

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Relationship between sociodemographic factors and specialty destination of UK trainee doctors: a national cohort study
AUTHORS	Kumwenda, Ben; Cleland, Jennifer; Prescott, Gordon; Walker, Kim; Johnston, Peter

VERSION 1 - REVIEW

REVIEWER	Marija Petek Šter Department of Family medicine, University of Ljubljana, Slovenia
REVIEW RETURNED	31-Oct-2018

GENERAL COMMENTS	<p>I read the article about relationship between sociodemographic factors and specialty destination of UK trainee doctors with great interest. Article gives us important new knowledge about the influence of socio-demographical factors on career choice. In general, article is well written; a little bit long. For the non-England reader is necessary to get some more insight into the entering criteria for specialty training and residential system in UK, but anyway try to reduce the number of words. My other comments are as follows:</p> <p>Introduction: Description of the residential system and election process for the training would be better put into introduction than in method section.</p> <p>Methods: As sad before – description of the system better fits into introduction section.</p> <p>Results: You reported that 9 % of students had received free school meals when they were in primary or secondary education represented. The highest percentage of trainees whose families were, at some point, recipients of income support was observed in general practice (15.8%), and their lowest representation was in obstetrics, gynecology and pediatrics (11.1%). Are the numbers correct?</p> <p>Discussion: Multivariate analysis suggests that increasing the number of mature students and students from lower socio-economic (non-traditional) backgrounds could help GP recruitment. Do the young resident in GP nowadays have already have any benefits (stimulations)?</p>
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REVIEWER	Dr Tom Gale Director of Assessment Faculty of Medicine and Dentistry University of Plymouth United Kingdom
REVIEW RETURNED	21-Nov-2018

GENERAL COMMENTS	<p>This is an interesting and topical study investigating factors associated with Foundation year 2 doctors' decisions to apply for different specialties at the end of their foundation training. Within the current international landscape to improve recruitment to primary care (and other specialties) and increase medical student numbers in the UK, the results will be relevant to an international audience involved with undergraduate and postgraduate training programmes.</p> <p>The main aim of the study was to identify the relationship between socio-economic background and previous academic performance with actual entry onto various specialty training programmes, by analysing how these factors predict the outcome 'accepted offer' for different specialties. The UKMED database contains many factors associated with socio-economic class which the authors have investigated fully. However, the main variable linked with academic performance was identified as the FPAS score. 50% of the FPAS score is made up of the Situational judgement test which is a test designed to assess 'values' and which is not necessarily a test of academic ability. The EPM measure is more closely aligned with academic performance but only makes up 7 points out of 100 in the FPAS selection process. Were the authors able to use EPM score as a single variable in the model in order to link EPM with specialty choices? What were the reasons for using the total FPAS score and not analysing EPM separately from the SJT?</p> <p>The authors state that this is the 1st study to link socio-economic class and academic performance with specialty choices but another UKMED study published in BMC Medicine https://doi.org/10.1186/s12916-017-0982-6 has investigated a range of socio-economic and educational factors linked with decisions to apply for specialty training programmes. The authors should compare findings and methodology between the 2 UKMED studies in order to strengthen the conclusions from this paper and provide more meaningful implications for policy as a result of this study.</p> <p>Methodology The sample includes 13,731 doctors graduating from UK medical schools between 2012 and 2014. Please clarify when the data extract was taken and whether all 6065 doctors included in the analysis applied for specialty training directly from foundation or whether there is a proportion who did not apply directly, but had applied by the time when the data extract was taken.</p> <p>The methodology states that UKFP score was the 2nd outcome measure. If UKFP score was chosen as an outcome variable then one of the aims of the analysis could have been to ascertain the factors which influence UKFP score. This is not explicitly mentioned in the paper although there are some results presented</p>
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	<p>which demonstrate factors associated with UKFP score. In 2012, the SJT score was used as a pilot basis; were these scores available in the UKMED database or was the UKFPO score solely derived from the EPM for 2012?</p> <p>Results In Table 2 it is not clear what tests the p-values relate to; please clarify in the table and the text where P-values are given. It is also not clear whether the P-values in the last column of table 2 relate to differences in classification of each socio-demographic variable in the whole sample or whether this shows differences between specialties chosen. For example: Page 11, line 8 states that significantly higher % of doctors choosing medical specialties entered medical school as school leavers rather than graduates. Table 2 shows that the overall proportion of school leavers in the study is 66.3% and not surprisingly, all specialties have a higher proportion of school leavers choosing their specialty. Does the P-value in the final column of table 2 refer to the overall difference between school leavers / mature entry in the overall sample or refer to differences in proportion of school leavers between specialties? There are clearly differences between medical specialties and diagnostics but the % of school leavers in the other specialties more closely resembles the overall proportion in the study sample. Text in the results section describing Table 2 could be condensed significantly by focusing on the specialties which attract trainees with different socio-demographic profiles from the overall study sample.</p> <p>Table 3 Insert N = ?? for various models. What does EXP (B) stand for? Is this expected probability of accepting offers in that specialty? UKFP application score didn't seem to have much of an effect compared to the effect due to socio-demographic factors especially in model 2 when imputed values are included.</p> <p>Discussion The first sentence should be reworded since the UKMED study published in BMC medicine (referenced earlier) investigated how sociodemographic and educational factors (including measures of attainment) influenced likelihood of those doctors applying to various specialties such as general practice. The influence of how academic attainment predicts career choice is overstated in the discussion section which should highlight:</p> <ol style="list-style-type: none"> 1. That the strength of the association with FPAS scores is not as strong as some of the socio-demographic factors, 2. FPAS score is not solely a measure of academic performance 3. Why no other measures of previous academic performance were included in the model such as HESA tariff, UKCAT score etc and why EPM score was not chosen as a single variable in the model <p>Page 16 line 4 and line 48 states that 'further research is needed'. Please be more specific as to what sort of studies / research would be useful in these areas.</p> <p>Page 16 line 32. The results from this study show that many of the socio-demographic variables investigated are associated with FPAS scores. Is the current FPAS selection system a fair process especially with the drive to increase widening participation in medicine?</p>
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	<p>Page 17 line 19. If specialty interview score / ranking was chosen as an outcome variable then scores would not be comparable between specialties since they use different selection processes.</p> <p>Page 16 Line 51; other studies have published findings related to these variables from the UKMED database.</p> <p>Page 17 line 22; alternative outcomes for future studies could include HESA tariff, UKCAT score Prescribing safety results and Medical licensing results.</p> <p>Page 17 line 25; UKMED holds data on applications made so it would be good to include reasons why you chose to focus on offers made rather than applications made.</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer: 2	Reviewer 2	
This is an interesting and topical study investigating factors associated with Foundation year 2 doctors' decisions to apply for different specialties at the end of their foundation training. Within the current international landscape to improve recruitment to primary care (and other specialties) and increase medical student numbers in the UK, the results will be relevant to an international audience involved with undergraduate and postgraduate training programmes.	I read the article about relationship between sociodemographic factors and specialty destination of UK trainee doctors with great interest. Article gives us important new knowledge about the influence of socio-demographical factors on career choice. In general, article is well written; a little bit long. For the non-England reader is necessary to get some more insight into the entering criteria for specialty training and residential system in UK, but anyway try to reduce the number of words.	Thank you for these kind words. We have reviewed the section on criteria for entry into specialty training. We have removed the section explaining the difference between core/higher and run-through training as, in retrospect, this is unnecessary for this paper. This reduces the words substantially.
TITLE AND ABSTRACT		
INTRODUCTION AND CONCEPTUAL FRAMEWORK		
Reviewer 2		
The authors state that this is the 1st study to link socio-economic class and academic performance with specialty choices but another UKMED study published in BMC Medicine https://doi.org/10.1186/s12916-017-0982-6 has investigated a range of socio-economic and educational factors linked with decisions to apply for specialty training programmes. The authors should compare findings and methodology between the 2 UKMED studies in order to strengthen the conclusions from this paper and provide more meaningful implications for policy as a result of this study.		We have added more text in the introduction section (pg4) referring to the Gale et al study – thank you for drawing this to our attention. ²⁹ We have also included reference to this study in the discussion (pg.14)
	Reviewer 1	
Description of the residential system and election process for the training would be better put into introduction than in method section.		We've mulled this over and think that these sections are probably best left in the methods section. They are presented at the start of the methods section, so immediately follow the research questions but to move them

	<p>earlier makes the end of the introduction a bit “clunky”. We also think they fit well there as these sections are fundamentally a description of the study population.</p>
<p>METHODICAL RIGOUR</p>	
<p>Reviewer 2</p>	
<p>The main aim of the study was to identify the relationship between socio-economic background and previous academic performance with actual entry onto various specialty training programmes, by analysing how these factors predict the outcome 'accepted offer' for different specialties. The UKMED database contains many factors associated with socio-economic class which the authors have investigated fully. However, the main variable linked with academic performance was identified as the FPAS score. 50% of the FPAS score is made up of the Situational judgement test which is a test designed to assess 'values' and which is not necessarily a test of academic ability. The EPM measure is more closely aligned with academic performance but only makes up 7 points out of 100 in the FPAS selection process. Were the authors able to use EPM score as a single variable in the model in order to link EPM with specialty choices? What were the reasons for using the total FPAS score and not analysing EPM separately from the SJT?</p>	<p>Thanks for the helpful observation. We took advice on this from the UK Foundation Programme Office and other colleagues. We see the value of comparing EPM (decile score + additional educational attainments) which is 50% of the FPAS score with the SJT, the other 50%. However, our reason for not doing so is because the total score (EPM+SJT) is used to allocate postgraduate programmes and from that jobs. The justification of the composition of the score is covered by UKFPO and there is published data on its efficacy. So, in short, our reason for using the total FPAS score in the analysis is that this is what is used in practice</p>
<p>The sample includes 13,731 doctors graduating from UK medical schools between 2012 and 2014. Please clarify when the data extract was taken and whether all 6065 doctors included in the analysis applied for specialty training directly from foundation or whether there is a proportion who did not apply directly, but had applied by the time when the data extract was taken.</p>	<p>Please see the supplementary file 1: data sources, which is meant to help clarify the data sources. This is the phase 1 of UKMED data and the specific extract was made in 2016. Our cohorts are identified by the year of graduating from medical school (and not the year the candidate completed F2 and/or applied for specialty training). We know from other studies that nearly 50% of the F2s do not immediately apply after finishing FP (and that estimate matches with the figures reported in table 1 i.e. 47.1% did not apply). However, for this data extract, we do not know the exact year when these trainees applied/offered/accepted these specialty posts.</p>
<p>The methodology states that UKFP score was the 2nd outcome measure. If UKFP score was chosen as an outcome variable then one of the aims of the analysis could have been to ascertain the factors which influence UKFP score. This is not explicitly mentioned in the paper although there are some results presented which demonstrate factors associated with UKFP score.</p>	<p>We believe that the aim stated on pg4 covers the aspect of UKFP score. It states that ...the aim of this study was to identify the relationship between socio-economic background, performance at the point of selection into the first stage of</p>

	generic postgraduate training in the UK (the Foundation Programme – see later) and accepted offers into specialty (residency) training.
In 2012, the SJT score was used as a pilot basis; were these scores available in the UKMED database or was the UKFPO score solely derived from the EPM for 2012?	Please see supplementary file 1. These scores were available in UKMED but they did not contribute towards allocation to FP outcome.
	Reviewer 1
As said before – description of the system better fits into introduction section.	Please see the response above.
RESULTS	
	Reviewer 2
In Table 2 it is not clear what tests the p-values relate to; please clarify in the table and the text where P-values are given.	We have edited table 2 to reflect the clarification.
It is also not clear whether the P-values in the last column of table 2 relate to differences in classification of each socio-demographic variable in the whole sample or whether this shows differences between specialties chosen. For example: Page 11, line 8 states that significantly higher % of doctors choosing medical specialties entered medical school as school leavers rather than graduates. Table 2 shows that the overall proportion of school leavers in the study is 66.3% and not surprisingly, all specialties have a higher proportion of school leavers choosing their specialty.	The reported p values are the results of the differences in the classification of each socio-demographic variable in the whole sample and just for a specific specialty. The test of significance is between the expected vs observed differences, but the analysis is not designed to show where exactly that (specialty distribution) difference lies. For example, table 2 shows that the overall (observed) distribution for age category was 66.3% for School leavers and 33.7% Mature. The null hypothesis is that there are no differences in specialty distribution between school leavers and mature. That is, all things being equal, we'd expect the distribution to be almost 66.3% by 33.7% across all specialties. However, the observed result shows that this is not true, there are more school leavers (74.5%) in medical specialties than the expected result. That is why the analysis rejects the null hypothesis. The main reason we conducted this type of chi-square was to identify the variables for the multinomial logistic regression models.
Does the P-value in the final column of table 2 refer to the overall difference between school leavers / mature entry in the overall sample or refer to differences in proportion of school leavers between specialties?	These p-values refer to the association between a given demographic factor and the overall specialty choices.

<p>There are clearly differences between medical specialties and diagnostics but the % of school leavers in the other specialties more closely resembles the overall proportion in the study sample.</p>	<p>This also relates to the explanation above. It is because of these stack differences (between medical specialties and diagnostics) that we are getting a statistically significant p-value for age category variable.</p>
<p>Text in the results section describing Table 2 could be condensed significantly by focusing on the specialties which attract trainees with different socio-demographic profiles from the overall study sample.</p>	<p>We have been criticised in the past for submitting papers for only reporting part of the data description! Given this, we would rather stick with the general description of the specialties choices (table 2) (pg9-10), then use the results of the regression models (table 3) to focus on specialties that attract/deter trainees from WA background (pg11). A compromise which we would ask the Editor to give his/her view on would be to include the full table as a supplementary file, make this clear in the text, and then present a condensed Table 2 in the text. We would like the Editor to give guidance on this suggestion.</p>
<p>Insert N = ?? for various models.</p>	<p>We have added the requested text. Please see table 3</p>
<p>What does EXP (B) stand for? Is this expected probability of accepting offers in that specialty?</p>	<p>The EXP(B) is the odds ratio of accepting offers in the given specialty relative to GP (the reference group). An Exp(B) of >1 mean an increase in the likely of the event to happen. As the abbreviation EXP(B) has led to confusion about its meaning, it has been replaced by "odds ratio" throughout.</p>
<p>UKFP application score didn't seem to have much of an effect compared to the effect due to socio-demographic factors especially in model 2 when imputed values are included.</p>	<p>Thanks for the observation. Indeed, the UKFP application score does not have a huge effect compared to other factors. However, the decision to fit the scores in the models was to control for the effect of 'academic prowess' because we saw in table1 that the median (IQR) varied for different specialties.</p>
<p>Reviewer 1</p>	
<p>You reported that 9 % of students had received free school meals when they were in primary or secondary education represented. The highest percentage of trainees whose families were, at some point, recipients of income support was observed in general practice (15.8%), and their lowest representation was in obstetrics, gynaecology and paediatrics (11.1%). Are the numbers correct?</p>	<p>We have double checked and we can confirm that the numbers are correct. To clarify, the 9% reported in the results section is 8.6% (see table 1) rounded to the nearest whole number. This represents the overall proportion of students who were entitled to free school meals when they were in primary/high school. Similarly,</p>

	<p>less than 14% (actual figure in table 1 is 14.3%) of the entire population were recipient of income support. Therefore, the 'expected' proportion of recipients of income support would be around 14.3% in each of the specialties. However, the observed pattern shows that this group was over-represented general practice (15.8%), and under-represented in obstetrics, gynaecology and paediatrics (11.1%).</p>
DISCUSSION	
Reviewer 2	
<p>The first sentence should be reworded since the UKMED study published in BMC medicine (referenced earlier) investigated how sociodemographic and educational factors (including measures of attainment) influenced likelihood of those doctors applying to various specialties such as general practice.</p>	<p>Thanks for highlighting this. We have acknowledged the existence of earlier studies.</p>
<p>The influence of how academic attainment predicts career choice is overstated in the discussion section which should highlight:</p> <ol style="list-style-type: none"> 1. That the strength of the association with FPAS scores is not as strong as some of the socio-demographic factors, 2. FPAS score is not solely a measure of academic performance 3. Why no other measures of previous academic performance were included in the model such as HESA tariff, UKCAT score etc and why EPM score was not chosen as a single variable in the model 	<p>The log likelihood ratio tests for the fitted model showed that the inclusion of UKFP application score improved the overall model fit in predicting the likelihood of trainees choosing a given specialty other than the reference category. We have also acknowledged in the discussion section that UKFP application score is not a measure of academic prowess alone. We have edited the discussion section to highlight that the effect of UKFP score alone is not as strong as socio-demographic indicators. We have added in reference to 3 in the discussion also.</p>
<p>Page 16 line 4 and line 48 states that 'further research is needed'. Please be more specific as to what sort of studies / research would be useful in these areas.</p>	<p>We have added more text to the discussion section specifying the examples of further research. See pg.15.</p>
<p>Page 16 line 32. The results from this study show that many of the socio-demographic variables investigated are associated with FPAS scores. Is the current FPAS selection system a fair process especially with the drive to increase widening participation in medicine?</p>	<p>We have a statement in the background section and used the relevant reference to highlight that the current FPAS selection system is not fair for certain group of applicants. [33. Kumwenda B, Cleland JA, Prescott GJ, Walker K, Johnston PW. Relationship between sociodemographic factors and selection into UK postgraduate medical training programmes: a national cohort study. <i>BMJ Open</i> 2018;8.] In general, the selection system does not discriminate against</p>

	individuals from low socio-economic backgrounds. However, the system is unfair towards BME candidates.
Page 17 line 19. If specialty interview score / ranking was chosen as an outcome variable then scores would not be comparable between specialties since they use different selection processes.	Thanks for this observation. We have added a note to this effect in the discussion.
Page 16 Line 51; other studies have published findings related to these variables from the UKMED database.	This information is now incorporated into the document.
Page 17 line 22; alternative outcomes for future studies could include HESA tariff, UKCAT score Prescribing safety results and Medical licensing results.	We have provided a rationale for focusing on just the UKFP score in the discussion.
Page 17 line 25; UKMED holds data on applications made so it would be good to include reasons why you chose to focus on offers made rather than applications made.	This study used the phase 1 UKMED data extract in which we did not have the specialty application / interview score / ranking. As the UKMED expands, these variables are now added and made available to the researchers. For example, our team only accessed additional application variables when we were conducting different UKMED project that aimed to answer a different research question. Access to the later dataset was only made available after the analysis and paper writeup for this project were complete.
Reviewer 1	
Multivariate analysis suggests that increasing the number of mature students and students from lower socio-economic (non-traditional) backgrounds could help GP recruitment. Do the young resident in GP nowadays have already have any benefits (stimulations)?	No, there are no incentives for those who go into GP.

VERSION 2 – REVIEW

REVIEWER	Tom Gale University of Plymouth
REVIEW RETURNED	21-Jan-2019

GENERAL COMMENTS	<p>The authors have added clarifications regarding the analyses undertaken and clearly defined the various components of UKFP selection scores in the manuscript. The discussion section has been expanded with more explanation on why other measures of academic attainment weren't explored in this study, and areas for further investigations articulated.</p> <p>This manuscript represents an excellent study linking socio-demographic variables and UKFP scores with specialty choice across all specialty programmes following Foundation training. The results will be of significant interest to an international audience.</p>
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