Author's response to reviews

Title: Characteristic profiles among students and junior doctors with specific career preferences

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Author's response to reviews: see over
In reply to comments from Reviewer: Professor Fred C.J Stevens

The authors appreciate Dr. Stevens’ extensive feedback on our manuscript. We revised English expressions that were not clear to the reviewer by paraphrasing and adding sentences/paragraphs. All changes we made are listed below. We hope these changes now adequately explain what we intended to discuss.

**Major compulsory revisions**

1. P. 4 Could you explain why you adopted the theory of reasoned action to ground your model, and then also tell the readers at the end of the paper whether the theory/model you used was appropriate?

A conceptual framework can add rigour or a theoretical frame to questionnaire development. However, when we initiated our research, there was little literature available in the area of career choice that explicitly employed a theory; and in those where one was utilized the theory of reasoned action (TRA) was most often used.

Based on the reviewer’s comment, we rewrite the paragraph about TRA and why it was used in methods section as following (p.4 Methods section “Questionnaire development” 1st & 2nd paragraph):

A literature search was conducted using MEDLINE from 1988 to 2008 using the search words “career”, “choice” and “medical education.” While very few papers explicitly used a conceptual framework, several authors employed the ‘theory of reasoned action’. The theory of reasoned action (TRA) illustrates that a person’s behaviour is determined by his/her intention to perform the behaviour, and the intention is shaped by two components: the attitude towards the behaviour (defined by beliefs about outcomes of the behaviour and importance of these outcomes), and subjective norms (beliefs about how people he/she feel close will view the behaviour and motivation to meet expectation of these individuals) [61]. All other variables including demographic variables
are categorized as external variables that operate through attitudes and norms. This framework was
designed to examine the impact of multiple factors influencing specific behaviour [14, 62, 63].

In order to structure a questionnaire (see Appendix), we adopted variables used in the study by
Gorenflo et al proposing “model of medical student specialty choice based on the theory of reasoned
action” [14]. We chose to use this model as it illustrated the attitudinal and normative influence and
effects of external variables on the behaviour of choosing a specialty.

Also tell the readers at the end of the paper whether the theory/model you used was appropriate?

We added the following paragraph in section of study limitations (p.9 1st paragraph):

We developed a questionnaire by implementing items previously utilised in the literature applying a
conceptual framework based on the theory of reasoned action (TRA). We did not employ the scale to
measure evaluation of beliefs separately from behaviour beliefs according to TRA, however, our
results confirmed that subjective norm was one of factors for career choice and there are groups of
beliefs that affect the intention.

2. P.5: Your answer categories on specialty choice were ‘the most probable specialty’ and other
specialties ‘under consideration’. What if a respondent had no probable specialty and only specialties
under consideration? Were these groups compared, and if yes, what were the findings? (And if not, I
suggest you do so.)

In this study, our aim was to illustrate characteristics of candidates who chose one particular specialty.
Therefore, we used the data of respondents who chose a single specialty as ‘the most probable specialty’
or a single specialty ‘under consideration’ without choosing ‘the most probable specialty’, and combined
the data for analysis to ensure sample size. Comparing these 2 groups is interesting but it will not answer
our research question.

3. I feel it is a rather ‘strange’ group of factors that you introduced in your factor analyses. For example I
am missing a dimension contrasting the bioscientific orientation (people instead of organ orientation?).
There is also quite some overlap between factors as can be seen from the correlation matrix you
present with inter-correlations ranging between .20 and .53(!). Considering your large sample this is
quite high, so you at least need to say something about this. (Have you tried to use factor scores
instead of sum scores?)

(1) I am missing a dimension contrasting the bioscientific orientation
As reviewer pointed out, our factor analysis did not yield a factor contrasting the bioscientific orientation.
In discussion section, the issue is raised as follows (P.9 “Primary care preference as an intermediate
group”):

This implies we may have missed external variables relevant to a primary care preference. Murdoch
et al. reported positive correlation between students’ interest in primary care and the factor of biosocial orientation, including importance of developing long-term patient relationships and enjoyment of tending to patients’ social and psychological needs[15], items which were not included in our questionnaire. On the other hand, in respondents with an interest in general/family medicine, the z-score of “bioscientific orientation” was the lowest among 5 factors. Murdoch et al. showed a negative correlation between bioscientific orientation factor and primary care preference. Generalist career selection was also reported associated with attitudes favouring helping people over opportunities for leadership, intellectual challenge and research [3]. Our results support these findings indirectly affirm the influence of biosocial orientation in potential primary care workforce.

We added the following in the limitation section:

*We used questionnaire items previously utilised in the literature. Although the results collectively demonstrate acceptable internal consistency, additional variables focusing on biosocial orientation may have improved its validity.*

(2) I also think the bioscientific orientation is a much more ‘deeper’ orientation than something like advice from others. What is the rationale for including all this in the same factor analysis?

Items in a questionnaire of our study, which were used as variables of the factor analysis, were adopted from the previous findings in literature. Social influence of people such as parents, medical school faculty, residents and friends was confirmed in Gorenflo’s study, which proposed “subjective norms (beliefs about how people s/he feels close will view the behaviour and motivation to meet expectation of these individuals)” as one of two components that affect specialty choice based on TRA. Our factor analysis also yielded “advice from others” as one of five factors that influence career preference. This result suggests variables representing subjective norms are important and relevant.

(3) There is also quite some overlap between factors as can be seen from the correlation matrix you present with inter-correlations ranging between .20 and .53(!). Considering your large sample this is quite high, so you at least need to say something about this. (Have you tried to use factor scores instead of sum scores?)

Based on the previous findings in literature, inter-correlations between possible factors were expected. Our preliminary analysis of the survey data also demonstrated inter-correlations between factors. Therefore, we used oblique solution for factor analysis.

We conducted exploratory analysis as the reviewer suggested and the results were similar to the findings we reported in this manuscript.

4. You did your study among students and junior doctors, but I don’t see any report of analyzing differences between these groups. Why not?

This was done with huge amount of data, which will be discussed in future. Our plan is to first publish this
manuscript describing methodology and factor analysis in detail to be referenced for future publication.

5. Table 2: I do not think you should report specialties separately when number of respondents are too small (e.g. neurosurgery, Urology, emergency medicine, etc.). I also don’t think the small numbers warrant some of your discussion points.

As pointed out by the reviewer, number of respondents who demonstrated preference in neurosurgery (n=33), Urology (n=34), or emergency medicine (n=57) is not as large as other specialties. However, one of our objectives in this study is to elucidate the difference of characteristics of respondents choosing popular/unpopular specialties. Therefore, we considered it relevant to report these specialties with smaller number of respondents. We also conceived specialties with smaller number of respondents such as ROAD specialties; radiology (n=64), ophthalmology (n=56), anaesthesiology (n=111), dermatology (n=61), held the face validity as we discussed in this manuscript.

Minor essential revision

6. P. 3 You write: ‘Therefore, studies in the non-American settings are needed to obtain findings more applicable to countries in which the health system is more equitable and most students enter medical school as undergraduates.’ Could you please give a more extensive description of the literature, not only focusing on the U.S?

We added the description of the literature from UK as following (p.3 Introduction section):

In the U.K., on the other hand, the UK Medical Careers Research Group has been conducting extensive cohort studies of medical graduates involving more than 1/3 of practising NHS doctors who qualified since 1974[37]. It follows the trend of career preference and progression [38-40], and has reported factors associated with specialty choice. For example, enthusiasm for the specialty was the important factor in career choice of ophthalmology and surgery, while the prospect of good working hours and conditions influenced choosing ophthalmology but much less so in surgery[41, 42]. Compared to other specialties, a choice of paediatrics was more influenced by experience of the subject as a student[43]. Studies on difference between early career preference and eventual choice of specialties in same individuals were conducted in the cohort [44-46], and revealed that issues of work-life balance were the single most common factor of changing in career choice. However, inadequate salary was chosen by only 1.2% of respondents as a reason of not pursuing preferred specialty, [46].

Specialty choice might also be influenced by factors such as the characteristics of a health care delivery system, the practice opportunities available, or the reimbursement policies of government and other payers[47]. In the U.K., about 90% of medical graduates remain in the NHS at four years after qualification[48] and there is similar job satisfaction score between specialties[49]. The
managed care system in the U.S.A. was perceived by medical students and residents to limit access to the health system, cause more conflicts and impair the doctor-patient relationship [50]. The demanding role in time-compressed practice makes primary care less attractive as career for future doctors in the U.S.A. [51, 52], while good hours and working condition of general practice in U.K. influences the career choice of medical graduates [42].

7. You say: ‘This implies that exposing students and residents to the expertise of the discipline, including technologies and research, might enhance the attractiveness of the field. On the other hand students and residents considering paediatrics and orthopaedics were influenced more by the factor “personal reasons”. This factor consists of illness experience and existing interest before entering medical school, which could be identified through interviewing candidates in enrolment process.’ But it also could be that the biomedical orientation precedes the other ones (see my previous comment) Yes, it could be, however, we were unable to identify the sufficient literature to make the further argument based on our results and support the possibility.

8. ‘This suggests that too much emphasis on the work environment in recruitment, in exchange of compromising the learning experience, could be counterproductive for candidates in these fields.’ I don’t understand this.

We paraphrased this sentence in a revised manuscript as follows:

This suggests that when recruiting to a specialty, emphasis on controllable lifestyle than learning experience could deter candidates from these fields.

9. You say: ‘We speculate that this difference reflects the fact that income disparities among specialties are generally not great in Japan due to a wage system based mainly on number of years after graduating from medical school, although wage difference might exist between hospitals or regions. Could it also be that high income in some specialties is guaranteed so that is will not be an issue for the students that opt for that choice?

It is an interesting suggestion, however, as the reviewer cited above, income difference among specialties is not great in general in Japan. Therefore, it may not be the case in our study population.

10. In your limitations I think you also need to say something about the difference between specialty preference and specialty choice.

In study limitations section, we added an underlined phrase below to the original sentence and moved it to the last:

Because this is a cross-sectional survey and results were analysed with regard to self-reported specialty preference not based on actual choice, further research is required to demonstrate predictive validity.
Discretionary revisions

11. P. 4: Please do not only report item numbers but add a few item topics as examples so the reader doesn’t need to look up the appendix all the time.

We agree with the reviewer that the original descriptions were cumbersome. We rewrote that part of the methods section as follows. We hope these changes will help readers to focus on the important variables discussed in this manuscript.

In Question 16, we selected variables to reflect the two components of TRA[64]: “behavioural beliefs (beliefs that specialty choice leads to certain outcomes)” such as working hours and attainable lifestyle (items 23-30), and the “normative beliefs (beliefs about whether specific individuals or groups approve or disapprove of the specialty choice)” such as advice/expectation of parents, advice from teachers/consultants (items 19-22). As external variables, we included demographic variables (age, gender, marital status with or without children, hometown size and proximity to a large city, previous degree, previous employment, doctor in the family, encounter with a doctor as a role model) in the questionnaire. Other external variables derived from the previous findings in literature [1, 2, 6, 7, 11, 13-15, 21, 23, 24] were also addressed in Question 16 (Appendix, items also listed in Table 1).

12. Table 2 and the figures seem to report the same things
We agree and have deleted Table 2.
In reply to comments from Reviewer: Professor Michael J Goldacre

Thank you very much for your positive comments and constructive feedback.

Discretionary revisions
1. This is a sound paper on an interesting and important topic. It is good to see a paper on this from outside the USA or UK. On a smallish point, however, in the Introduction, page 3, last full paragraph, the authors claim that, outside the USA, studies are limited in focus such as dealing with ‘medical graduates who have already chosen their specialties’, and that ‘there are no studies done at a national level’. I think that it is a bit misleading to class the publications from the UK Medical Careers Group in this way. It has published extensively on foundation year doctors (who have not fully chosen their careers but have expressed career preferences for different specialties), has reported on factors that have influenced career choice for particular specialties, and its publications are all national (all UK) – see list of relevant publications at the bottom of this review. The authors don’t need to list them but, in my view, they should acknowledge that there is a large literature on national studies of career preferences for individual specialties from the UK.

The links to the extensive publication from UK Medical Careers Research Group are greatly appreciated. We deleted the following: “There have been no studies done at a national level”
We introduced some of the work of UK Medical Careers Research Group in response to the other reviewer’s comment (please see previous page, Point 6).

2. I have a couple of points on presentation.
The Legends to the Tables – the text after the first line is presumably intended to be published as a footnote. For some readers, the content of the tables will be unfamiliar, and in a slightly extended footnote I think it would be good to add a sentence to specify what the data in the table mean and how they should be interpreted. Then each Table would ‘stand alone’ in being meaningful without searching for any other information.

We added sentences to each table and figure as following:

Table 1 Factor analysis of specialty preferences
Factor analysis identified 5 factors that influence career preference on the basis of a set of variables in a questionnaire conducted in 4th and 6th year medical students as well as junior doctors. A principal factor analysis and promax rotation was used since inter-correlations between possible factors were expected from literature and our preliminary analysis. Among 30 items in the questionnaire; 7 items were excluded because of the reasons described at the bottom. Cronbach’s alpha coefficients demonstrated internal consistency ranged between 0.70 and 0.86.
Figure 1. Fulfilling-life oriented group
The 6th year medical students and residents who chose one of the specialties in this group as the single most probable specialty or only specialty under consideration showed the highest z-score in the factor of “fulfilling life with job security” compared to other 4 factors, and there was more than 5 (=1 SD) difference between the highest and the lowest scores. The z-score was calculated from the mean of each factor in the specialty, and mean and SD of all valid responses in this survey. The z-score of 50 indicates that the mean of the factor is average of the whole group. The higher the z-score, the more the influence of the factor in choosing the specialty compared to other factors within the specialty or in other specialties.

Fig. 2 Bioscientific-orientation group
Respondents who chose one of these specialties as the most probable career showed higher z-score in factor of bioscientific-orientation compared to other 4 factors. The “fulfilling life” factor ranked second lowest in internal medicine subspecialty and the lowest in other specialties in this group. At the same time, z-score of “educational experience” was ranked second highest among specialties in this group.

Fig. 3 Personal-reasons group
Respondents who chose paediatrics or orthopaedics as the most probable career showed the highest z-score in factor of “personal reasons” and the lowest score in “fulfilling life” factor with more than 1SD difference between the two.

Fig. 4 Intermediate group
The difference of the highest and lowest z-scores among 5 factors was less than 5 (=1SD) in the respondents choosing general medicine/family medicine or otolaryngology as the most probable career. Because of the similar weight of the 5 factors, General/family medicine and otolaryngology were both categorized as an “intermediate group”. In respondents who considered general medicine/family medicine as their future specialty, the z-scores of all 5 factors were less than 50, which implies external variables relevant to primary care preference were missing in the questionnaire.