



# Individual student characteristics and attainment in pre registration physiotherapy: a retrospective multi site cohort study

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## Abstract

**Introduction** Worldwide there is a desire to diversify the physiotherapy workforce. However, limited research indicates that some student characteristics linked to under-representation in pre registration physiotherapy education have lower attainment and greater attrition. This study explored the relationship between individual characteristics and success of students in pre registration physiotherapy education within South East England.

**Design** A retrospective multi site cohort study including pre registration physiotherapy programmes in the South East of England. Anonymised data included background information (age, gender, ethnicity, socio-economic status) and outcomes (assessment marks, type of award and classification of degree). Analysis involved Bayesian regression models and ordinal logistic regression to examine the association of student characteristics on outcomes.

**Results** Data from 1851 student records were collected from four institutions. There were significantly lower assessment scores for Asian (−11% 95% CI: −13.1 to −9.2), Black (−7%, 95% CI: −9.7 to −4.5) and Other/Mixed ethnicity groups (−5%, 95% CI: −7.1 to −2.4), most notable in clinical and observed assessments, compared to their White British colleagues. All BME groups also demonstrated worse odds for a one step lower overall award or no award (Black OR: 3.35, Asian OR: 3.97, Other OR: 2.03). Associations of learning disability, age and non-traditional entry routes with assessment scores and/or degree classification were also noted.

**Conclusion** These findings suggest significant attainment gaps in pre registration physiotherapy education in this specific geographical region, particularly for non-White ethnic and disability groups. The association with assessment type challenges educators to look beyond a purely student deficit model to explore all factors that may lead to inequality.

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**Keywords:** Physiotherapy; Student characteristics; Attainment; Ethnicity; Widening participation

## Introduction

The need to educate a more diverse physiotherapy workforce to reflect the changing nature of the wider population has been raised previously [1] and emphasised more recently by a Health Education England report [2] and the NHS Workforce Race Equality Standard. These issues are not unique and reflect changes in healthcare workforce planning and delivery in recent decades in other countries worldwide [3,4]. In 2014/15, reported data in the UK demonstrates that the phys-

*Abbreviations:* BME, Black and Minority Ethnic; BSc, Bachelor of Science; BTEC, Business and Technology Education Council; CSP, Chartered Society of Physiotherapy; FD, Further Degree; HESA, Higher Education Statistics Agency; IB, International Baccalaureate; IQ, interquartile; MSc, Masters of Science; OSCE, Objective Structured Clinical Examination; OR, Odd's Ratio; PG, Post Graduate; PhD, Doctorate in Philosophy; POLAR3, participation of local areas version 3; UCAS, University and Colleges Admission Services; VIVA, Viva voce Oral exam.

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iotherapy student population has an increasing proportion of men (36%), an equal proportion of mature (21 and over) and young (18–20) students, 15% self identify as from a Black or Minority Ethnic Group and 12% identify as having a disability with a significant proportion identifying dyslexia [5]. While this demonstrates that recruitment of equality targeted groups is improving within physiotherapy education provision, the evidence of attainment, success and retention of different groups also needs to be examined.

There is a growing body of evidence in physiotherapy and healthcare education more broadly exploring the link between student parameters and attainment, success and retention. Some studies have explored the relationship between pre-entry qualification and programme level attainment and success, and have found an inconsistent mix of potential influences with clear conclusions remaining elusive [6–9]. In research that considers gender findings are also mixed. Some studies have demonstrated a gender difference in attainment of clinical based modules in physiotherapy [10] and medicine [7,11], while others have not found any discrepancy in attainment in assessment or degree award [6,12–14]. There is little evidence in the literature that age has an impact on attainment or degree classification in physiotherapy [6,12,14], although there is contrasting evidence from a single centred study of Occupational Therapy students [9] in which school leavers (under 21) were more likely to progress through the programme than their mature colleagues.

Studies focusing on ethnicity more consistently demonstrate that students from a Black and Minority Ethnic (BME) background are less successful. Studies have identified students from BME background have lower attainment in clinical performance [13], academic results and overall award [12,14,15] even when adjusted for entry qualification [15]. In other healthcare fields, similar differences are noted in attainment [7,16,17] and success [18,19], that remain even when adjusted for possible confounders such as study habits, negative life events and previous psychological morbidity [20].

In contrast, specific consideration of disability has been very limited in the literature. Frank *et al.* [21] described a contradiction within the profession where applicants with visual impairment were encouraged to study physiotherapy, but faced significant barriers to full participation such as time, effort and fear of disclosure. This concern is supported by related literature which suggests significant prejudice towards students with disabilities entering professional training from academic and clinical staff [22,23]. One study demonstrated that students with visual impairments had a high success rate but required an extended period of study [24].

To summarise, in physiotherapy education, with the potential exception of ethnicity, it is difficult to draw convincing conclusions about a link between demographic variables and student attainment and success. There are also important methodological limitations in the research reporting potential associations. First, studies tend to be small and uni-institutional which limits the generalisability of the findings.

Second, some of the research is already dated due to the significant changes in recruitment, selection and curriculum in recent years. Third, looking at factors in isolation may be limiting. For instance identifying differences based on gender, age and ethnicity alone does not recognise the intersectionality of identities [25], which must be explored. Finally there is a paucity of evidence on socio-economic factors [12] potentially because of the difficulty in how categories are determined and measured [26].

To address some of these limitations, the aim of this study is to explore the relationship between key individual characteristics linked to widening participation, including gender, age, ethnicity, socio-economic status, pre-entry education, route of entry and disability, and attainment in pre registration physiotherapy programmes in South East England.

## Methods

A retrospective analysis of all marks awarded for academic and clinical assessments across all levels of study including degree award (for BSc and MSc pre registration physiotherapy programmes) was an appropriate method to capture data. All HEI's within the South East region which provided pre registration physiotherapy education were invited to participate. Following acceptance, cohorts from each institution were identified during recent periods with relatively consistent curricula. In line with an agreed protocol and both ethical and data protection directives, participant organisations provided anonymised data at individual student level. Data was retrieved from institutionally stored student records, checked for accuracy and completeness and securely sent to the project team.

Pre-existing categories for demographic variables were used from the Higher Education Statistics Agency (HESA) or University and Colleges Admission Services (UCAS) including: gender, age, ethnicity, socio-economic status, pre-entry/route of education and disability. POLAR3 data was also collected which is an approximation of educational participation and a proxy for social demographics. Attainment data collected included all marks awarded for academic and clinical assessments across all levels of study of BSc and MSc programmes (BSc levels 4–6, and MSc level 7), number of attempts, the level of the award (degree classification or intermediate award). In addition to the categories detailed above, further factors which may interact with individual characteristic were also collected including whether a student has taken a period of abeyance that impacted on the student's length of study.

Assessments were categorised as 'blind' (anonymously marked or assessed) or 'observed' (assessor sees the student's performance) in the university setting. Blind assessment was further coded to reflect whether it was 'timed' (e.g. a written examination) or 'untimed' (e.g. an essay). Clinical assessments were coded separately, defined as those assessed primarily by clinicians.

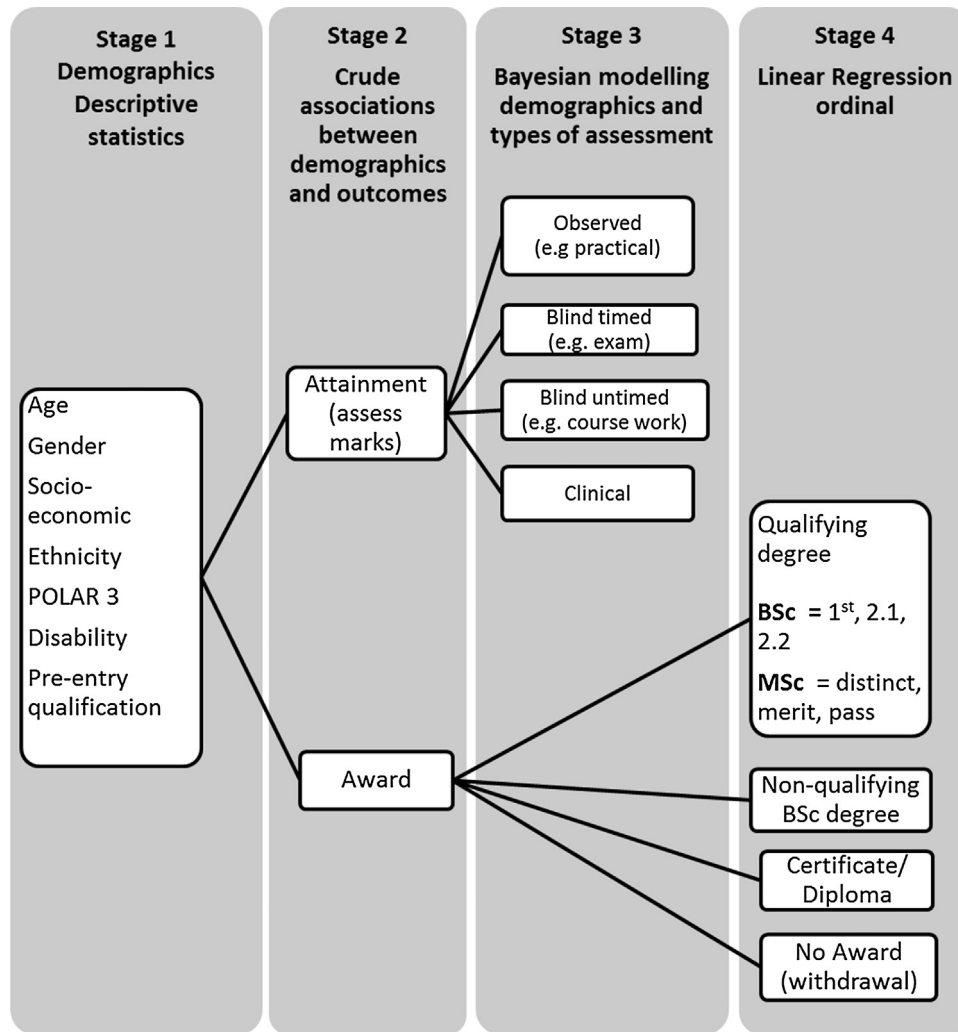


Fig. 1. Stages of analysis.

### Analysis

Analysis consisted of a number of specific steps. First the basic demographic and attainment levels were analysed descriptively.

A Bayesian model [27] was created through two stages to assess the association between student characteristics, assessment type and attainment (assessment and award marks). The data are multilevel and longitudinal in that students are followed over their studies, and coarsened in that some assessments record only whether a student passed or failed, and the Bayesian approach allowed us to deal with these complications, as with previous work in health education [28]. In stage one, associations were explored to predict first attempt scores. As the Bayesian model does not provide *P*-values in the traditional sense, a meaningful difference was set at >1% attainment score and when the confidence interval did not cross 0. Any completed assessment scores were included in this analysis, even if the student was withdrawn at a later point. This allowed us to impute marks for those clinical

practice assessments which receive pass or fail only. In stage two, the model was extended to assess the effect of individual characteristics along with their interaction with the other characteristics and the assessment type. This analysis was performed using Stan software through the rstan package in R version 3.2.3 (further details available at [mc-stan.org](http://mc-stan.org); [r-project.org](http://r-project.org)). Within the model, the baseline group for each of the categories in BSc was white, male, under 21, A level highest entry qualifications, no disability, POLAR3 quintile 3, and parents took part in HE. The modeling then indicated any difference with other characteristics in that category as either negative or positive from the baseline (e.g. female student records compared to male as the default). For MSc the baseline age was under 30, and pre-entry qualification was a first degree. The baseline assessment type was university-based observed (unblinded) assessment.

When considering award levels, the problems of multi-level, coarsened data are not present, and the relationship between characteristics and physiotherapy qualifying award levels, other awards and no award (non-completion) was cal-

Table 1  
Student characteristics.

Category	BSc % (n = 1583)	MSc % (n = 268)
Age	60% (948) aged <21	93% (248) aged 21–29
Gender	67% (1063) Female	62% (165) Female
Ethnicity	74% (1179) White 8% (134) Asian 5% (78) Black 6% (93) Other or Mixed 6% (99) not given	84% (225) White 6% (17) Asian 4% (11) Black 5% (14) Other or mixed >1% (1) not given
Disability	83% (1315) no disability 12% (194) learning difficulty 2% (33) physical disability 1% (19) mental health problem	85% (225) no disability 11% (29) learning difficulty 2% (6) physical disability
Highest entry qualification	78% (1247) traditional (A Levels, IB or equiv.) or higher (degree, FD, diploma) 16% (250) non-traditional (Access to Higher Education and BTEC awards)	All higher degree (12% (31) with PG/MSc or PhD)
Socioeconomic (POLAR 3)	58% (939) quintiles 3–5 11% (172) quintiles 1–2 30% (472) missing data	66% (176) quintiles 3–5 20% (54) quintiles 1–2 15% (38) missing data

culated through an ordinal logistic regression (see Fig. 1). The BSc and MSc (pre registration) data were analysed separately.

## Results

Of the nine invited institutions, five were unable to participate due to reasons such as lack of staff capacity or inability to obtain institutional ethical approval. The four institutions that contributed data, represent both urban and more rural areas of the South East region. In total, data from 1583 BSc and 268 MSc pre registration student records were included. All completed their programme of studies between 2008–2015.

### Descriptive data

A summary of student characteristics is shown in Table 1.

During the period of study, 79 BSc students (5%) had a period of abeyance and subsequently continued studying.

Results from 69 BSc and 35 MSc modules were included. In total this resulted in data on 22,641 BSc assessments and 2041 MSc assessments. Over three quarters of all assessments were conducted within the University, and the remainder within the clinical environment. Observed assessments (within University and clinical placements) constituted 56% (n = 61) of all of the assessments across the three years of all courses combined, and blinded assessments (all at University) made up the other 44% (n = 48).

Overall assessment marks were not normally distributed due to the large number of safety fails scored at 0, therefore medians and interquartile ranges (IQR) are reported. These illustrated a higher median mark for observed and clinical (64, IQR 53 to 72) and lower in blind (timed or untimed) (60, IQR 50 to 68) at BSc level, with a similar pattern demonstrated at MSc level (67, IQR 58 to 75; 62, IQR 55 to 69 respectively).

Table 2

BSc model with significant interactions between characteristics. The coefficient indicates a negative or positive predicted score in relation to the default for that category (e.g. assessment type compared to default university observed assessment).

	Coefficient (% marks)	95% CI
Baseline mean mark (%)	64.3	61.8 to 66.7
Assessment type compared to observed		
Blind, untimed	−4.6 <sup>a</sup>	−5.4 to −3.9
Blind, timed	−10.9 <sup>a</sup>	−11.8 to −9.96
Clinical	0.4	−4.6 to 5.1
Gender compared to male		
Female	0.7	−0.5 to 1.9
Age compared to >21		
21 and over	4.3 <sup>a</sup>	2.7 to 5.9
Ethnicity compared to White		
Asian ethnicity	−11.1 <sup>a</sup>	−13.1 to −9.2
Black ethnicity	−7.1 <sup>a</sup>	−9.7 to −4.5
Other ethnicity	−4.7 <sup>a</sup>	−7.1 to −2.4
Disability compared to no disability		
Physical disability	−1.5	−5.4 to 2.4
Learning disability	−1.6	−3.2 to 0.1
Other disability	3.5	−1.9 to 8.9
Combined characteristics compared to White observed		
Asian ethnicity + blind, untimed	5.3 <sup>b</sup>	3.7 to 7.0
Black ethnicity + blind, untimed	−0.0 <sup>b</sup>	−2.0 to 1.9
Other ethnicity + blind, untimed	1.4 <sup>b</sup>	−0.4 to 3.2
Asian ethnicity + blind, timed	2.8 <sup>b</sup>	1.1 to 4.6
Black ethnicity + blind, timed	0.7 <sup>b</sup>	−1.4 to 2.9
Other ethnicity + blind, timed	−0.4 <sup>b</sup>	−2.3 to 1.6
Asian ethnicity + clinical	4.2 <sup>b</sup>	1.9 to 6.4
Black ethnicity + clinical	1.6 <sup>b</sup>	−0.9 to 4.2
Other ethnicity + clinical	−1.4 <sup>b</sup>	−3.7 to 0.9

<sup>a</sup> Meaningful difference from baseline group.

<sup>b</sup> Further difference as compared with the sub-category ethnic baseline.

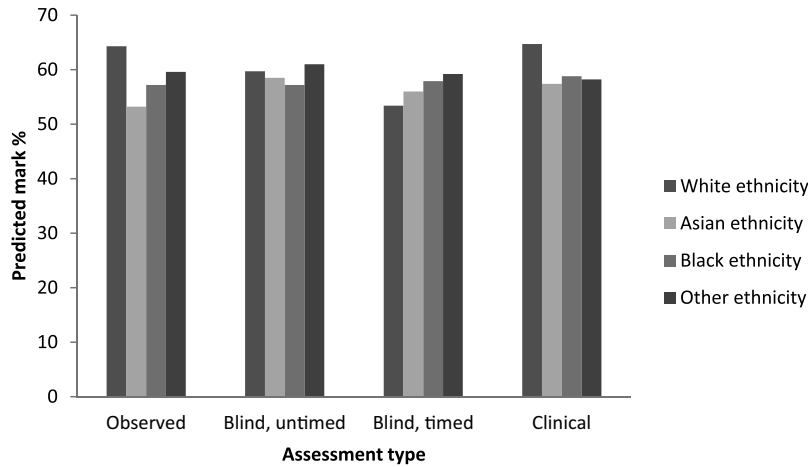


Fig. 2. BSc model illustrating predicted marks of assessment type interacting with ethnicity.

### BSc

A summary of the result of the Bayesian modelling is shown in Table 2. For BSc records, there was no significant difference in predicted assessment scores for gender, socio-economic background or pre-entry qualification. Mature students (21 and over at the start of their education) were predicted significantly higher assessment marks (+4%, 95% CI: +2.6 to +5.9) than their younger peers. However, there were significantly lower overall predicted assessment scores for Asian (−11%, 95% CI: −13.1 to −9.2), Black (−7%, 95% CI: −9.7 to −4.5) and Other/Mixed ethnicity groups (−5%, 95% CI: −7.1 to −2.4) compared to their White colleagues even when adjusted for other factors in the modelling. For assessment type, while blinded assessments overall demonstrated a significant lowering of mark, observed and clinical assessments demonstrated the biggest differences in relation to ethnicity (see Fig. 2). There was also a mild negative predictive influence on scores awarded for students with a learning disability (−2%, 95% CI: −3.2 to −0.1).

In terms of award level, being female (OR: 0.66, 95% CI: 0.54 to 0.81) or 21 and over (OR: 0.69, 95% CI: 0.52 to 0.90) predicted greater odds of a higher award. All BME groups demonstrated greater odds for a one step lower overall award or no award (Black OR: 3.35, 95% CI: 2.21 to 5.06, Asian OR: 3.97, 95% CI: 2.81 to 5.59 and Other OR: 2.03, 95% CI: 1.36 to 3.01). While no specific interactions were seen at assessment level for entry qualification, Access/BTEC or other non-traditional entry routes were seen to achieve lower final award levels (OR: 2.05, 95% CI: 1.49 to 2.82), while a prior degree was not significantly different to A-levels (the baseline for comparison).

### MSc

In the MSc records the pattern for assessment scores reflected the BSc student predictions to some degree. Specifically, Asian (−8%, 95% CI: −13.6 to −1.7) and Black

students (−5%, 95% CI: −9.6 to −0.2) achieved significantly lower assessment scores compared to White colleagues. MSc student records also demonstrate significantly lower assessment scores for learning disabilities (−5%, 95% CI: −9.0 to −1.7) and other disabilities (−13%, 95% CI: −22.4 to −3.1). These differences remain when adjusted for pre-entry qualification and other variables. At award level, no specific factors were seen to be predictors.

### Discussion

The results of this study highlight significant attainment gaps for some under-represented groups in pre registration physiotherapy education, particularly non-white ethnic groups. This study supports previous findings in physiotherapy [12–15], but also in higher education more widely [7,16–20]. Within this broad result lie some important nuances. Based on the study data the model predicts that White students are awarded higher marks specifically for observed and clinical assessments. While the results for the Black students are relatively consistent across all assessment types, for Asian students, observed assessments were lower. The effect was also seen both at the BSc and MSc programme level indicating that this effect persists across course types and level of education, but also with previous University experience. This lowering of marks in specific assessments compounds other results demonstrating that BME students were also more likely to discontinue their studies and get lower degree classifications than their White peers.

The increased degree of difference on observed assessments, particularly seen for the Asian students may give credence to the findings of Clouten *et al.* [29] and Haskins *et al.* [30], supported by Woolf *et al.* [31] who suggest the existence of covert bias and negative ethnic stereotyping amongst assessors. Given the lack of diversity in the profession [5], and the potential dominance of White British values within the NHS constitution [25], the expectation of asses-

sors and what they are looking for in future physiotherapists may be influenced in part by their own ethnicity. From the students' perspective, it is possible that being and knowing you are in the minority impacts on their sense of belonging and socialisation within the profession. Subtle or less subtle differences in dress and how physical contact is interpreted for example, may result in students identifying significant differences between themselves and the majority of their peers [32,33]. Belonging to and participating within a cohesive and intimate student group has been linked to success in the undergraduate physiotherapy course and therefore disruption in this could impact negatively on that success [34].

The second important result is a consistent, if smaller, lower attainment and success associated with a diagnosed learning disability in the MSc cohorts. A significant challenge in exploring the potential reasons for this difference is a lack of specific literature and data within physiotherapy. Research refers to potential issues with staff behaviours [21] and prejudice following disclosure [22,23], but the relevance of these to physiotherapy students with learning disabilities requires further exploration. To add further complexity, there is some literature which suggests that discrimination may not only be apparent amongst assessors, but also within the student body itself [35]. Negative attitudes may have an adverse effect on students if they disrupt group cohesion.

Disability and ethnicity were the only categories that demonstrated important and consistent influence on individual assessment scores. However, at award level gender, age and pre-entry qualification demonstrated a significant influence. Data presented here suggests that women, mature students and those with traditional qualifications are more likely to be awarded a higher degree classification. This finding reflects what has been seen across all HE study in the UK [36], indicating a broader social phenomenon not restricted to physiotherapy. However, the data does not highlight any specific assessment types that may account for this difference.

Despite the quantity of data collected in this multi centred study and the complexity of the analysis, there are some limitations that must be acknowledged. The first is that despite our attempts to include more institutions, a number were unable to participate. This highlights the need for greater cooperation between HEIs that provide physiotherapy pre registration education as each institution has a unique mix of students and contexts. The geographical context of this study is also acknowledged.

The second limitation is that, in combining data from different HEIs, broad categories had to be formed to facilitate statistical analysis. In some cases, such as disability, small student numbers prevented in-depth analysis such as interactions with other predictors. We acknowledge that categories such as Black and Asian belie the heterogeneity that lies within those very broad categories. With larger data sources such categorisation could be more nuanced.

The third limitation is a lack of data on institutional approaches and broader social information which may influence student participation. Socio-economic measures such as

### Key messages

- Diversity in student cohorts is increasing in pre registration Physiotherapy education
- This is the first known study across multiple Higher Education Institutions to suggest factors influencing attainment and success in pre registration Physiotherapy Education
- Students from a Black and Minority Ethnic background are predicted to be more likely to receive a lower award than their White peers
- The presence of learning disabilities was associated with lower assessment scores.
- Specifically, higher marks for observed and clinical assessments were predicted for White students

POLAR3 and parents participation in higher education were incomplete and may not robustly represent socio-economic status. More directly relevant information such as student caring responsibilities, and disability support, is not accessible at institutional level, but may be key in predicting success.

### Conclusions

This is the first study to explore individual characteristics related to widening participation in physiotherapy across a number of institutions in the UK. The findings indicate that students from Black and Minority Ethnic groups have greater odds of receiving a lower award than their White peers, even when adjusted for other factors. Further interrogation of assessment scores predicts that White students are awarded higher marks in observed and clinical assessments. Learning disabilities were associated with lower assessment scores on both programmes. Multiple other factors also impacted negatively on BSc award attainment including non-traditional entry qualifications, young entrants (aged under 21) and male gender. Potential explanations, including covert bias of assessors and factors affecting student identity and sense of belonging, require further investigation if this attainment gap is to be redressed. Therefore those involved in physiotherapy education need to move away from a purely student deficit model to explore and be willing to confront all factors that lead to inequalities. Due to the limited locality of this study a wider national review would be welcomed.

*Ethical approval:* Ethical Approval for this study was granted by the Research Ethics Committee of Brunel University London, College of Health and Life Sciences Reference 15/05/STF/37 and all ethical protocols were adhered to. In addition each participating institution fulfilled their specific institutional ethical requirements for sharing anonymised data.

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*Conflicts of interest:* None declared.

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