 19.1 years, respectively for the EXT degree (n= 95,502 applicants with age data).

Of the three types of undergraduate medical degrees examined in the research, the EXT degree does appear to have been more successful than either the STN or GEM degree at widening access, but the number of EXT degrees available (2002-11) was far fewer than either the STN or GEM degrees. In this non-random sample of eighteen universities which ran STN degrees; 14 also ran GEM degrees; with eight running EXT degrees. The socio-demographic and scholastic background of EXT applicants and accepted applicants was generally broader than those of the STN or GEM degrees. Even on the EXT degree, at several of the universities in this sample, there were applicants and accepted applicants who (based on the data provided) did not appear to meet standard measures of socio-economic disadvantage or widening access criteria (NS-SEC4-7; POLAR LPN; non-selective state school or college).

This study sought to answer the research question: did non-standard undergraduate medical degrees widen access, at the eighteen universities which ran two or more types of undergraduate medical degrees (2002-11). In summary, it can be concluded that the GEM and EXT degrees did succeed in widening access a little in terms of some key demographics, such as age (GEM degree) and school type (EXT degree) but that overall undergraduate medical studies remain dominated by those from advantaged backgrounds.

The existence of GEM and EXT degrees does allow those who would previously have been ineligible for admission to undergraduate medical degrees, but given the nature of these types of degrees, the numbers admitted each year can only be small, especially when compared to the longer-established STN degrees. Despite these limitations, the positive impact of becoming a medical student must have on these individuals cannot be underestimated, and neither should the opportunity for them to be a role model for any future potential medical students.

Chapter nine

9.1 PhD conclusion

This research examined the area-based (POLAR), education (school type) and socio-economic background (NS-SEC) of applicants and selected applicants to the three different types of undergraduate medical degrees (STN, GEM and EXT), at the eighteen universities which ran two or more types of undergraduate medical degrees (2002-11). Whilst previous studies have claimed GEM degrees have led to the socio-economic and educational diversity of undergraduate medicine and dentistry degrees (Olivarius-McAllister et al 2021; Booth et al 2022), the findings in this research (for medical degrees) were much less conclusive. GEM degrees have certainly widened access in terms of the age of applicants and accepted applicants, but this is to be expected as the minimum age for entry is twenty-one years (Garrud 2022). It appears from the evidence in this research (where data were available), that the SES, neighbourhood and scholastic backgrounds of GEM applicants and accepted applicants were remarkably similar, but the GEM dataset contained more missing data than the STN or EXT datasets.

The EXT degrees in this study do appear to have been successful in widening access, compared to the STN degrees, drawing applicants and accepted applicants from a more diverse range of backgrounds, in terms of lower NS-SEC and lower POLAR categories, and non-selective state schools. The percentage of accepted applicants for the GEM and EXT degrees are; 2.91% (GEM degree) and 0.90% (EXT degree). These percentages have likely increased, as GEM students now account for around 10% of per annum intakes of medical students (Garrud and McManus 2018); and in 2023/24, fifteen universities will be running EXT degrees (Garrud 2022).

9.2 Recommendations

Since the timeframe of this research concluded in 2011, medical schools are increasingly using contextual admissions for their undergraduate medical degrees, including the STN degree (Bowes et al 2015; Mountford-Zimdars and Moore 2020; Murray et al 2021; Spong et al 2021). An examination of the widening participation criteria for entry to undergraduate medical degrees, particularly six-year EXT shows they require applicants to

meet similar criteria: household incomes below £25-35,000 per annum; parents or guardians or self in receipt of means tested benefits; applicants in receipt of 16-19 Bursary or similar: resident in LPN (POLAR Q1 or Q2) or a deprived area (lowest 20% for IMD areas); attended a non-selective state school with below average GCSE or A Level attainment rates; looked after or estranged student; are a carer to family member, come from a military family, have refugee status or be a member of a minority group, such as Romani, Gypsy or Traveller. Most of these require evidence to be provided by the individual, their school or a social worker or the Home Office (Bristol, Dundee, Edge Hill, Hull York, Keele, Kings, Lancaster, Leeds, Lincoln, Norwich, Nottingham, Plymouth and Southampton university websites 2022).

The either/or status of many of these criteria, means (theoretically) it would be possible for someone educated solely in the independent sector or at a selective state school to benefit from contextual admissions/widening participation scheme if they fulfilled certain. With only 3% of state grammar school students being eFSM (Danechi 2020) and the average price of private school fees (not including boarding school) amounting to £13,700 per annum (Adams 2021), students attending these types of schools, even if they receive a scholarship or are in receipt of Free School Meals, are already what the American academic Anthony Abraham Jack terms the *privileged poor*, who have benefitted from an elite education prior to university (Jack 2019).

Most of the widening participation criteria listed previously could be *gamed* by an applicant, who might be considered one of the privileged poor meaning the *doubly disadvantaged*, who have attended poor quality state schools and live in deprived neighbourhoods could be missing out on a place at medical school or in an elite university (Jones 2010; Jack 2019; Lavelle 2019).

As early as 2014, the Medical Schools Council (MSC) recommended medical school admissions staff use multiple, rather than single measures of widening participation indicators, but raised concerns that there was relatively little consistency between medical schools regarding how these were applied and which students benefitted (Garrud 2014).

UCAS has since introduced a *Multiple Equity Measure (MEM)* which combines details about an applicant's gender, ethnicity, POLAR quintile and secondary school/s attended (Britten 2020). But there remains little consensus amongst medical school admissions staff regarding which methods reliably evaluate the non-academic attributes of applicants (Patterson et al 2016). Although the MSC has suggested there is little evidence for a national framework for selection, and instead individual medical schools can determine own (Dilnot and Boliver 2018).

An argument could be advanced that the creation of a (points-based) national framework could be a useful additional tool for applicants, their parent/s or guardian/s, school staff providing careers advice and assisting with university applications, and medical school admissions staff. One could argue that the single most important criteria should be that an applicant attended a non-selective state secondary school, which has below national average GCSE and A Level results, along with a below average Attainment 8 score, coupled with an above average percentage of students who are eFSM, and priority should be given to these applicants, who are the *doubly disadvantaged* rather than the *privileged poor* (Jack 2019).

9.3 Non-random sample

The focus of this research, were the eighteen university-based medical schools which ran two or more types of undergraduate medical degree, between 2002 and 2011. These eighteen were chosen as a non-random sample because they ran either a six-year extended-entry (EXT) or a four-year graduate-entry medical degree, alongside a five-year or six-year standard-entry (STN) degree, at some point during the decade.

At the time of this research there were thirty-one universities running undergraduate medical degrees (Petty-Saphon 2008). It is therefore possible that the intake of medical students to the two or three different types of undergraduate medical degrees which ran at the eighteen universities in this study differed significantly from those which only ran one type of undergraduate degree. This is particularly relevant to newer medical schools, such as those at Chester, Swansea, Ulster (Derry), Warwick and Worcester universities, where

the GEM degree is run as a standalone degree, and not alongside a pre-existing STN degree (Garrud 2022). Research about the pre-medical degree academic attainment levels of GEM students at Swansea and Warwick universities indicates they are all highly qualified (Carter and Peile 2007; Bodger et al 2011).

9.4 Obtaining the data

The UK's Freedom of Information Act (FOIA) was passed into law in 2000, but did not become operational until 2005 (Cherry and McMenemy 2013). Prior to this date this study would not have been possible. Freedom of Information (FOI) requests have been used extensively by investigative journalists, but they are a much under-utilised resource in social science research (Savage and Hyde 2014), which means this study has used an approach which is both novel and innovative, and one which few social science research have exploited.

The data for this research were obtained from HESA, UCAS and the eighteen universities included in the non-random sample. Data were purchased from HESA and UCAS, and identical Freedom of Information (FOI) requests were sent to each of the eighteen universities included in the study. Birmingham University was chosen for the pilot FOI request, and following a meeting with the university solicitor the data were provided, with several caveats, including not sharing the data with any third party, and its safe storage on a non-networked, password protected laptop. This data amounted to anonymous undergraduate applicant and admissions data (n=320,929 disaggregated, individual-level records).

Bouyed up by this successful request, a further seventeen FOI requests were made to the remaining universities, and each one was turned down (legitimately) on the grounds of cost, time or computerised records not being available (Bourke et al 2012). The requests were heavily revised and resent to the seventeen universities. Eventually, after around 4-5 months of negotiations, data were obtained from the remaining seventeen universities. Despite the FOI requests being identical, the quality and quantity of the data varied greatly. This needs to be taken into account in any future research using FOI requests.

9.5 Limitations of the research

All research begins with the identification of social phenomena (Cohen et al 2018) and asks what is going on and why (De Vaus 2001). In this research the social phenomena being explored were applications and accepted applicants to undergraduate medical degrees. Following the third report of the UK's Medical Workforce Standing Advisory Committee (1997) and the NHS Plan (2000), the number of medical school places was set to double in ten years, through the expansion of places at existing medical schools and the creation of new medical schools (Arulampalam et al 2005). This rapid expansion took place alongside government targets to widen participation and widening access to higher education generally (Callender 2001). To attempt to diversify the undergraduate medical student body, the year 2000, saw the introduction of GEM degrees at St George's and Warwick universities, followed a year later by the launch of an EXT degree at King's College, London (Garlick and Brown 2008; Haldane et al 2012). Since this time the number of places at medical school and the number of undergraduate medical degrees has expanded rapidly; for entry in 2023/24, forty universities will be running STN degrees; GEM degrees will be available at seventeen universities; with (six-year) EXT degree taking place at fifteen universities (Garrud 2022). It would be an interesting and worthwhile exercise to repeat this research from 2011-2020 and beyond, to assess the impact of GEM and EXT degrees have had on widening access, when compared to STN degrees.

9.6 Secondary data analysis

This research utilises secondary data, which originated when individuals completed their medical school application, via the UCAS website. As with FOI requests, the use of secondary quantitative data is rare in social science research, particularly in education research, as social scientists tend to shy away from quantitative studies (Smith 2008; Davies 2020). The use of secondary data has its limitations and its strengths (Panchenko and Samovilova 2020). On the positive side, *very* large amounts of data were readily available with relative ease, but this has been both strength and a weakness throughout this study (Kaplan et al 2014). The datasets which were analysed using SPSS comprised 108,926 (STN degree); 35,426 (GEM degree); and 5,247 (EXT degree) application records. On the negative side, because of the nature of this secondary data, there were large

volumes of missing data on key variables, particularly NS-SEC data, and strategies had to be devised to deal with this level of missingness to negate its impact on the study, and to ensure the findings are robust (Wang et al 1992; Graham 2009).

9.7 Missing data

Because of the nature of this data (retrospective secondary data) which was collected for an entirely different purpose to the research, prior to beginning analyses, strategies had to be devised to deal with missing data. Between 15-20% of data is missing in educational research (Enders 2010), more was missing on some of the variables in this study, particularly NS-SEC. UCAS and HESA have already devised a category for missing NS-SEC data (NS-SEC9), so this pre-existing convention was followed throughout this study. In respect of POLAR (where POLAR data was provided by a university) a dummy quintile (POLARQ6) was created to deal with the small percentage of missing data. As with POLAR, a pre-existing dummy variable was adapted to deal with the volumes of missing school type data (UCAS9).

On the smaller datasets, mean imputation was used effectively to complete the missing values (Arteaga and Ferrer-Riquelme 2009). Due to the large volumes of missing data in the NS-SEC variable, it was not deemed appropriate to use listwise deletion, as this would have reduced the sample sizes significantly, and produced biased data, because as one study noted, university applicants who declined to provide details of their SES background, are disproportionately from areas of high socio-economic deprivation and POLAR LPNs (Harrison and Hatt 2009; Pepinsky 2018). These were the very applicants and accepted applicants this research hoped to investigate.

9.8 Quantitative, qualitative or mixed methods research

Quantitative and qualitative research designs have been used for decades, but mixed methods research is a relative new-comer, and has been described as the third methodological movement, and one which bridges the gap between positivistic and interpretivistic research paradigms (Tashakkori and Teddie 2010).

This study appropriated an objectivist ontology and embraced a positivist research paradigm (Davies 2020). These were a pragmatic response to the nature of the research question/s, the aims and objectives of the research, and the academic and professional status of the researcher. Both the qualitative and mixed methods research paradigms were discussed in the preliminary stages of the research design. The former was dismissed almost immediately, because of the nature of the research, and the data collection methods. The potential of the latter was discussed, particularly as qualitative research findings can be used to explain the quantitative findings in greater detail (Verhoef and Casebeer 1997; Johnson and Onwuegbuzie 2004).

Although previous studies involving medical students and healthcare professionals have used this relatively new research (mixed methods) paradigm (Anaf and Sheppard 2007; Maudsley 2011; Tariq and Woodman 2013; Rockey et al 2021) it was not deemed appropriate in this study, because of the nature of the data and the research design. This involved the use of a retrospective longitudinal quantitative research paradigm, involving time-series secondary data which had been collected annually between 2002/3 and 2011/12. This precluded the use of a mixed methods research paradigm, as the data were collected *after* 2012. Using qualitative research methods, to compliment the quantitative ones in this study had the potential to introduce a sampling bias; as only those students who entered medical school after 2006 were still at university, and were therefore, theoretically more easily contactable than the remainder who began their course earlier in the decade, and would have graduated between 2006 and 2008, depending on which sort of undergraduate medical degree they were studying.

Although not used in this study, the mixed methods research paradigm could potentially be incorporated within any future research into medical education, particularly if a prospective longitudinal quantitative paradigm could be used to track school students who expressed a desire to study medicine at school or college, through the applications and admissions process. This would enable causal inferences to be drawn about the relationship between the exposure (decision to study medicine and the medical school

application process) and the outcome (being admitted to an undergraduate medical degree) (Pole and Bondy 2010).

9.9 Dates of the research (2002-11)

The non-random sample of secondary data used in this study dated from the 2002/03 to 2011/12 academic years. By its very nature this data is historical, as it was when it was collected after the conclusion of the 2011/12 academic year. Despite this, the research provides an extremely useful snapshot into the decade which witnessed the introduction of the GEM and EXT degrees, as medical organisations, such as the Medical Schools Council (MSC) and the British Medical Association (BMA), sought to diversify the composition of the undergraduate medical school student body and the profession itself (Milburn 2009; O'Dowd 2009; Milburn 2012; Garrud 2014). It was therefore possible (as it would not have been prior to 2000 and 2001, when the GEM and EXT degrees were introduced) to assess the impact these degrees had on widening access, compared to the STN degree (Haldane et al 2012; Curtis and Smith 2020).

This decade (2002-11) also saw the introduction of the Participation of Local Areas (POLAR) classification, in 2005 (Austin 2018), which provided a complimentary tool with which to explore widening access to undergraduate medical degrees, in addition to NS-SEC and school type. Based on an applicant's home postcode, POLAR cannot be *gamed* as easily as NS-SEC, but is still not without issues around identifying individuals with their neighbourhood of residency (Harrison and McCaig 2015) but in this study it was a useful tool to the researcher's arsenal, as the volumes of missing NS-SEC data increased during this decade, to almost 25% (Singleton 2010), and school type [last institution attended] is arguably less relevant to GEM degree students, most if not all of whom have a degree (Bodger et al 2011).

Twenty years have elapsed since the very first anonymous individuals in the research applied to study medicine (for entry in 2002). And in some respects this data and the findings suffer from one of the major issues arising from using a historical or retrospective research design: namely how relevant are the findings today (Klebanoff and Snowden

2018). However, the issues around disadvantaged students and their lack of access to undergraduate medical degrees remains as pertinent today, as it did one to two decades ago, and none more so than during the Covid-19 years of 2020 and 2021, when students at independent schools experienced far higher A Level grade inflation than any other type of school or college, resulting in more them being eligible for admission to an undergraduate medical degree (Dilnot and Boliver 2018; Garrud and McManus 2018; Niven et al 2019; Curtis and Smith 2020; Sartania et al 2021; Cakitaki et al 2022; Rees et al 2022).

9.10 Variables not examined in this research

Absent from this research is an exploration of the impacts ethnicity and gender, have on applications and accepted applicants to undergraduate medical degrees. An acknowledgment of the intersectionality between race, class and education in the UK has to be made, but could not be explored in this research, due to time constraints (Bhopal and Preston 2012).

Ethnicity was not explored in this research, although the data were provided by some of the eighteen universities. White British applicants and accepted applicants comprise the majority of on all three types of undergraduate medical degrees. After White British, the largest ethnic groups are British Indian and British Asian Other (STN degrees); British Indian, British Black African and British Pakistani (GEM degree); British Black African, British Pakistani; British Asian Other (applications) and British Indian (accepted applicants) (EXT degree). These findings concur with those of previous studies examining the ethnicity of undergraduate medical applicants and students (Mathers et al 2011; Ferguson et al 2012; Steven et al 2016; Niven et al 2019)

As with ethnicity a discussion of gender was absent from this study, although this data was provided by some of the universities. Overall, women are the majority of applicants on the STN, GEM and EXT degrees; but men are the majority of accepted applicants on the STN degrees at Cambridge, Imperial, Keele, Liverpool and Oxford universities. On the GEM degrees, females comprise almost 60% of applicants and accepted applicants; and more than 60% of accepted applicants at Cambridge, Keele and Southampton universities. On

the EXT degrees male and female applications and accepted applicants are roughly 50/50, but males comprise 78% of accepted applicants on the EXT degree at Keele University, however there were only thirty-six accepted applicants on this course. There has been much discussion recently, about the impact having a majority female medical student body and professional workforce has and will have in the future (Bedi and Gilthorpe 2000; Lempp and Seale 2006; McKinsty 2008; Shiner et al 2010; Bleakley 2013; Hewitt 2020).

9.11 Potential future research

9.11.1 Poshest cohorts ever?

Of particular interest for future research, in relation to admissions to the STN degree in particular, are the years 2020-21, when timed A Level examinations were cancelled due to government imposed lockdowns during the Covid-19 pandemic. Students were instead awarded their A Level grades based on teacher-assessed or centre-assessed grades (Roberts and Danechi 2021; Finn et al 2022). This saw grade inflation throughout the system, but the greatest beneficiaries were the students at independent schools, who saw their grades increased by much more than those in comprehensive schools and state sixth form colleges (Kippin and Cairney 2022)

Universities routinely make more offers to applicants than they have places available, because they know a significant number of applicants will not meet the academic entry requirements (Hewitt et al 2021). In 2020 and 2021, so many would be undergraduate medical students met their university's offer grades, that the government was required to temporarily lift the cap on incoming medical student numbers (Rimmer 2020). This prompted one anonymous university staff member to say they had the poshest cohort ever at their university (Johnson 2020). To conduct this new study, Freedom of Information requests will be made to obtain applications and admissions data from universities running the STN undergraduate medical degree or purchased from HESA. The data could be requested for the two years prior (2018-19) to the Covid19 pandemic years (2020-21) and two years afterwards (2022-23), enabling appropriate comparisons to be made.

9.11.2 You are where you live?

POLAR and TUNDRA

POLAR has been described as an ecological fallacy (Harrison and McCaig 2015). These three proposed research projects would test this hypothesis:

9.11.3 POLAR and Indices of Multiple Deprivation (IMD)

The large dataset supplied by Birmingham University, provided details about applications and admissions to all its undergraduate degrees (n=320,929 anonymised individual records), from 2002-11. This included postcode and POLAR2 details. The Office for Students (OFS) makes available details of all UK postcodes with their associated POLAR3, POLAR4 and TUNDRA, which can be downloaded in Excel format. This research, would take one discrete postcode district, which covers rural and urban areas, such as that for the Cardiff area (CF postcode) or Coventry and Warwickshire (CV) and map POLAR2 onto the later iterations, to compare these areas with the relevant Index of Multiple Deprivation (WIMD, Wales and IMD, England). This would explore how well POLAR is able to identify those who are genuinely disadvantaged, rather than those who happen to be resident in an area where fewer 18-19 year olds participate in higher education. Potentially, using these two postcode areas would enable to robustness of POLAR in rural and urban areas.

9.11.4 Urban POLAR

Using the same Birmingham University and that provided by St George's University and aforementioned OFS datasets, it would be possible to assess the urban implications of using POLAR to identify individuals entitled to participate in outreach schemes or to be a recipient of a contextual admission offer. The extent to which POLAR Q5 dominates in London and the impact this has on the most educationally disadvantaged students has been well documented (HEFCE 2012; Atherton et al 2019; Martin 2019; Kernohan 2021).

What is less well understood is the impact this has in other large urban centres such as Birmingham or Manchester. One strand of this future research could utilise the Birmingham University dataset to map the Birmingham only (B postcodes) undergraduate applicants and their POLAR2 quintile against the more recent POLAR3 and POLAR4

datasets as provided by the OFS. This would track any changes over time, and comparisons could be made against the findings for London, where pockets of educational disadvantage sit side-by-side with extreme wealth.

9.11.5 Rural POLAR

Deprivation in rural areas is often over-looked as cities are placed at the forefront of the austerity narrative in the UK (May et al 2020). Urban disadvantaged is more visible than that in the countryside, particularly, when as in London areas of high deprivation sit alongside those of with very high levels of affluence (Bagherli 2014). Buolic visions of rural Britain as a place to holiday or an ideal location for a second home, blind policy makers to the hardships endured by the rural poor (Anderson 2021; Smith 2023).

Not only has POLAR being criticised as ineffective in dealing with the pockets of educational disadvantage in larger cities, prompting some London-based universities to cease to use it as a measure of disadvantage and a range of different criticisms has been levelled at POLAR regarding the categorisation of rural areas; where the same POLAR quintile is often given to very geographically dispersed and disparate communities, which often have little in common, save sharing part of the same Royal Mail postcode (Harrison and McCaig 2015).

Again, using the Birmingham University dataset relating to undergraduate applications (2002-11), this study will explore 18-19 year olds applicants from Welsh only postcode areas. Around 20.9% of England's population live in rural areas, compared to 17.0% in Scotland; 36% in Northern Ireland; and 23.8% in Wales (Scott 2020). Because there were so few applicants to Birmingham University from Scotland and Northern Ireland, this research will examine applicants from Welsh postcode areas (CF, LD, LL, NP, SA and SY).

The Newport (NP) and Shrewsbury (SY) postcodes straddle the border between England and Wales, which will necessitate stripping out those entries which are resident and/or studying at schools or colleges in England. Doing this will create a discrete population of approximately c.10,000 applicants (around 3-4% of total applicants to the Birmingham

University). Like the previous study, this research will link POLAR2 with POLAR3, POLAR4 and the Welsh IMD (WIMD). The results of the statistical analyses should reveal how appropriate it is to use POLAR in largely rural and more sparsely populated areas. This has relevance, because although the OFS has announced POLAR4 will be the last iteration it remains an integral part of UCAS's Multiple Equality Measure (Corver 2019), which also includes data from the National Pupil Database and IMD (Best 2019).

9.11.6 Old and new medical schools

Since 2010, fourteen new medical schools have been opened in areas of the country which lack a medical school, and have significant shortfalls in the medical workforce (MSC 2021). These include new medical schools at Sunderland University (opened 2018), Lincoln University (opened 2019), Worcester University (opened 2021). Examples of well-established medical schools, include Birmingham (founded 1825), Cardiff (founded 1983) and Sheffield (founded 1828) (Petty-Saphon 2008).

The newer or post-92 universities tend to attract applications and students from less advantaged backgrounds (Greenhalgh et al 2006; Reay 2009; Bathmaker et al 2011; Boliver 2013; Crawford 2014; Downs 2016; Wyness 2017; McGrath and Rogers 2021). FOI requests could be sent to the forty universities which currently run the standard-entry undergraduate medical degree (Garrud 2022), requesting data relating to the socio-economic and educational background characteristics of applicants and students. Examining this data, would reveal if there were any statistically significant differences of the background characteristics of applicants and students at well-established medical schools, and more recently created ones.

Appendix

Ethnical approval was sought from and granted by Durham University.

Application number: EDU-2020-12-07T22_03_35-cjwm22.

Although the research involves living human subjects, they cannot be recognised, and the project has therefore been deemed a low risk.

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