ORIGINAL CLINICAL RESEARCH REPORT

Women Anesthesiologists in Sub-Saharan Africa in the Pre-COVID Era: A Multinational Demographic Study

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BACKGROUND: Gender imbalance and poor representation of women complicate the anesthesiology workforce crisis in sub-Saharan Africa (SSA). This study was performed to obtain a better understanding of gender disparity among medical graduates and anesthesiologists in SSA.

METHODS: Using a quantitative, participatory, insider research study, led by female anesthesiologists as the national coordinators in SSA, we collected data from academic or national health authorities and agencies. National coordinators were nominees of anesthesiology societies that responded to our email invitations. Data gathered from 13 countries included information on medical graduates, anesthesiologists graduating between 1998 and 2021, and number of anesthesiologists licensed to practice in 2018. We compared data between Francophone and Anglophone countries, and between countries in East Africa and West Africa/Central Africa. We calculated anesthesiology workforce densities and compared representation of women among graduating anesthesiologists and medical graduates.

Data analysis was performed using linear regression. We used F-tests on regression slopes to assess the trends in representation of women over the years and the differences between the slopes. A value of $P < .050$ was considered statistically significant.

RESULTS: Over a 20-year period, the representation of female medical graduates in SSA increased from 29% (1998) to 41% (2017), whereas representation of female anesthesiologists was inconsistent, with an average of 25%, and lagged behind. Growth and gender disparity patterns were different between West Africa/Central Africa and East Africa. Representation of female anesthesiologists was higher in East Africa (39.4%) than West Africa/Central Africa (19.7%); and the representation of female medical graduates in East Africa (42.5%) was also higher that West Africa/Central Africa (33.1%).

CONCLUSIONS: On average, in SSA, female medical graduates (36.9%), female anesthesiologists (24.9%), and female anesthesiology residents projected to graduate between 2018 and 2022 (25.2%) were underrepresented when compared to their male counterparts. Women were underrepresented in SSA, despite evidence that their representation in medicine and anesthesiology in East African countries was rising. (Anesth Analg 2023;XXX:00–00)

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KEY POINTS

- **Question:** Amidst the workforce crisis, is there gender disparity among medical graduates and anesthesiologists in sub-Saharan Africa?
- **Findings:** In West Africa/Central Africa, women represented 33.1% of medical graduates and 18.9% of anesthesiologists while in East Africa, women represented 42.5% of medical graduates and 37.2% of anesthesiologists.
- **Meaning:** The gender disparity in medicine and anesthesiology should be tracked, and deliberate plans designed to increase the admission of women into medical schools and anesthesiology residency programs.

To achieve a reasonable standard of health care, low- and middle-income countries (LMICs) should aim to have at least 4 anesthesiologists per 100,000 of the population.[1] Of the 46 countries classified by the UN as sub-Saharan Africa (SSA), 43 countries have fewer than 1 anesthesiologist per 100,000 population indicating a severe anesthesiology workforce crisis.[2] South Africa has the highest workforce density in SSA with 3.3 anesthesiologists per 100,000 population. By comparison, Saudi Arabia has 4.76, China has 5.12, Brazil has 11.55, the United Kingdom has 17.85, the United States has 20.82, Russia has 20.91, Australia has 23.09, and Greenland has 33.96 anesthesiologists per 100,000 population respectively.[2,3] Compounding the anesthesiology workforce crisis in SSA countries is the gross limitation in clinical training capabilities,[2,4–6] not excluding a general lack of education from childhood. Without appropriate anesthesiology capacity building, the crisis will remain for many years in SSA.[1,7]

Further complicating this crisis is a gender imbalance and poor representation of women in the anesthesiology workforce, leadership, and research.[8–10] Zoumenou et al showed that, even with a trend of increasing female medical graduates over a 20-year period, only 15% of medical graduates were women.[5] In most high-income countries, it is well recognized that women are underrepresented in anesthesiology compared with the proportion of women in medicine.[11–13] An analysis of data on graduate medical education in the United States, from 2013 to 2019, showed that female anesthesiology residents dropped from 36% in 2013 to 33% in 2019.[13] Various pathways are being suggested and explored on how to improve gender balance,[14] promote gender diversity, equity, and inclusion in anesthesiology.[15–17]

This African study was performed to obtain a better understanding of gender disparity among medical graduates, residents in anesthesiology, and anesthesiologists in SSA.

METHODS

This was a quantitative, participatory, insider research study led by female anesthesiologists working in SSA. All requested data were publicly available, and consent and regulatory requirements for this study were country-specific and compliant. Data were collected between July 2018 and May 2019. We considered the 46 SSA countries with a total population of 1.06 billion in 2017.[18] To facilitate data analysis and comparison, we included countries with a population of more than 3 million, more than 3 anesthesiologists, and a socio-political condition that was anticipated to allow study completion.[19,20] We excluded countries with fewer than 3 anesthesiologists because they were unlikely to send data on workforce and training and were not registered with the World Federation of Societies of Anesthesiologists (WFSA). We ended up with 13 participating countries.

A representative medical school was selected in each country based on the school being the first to begin an anesthesiology training program as well as the administrator's willingness and capacity to provide data.

To recruit a female anesthesiologist as a study coordinator for each selected country, invitations were sent by email obtained through personal contact or via each national anesthesiology society. Data collection templates and procedures were prepared collaboratively by the 2 project coordinators and the 13 national coordinators, and English/French data templates were used. All communications were in both French and English (Supplemental Digital Content 1–3, Supplemental Tables 1, 2, and 3, http://links.lww.com/AA/E675, http://links.lww.com/AA/E676, http://links.lww.com/AA/E677).

Data Collection

Data were collected by each national coordinator from the representative medical school. Whole-country anesthesiologists' data were collected from academic or national health authorities, and national medical council registers. Complementary and confirmatory sources included data obtained from official members of national societies of anesthesiologists.

The data sets included:

Data set 1: The number of male and female medical doctors graduating from 1 representative medical school per year from 1998 to 2017 in participating countries.

Data set 2: The number of male and female anesthesiologists who completed their specialist training per year from 1998 to 2017, as well as the number of

male and female residents expected to complete a training program before 2022.

Data set 3: The number of male and female anesthesiologists registered to practice in each country by December 31, 2018, irrespective of where they obtained their training. This included anesthesiologists in each country working in public, private, and tertiary hospitals regardless of age, nationality, and time spent on clinical tasks. Sub-Saharan African anesthesiologists practicing abroad were omitted.

The data for medical graduates and anesthesiology graduates were obtained from the same university unless otherwise stated. All data were pooled together into 1 Excel spreadsheet by the project coordinators, and then sent to the national coordinators for corrections. Data were then anonymized by the 2 project coordinators and verified for coherence (Supplemental Digital Content 1–3, Supplemental Tables 1, 2 and 3, http://links.lww.com/AA/E675, http://links.lww.com/AA/E676, http://links.lww.com/AA/E677). Subsequently, data were validated and rechecked by the national coordinators.

Analysis

Country selection process is shown in Figure 1. For analysis, the 13 countries with completed data were grouped into 3 according to the national official language and their affiliation with either a French, English, or Portuguese postgraduate training program, and their board certification agency. The countries were further grouped into 2 according to their geographical regions, namely East African countries, and West African/Central African countries. The West and Central African countries were grouped together because of their proximity and affiliations with the West African College of Surgeons (WACS). The situation of Cameroon between the Central and Western regions of Africa is geographically described as West-Central Africa.

Data comparisons were made between Francophone and Anglophone countries, and between countries in East Africa and West Africa/Central Africa. Statistical data analysis was performed using linear regressions. *F*-tests on regression slopes were used to assess the trends in the representation of women over the years and the differences between the slopes. Statistical significance was defined as $P < .05$.

RESULTS

Data Recovery Rates

Two countries had no anesthesiology graduate data in the first 2 years (1998–1999) of the study period making the data collection recovery rate 98.7% (Supplemental Digital Content 1, Supplemental Table 1, http://links.lww.com/AA/E675). Four universities had no data for medical graduates for periods ranging from 1 to eleven years making the overall medical graduates data collection recovery rate 92.7% (Supplemental Digital Content 2, Supplemental Table 2, http://links.lww.com/AA/E676). The 13 participating countries completed the 2018 anesthesiologists' workforce data; thus, data collection recovery rate for their national anesthesiology workforce was 100% (Supplemental Digital Content 3, Supplemental Table 3, http://links.lww.com/AA/E677).

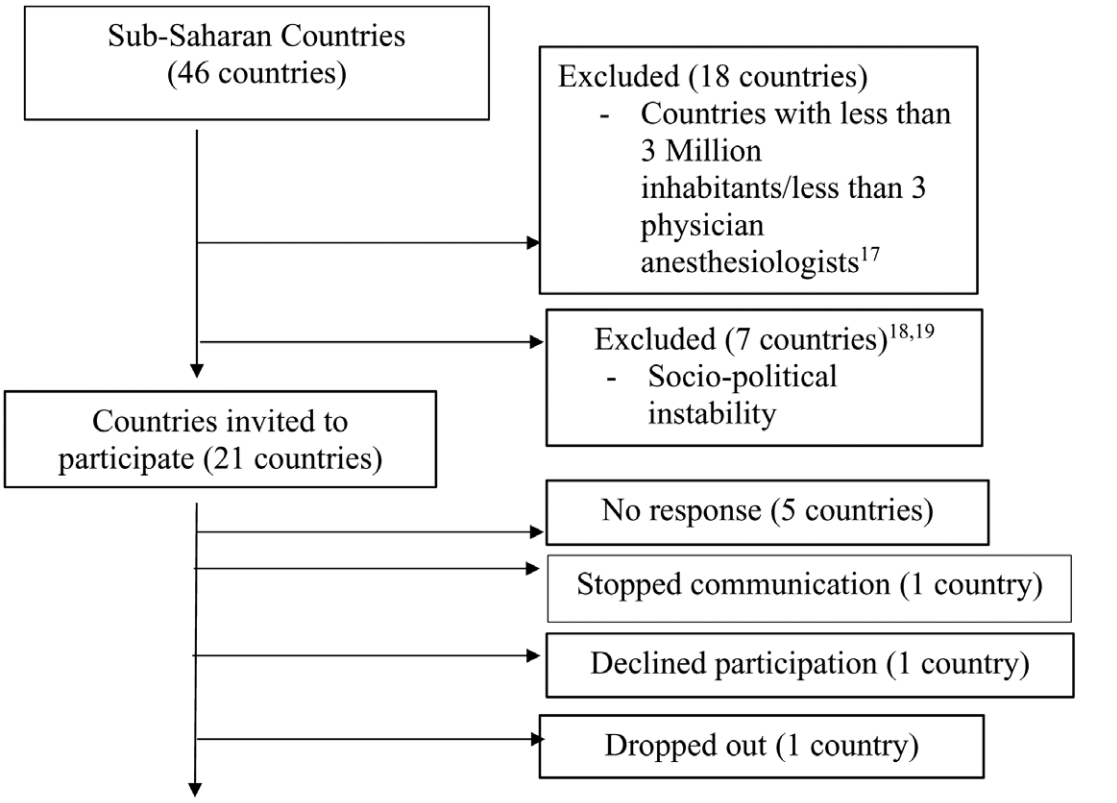
Medical Graduates

All the 13 participating universities had complete data for 8 out of the 20-year period with the first set of complete data in 2007 (Supplemental Digital Content 2, Supplemental Table 2, http://links.lww.com/AA/E676). The total number of medical graduates in the participating universities in 2007 was 1624 of whom 553 (34%) were females, and in 2017 it was 2017 of whom 837 (41%) were females. This was an increase of 24.2%. For the 20-year period (1998–2017) the total number of male medical graduates, 17,878 (63%) outnumbered the female medical graduates, 10,462 (37%). The trend over time is shown in Figure 2.

Graduating Anesthesiologists

For the 20-year period (1998–2017) the total number of anesthesiologists graduating from the 13 countries was 875 of whom 657 (75%) were male and 218 (25%) were female (Supplemental Digital Content 1, Supplemental Table 1, http://links.lww.com/AA/E675). Figure 3 shows the trend over time in the 13 countries and the projections from 2018 to 2022. The yearly numbers were inconsistent and varied: 6 in 1999 (of whom 50% were female), 59 in 2009 (of whom 19% were female), and 209 anesthesiologists, the highest number, projected to graduate in 2019 (of whom 24% were female). Notably, male anesthesiologists outnumbered females in all years including the projections for 2019.

The patterns of underrepresentation of female anesthesiologists from the 13 SSA countries and female medical graduates from the 13 participating universities were dissimilar (Figure 4). The representation of female medical graduates increased from 21% (215) in 1998 to 41% (837) in 2017, growing at 0.55% per year (95% confidence interval [CI], 0.41%–0.68%; F = 56.7; $P < .001$). The representation of female anesthesiologists showed an increase from 2004 at 0.49% per year (*F*-test) (95% CI, –0.10%, 0.82%; $P = .15$).



The 13 countries in final analysis according to geographical regions		
East African Group = 5 Kenya Madagascar Mozambique Rwanda Uganda	West Africa/Central African Group = 8	
	West African Group = 6 Benin Burkina Faso Côte d'Ivoire Niger Nigeria Senegal	Central African Group = 2 Cameroon Congo Brazzaville
The 13 countries in final analysis according to language		
Anglophone countries = 4 Nigeria Kenya Rwanda Uganda	Francophone countries = 8 Benin Burkina Faso Côte d'Ivoire Niger Senegal Cameroon Congo Brazzaville Madagascar	Lusophone (Portuguese-speaking) country = 1 Mozambique

Figure 1. Sub-Saharan African countries recruitment.

Female Medical Graduates, West Africa/Central Africa Versus East Africa Groups

Figure 5A (and Supplemental Digital Content 4, Supplemental Table 4, http://links.lww.com/AA/E678) shows the percentage of female medical graduates of the 13 representative universities. The trend was stable in the East African group, averaging 43% (±5 % SD, P = .16), but increased in the West Africa/

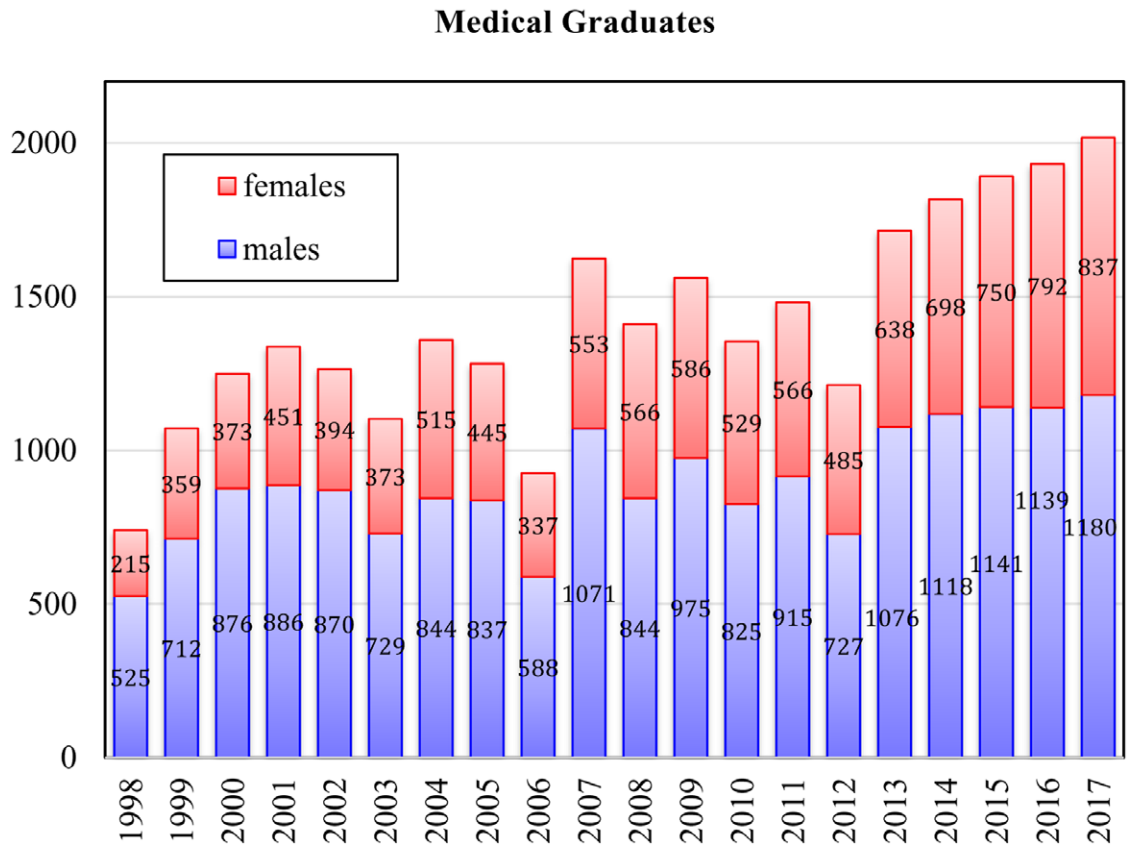


Figure 2. Trends in the numbers of male and female medical graduates in 13 sub-Saharan Africa countries from 1998 to 2017 (n = 28,340 total medical graduates in 13 countries in the given time period; women = 10,462 [36.9%] and men = 17,878 [63.1%]).

Central Africa group, from 17% (1998) to 38.1% (2017), at a growth rate of 0.98%, with the highest representation 39.3% in 2010 ($P < .001$). Both curves converged around 2019 to 2020 (red dot) at ±42 % female graduates. There was a significant difference between the growth trend of female medical graduates in the East and West/Central Africa Groups ($P < .001$).

Female Anesthesiology Graduates, West Africa/Central Africa Versus East Africa Groups

Figure 5B (Supplemental Digital Content 5, Supplemental Table 5, http://links.lww.com/AA/E679) shows that the West Africa/Central Africa group of countries had higher absolute numbers but lower representation of female anesthesiologists, 225 (19.8%) compared with the East Africa group, 163 (39.5%). $P = .029$ for anesthesiologists alone, and $P = .023$ when both anesthesiologists and those expected to graduate between 2018 and 2021 were combined. There was no convergence between West Africa/Central Africa and East Africa groups. The average annual growth rate of female representation in anesthesiology in East Africa is 1.5%. The representation pattern of female anesthesiologists in West Africa differs from the pattern in East Africa ($P < .001$ West Africa/Central Africa versus East Africa).

Female Medical Graduates, Francophone Versus Anglophone

Figure 6A shows the representation trends of female medical graduates in Francophone (n = 6868, 37%) and Anglophone (n = 2811, 35%) countries from 1998 to 2017. The representation of Anglophone female medical graduates increased from 13% in 1998 to 43% in 2017, while Francophone female medical graduates increased from 31% in 1998 to 41% in 2017, both increasing in a similar pattern ($P < .001$) and not significantly different from each other ($P = .055$). Details are in Supplemental Digital Content 6, Supplemental Table 6, http://links.lww.com/AA/E680.

Female Anesthesiology Graduates, Francophone Versus Anglophone

Figure 6B shows that women averaged 28% of graduating anesthesiologists in Anglophone countries and 21% in Francophone countries ($P = .20$ and $P = .95$ respectively, with no significant difference, $P = .60$). Details are in Supplemental Digital Content 7, Supplemental Table 7, http://links.lww.com/AA/E681. Mozambique, a Portuguese-speaking country, was not included in the comparison between Francophone and Anglophone groups because the

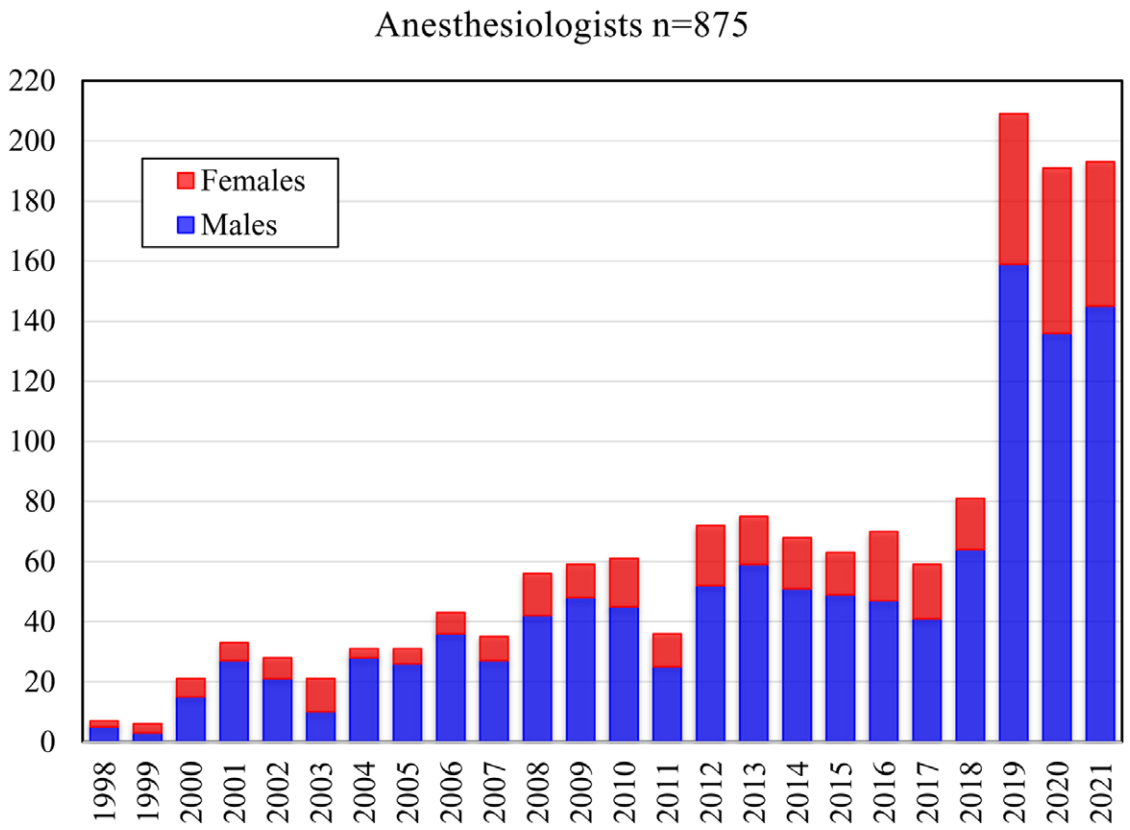


Figure 3. The annual output of anesthesiologists in 13 sub-Saharan Africa countries from 1998 to 2017. Total output in 20 y (n = 875; 218 women [24.9%] and 657 men [75.1%]). Projected output from 2018 to 2021 (n = +674; 170 women [25.2%] and 504 men [74.8%]).

numbers were small (35 anesthesiologists in 20 years, f = 21, m = 14).

Anesthesiologist Workforce Density and Gap

The total number of anesthesiologists registered to practice in the 13 SSA countries in 2018 was 975 (Supplemental Digital Content 3, Supplemental Table 3, http://links.lww.com/AA/E677). The countries had a combined population of 482.9 million, with 159.5 million for East Africa and 323.4 million for West Africa. The average anesthesiologist workforce density was 0.20 per 100,000 population, ranging from 0.08/100,000 to 0.49/100,000. The representation of female anesthesiologists practicing in the 13

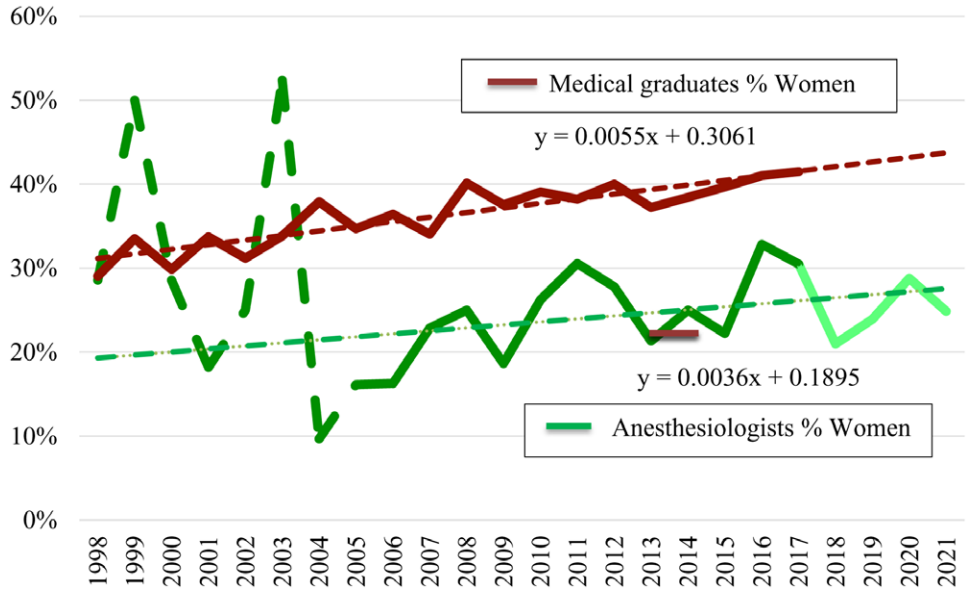


Figure 4. The annual representation of female medical graduates from 13 universities and output of anesthesiologists from 13 countries.

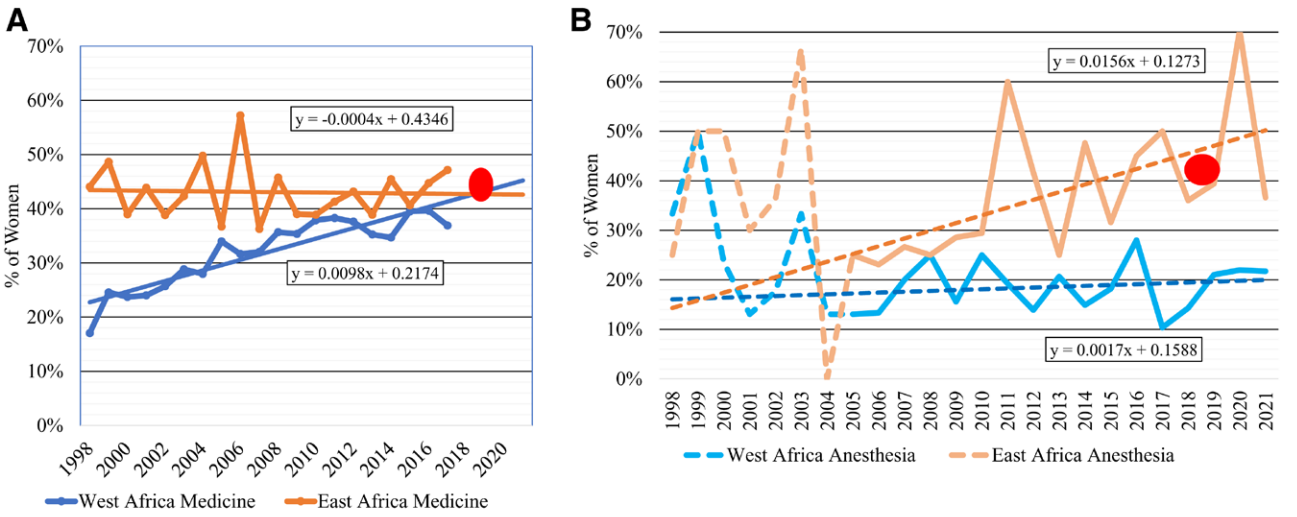


Figure 5. Representation of female medical graduates of 13 representative universities and female anesthesiologists from 13 countries in SSA: West African/Central African Group versus East African Group in the WASA study. A, Percentage of female medical graduates in West African/Central African Group (n= 5588, 33.1%) and East African Group (n = 4874, 42.5%) from 1998 to 2017. Both curves converged around 2019 to 2020 (red dot) at ±42% female graduates. B, Percentage of female anesthesiologists in West African/Central African Group, 111 (18.9%) anesthesiologists +114 (20.8%) due to graduate from 2018 to 2021 = 225 (19.8%); and from East African Group, 107 (37.2%) anesthesiologists +56 (44.4%) due to graduate from 2018 to 2021 = 163 (39.5%). Absolute numbers are exceedingly small before 2005, thus slopes are calculated for subsequent years only. $P = .023$ when anesthesiologists were combined with anesthesiologists due to graduate (2018–2021). No convergence. SSA indicates sub-Saharan Africa; WASA, Women Anesthesiology Specialists in Africa.

countries varied between 9% and 49% with an average of 30.2 %. By region, the anesthesiologist density in East African countries was 0.26 per 100,000 population, while it was 0.19 per 100,000 population in West Africa/Central Africa.

DISCUSSION

The principal finding in our study was that the representation of women in anesthesiology lagged behind when compared to the representation of women in medicine, suggesting gender disparity in anesthesiology in the 13 SSA countries studied. Our findings were similar to other parts of the world, in that the rate of increase in the representation of women was significantly higher for medical school graduates when compared with anesthesiology residents ($P < .001$) and anesthesiologists ($P < .05$).[21,22]

In our study, there was a sustained growth rate of female medical graduates from 1998 (29%) to 2017 (41%), while no significant growth in the percentage of female anesthesiologists was observed (Figure 4). In addition, the number of female anesthesiologists was

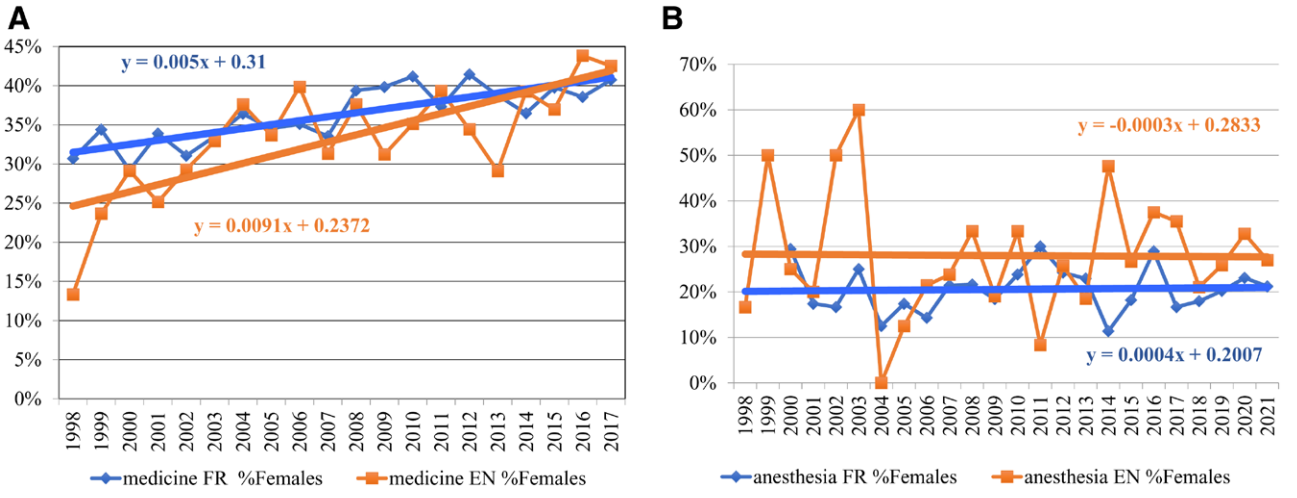


Figure 6. Representation of female medical graduates of 13 representative universities and female anesthesiologists from 13 countries in SSA: Francophone and Anglophone groups. A, Representation trends of female medical graduates in Francophone universities (FR) n = 6868 (37%) and Anglophone universities (EN) n = 2811 (35%) from 1998 to 2017. B, Representation trends of female anesthesiology graduates (1998–2018) and those projected to graduate (2008–2021) in Francophone countries (FR) n = 165 (21%) and Anglophone countries (EN) n = 202 (28%) from 1998 to 2021. EN indicates English-speaking; FR, French-speaking; SSA, sub-Saharan Africa.

too small to allow meaningful interpretation of representation and trend before 2005. The details are available in Supplemental Digital Content 1, Supplemental Table 1, http://links.lww.com/AA/E675. With 95% CI, −0.10% to 0.82% and $P = .15$, there was no statistical evidence to conclude there was growth in the percentage of female anesthesiologists.

Although the rate of growth did not exceed 0.55% for female medical graduates and 0.49% for female anesthesiologists, the onset and pattern of growth were different, resulting in a smaller representation of female anesthesiologists. While female representation in anesthesiology was changing at a rate not statistically significantly different than that of female medical graduates ($P = .38$), there was significant evidence that the rate was substantially lower ($P < .001$), suggesting that the rate of growth for female anesthesiologists was lagging, relative to the growth rate of female medical graduates. This pattern is similar to that observed in Australia, Belgium, Canada, Ireland, New Zealand, and the United Kingdom where the percentage of female medical graduates was found to be between 47% and 55% while anesthesiology had a smaller percentage (37%–48%) of female graduates.[21,23]

Our findings suggest that the pattern of representation of female anesthesiologists in West Africa/Central Africa was different from the increase observed in East Africa. This may be related to the poorer ranking of the gender inequality index (GII) in the West Africa/Central African countries compared with the East African countries.[24,25] The GII is a composite measure that reflects the inequality in the achievements of men and women in reproductive health, political empowerment, and the labor market.

While there was a significant and rapid increase over time in the representation of female medical graduates in the West African group, it plateaued in the East African group with convergence in 2019. The reasons for this representation pattern of medical graduates in SSA require further research. Our sample using 1 representative medical school from each of the 13 Women Anesthesiology Specialists in Africa (WASA) countries and our data show that women and men are not equally represented in medical school classes. Creating awareness of gender representation is a step in the right direction to promote diversity, equity, and inclusion.

Research suggests that gendered languages like French are associated with gender inequality compared with a genderless language such as English.[26] Although we assumed gender equity may be influenced by academic language heritage (French versus English), we did not find any differences in gender equity trends based on language. While our intention was to compare Francophone and Anglophone countries, Nigeria the only Anglophone country in West Africa, demonstrated a gender representation pattern typical of the Francophone countries in West Africa. Mozambique, the only Portuguese-speaking (Lusophone) country showed a reduction in GII from 0.63 in 1990 to 0.54 in 2021,[27] a gender representation pattern similar to the East African group. This confirms that geographical location matters, and countries are more influenced by their neighboring countries,[28] rather than language. For the same reason, we cannot make inferences about other lusophone countries in Africa because they are geographically distant from one another, and they have less frequent contact.

Considering the diverse political landscape of SSA, and the impact of a diverse population and culture on society and health care, the Dakar Declaration, and its Regional Action Plan 2022 to 2030, has committed to establish quality and sustainable surgical, obstetric, and anesthesia care in each African country within the framework of "The Africa we want" Agenda 2063.[29] This Agenda has a broad scope, which includes social, economic and sustainability considerations as well as political, cultural, and other African priorities.

In our data, the total output of graduating anesthesiologists, 1549 from the 13 countries from 1998 to 2021 (23 years), as seen in Figure 5B (Supplemental Digital Content 5, Supplemental Table 5, http://links.lww.com/AA/E679), was inadequate when considering the rate of increase in population of those countries over the years. This is worrisome because it falls short of the minimum recommendation of 4 anesthesiologists per 100,000 population. Likewise, the 28,340 doctors (Supplemental Digital Content 4, Supplemental Table 4, http://links.lww.com/AA/E678) graduating from the 13 representative medical schools in 20 years, suggests there may be a serious medical workforce shortage. The low output of anesthesiologists and the underrepresentation of female anesthesiologists suggest the unpopularity of anesthesiology, as well as gender inequality in SSA. Although our study was not designed to investigate the unpopularity of anesthesiology as a career choice, our study and the already available literature show that this is a major problem.[30–33]

While there are many positive reasons for choosing anesthesiology, different countries also show variations in the percentage of candidates who choose it on graduation from medical school.[33–35] Women generally seek acceptable hours and working conditions, and a career fitting their domestic conditions, and may be less interested in high-income specialties compared to men.[36,37] Future research should explore specialty selection among female medical students and the perceived barriers to a career in anesthesiology especially post-coronavirus disease-2019 (COVID-19).

We note a European survey that showed that considerations related to the partner (lack of support,

career development of partner) were last on the list of variables reported by female anesthesiologists as barriers.[36] While we assume that male doctors find it easier to pursue specialization programs, as well as seek professional training and development outside their home countries, we wondered if these factors explain the male/female disparities in the anesthesiology workforce in SSA.

A study performed in Australia and New Zealand showed that more women (55.3%) than men (10.3%) believed their gender had a negative effect on the way they were treated during anesthesiology training.[38] Notable reasons for low representation of women in anesthesiology in SSA include the perceived long working hours, high-stress levels, insufficient mentorship, and low job opportunity. A study conducted by the American Society of Anesthesiologists (ASA) showed that approximately 1 in 10 female anesthesiologists would counsel a student against a career in anesthesiology due to obstacles pertaining to motherhood.[36] In contrast, a similar French study reported a high proportion (42.7%) of female candidates asking for anesthesiology training posts.[35]

We believe that the absence of anesthesiology training programs in some African countries forced candidates to seek training in neighboring countries or abroad, which is more challenging for women of child-bearing age. For example, Congo and Niger had no postgraduate training program and depended on Benin, Senegal, and Ivory Coast for the training of their anesthesiologists.

The projected increase in the anesthesiology workforce in West Africa by the year 2022, was made because of the 3 different pathways for anesthesiology postgraduate programs available from either the National Postgraduate Medical College of Nigeria (NMPCN) unique to Nigeria; or the WACS, the board certification agency for the region.[39,40] These pathways to anesthesiology practice nationally (for Nigeria) and in the West Africa/Central Africa regions are:

1. An 18-month Diploma in Anesthesia. This qualifies graduates to provide anesthesia services for cesarean delivery, laparotomy, and open fractures (known as the Bellwether procedures) in primary and secondary level hospitals where they can also practice as anesthesiology general practitioners. Perhaps this pathway can be leveraged to attract women into a career in anesthesiology, and eventually increasing the percentage of female anesthesiologists in SSA.
2. A 3-year residency training program leading to a Membership in anesthesiology from either the NPMCN or WACS. This qualifies graduates to provide specialist care.
3. A 5-year residency training program leading to a Fellowship in anesthesiology from either the NPMCN or WACS, thus providing specialist care and research skills required for a career in academics.

It is therefore possible in the West Africa/Central Africa region to start a career in anesthesiology with a diploma in anesthesia, then proceed to get board certified and obtain the membership, and eventually the fellowship, after fulfilling the training requirements. No Francophone country offers 3 pathways, neither do Kenya, Rwanda, or Uganda. Whether the diploma programs will increase women's representation in anesthesiology remains to be seen and the extent to which it succeeds needs to be measured in the future.

The strengths of this study:

1. Thirteen African countries participated representing East, West, and Central Africa. All countries had national societies that provided anesthesiologist workforce data. This study therefore represents the current realities of anesthesiology in SSA and LMICs in Africa.
2. The participating countries were socio-politically stable for the last 25 years, which made the data relatively reliable.
3. The high data recovery rates were remarkable, despite the diversity of participating countries and the initial delay in collecting the data.

Limitations of the Study

1. Seven countries were excluded because of the presumed unreliability of the data secondary to geo-political factors.
2. Medical graduate data came from only 1 university in each country. These universities were selected because they were the first to start an anesthesiology training program in their country, which may not be representative of other universities.
3. The numbers of anesthesiologists were used instead of density. Several studies have shown that 93.5% of the SSA countries have an anesthesia workforce crisis with a density of less than 1 physician anesthesia provider (PAP) per 100,000 population.[2,3,6] This exceptionally low density informed our use of absolute numbers for our study.

For future anesthesiology workforce and gender studies in SSA, approval by countries should be facilitated and bottlenecks for research be removed because human subjects are not involved. We suggest that ethical and scientific committees should enable researchers by providing the necessary waivers and

approvals for cross-national studies. Record keeping must be practiced across SSA to facilitate more collaborative studies. National anesthesiology societies should endeavor to have up-to-date data for their members. Future comprehensive studies must be performed to include data from all medical colleges and universities in SSA. We believe this study will provide a planning tool for national and regional authorities.

CONCLUSIONS

The finding of this study indicates that the representation of female medical graduates has grown in West Africa, while representation of women in anesthesiology lags behind. In contrast, the representation of women in anesthesiology in East Africa seemed to increase in concert with the representation of female medical graduates. Countries in Africa need to intentionally increase the enrollment of women into anesthesiology training programs to increase gender diversity. They also must increase the anesthesiologist workforce density by training more anesthesiologists to implement global surgery objectives, as well as universal health coverage by 2030. Given the high demographic surge in Africa, anesthesia will continue to experience a workforce crisis if deliberate actions are not taken. As a matter of urgency, strategies must be devised to attract women to study medicine and to specialize in anesthesiology.

This study has important implications for physician and anesthesiologist workforce planning in SSA countries and provides a baseline for future assessment.

DISCLOSURES

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