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Career aspirations of specialty among medical students in sub-Saharan Africa: a systematic review and meta-analysis of data from two decades, 2000–2021

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ABSTRACT

Objectives To determine the distribution of career aspirations for the discipline of specialty among undergraduate medical students in sub-Saharan Africa (SSA).

Design We searched PubMed/MEDLINE, EMBASE Google Scholar and Google for studies published between 1 January 2000 and 31 June 2021. Two reviewers extracted data from eligible studies, with disagreements resolved through consensus with a third reviewer. The random effects model was used to pool proportions, presented with the corresponding 95% CI. Heterogeneity was assessed using Cochrane's (Q) test but quantified with I^2 values. Sources of heterogeneity were checked using meta-regression analysis while publication bias was assessed using funnel plot and Egger's test.

Setting SSA.

Participants Undergraduate medical students.

Outcomes Primary outcome was pooled proportion of career aspirations for the discipline of medical specialty and the secondary outcome was reasons for the specialty selection.

Results We identified 789 citations but meta-analysed 32 studies, with an overall sample size of 8231 participants. The most popular career aspiration for the discipline of specialty was surgery (29.5%; 95% CI 25.0% to 34.2%), followed by internal medicine (17.3%, 95% CI 11.7% to 23.7%), and then obstetrics and gynaecology (15.0%, 95% CI 12.3% to 17.9%), and paediatrics (11.3%; 95% CI 9.6% to 13.2%). The less popular medical disciplines of specialty included public health, orthopaedics, ophthalmology, family medicine, pathology, anaesthesiology, dermatology, otolaryngology, psychiatry and emergency medicine. The reasons for the selection of a medical discipline for specialty related to mentor and peer influences, prospect for economic gains, personal factors, long-term career interests and goals and discipline-specific factors.

Conclusion Surgery is the most preferred career aspiration for medical students in SSA, followed by internal medicine. The choices do not necessarily match the disease burden on the continent and medical schools should consider strengthening career counselling and mentoring in their curriculum.

PROSPERO registration number CRD42021260501.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ First-ever systematic review in sub-Saharan Africa on medical career aspiration.
⇒ Rigorous methodology and analytical approach.
⇒ Lack of data from all countries on the continent.

BACKGROUND

There is a severe shortage of human resources for health in sub-Saharan Africa (SSA). The WHO recommends 4.5 health professionals for a population of 1000, the minimum coverage of health workers required to deliver basic health services.[1] At least 125 countries in the world do not meet this threshold and majority of them are in SSA.[2] The shortage remains despite several years of growth in the number of medical schools and the accompanying increase in number of medical graduates. The persistent shortage may be explained by the inflow of health workers not being able to match the outflow[3] but also by the rapid population growth on the continent.

The health worker shortage is even more severe for the case of specialists such as surgeons, paediatricians, obstetricians and the specialised disciplines such as oncology and cardiology.[4] As an example, there is only one trained surgeon for 400 000 people in East Africa compared with 22.8 surgeons for the same population size in the USA[5 6] and efforts to task shift surgical roles or shifting these roles to non-specialist physicians have been proposed to bridge this gap.[6 7] Many health facilities in SSA are unable to deliver specialised services such as safe surgical procedures due to shortages in anaesthesia services,[8] or lack expertise in specialisations such as nephrology.[9]

Career aspirations influence the areas of specialisation where doctors will spend the bulk of their years of service. In SSA, the areas

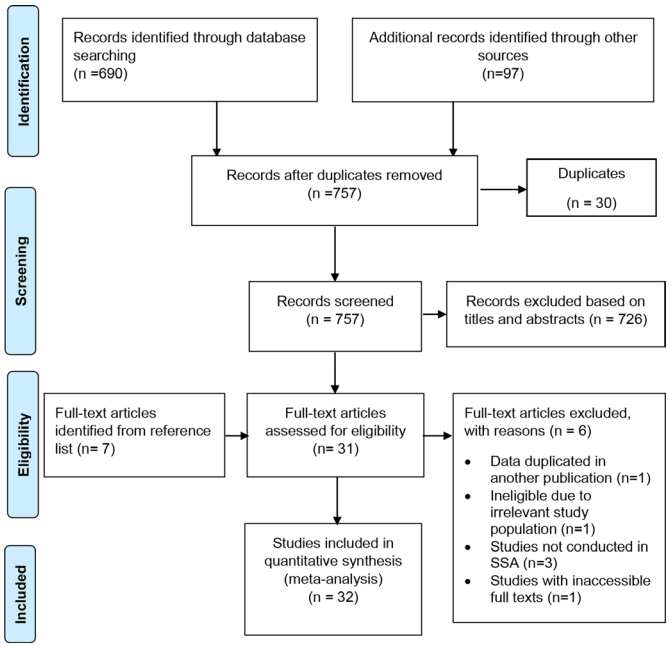

Figure 1 PRISMA flow chart showing the identification and selection of studies. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-analyses.

of greatest need are in maternal and child health. It is not clear whether the career aspirations held by medical students match these areas of need. It is also not clear what the drivers of the career aspirations are, but it appears that motivation from role models,[10] funding priorities[11] and financial remuneration[12 13] play a significant role. Some medical students have expressed an intention to relocate or migrate from their home countries[14 15] but the data across the continent are variable.

There are several studies scattered across the continent on career aspirations of medical students but the results show significant variation. Some studies show that general surgery is the most popular career aspiration for specialisation,[16–21] Obstetrics and gynaecology in others,[13] yet some show a career in infectious diseases as the most popular choice.[11] Although results on career aspirations vary, no study has been done to aggregate this information.

It is important to identify the career aspirations held vis-a-vis the areas of need and use these data to generate interest in initiatives and interventions that create opportunities for training in areas where more is needed and enable their selection. Therefore, the purpose of this systematic review is to aggregate data on career aspirations of specialisation among medical students in SSA and also summarise the factors that drive these career aspirations.

METHODS AND MATERIALS

Study design and eligibility criteria

We performed a systematic review and meta-analysis and reported the findings according to the elements of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline.[22] The study protocol was registered with PROSPERO and was assigned the number CRD42021260501.The included studies fulfilled the following criteria: (1) Study population: studies that involved undergraduate medical students regardless of the year of study; (2) Study outcomes: studies that reported the choice of any of the medical specialty such as surgery, paediatrics, psychiatry, internal medicine, among others; (3) Period: Studies published between 1 January 2000 and 31 June 2021; (4) Study design: Observational studies namely cross-sectional, cohort and case–control studies and (5) Study setting: studies conducted in any of the SSA countries. We included studies conducted in more than one country provided the data for each country were reported. We excluded studies with a high risk of bias, published in a non-English language, those with inaccessible full-text articles even after contacting the primary or corresponding authors. We also excluded systematic reviews and reports and studies with duplicated data. We used Endnote to identify the duplicate publications.

Identification and screening of studies

We developed a comprehensive and sensitive search strategy based on key concepts within the research question, and for each key concept, we developed text words and Medical Subjective Headings (MeSH) terms. We combined the key concepts, text words and MeSH terms using Boolean operators of "AND", "OR" and "NOT". The search strategy that we used was *"("Medical students") AND ("Career choices" OR "Career intentions" OR "Career preferences" OR "Specialty intentions" OR "Specialty choices" OR "Medical specialty" OR "Career aspirations") AND Africa)"*. We replaced the word 'Africa' with any of the names of the countries in SSA during the search. An example of the search strategy in PubMed used is shown in online supplemental file 1.

Before the search, two reviewers (JI and FB) pretested the search strategy in PubMed and revised it until relevant articles were retrievable. Thereafter, two reviewers (JI and DS) searched the electronic databases of PubMed. For grey literature, the reviewers searched GoogleScholar, Google, OpenGrey and LILACS. All the searches were conducted in an iterative manner and we rerun the searches for updates. Furthermore, we contacted experts in the field of medical or health professions education for additional relevant articles and handsearched the reference list of eligible studies to identify other studies. We imported all the retrieved articles into EndNote, a referencing software and screened them for eligibility criteria using the study titles and abstracts. Studies that did not fulfil the inclusion criteria based on the title and abstract were then excluded. The full-text articles of the remaining studies were reviewed rigorously based on the inclusion criteria and the relevant data items were thereafter extracted.

The last search date for all databases was on 30 July 2021 and we summarised the overall search results in a PRISMA flow chart (See online supplemental file 1).

Table 1 Characteristics of included studies

Author and year	Country	Region	HDI	Study population	Data collection method	Response rate	Sample size
Onyeka[37] 2010	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	100	195
Kollias[38] 2010	Malawi	South Africa	Low	Third-fifth year	Self-administered questionnaire	48	70
Makama[39] 2010	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	100	120
Mwachaka[40] 2010	Kenya	East Africa	Medium	First-Final year	Self-administered questionnaire	85.6	385
Eze *et al.*[29] 2011	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	90.8	287
Burch *et al.*[12] 2011	Multiple (DRC*, Kenya, Nigeria, Tanzania, Uganda, SA)	Multiple	N/A	Final year medical students	Self-administered questionnaire	78.5	984
Deressa[41] 2012	Ethiopia	East Africa	Low	All medical students	Self-administered questionnaire	78	600
Bittaye *et al.*[34] 2012	The Gambia	West Africa	Low	Final year medical students	Self-administered questionnaire	52.4	106
Gana[42] 2013	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	100	160
Oku[43] 2014	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	100	95
Seyoum *et al.*[10] 2014	Ethiopia	East Africa	Low	Final year medical students	Self-administered questionnaire	100	161
Abdul-Rahman *et al.*[44] 2015	Ghana	West Africa	Medium	Final year medical students	Self-administered questionnaire	79.8	146
Alawad *et al.*[20] 2015	Sudan	East Africa	Low	All medical students	Self-administered questionnaire	73	604
Chan *et al.*[45] 2016	Rwanda	East Africa	Low	Final year medical students	Self-administered questionnaire	100	79
Dossajee[17] 2016	Kenya	East Africa	Medium	Final year medical students	Self-administered questionnaire	87.1	156
Saidu[46] 2016	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	95.4	62
Ossai *et al.*[47] 2016	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	86.7	457
Rukewe *et al.*[48] 2017	Botswana	South Africa	High	Third-fifth year	Self-administered questionnaire	81	116

Continued

Table 1 Continued

Author and year	Country	Region	HDI	Study population	Data collection method	Response rate	Sample size
Eke *et al.*[49] 2017	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	84	126
Onyemaechi *et al*.[18] 2017	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	100	152
Scot[19] 2017	South Africa	South Africa	High	All medical students	Online questionnaire	24.4	245
Aseffa *et al.*[35] 2017	Ethiopia	East Africa	Low	Final year medical students	Self-administered questionnaire	82.2	959
Rabiu[50] 2017	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	100	85
Cheduko[51] 2018	Ghana	West Africa	Medium	First and final year	Self-administered questionnaire	92	315
Obarisiagbon[52] 2018	Benin	West Africa	Low	Final year medical students	Self-administered questionnaire	100	654
Maanongun *et al.*[53] 2018	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	98.4	182
Kansayisa *et al.*[54] 2018	Rwanda	East Africa	Low	Final year medical students	Self-administered questionnaire	49.2	181
Idowu *et al.*[55] 2020	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	100.0	130
Okunola *et al*.[56] (2020)	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	88	83
Ojabo *et al.*[57] 2020	Nigeria	West Africa	Low	Final year medical students	Self-administered questionnaire	85.2	52
Kanmounye[58] 2020	Multiple (DRC, Cameroon)	Central Africa	Low	Final year medical students	Self-administered questionnaire	80.1	149
Kuteesa *et al.*[13] 2021	Uganda	East Africa	Low	Final year medical students	Self-administered questionnaire	93	135

DRC, Democratic Republic of Congo; HDI, Human Development Index.

Table 2 Pooled proportions by medical discipline of specialty

Discipline	No of studies	Sample size	Frequency	Pooled proportion (95% CI)	I^2 (95% CI)	Q-test, p value
Surgery	31	7631	2304	29.5 (25.0 to 34.2)	94.9 (93.4 to 95.7)	553, <0.0001
Internal medicine	31	7986	1981	17.3 (11.7 to 23.7)	98.0 (97.6 to 98.3)	1469.0, <0.0001
Obstetrics and gynaecology	30	7386	985	15.0 (12.3 to 17.9)	90.6 (87.7 to 92.8)	308.4, <0.0001
Paediatrics	30	7386	798	11.3 (9.6 to 13.2)	80.6 (72.9 to 86.0)	149.1, <0.0001
Undecided	15	4795	548	11.1 (7.3 to 15.6)	94.8 (92.8 to 96.2)	269.7, <0.0001
Others	18	3647	352	9.7 (4.4 to 16.6)	97.3 (96.6 to 97.9)	630.4, <0.0001
Public health	25	7085	363	5.8 (4.4 to 7.4)	84.7 (78.6 to 89.1)	157.2, <0.0001
Orthopaedics	5	662	26	3.3 (0.9 to 6.8)	75.5 (39.9 to 90.0)	16.3, 0.003
Ophthalmology	17	3658	109	3.1 (2.2 to 4.2)	53.8 (20.0 to 73.3)	34.6, 0.005
Radiology	22	5665	159	2.9 (1.9 to 4.1)	78.3 (67.7 to 85.5)	96.9, <0.0001
Family medicine	14	3064	98	2.7 (1.7 to 3.8)	55.1 (18.1 to 75.4)	29.0, 0.007
Pathology	14	3724	82	2.5 (1.3 to 4.2)	83.3 (73.4 to 89.6)	78.1, <0.0001
Anaesthesiology	19	5235	101	2.1 (1.0 to 3.6)	87.3 (81.6 to 91.2)	141.6, <0.0001
Dermatology	4	1610	20	1.5 (0.3 to 3.4)	77.6 (39.3 to 91.7)	13.4. 0.004
Ear, Nose and Throat (ENT)	10	2464	31	1.4 (0.4 to 2.8)	77.2 (58.0 to 87.6)	39.4, <0.0001
Psychiatry	16	4901	99	1.4 (0.8 to 2.2)	67.9 (46.0 to 80.9)	46.7, <0.0001
Emergency medicine	3	323	4	0.9 (0.0 to 3.4)	50.9 (0.0 to 85.8)	4.07, 0.131

Data items and abstraction, and consensus in data abstraction

Two reviewers (JI and DS) independently extracted the following data items using a standardised Microsoft Excel sheet: the author's first name, the year of publication, the country of publication, the country's most recent Human Development Index (HDI), region within SSA, study design, sample size, the frequency for each medical discipline of specialisation and the reason for selection of a particular discipline for specialty. The medical discipline of specialisation included general surgery/surgery, internal medicine, obstetrics and gynaecology, paediatrics, public health, orthopaedics, ophthalmology, radiology, family medicine, pathology, anaesthesiology, dermatology, otolaryngology (Ear, Nose and Throat orENT), psychiatry and emergency medicine. Participants who had no choice of the discipline of specialisation were categorised as undecided while disciplines of specialisation other than those mentioned were categorised as others.

Agreements and disagreements in between the two reviewers were resolved by consensus with a third reviewer (FB). The percentage agreement between the reviewers (JI and DS) was computed using kappa statistics.

Assessment of quality of included studies

We employed a nine-item checklist to assess the risk of bias across the included studies.[23] This tool has been validated and found to have excellent psychometric properties, namely percentage agreement of 91% and kappa statistic of 0.82 (95% CI of 0.76 to 0.86). The tool contained questions that assessed whether the target population was a close representation of the entire population, the sampling frame was a true or a close representation of the target population, whether random selection or census was used, chance of non-response bias was minimal or not, the data were collected directly from the participants, a validated instrument was used for the data collection, the same mode of data collection was used throughout the study, and appropriate numerators and denominators were used. Each of these items was measured on a binary scale of low risk (score=0) or high risk (score=1) so the total score equals 9. Studies with total scores of 0–3, 4–6 and 7–9 were considered to have a low, moderate or high risk of bias, respectively.

Statistical analysis

The data analysis was performed in Stata V.15 and R V.4.0.2. We summarised the included studies in an evidence table using the first author's last name and year of publication, country of origin, region within SSA, HDI, study population, data collection methods, the response rate in the study and sample size. The primary outcome was career aspiration of medical specialty computed as the proportion of participants reporting a particular specialty, for example, surgery, paediatrics, internal medicine, obstetrics and gynaecology and other disciplines of specialisation. The numerator was the number of

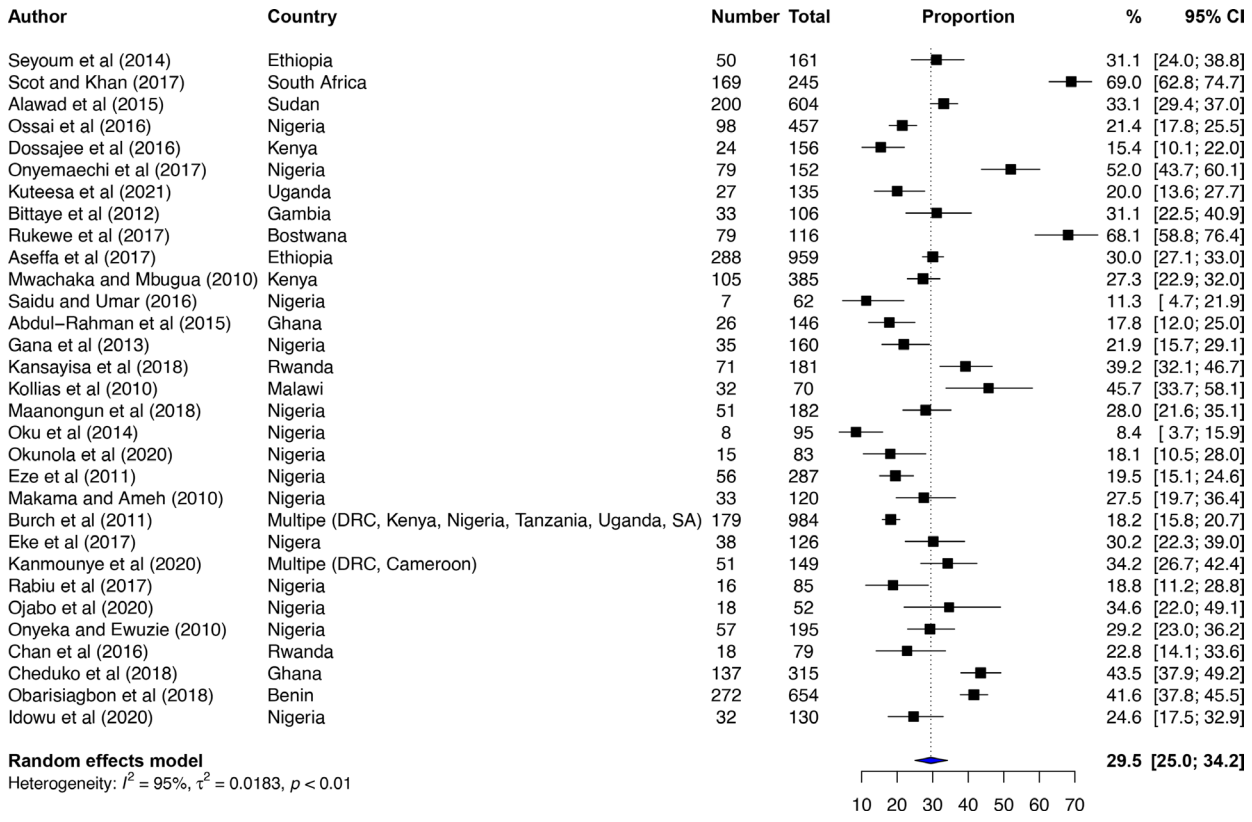

Figure 2 Pooled proportion for medical students with surgery as their first career aspiration.

participants favouring a particular discipline of medical specialty and the denominator was the study sample size.

To pool the proportions for each discipline of specialty, we used the DerSimonian and Laird random-effects model, allowing for Freeman-Tukey double arcsine transformation to prevent the pooled proportions from exceeding the zero to one range where normal approximation procedures fall.[24] We summarised the pooled proportions in a table along with the 95% CI and the 95% predictive interval (PI). A PI was computed to show the effect of statistical heterogeneity on the pooled proportion and the variation of the pooled proportion in different settings including its direction in future studies.[25] We abstracted the reasons for the selection of a medical discipline for specialty and summarised them using subthemes and themes.

Assessment for publication bias

We examined the included studies for publication bias using a funnel plot, with an asymmetrical funnel plot interpreted as suggestive of publication bias and vice-versa.[26] Egger's test was performed to confirm publication bias at a probability value less than 10% (p<0.1).[26] Since a funnel plot cannot distinguish between genuine publication bias and small study effect, a contour-enhanced funnel plot was graphed in the event of funnel plot asymmetry. In the contour-enhanced funnel plot, if all the studies fell in the region of statistical significance (p<0.05), it was concluded that the asymmetry was caused by publication bias. A trim-and-fill analysis was performed to determine the number of missing studies, impute them and obtain a new pooled proportion using existing methods,[26] when there was publication bias.

Assessment for heterogeneity

We assessed heterogeneity using the Cochrane Q-test, with p<0.1 regarded as suggestive of heterogeneity. We quantified heterogeneity using I^2 values, with values categorised as less than 25%, between 25% and 50%, between 50% and 75% and above 75% for no, low, moderate and high heterogeneity,[27] respectively. For moderate and high heterogeneity, we employed meta-regression analysis to identify the source using the study characteristics, namely study population, year of publication, HDI, method of data collection, participant response rate in the study, risk of bias and the study sample size. These factors contribute to clinical heterogeneity (differences between participants), methodological heterogeneity (study design and risk of bias) and statistical heterogeneity (differences in meta-analytical results), and therefore, require further investigation when observed heterogeneity is either moderate or high.

Sensitivity analysis

We assessed the robustness of the study results and the conclusions to changes in the analytical approach and methodology through sensitivity analysis.[28] Here, we omitted one study at a time and computed a new pooled proportion for the choice of medical specialty. When the new estimate fell within the 95% CI of the original

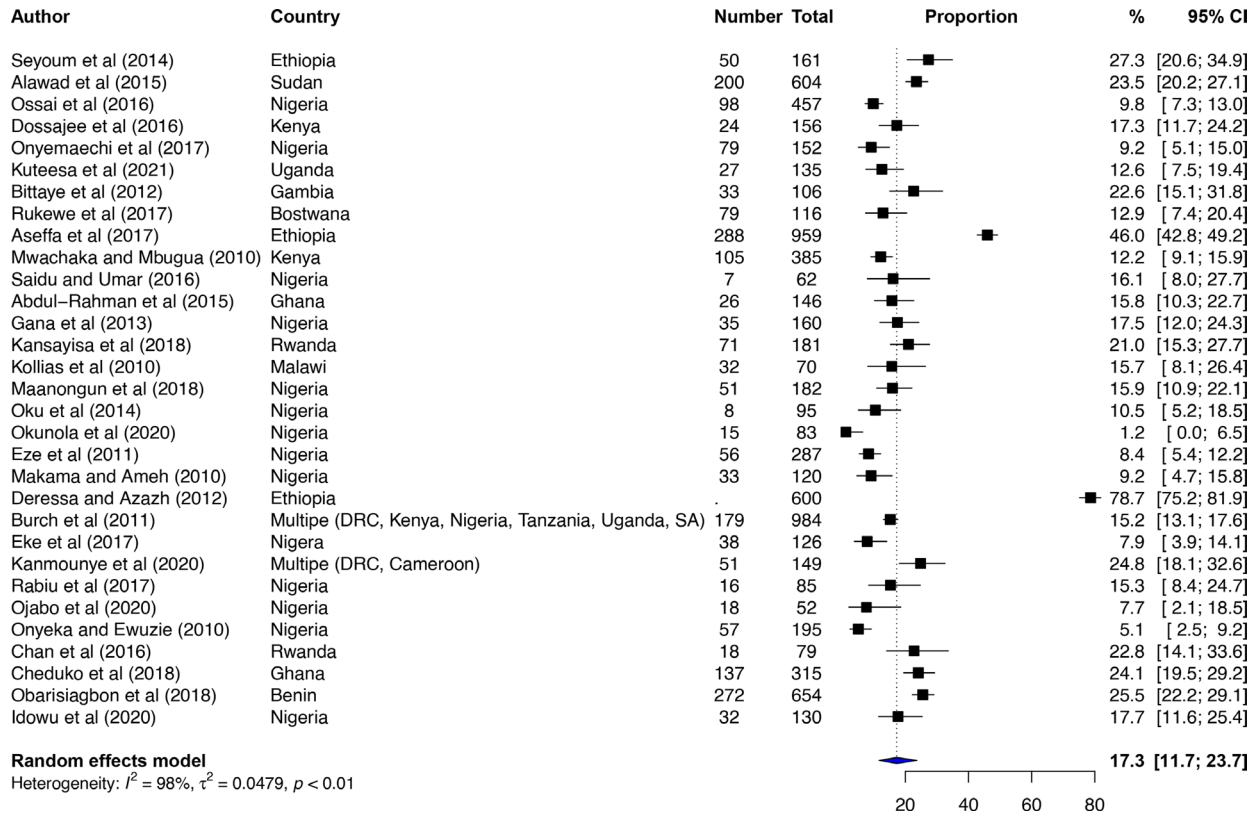

Figure 3 Pooled proportion for medical students with internal medicine as their first career aspiration.

pooled estimate, we concluded that the excluded study had no influence on the overall meta-analytical results suggesting robust findings. Conversely, when the new pooled estimate fell outside the 95% CI of the original pooled proportion, it was concluded that the excluded study had influence and so the results and conclusions are not robust.

Patient and public involvement

The study does not involve patients or interaction with the public.

RESULTS

Identification and selection of studies

We summarised the studies that were identified and they are shown in figure 1. We identified 787 citations from the databases and other sources and excluded 30 duplicated citations.

Of the remaining 757 citations that were screened by titles and abstracts, 726 were excluded because they did not meet the criteria for inclusion. We; therefore, retrieved and reviewed full texts for 31 citations but excluded further 6 articles with reasons: duplicated data (1 study), irrelevant study population (1 study), inaccessible full text (1 study) and study conduct outside SSA (3 studies). Seven other studies were identified from the reference list of the included studies making a total of 32 studies for the final meta-analysis.

Characteristics of included studies

In table 1, we present data that summarise the characteristics of the included studies. Thirty-two studies were published between 2010 and 2021 and they all used a cross-sectional study design. Thirteen studies (40.6%) were from Nigeria and 25 (78.1%) were from countries with low HDI. All the 32 studies collected data through a self-administered questionnaire. Overall, participant response rate was good, and 28 studies (87.5%) had a response rate of ≥70%. The sample size ranged from 52 to 984 participants and overall sample size was 8231 participants.

Percentage agreement and risk of bias across studies

The percentage agreement between the two reviewers was 81.3%, which was higher than the expected agreement of 76.4% (kappa value=0.21, p=0.027). Only one study by Eze *et al*[29] employed a validated tool to collect data. However, our analysis showed that 30 studies had a low risk of bias and two studies had a moderate risk of bias.

Frequency of career aspirations for the discipline of specialisation among undergraduate medical students in SSA

In table 2, we present the pooled proportion of disciplines of specialty in descending order. The most popular career aspiration for the discipline of specialty was surgery with a pooled proportion of 29.5% (95% CI 25.0% to 34.2%) reported by 31 studies as shown in figure 2. Internal medicine was the second most popular discipline at 17.3% (95% CI 11.7% to 23.7%) as shown in figure 3,

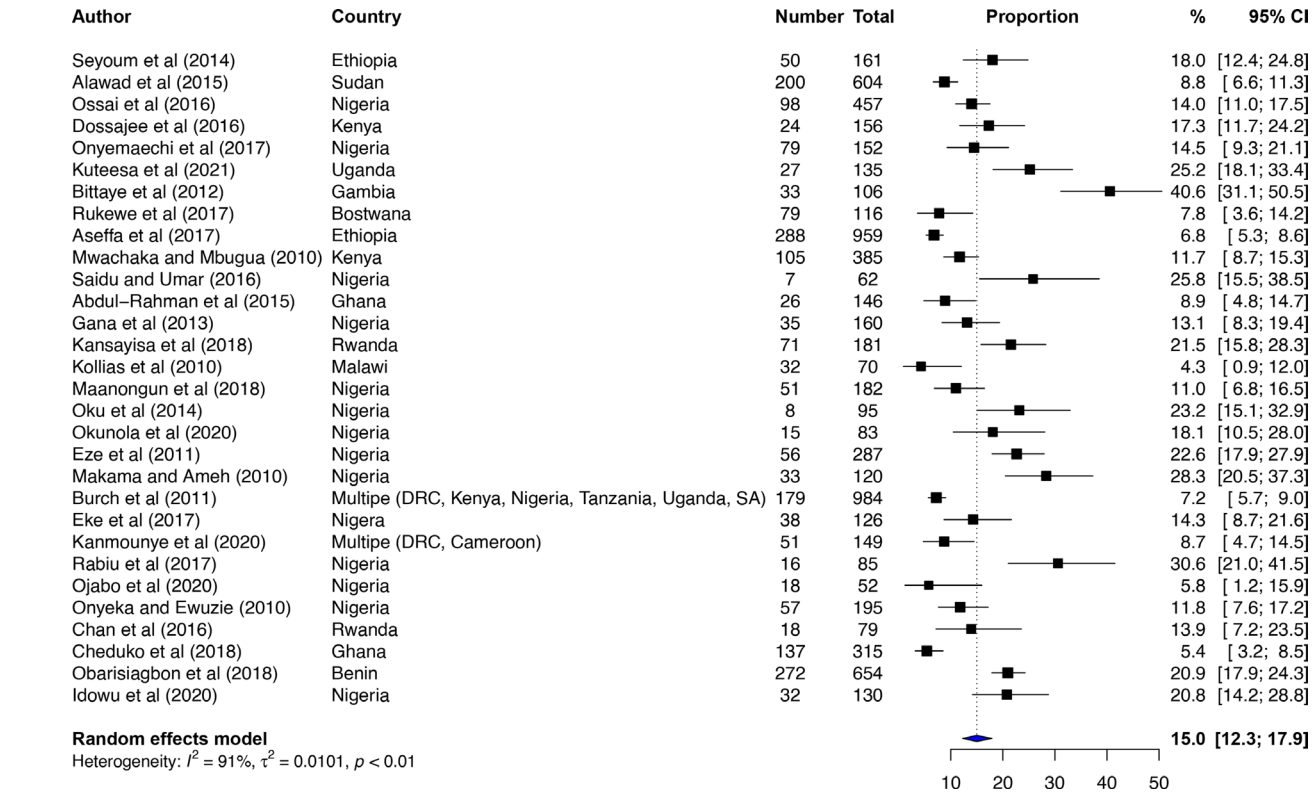

Figure 4 Pooled proportion for medical students with obstetrics and gynaecology as their first career aspiration.

obstetrics and gynaecology at 15.0% (95% CI 12.3% to 17.9%) came third as shown in figure 4, and paediatrics came fourth at 11.3% (95% CI 9.6% to 13.2%) as shown in figure 5. We also found that slightly more than 10% of medical students were undecided about their medical discipline of specialty (pooled proportion, 11.1%; 95% CI 7.3% to 15.6%). The least popular medical disciplines of specialty include public health, orthopaedics, ophthalmology, family medicine, pathology, anaesthesiology, dermatology, otolaryngology, psychiatry/mental health, and emergency medicine, all with a pooled proportion less than 6%.

Factors that influence the choice of the discipline of specialisation among undergraduate medical students in SSA

In table 3, we present the summary of the factors that influence the choice of medical specialty, presented using themes and subthemes. Overall, five themes emerged namely, mentor and peer influences, prospect for economic gains, personal factors, long-term career interests and goals, and discipline-specific factors.

Theme 1: mentor and peer influences

We found that 11 studies reported that participants selected a career discipline of specialty due to motivation

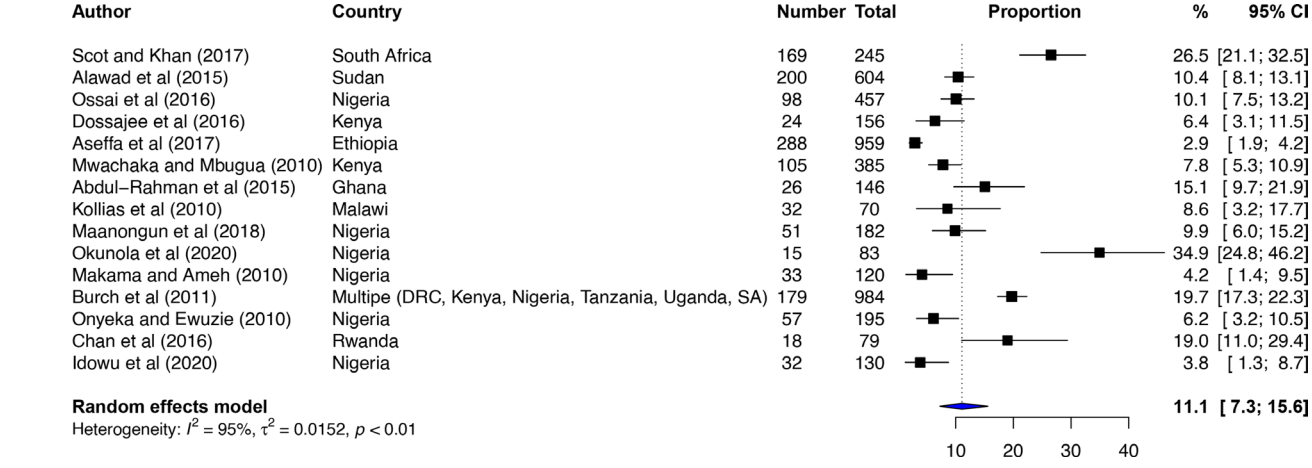

Figure 5 Pooled proportion for medical students with paediatrics as their first career aspiration.

Table 3 Themes and subthemes about factors influencing the choice of medical specialty

Themes and sub-themes	No of studies	Citations
Theme 1: Mentor and peer influences		
Motivation during clinical rotations or mentorships, by role models or senior specialists, and encouragement by staff	11	10 13 19 40 44 48 51 53–55 57
Influence from family/parents, guardians, or friends and other significant people	6	20 29 48 52 53 57
Theme 2: Prospects for economic gains		
Financial liberty is characterised by the assurance of a good salary, high financial reward, and high-income potential or better financial remuneration	12	10 13 17 19 20 40 48 49 51 53 55 57
Potential to have several job opportunities, have job security and the potential for self-employment	5	17 20 48 53 55
Theme 3: personal factors		
High individual interest in the discipline	11	10 18–20 29 44 46 48 49 53 55
Personal capability or competence	6	18 29 48 49 52 57
Controlled lifestyle: avoidance of unnecessary calls, low or short working hours, and flexible working hours	7	13 18–20 40 48 55
Personal convenience	6	49 51 53 55 57
Prestige or high social status	4	17 19 20 40 46 53
Ease of raising a family	3	17 40 53
Gender issues	2	53 57
Focus on urgent care	3	13 45 57
Theme 4: long-term career interests and goals		
Potential for career development in academic teaching	2	18 29
Potential to conduct research.	2	40 48
Theme 5: discipline specific factors		
Immediate improvement in patient condition and ability to widely help the community.	6	18–20 29 46 52
Intellectual content of specialty/intellectual challenge	5	13 40 45 54 57
Shortage of specialists in the country	2	46 48
The only existing programme	2	46 52
High-quality teaching	1	53
A shorter length of training	1	20
Hands-on work (practical)	2	19 45

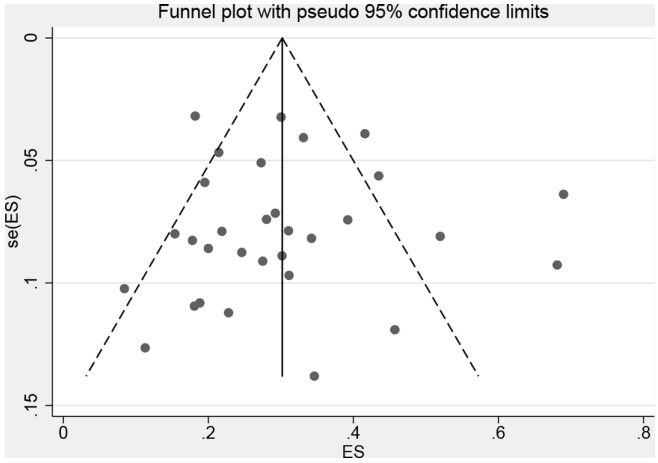

Figure 6 Funnel plot with pseudo 95% confidence limits.

that arose during clinical rotations or mentorships, as well as from role models or senior specialists, and staff encouragement. The influence of parents/guardians, friends and other significant people was also key in determining the career aspiration of specialty.

Theme 2: prospects for economic gains

Economic gain was at the centre of career aspirations across the majority of the studies. In 12 studies, the participants indicated that they would consider a career discipline for specialisation if it provides financial liberty in the short term, medium term and long term. Financial liberty was characterised by the certainty of good or attractive salary including the associated benefits as well as a high-income potential and being in a better position of financial remuneration. In five studies, the participants

Table 4 Sources of statistical heterogeneity in meta-regression analysis

Characteristics	No.	Univariable meta-regression analysis Beta-coefficients (95% CI)	Multivariable meta-regression analysis Beta-coefficients (95% CI)
Study population			
All medical student years	5	1	1
Final year students	25	-0.16* (-0.27 to -0.04)	-0.10 (-0.24 to 0.03)
Third year students	2	0.16 (-0.06 to 0.39)	0.07 (-0.25 to 0.39)
Years			
2010–2014	11	1	
2015–2021	21	0.08 (-0.03 to 0.19)	
HDI			
High	2	1	1
Low	25	0.40† (-0.55 to -0.24)	-0.23 (-0.62 to 0.16)
Moderate	4	-0.41† (-0.58 to -0.23)	-0.29 (-0.70 to 0.11)
Method of data collection			
Online questionnaire	1	1	1
Self-administered questionnaire	31	-0.40‡ (-0.63 to -0.17)	-0.07 (-0.54 to 0.40)
Response rate			
<75	5	1	1
≥75	27	-0.16‡ (-0.29 to -0.03)	-0.01 (-0.12 to 0.11)
Sample size categories			
<350	25	1	
350–500	2	-0.07 (-0.27 to 0.13)	
>500	5	-0.004 (-0.15 to 0.14)	
Risk of bias			
Low	30	1	
Moderate	2	0.12 (-0.10 to 0.35)	

Note: 95% CIs in brackets for beta-coefficients at 5% significance level.
*P<0.05.
†P<0.001.
‡P<0.01.
HDI, Human Development Index.

indicated that they would select a discipline for specialisation if it can offer several job opportunities, has job security and has the potential for self-employment.

Theme 3: personal factors

Our data indicate that in 11 studies, the choice of medical specialty was influenced by the students' interest while in six studies, it was influenced by personal capability/or competence. Other factors included the ability to have a controlled lifestyle, which participants described as the avoidance of unnecessary calls during daytime or at night, and having reasonable and flexible working hours. Personal convenience, the prestige associated with the discipline of specialty, possibility to gain fame or a high social status in the community, flexibility to allow attention to family matters such as child upbringing, gender such as females preference for paediatrics and male preference for surgery, and the desire to focus on urgent/emergency care were some of the other important personal factors.

Theme 4: long-term career interests and goals

A career in academia especially teaching and research was rarely suggested by the participants as a career aspiration. We found only two studies that reported that the selection of medical discipline of specialisation would depend on its potential for career development in teaching and another two studies reported the potential to design and conduct research as reasons for career aspiration.

Theme 5: discipline-specific factors

We found that in six studies, participants would select a medical discipline for specialisation if the discipline ensures immediate improvement in patient condition and if the discipline would enable them to help the entire community. Some disciplines were selected due

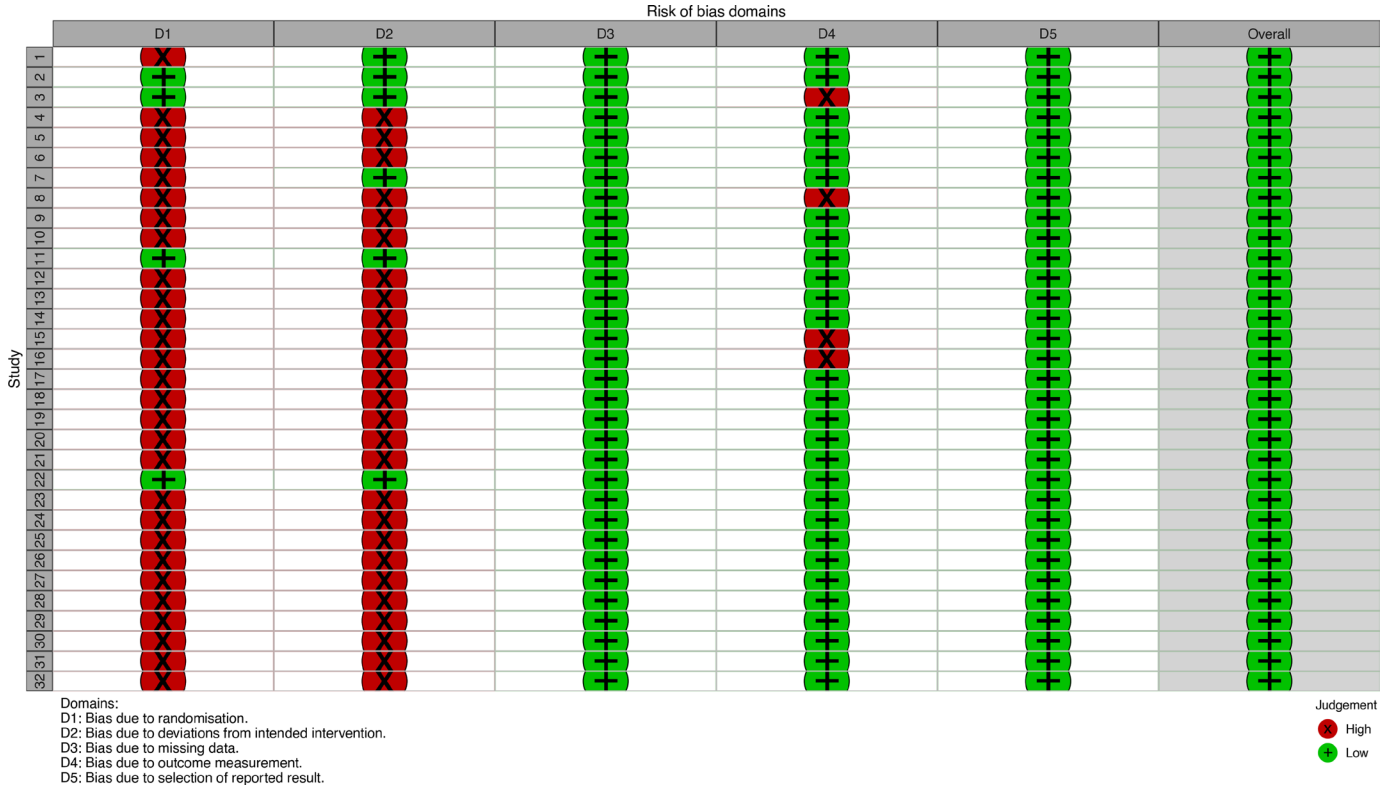

Figure 7 Risk of bias among studies in a meta-analysis of career aspirations of medical students in sub-Saharan Africa.

to their requirement for intellectual content, the lack of other specialty programmes, critical shortages of human resources for health, the quality of teaching being high, a shorter length of training and hands-on work.

Publication bias assessment

We found no evidence of publication bias on the funnel plot shown in figure 6. The plot showed a symmetrical distribution of studies and this was confirmed by Egger's linear regression test of funnel plot asymmetry (t-test=0.154, df=29, p=0.879).

Based on these data, we do not reject the null hypothesis of no small-study effect. Accordingly, we neither graphed a contour-enhanced funnel plot nor performed a trim-and-fill analysis.

Level of heterogeneity and sources

The Q-test results seen in table 2 suggest that the included studies were largely heterogeneous. The sources of heterogeneity are summarised in table 4. In the univariable meta-regression analysis, heterogeneity was less likely when the study was conducted among final year students compared with all medical student years (beta-coefficient (β) = 0.16; 95% CI −0.27 to −0.04), in a country with moderate HDI compared with high HDI (β=−0.41; 95% CI −0.58 to −0.23), the questionnaire was self-administered compared with an online administration (β=−0.40; 95% CI −0.63 to −0.17), and when the response rate in the study was ≥75% compared with less than 75% (β=−0.16; 95% CI −0.29 to −0.03). On the other hand, heterogeneity was more likely in studies conducted in countries with low HDI compared with countries with high HDI (β=0.40; 95% CI −0.55 to −0.24; <0.001). In the multivariable meta-regression analysis, none of these factors was an independent source of the statistical heterogeneity.

Sensitivity analysis results

The results were robust to changes in the analytical approach and methodology. All the pooled estimates following the exclusion of one study at a time were within the 95% CI of the original pooled estimate and results on risk of bias are shown in figure 7.

DISCUSSION

Our systematic review shows that surgery is the most popular career aspiration of specialisation among medical students in SSA. This was followed by internal medicine, obstetrics/gynaecology, paediatrics and the other disciplines came after. However, a significant proportion were undecided, signifying the need for career guidance and mentoring to enable medical students make informed choices. The choices identified in this systematic review do not match the health needs of the continent based on recent data on health systems and effective coverage for health services.[30] The continent is dealing with a surge in non-communicable diseases amidst a persistent high maternal and neonatal mortality. It is a complex blend of disease epidemiology and countries will need to cautiously adapt their training plans to suit the traditional and emerging burden of disease epidemiology.

The data on career aspirations only represents intentions for the field of specialisation and it is not clear whether medical students retain these aspirations when they eventually enter fields of specialisation. Some data suggests that there may be a discrepancy between aspirations held as medical students and the actual areas of specialisation they enter once they complete medical school. As an example, data on patterns of specialisation in Malawi spanning a decade showed that most medical graduates trained in public health, followed by internal medicine and paediatrics[31] differing from the career aspirations expressed by medical students on the continent. This discrepancy is likely to be reflected in other African countries but data to establish this are scarce.

It is also important to note that career aspirations may change over time, although our data did not demonstrate any trends with time. The absence of a trend in our data could be explained by the concentration of the studies in one decade. If such changes occur, it may be important that surveys on career aspirations are done on a regular basis to capture these trends. In order to meet the future health needs, up-to-date data on disease burden and career aspirations are needed. Regular surveys on career aspirations will determine whether these choices are aligned with the changing health needs of the population.

The choices for discipline of specialisation appear to be strongly influenced by availability of training opportunities.[31] There is evidence that although the majority of medical students express a desire to specialise in a given discipline, some countries either have limited slots, no funding opportunities for training or do not offer training in these disciplines at all.[32] This may not only limit the choice but may also influence the medical graduates to seek training abroad, subsequently leading to brain drain. The disconnect between career aspirations and opportunities for training, and the incongruity between career aspirations and disease epidemiology has examined in the past by Kakembo *et al* who recommended opening up more career opportunities and surgical residencies in SSA to minimise brain drain.[11]

The brain drain of human resources for health remains a major challenge in SSA. Based on existing literature, some interventions have already been proposed to minimise it. The proposed interventions include consideration of personal characteristics of students at the time of selection as a prerequisite for entry into medical school, having career motivation and measures to sustain student motivation.[33] Our results on motivators of career aspirations support these interventions.

Building a health workforce capacity, therefore, necessitates effective control over influences from several sources namely, individual, institutional and market forces since they push or pull students' career aspirations to or away from primary healthcare or a given medical discipline.[33] There is also a need to provide career counselling[34] with focus on influencing student attention towards equitable distribution of specialised human resources.[35] Governments will also need to put in place policies for distribution of resources for training to ensure that the required career aspirations are supported.

Our review shows that a variety of reasons influence the choice of career specialisation and notably included influence of mentors or peers, financial remuneration and personal factors. The reasons for choice appear to differ based on income status of the country. Studies in high-income settings show that the reasons match the Maslow's hierarchy needs of motivation. In a recent systematic review of what motivates medical students to make career decisions, data from high-income countries showed that the main motivating reasons were scientific or social interest yet in the middle-income countries, the reasons were financial or related to prestige.[36]

Implications of findings

Our findings have important implications for students, medical educators and leadership within the healthcare system. At the student level, there is a need for career mentorship and counselling[34] and funded opportunities for fellowships and/or residency programmes in the disciplines with greatest need. The prioritisation of the relevant health workforce by the health systems needs no emphasis. Medical educators and health systems leadership should work together to ensure there is training for a sufficient number of specialised health workforce in a distribution that matches the changing patterns of disease burden in each country

Strengths and limitations

Our study has some important strengths. First, to the best of our knowledge, it is the first to summarise data on career aspirations among medical students in SSA and provides a starting point to discuss how medical students can be supported in making career choices and align these to country-specific needs. There is significant lack of career guidance and mentoring among medical schools in SSA, yet the critical role this guidance plays is well known. The career guidance should also be directed towards the needs of the specific countries.

In SSA, most health needs are in the field of maternal and child health, and therefore, disciplines such as paediatrics plus obstetrics and gynaecology would be expected to be the dominant choices.

Our review has some weaknesses. As already noted, the career aspirations held by medical students do not necessarily reflect the disciplines in which they will eventually specialise. Therefore, these aspirations do not mirror the actual distribution of specialists in clinical practice. Second, although gender appears to significantly influence the career aspiration, we were not able to break down the data by gender, as this stratification was not consistent across the different studies. Future studies that examine career aspiration should conduct gender stratified analyses to allow aggregation of data by gender. In addition, the studies included in this meta-analysis did not disaggregate data by age or year of study of the medical students. There is a possibility that age

and year of study may influence career aspiration as older students or those closer to completion of their medical degree are more knowledgeable about the disciplines of specialisation compared with younger ones or those in the early years of the course. Also, our findings might not accurately depict a continental picture regarding career aspirations of specialty because the data are not from all the countries in SSA. There was an imbalance in the distribution of publications with majority of data from west Africa. And lastly, we proposed to retrieve data for at least two decades between 2000 and 2021, a long period in order to obtain sufficient data and examine trends. However, there were limited studies in the earlier part of the century. We also found that none of the participant or study characteristics explained the heterogeneity between the studies. This could be because the studies did not have sufficient variables to allow full exploration of the sources of heterogeneity.

In conclusion, our study has showed that surgery is the most preferred career aspiration for medical students in SSA, followed by internal medicine, obstetrics and gynaecology and paediatrics. The most commonly cited reasons for these aspirations include influence from peers and mentors, financial remuneration and personal reasons. Medical schools should consider strengthening career counselling and mentoring in their curriculum and ensure that career aspirations are informed and match the country needs of expertise.

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