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SURGERY IN LOW AND MIDDLE INCOME COUNTRIES

Ugandan Medical Student Career Choices Relate to Foreign Funding Priorities

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Abstract

Introduction The surgical workforce in sub-Saharan Africa is insufficient to meet population needs. Therefore, medical students should be encouraged to pursue surgical careers and "brain drain" must be minimized. It is unknown to what extent foreign aid priorities influence medical student career choices in Uganda.

Methods Medical students in Uganda completed an online survey examining their career choices and attitudes regarding career opportunities and funding priorities. Data were analyzed using descriptive statistics, and responses among men and women were compared using Fisher's exact tests.

Results Ninety-eight students participated. Students were most influenced by inspiring role models, employment opportunities and specialty fit with personal skills. Filling an underserved specialty was near the bottom of the influence scale. Women placed higher importance on advice from mentors ($p = 0.049$) and specialties with lower stress burden ($p = 0.027$). Men placed importance on opportunities in non-governmental organizations ($p = 0.033$) and academia ($p = 0.050$). Students expressed that the most supported specialties were infectious disease ($n = 65$, 66%), obstetrics ($n = 15$, 15%) and pediatrics ($n = 7$, 7%). Most students ($n = 91$, 93%) were planning a career in infectious disease. Fifty-three students (70%) indicated plans to leave Africa for residency. Female students were more likely to have a plan to leave ($p = 0.027$).

Conclusion Medical students in Uganda acknowledge the career opportunities for physicians in specialties prioritized by the Sustainable Development Goals. In order to avoid "brain drain" and encourage students to pursue careers in surgery, career opportunities including surgical residencies must be prioritized and supported in sub-Saharan Africa.

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Introduction

There are currently 263 surgeons in Uganda [1], a country with 43 million people, yielding a surgeon density of 0.61 per 100,000 inhabitants. For comparison, the USA has a surgeon density of 16 per 100,000 inhabitants [2]. This surgical workforce deficit is similar across other countries in sub-Saharan Africa, and equally lacking are anesthesiologists and nurses. A shortage of qualified surgical providers is just one missing piece of the necessary components to provide safe and affordable access to surgery, as defined by the Lancet Commission on Global Surgery [3].

In order to increase the surgical workforce in Africa, local surgeons and anesthesiologists must be trained and they must be encouraged to stay in the country. Previous studies have shown that medical students from rural and low-income backgrounds are more likely to serve in rural and low-income areas upon completion of training [4]. It has also been shown that students are more attracted to surgical specialties when they have positive clerkship experiences, intellectually challenging rotations, and focused mentoring relationships [5]. However, previous studies in Uganda have shown that large percentages of medical students plan to leave the practice of medicine for other careers or have plans to immigrate to high-income countries to practice medicine [6].

In this study, we propose that funding opportunities and international aid patterns may influence Ugandan medical student decision making. For many years, funding priorities in global health have been placed preferentially toward infectious disease and maternal mortality, with very little aid given toward needed surgical resources [7–9]. The objectives of this study were to describe the factors that influence career choices for medical students, to identify the level of interest in a surgical career and to assess student perception of what specialties are supported by aid.

Methods

The study was approved by the Institutional Review Board (IRB) at Makerere University in Kampala Uganda and was determined exempt from review by the Duke University IRB. Makerere University is the largest and most prestigious university in Uganda. Within the School of Medicine, students can earn a Bachelor of Medicine or Bachelor of Surgery (MBChB, ~ 150 graduates/year) or a graduate degree (M.Med, ~ 15 graduates/year) in several different specialties including: Anesthesia, Ear Nose and Throat Surgery, Family Medicine, Internal Medicine, Obstetrics and Gynecology, Ophthalmology, Orthopedic Surgery, Pediatrics, Psychiatry, Radiology, Surgery, Neurosurgery, Emergency Medicine and Radiation Oncology.

Medical students in the MBChB program at Makerere University were contacted by email and offered participation in the survey ("Appendix"). The survey was anonymous. Informed consent was obtained, and participation in the survey was voluntary. Study data were collected and managed using REDCap (Research Electronic Data Capture) hosted at Duke University [10].

The survey questions focused on medical student intended career choice, perceptions of workforce needs, job opportunities, and specialty support from various funding sources. Participants were asked to rank on a Likert scale factors that influenced their career choices, such as lifestyle, job opportunities, advice from various sources and personal plans to leave the country or the region ("Appendix"). Survey results were summarized and compared between male and female students and between lowerclassmen (years 1–3) versus upperclassmen (years 4–5) using Fisher's exact test for categorical variables and *t* tests for continuous variables. The statistical analysis was performed in R (version 3.5.0). No adjustments were made for multiple comparisons, and p values < 0.05 were considered statistically significant.

Results

A total of 379 email invitations were sent, of which 58 were undeliverable addresses. 98 medical students completed the survey. There were more males ($n = 71$, 72%) than females ($n = 27$, 28%) responding to the study, with an age range of 20–45 years and mean age of 25 (SD 4.7) years. Thirty-seven students (38%) were lowerclassmen and 61 students (62%) were upperclassmen (Table 1).

Factors influencing specialty choices

Table 2 shows factors that medical students identified as influencing their specialty choice in order of decreasing impact. Students reported that they were most influenced by inspiring role models, employment opportunities and specialty fit with their personal skills. Of note, filling an underserved specialty was near the bottom of the influence scale. Differences across gender and class year were assessed for these factors. For all factors, there was no difference in comparing upperclassmen to lowerclassmen. For most factors, there was no statistically significant difference between men and women. However, women did place a higher importance on advice from mentors ($p = 0.049$) and choosing specialties with a lower stress burden ($p = 0.027$). Men placed a higher importance on having opportunities in non-governmental organizations

Table 1 Participant demographics

	$N = 98$ (%)	Mean (SD) [range]
Gender		
Male	71 (72%)	
Female	27 (28%)	
Age		25 (4.66) [20–45]
Level of Training		
Year 1 (Lowerclassmen)	14 (14%)	
Year 2	10 (10%)	
Year 3	13 (13%)	
Year 4 (Upperclassmen)	15 (15%)	
Year 5	46 (47%)	

(NGOs) ($p = 0.033$) and academic and teaching opportunities ($p = 0.05$).

Perceptions of Ugandan specialty need and support by domestic and foreign sources

Students expressed that many different specialties were needed in Uganda (Fig. 1a). However, neurosurgery and emergency medicine were thought to be the most needed. Table 3 shows the differences across gender and class year regarding perceptions of specialty need, specialty support and career choice. Female students were more likely to think that emergency medicine and psychiatry were needed, while male students were more likely to recognize the need for neurosurgery, general surgery and urology ($p = 0.027$). Upperclassmen were more likely to think that emergency medicine is most needed, while lowerclassmen were more likely to think that infectious disease and neurosurgery were most needed ($p = 0.01$).

In contrast, when asked which specialties are most supported by foreign aid, infectious disease was felt to be heavily supported ($n = 65$, 66%) followed by obstetrics ($n = 15$, 15%) and to a lesser extent, pediatrics ($n = 7$, 7%) (Fig. 1b). Upperclassmen thought that obstetrics had more support from the Ugandan government, while lowerclassmen thought infectious disease, medicine, pediatrics and basic science had more support from the Ugandan government ($p = 0.003$). The overwhelming majority of students ($n = 91$, 93%) were planning for a career in infectious disease (Fig. 1c), but they felt that obstetrics currently has the most job opportunities (Fig. 1d). Upperclassmen were more likely to believe that anesthesia and

Table 2 Differences across gender and class year regarding factors that influence specialty choice

Survey response item	By gender		By class year (Years 1–3 vs. 4–5)	
	P	Stronger influence	*P*	Stronger influence
Inspiring role model	0.869		0.923	
Employment opportunities	0.115		0.478	
Fit with my personal skills	0.435		0.441	
Intellectual challenge	0.190		0.781	
Relationships with patients	0.310		0.692	
Lifestyle after training	0.219		0.871	
Opportunity in private practice	0.762		0.289	
Financial compensation	0.082		0.753	
Work hours	0.263		0.235	
Job security	0.305		0.512	
Advice from mentors	**0.049**	**Females**	0.924	
Stress	**0.027**	**Females**	0.623	
Opportunities in NGOs	**0.033**	**Males**	0.553	
Academic and teaching opportunities	**0.050**	**Males**	0.133	
Opportunities in government practice	0.711		0.119	
Current financial difficulty	0.302		0.104	
Prestige	0.379		0.773	
Filling an underserved specialty	0.068		0.160	
Advice from family	0.577		0.287	
Advice from friends	0.457		0.364	

Significant *p* values are indicated in bold

P values are from Fisher's exact tests comparing responses between male and female students and between lowerclassmen and upperclassmen

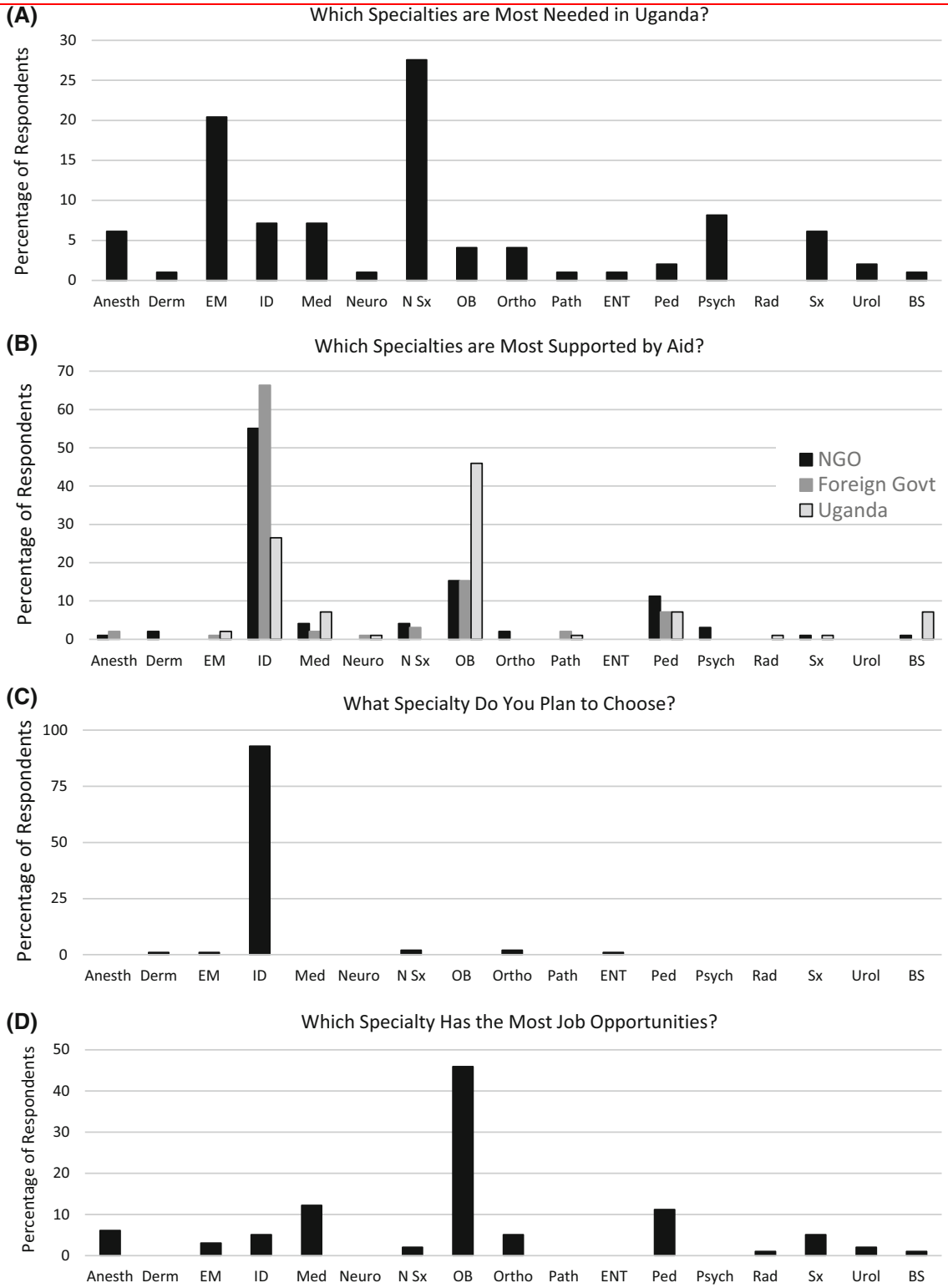

Fig. 1 Student opinions regarding: **a** Specialty most needed in Uganda, **b** Specialty most supported by aid, **c** Specialty students are planning to choose, and **d** Specialty with the most job opportunities. *Anesth—anesthesia, Derm—dermatology, EM—emergency medicine, ID—infectious disease, Med—internal medicine, Neuro—neurology, N Sx—neurosurgery, OB—obstetrics and gynecology, Ortho—orthopedic surgery, Path—pathology, ENT—otolaryngology, Peds—pediatrics, Psych—psychiatry, Rad—radiology, Sx—surgery, Urol—urology, BS—basic science

Table 3 Differences across gender and class year regarding perceptions of specialty need, specialty support and career choices

Survey response item	Gender *P*	Class year *P*
Planned specialty	0.744	0.501
Certainty of planned specialty	0.109	**0.015**†
Which specialties are most needed in Uganda?	**0.027***	**0.011**††
Which specialties have the most job opportunities?	0.706	0.46
Which specialties have the highest paying opportunities?	0.228	**0.049**†††
Which specialties have the most support from NGOs?	0.098	0.85
Which specialties have the most support from foreign governments?	0.887	0.483
Which specialties have the most support from Ugandan government?	0.110	**0.003**††††
I plan to purse graduate training outside of Africa	**0.027****	0.321
I plan to practice outside of Africa	0.18	0.942
I plan to practice always in Uganda	0.36	0.389
I plan to practice always in Africa	0.82	0.978
Given the opportunity to pursue training abroad, I would take it	0.236	0.346
Given the opportunity to work abroad, I would take it	0.238	0.438
I have plans to train abroad, but will return to Africa	0.429	0.564
It is important for doctors to stay in Uganda	0.230	0.539
It is important for doctors to take the best opportunities, even if that means leaving Africa	0.314	0.942

Significant *p* values are indicated in bold

P values are from Fisher's exact tests comparing responses between male and female students and between lowerclassmen and uppclassmen

†Upperclassmen were more certain of their planned specialty

*Females were more likely to think that emergency medicine and psychiatry are most needed, while males were most likely to think that neurosurgery, surgery, and urology were most needed

††Upperclassmen were more likely to think that emergency medicine is most needed, while lowerclassmen were more likely to think that infectious disease and neurosurgery were most needed

†††Upperclassmen thought that anesthesia and obstetrics were high-paying, while lowerclassmen thought infectious disease would be high-paying

††††Upperclassmen thought that obstetrics had more support from the Ugandan government, while lowerclassmen thought infectious disease, medicine, pediatric and basic science had more support

**Females were more likely to have plans to train outside of Africa

obstetrics would garner the highest pay, while lowerclassmen thought that infectious disease would yield the highest pay ($p = 0.049$).

Opportunities and "brain drain"

Students indicated that job opportunities in private practice, government practice and NGOs were important factors when choosing a specialty (Fig. 2). Fifty-three (70% of question respondents) indicated mild or strong agreement when asked if they had plans to leave Africa for residency and 29 (38% of question respondents) agreed that they had plans to practice outside of Africa (Fig. 3a). Female students were more likely than male students to have a plan for residency outside of Africa ($p = 0.027$). However, given the opportunity to pursue residency or practice outside of Africa, 53 (70% of question respondents) and 48 (64% of question respondents) said they would take the opportunity, respectively (Fig. 3b). When asked if it was important for doctors trained in Uganda to stay in Uganda, there was an even distribution of responses (Fig. 4a). However, when asked if it is important for doctors trained in Uganda to take the best opportunities, even if that means leaving Uganda, 54 students (71% of question respondents) agreed to that statement.

Discussion

Gender differences

In this study, we observed minor differences between female and male students. Women placed a higher importance on advice from mentors and choosing specialties with a lower stress burden. Men placed a higher importance on having opportunities in NGOs and academic opportunities. Female students were more likely than male students to have a plan for residency outside of Africa, and

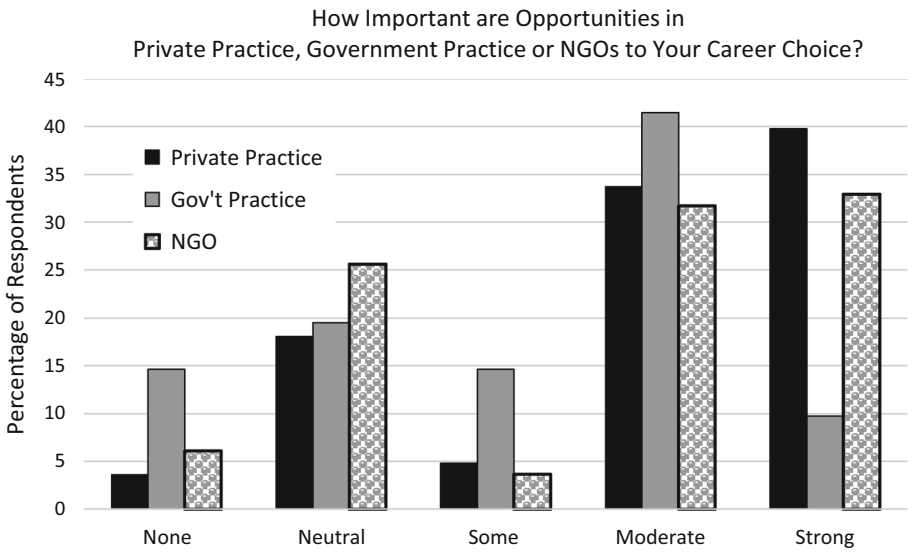

Fig. 2 Importance of job opportunities in medical student career choices

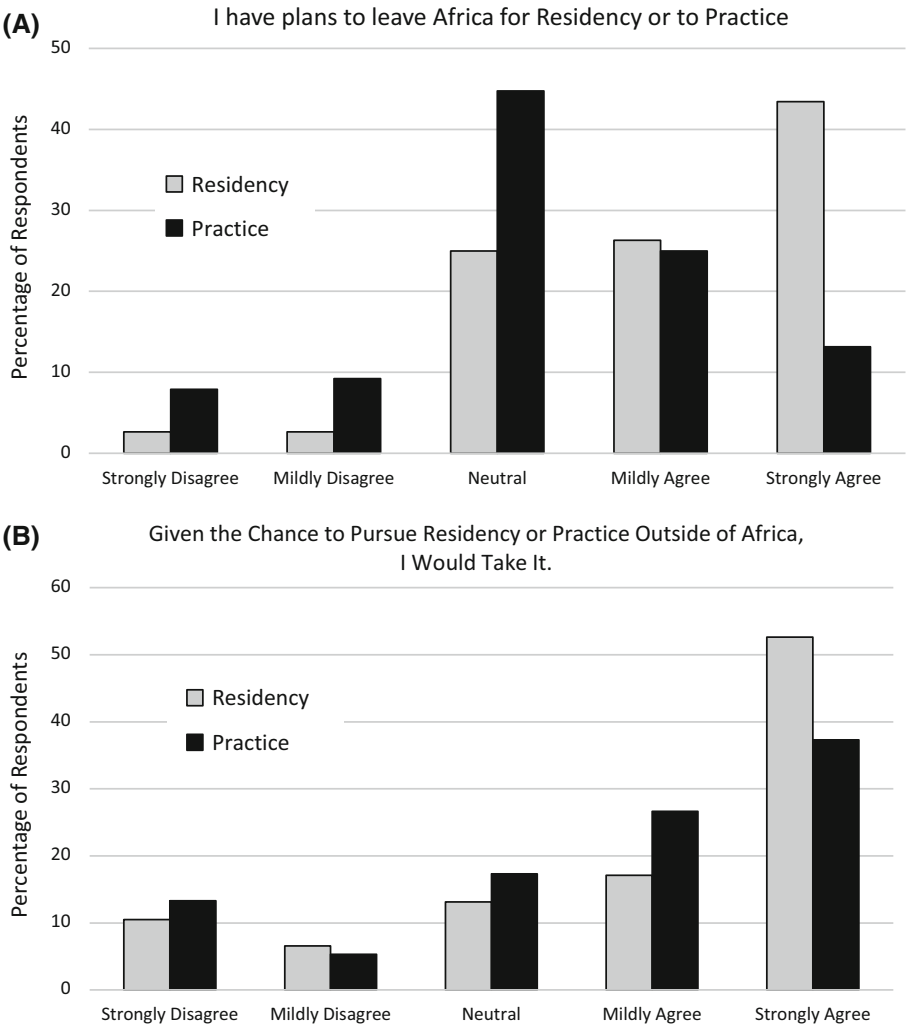

Fig. 3 **a** Medical student plans to leave Africa. **b** Attitudes of medical students toward opportunities to leave Africa

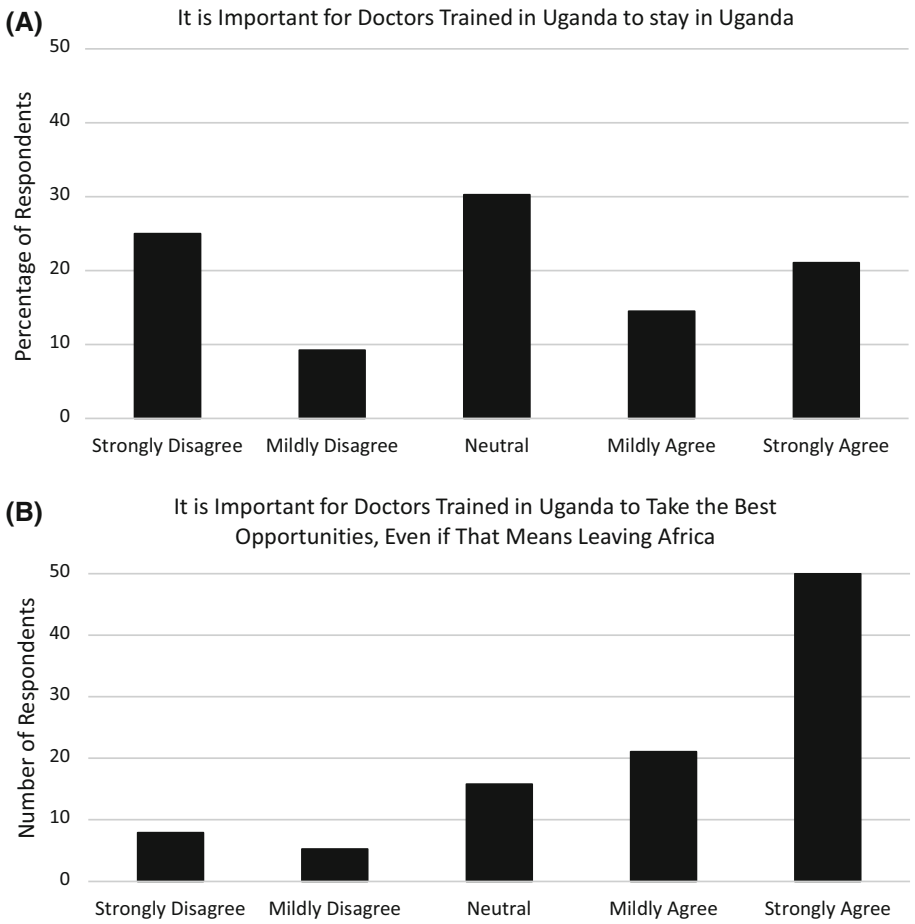

Fig. 4 **a** Medical student attitudes toward the importance of staying in Uganda. **b** Medical student attitudes regarding doctors taking the best opportunities

a previous study from South Africa demonstrates this same trend [11]. It is unclear why females were more interested to leave the continent but speaks to the importance of addressing the concerns of women in the African physician workforce. A previous study from Rwanda has shown that male students were more likely to choose surgery than female students (47% vs. 20%), but when asked about which specialty would be preferred under ideal circumstances with all variables controlled, the number of women who would choose surgery doubled to 41% [5]. These data suggest that further research regarding the experience of women surgeons in Africa is needed, and perhaps there are areas that can be addressed which would encourage greater recruitment and retention of female surgeons in Africa. As one example, Women in Surgery Africa (WISA) has several ongoing initiatives to support women surgeons [12].

Influencing medical students to choose a surgical career globally

Medical student career choices are shaped by multiple factors when considering different health systems and diverse geographic and politic regions. In Japan, desire for rural practice and a fulfilling lifestyle were important factors, while presence of medical relatives in that specialty and scientific orientation did not seem to be of much importance [13]. In Kuwait, economic and social incentives were vital determinants of career choice as 28% of students stated that having a high monthly income was important and 31% stated that they were looking for a specialty with a good reputation and prestige [14]. Personal intelligence, ability and career opportunities were important for Taiwanese students [15]. Studies conducted in the USA have shown that medical students understand very early in their careers which specialties are economically more desirable [16].

Previously, surgical specialties have matriculated more males than females [17], but there are many other factors that lead students to choose a surgical career. In Nigeria, male gender, single status, having a surgeon as a role model in medical school and having a surgeon as a first-degree family member were associated with selecting a career in surgical subspecialties. One study from Sudan found that having a high income and advice from others were the most common reasons to choose surgery [18]. In the USA, mentorship, surgical experience, stereotypes,

exposure, and personal factors have been shown to be influential in medical students' choices to pursue surgery [19]. A previous study in Uganda demonstrated that male gender and having a surgeon as a role model were significant independent predictors of a future career in surgery, but this study did not examine the influence of health funding priorities [20].

Surgical care and anesthetic care are vital to achieve the Sustainable Development Goals, but most funding directed toward sub-Saharan Africa has still not focused on surgical care [21]. In Rwanda, medical students were unlikely to choose anesthesiology as a career due to low job opportunities [22], which stands in contrast to the great *need* for anesthesia care in this country. A previous survey of medical students in Ghana has shown that students would agree to work in a rural post if there was improved infrastructure, supportive leadership and a 100% salary bonus [23]. In high-income countries, financial compensation and job opportunities have been shown in multiple studies to influence specialty choice [24–26]. It stands to reason that doctors training in low- and middle-income countries may tend to gravitate toward careers that are likely to garner outside funding and support from governmental and non-governmental organizations. After all, no surgeon wants to work diligently through medical school and surgical residency, and then find that there is a scarcity of jobs or resources in the healthcare system to support their career.

In the current study, we found that employment opportunities had a strong influence on medical student career choices, while filling an underserved specialty was near the bottom of the list. Likewise, students asserted that the specialties of infectious disease, obstetrics and pediatrics drew the most support from foreign and domestic sources. It is therefore not surprising that 93% of study respondents were planning to pursue residency training in infectious disease, given the historical funding priorities in HIV, malaria and tuberculosis in sub-Saharan Africa. The ministry of health and various non-governmental organizations have previously tried to support underserved clinical specialties through sponsorship of residency training, and there has also been a substantial shift in the burden of disease to non-communicable diseases [27], but this has not been reflected in career plans for students.

Preventing brain drain and encouraging surgical careers

This study observed that 70% of respondents had plans to leave Africa for residency and 71% of respondents felt that doctors should take the best opportunities available, even if that means leaving Africa. This large number of medical students having a plan to leave Africa is alarming, and consistent with other reports about the migration of African doctors to high-income countries. In one review, over the period of 2005–2015, it is reported that 13,584 international medical graduates who are practicing in the USA were educated in African medical schools. Egypt, Nigeria, South Africa, Ethiopia and Ghana accounted for the majority of African migration, but Makerere University was listed as one of the medical schools that supplied over 100 medical graduates to the USA in this time period [28]. This, of course, does not include those African graduates who pursued opportunities in other high-income settings besides the USA.

In contrast, the College of Surgeons of East, Central and Southern Africa (COSECSA) has shown that for those doctors who completed a surgical residency in Africa, the retention rate was 93% within Africa and 85% within in the country where they trained. These data suggest that one strategy to prevent "brain drain" and to increase the numbers of surgeons in sub-Saharan Africa is to offer more opportunities to pursue graduate surgical education in Africa and then provide attractive employment opportunities upon residency completion. In addition, the Community Based Education and Service (COBES) program has recently been developed at Makerere University to provide students with early exposure to rural service and community care [29]. This information is invaluable from a policy making perspective and in preparing for the future supply trend of healthcare professionals in the country. As multiple African countries seek to improve surgical and anesthetic capacity, we would recommend: (1) Increased advocacy for surgery and anesthesia in Ministries of Health and other high government offices. (2) NGOs and foreign aid organizations should coordinate with local stakeholders to align available aid with the burden of disease and vision of local healthcare leaders. (3) Jobs and grant opportunities should be created for graduating surgeons and anesthesiologists.

Study limitations

This was a single-site study and may not represent the beliefs and attitudes of Ugandan medical students from different regions or other African countries. The study was also limited by the nature of electronic mail access in Uganda, in that nearly all students have private email accounts. This limited our ability to contact all students for participation in the survey. There was a low response rate, which may be attributed to cultural norms that value in-person over electronic communication. The low response rate may have contributed to selection bias.

Conclusion

The surgical workforce in sub-Saharan Africa must be expanded to achieve universal access to surgical care and African medical students should be encouraged to pursue surgical careers and practice in their home countries. In the current study, medical students in Uganda acknowledged that specialties most aligned with the Sustainable Development Goals are heavily supported by foreign and domestic resources. Students also expressed the importance of African doctors taking the best opportunities available to them. As such, most students were planning a career in infectious disease and many students had plans to leave Africa for residency training. In order to avoid "brain drain" and encourage students to pursue careers in surgery, career opportunities including surgical residencies and post-residency positions must be prioritized and supported in sub-Saharan Africa.

Appendix: Survey questions

For the following questions, please choose one of the following specialties: (Anesthesia, Dermatology, Emergency Medicine, Infectious Disease, Internal Medicine, Neurology, Neurosurgery, Obstetrics and Gynecology, Orthopedic surgery, Pathology, Otolaryngology, Pediatrics, Psychiatry, Radiology, General Surgery, Urology)

Please enter the specialty that you are planning to pursue in your career:

In your opinion, in which specialties does Uganda have the greatest need for more doctors:

Please indicate which specialties have the most job opportunities available:

Please indicate which specialties have the highest paying job opportunities available:

Which specialties have the most financial support from non-profit organizations?

Which specialties have the most financial support from foreign government sources?

Which specialties have the most financial support from the Ugandan government?

Please rank the following factors according to their importance in your career choice:

	No influence	Some	Neutral	Moderate	Strong influence
Employment opportunities	1	2	3	4	5
Job security	1	2	3	4	5
Intellectual challenge	1	2	3	4	5
Lifestyle after training	1	2	3	4	5
Relationships with patients	1	2	3	4	5
Academic opportunities	1	2	3	4	5
Work hours	1	2	3	4	5
Stress	1	2	3	4	5
Lifestyle during training	1	2	3	4	5
Financial compensation	1	2	3	4	5
Advice from family	1	2	3	4	5
Advice from friends	1	2	3	4	5
Advice from mentors	1	2	3	4	5
Inspiring role model	1	2	3	4	5
Prestige	1	2	3	4	5
Current financial difficulty	1	2	3	4	5
Fit with my personal skills	1	2	3	4	5
Filling an underserved specialty	1	2	3	4	5
Opportunity in private practice	1	2	3	4	5
Opportunity in government practice	1	2	3	4	5
Opportunity in NGO	1	2	3	4	5

Please rank the following according to your future career plans and desires:

	Do not agree	Neutral	Some	Moderate	Strongly agree
I plan to pursue residency training outside of Africa	1	2	3	4	5

	Do not agree	Neutral	Some	Moderate	Strongly agree
I plan to practice medicine outside of Africa	1	2	3	4	5
I plan to practice medicine always in Uganda	1	2	3	4	5
I plan to practice medicine always in Africa	1	2	3	4	5
I do not have plans to leave Africa, but if given the opportunity to pursue training abroad, I would take it.	1	2	3	4	5
I do not have plans to leave Africa, but if given the opportunity to work abroad, I would take it.	1	2	3	4	5
I have plans to pursue some training abroad, but I plan to return to Africa.	1	2	3	4	5
It is important for doctors trained in Uganda to stay in Uganda.	1	2	3	4	5
It is important for doctors trained in Uganda to take the best opportunities, even if that means leaving Africa.	1	2	3	4	5

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