

Availability and distribution of human resources for emergency obstetric care services in Ethiopia

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Abstract

Background: Being able to provide emergency obstetric and newborn care requires a frontline team of skilled personnel that includes physicians, surgeons, anesthetists, nurses, midwives and other cadres. Meeting in-country and international standards for the development and distribution of human resources is a key component of a system-wide strategy to lower maternal and newborn death rates. This study uses the findings from the national Ethiopian Emergency Obstetric and Newborn Care Assessment to provide an overview of the status of human resources for health in the country and the availability, distribution and status of in-service training for EmONC.

Methods: We used a secondary data analysis technique of the 2016 Ethiopia Emergency Obstetric and Newborn Care Assessment that included 3,804 facilities providing childbirth services. Using the data on overall staffing, we calculated the number of midwives, nurses, physicians, general surgeons, neonatologists, emergency surgical-officers and anesthesiologists in order to make comparisons with national and international benchmarks.

Results: Ethiopia met national standards of health facility staffing much more often than international ones. There is a relatively equitable distribution of health worker cadres across regions, location and managing authorities. Despite policies to accelerate the training of midwives, nurses and health officers in the country, large proportion of these professionals had not received in-service training in either basic or comprehensive emergency obstetric and newborn care services, or on neonatal intensive care, which are critical to saving lives when a woman or her newborn develops or is born with severe complications.

Conclusion: This study suggests that national numerical standards are being met but key international standards are not, especially for physicians, nurses and midwives. Although a large proportion of higher-level cadres had training on emergency obstetric and newborn care, the mid-level health workers who attend most births had much lower levels of specialized training. Policies aimed at keeping health workers in the public sector must be implemented in order to prevent more health professionals from clustering in big cities and private facilities.

Keywords: BEmONC, CEmONC, HRH, MCH

Introduction

The effective development and equitable distribution of human resources for health (HRH) is a key priority for all countries because the performance of health systems depends on the knowledge, skills, motivation, and availability of the people delivering care (Faqr et al. 2015; WHO 2010, 2017a). Providing emergency obstetric and newborn care (EmONC) services requires a frontline team of skilled personnel that includes physicians, surgeons, anesthetists, nurses, midwives to clinically manage emergencies and other health cadres who support the frontline team such as laboratory technicians (Faqr et al. 2015; WHO 2016). However, many low and middle-income countries (LMICs) struggle with the effective allocation of resources and personnel, and are not able to provide or implement an effective primary healthcare care delivery model that includes emergency maternity and postpartum care (WHO 2016).

Over thirty years have passed since the launching of the Safe Motherhood Initiative, and although much progress has been made, thousands of women continue to die unnecessarily because of pregnancy or childbirth-related complications (Stanton

et al.2018). The World Health Organization (WHO) estimates that 88-98% of maternal deaths could be averted if women had timely access to facility-based care provided by competent human resources for health (Campbell et al. 2013; Roome et al. 2014; WHO 2017a). This is especially true of sub-Saharan Africa, the region that carries the highest burden of maternal morbidity and mortality in the world.

Ethiopia is one of six countries that contribute to more than 50% of the maternal deaths in the world (WHO 2017a). In an effort to improve its maternal mortality ratio (MMR) of 412/100,000 live births (CSA 2016) and other health indicators, the Federal Ministry of Health (FMoH) developed the Health System

Transformation Plan (HSTP) (FMOH 2015). Among its targets, achieving adequate numbers and a fair distribution of HRH for providing EmONC were highlighted as national priorities. Despite increases in health worker density, as well as in investment in training and hiring HRH, the country has not yet reached international standards, with significant bottlenecks still in place. According to the 2014 State of the World's Midwifery report, the country has only met 32% of its 2030 target for skilled birth attendance (WHO 2017a).

Numerous studies have shown the important role that skilled birth attendance plays in reducing maternal and perinatal mortality (Bhutta et al. 2010), and the Ethiopian government has invested greatly in the development and implementation of policy around increasing the numbers and distribution of skilled HRH. This study uses the findings from the national Ethiopian Emergency Obstetric and Newborn Care Assessment 2016 (EPHI and FMOH 2016) to provide a comprehensive overview of the status of human resources for health in the country and the availability, distribution and status of in-service training for EmONC.

Methods

Study design and data collection: Data were collected from May to October of 2016 from all public and private health facilities that had provided childbirth services in the previous 12 months in all nine regions and both city administrations of Ethiopia. A total of 3,804 facilities were surveyed in this cross-sectional study, and included data from all referral, general and primary hospitals, health centers, and all eligible private clinics, and maternal and child health specialty (MCH) centers and clinics (eligibility was defined by standards set by the Food, Medicine and Healthcare Administration and Control Authority (FMHACA). The HRH data were obtained from the facility officer

in charge, the administrator who worked with payroll, or the person in charge of maternity care.

Data analysis: Using the data on HRH and overall staffing, we calculated the number of midwives per 1,000 institutional deliveries, the number of physicians (general practitioners (GPs), obstetricians and gynecologists (OB/GYN), general surgeons, neonatologists, emergency surgical officers (ESOs) and anesthesiologists), nurses, and midwives per 10,000 population. In addition, we calculated the number of nurses per 5,000 population, the number of midwives per 5,000 population, and number of physicians per 1,000 population in order to make comparisons with international benchmarks. In order to compare results with national standards, region, facility type, managing authority and location calculated the mean number per cadre. The underlying data were tested for normality, and as the distribution was not normal, we used the non-parametric Kruskal-Wallis test to determine differences across regions and managing authority, and the two-sample Wilcoxon Ranks sum test for assessing differences in location. This was carried out using SPSS version 20 and R-commander.

Ethical considerations: Ethical clearance to carry out the assessment was obtained from the Ethiopian Public Health Institute (EPHI) scientific and ethical review board. Verbal informed consent was obtained from all selected health facilities, and data were maintained in a password-protected EPHI server.

Results

Figure 1 shows the human resource minimum requirements established by FMHACA for type of facility and compares them with the assessment results for midwives, nurses, health officers, GPs, ESOs and OB/GYNs. At the time of data collection, only the number of midwives was below FMHACA standards.

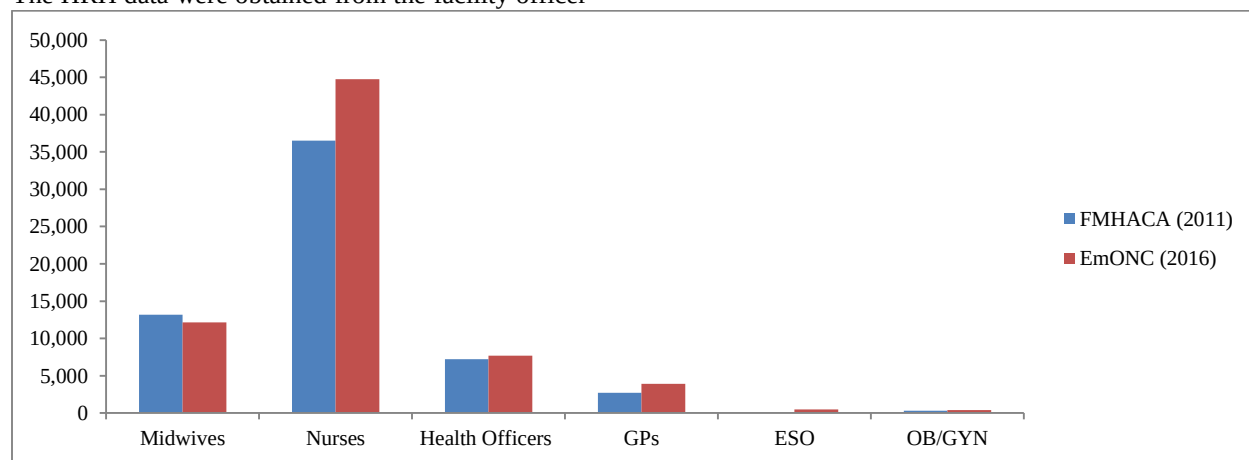


Figure 1: Comparison between FMHACA human resource minimum requirement and the observed number of human resources in facilities, Ethiopia EmONC, 2016

This information is converted into ratios and disaggregated by region in Table 1. The number of midwives per 1,000 institutional deliveries was 6 at the national level. Only the region of Oromia fell below this with only 4 midwives per 1,000 institutional deliveries. Several regions registered more favorable ratios of midwives per 1,000 institutional deliveries, such as Somali (34), Afar (24) and Benishangul-Gumuz (17). Somali and Afar are pastoralist regions, the population is dispersed and relatively few institutional births take place in those regions (FMOH

of Ethiopia, 2011). The ratio of physicians, nurses and midwives per 10,000 population was less than 23 at the national level. This was true for all regions except Harari (31) and Addis Ababa (28). The number of physicians per 1,000 population was less than 1 at the national level, and this was the case for all regions and city administrations. The World Health Organization's minimum standard of at least 1 nurse per 5,000 population was **ml.** in all regions and city administrations, as well as at the national level.

Table 1: Number of midwives per 1,000 annual institutional deliveries, number of physicians/nurses/midwives per 10,000 population, number of physicians per 1,000 population, number of nurses and number of midwives per 5,000 population by region.

	Number of midwives per 1,000 institutional deliveries	Number of physicians ¹ , nurses and midwives per 10,000 population	Number of physicians ² per 1,000 population	Number of nurses per 5,000 population	Number of midwives per 5,000 population
International target	6	23	1	1	1
National	6	6.8	0.1	2.4	0.7
Region					
Tigray	8	9.3	0.1	3.5	0.9
Afar	24	4.2	0.0	1.4	0.5
Amhara	7	5.9	0.1	2.0	0.6
Oromia	4	4.7	0.0	1.6	0.5
Somali	34	4.5	0.0	1.4	0.7
B. Gumuz	17	16.4	0.1	6.9	1.0
SNNP	6	6.9	0.1	2.6	0.6
Gambella	12	12	0.1	5.2	0.5
Harari	10	31	0.4	11.7	1.6
Addis Ababa	13	28	0.4	9.9	2.0
Dire Dawa	10	12.2	0.1	4.6	0.9

^{1,2}Includes all physicians (GPs, OB/GYNs, neonatologists, surgeons, ESOs and anesthesiologists). International targets from (WHO, 2016, 1980).

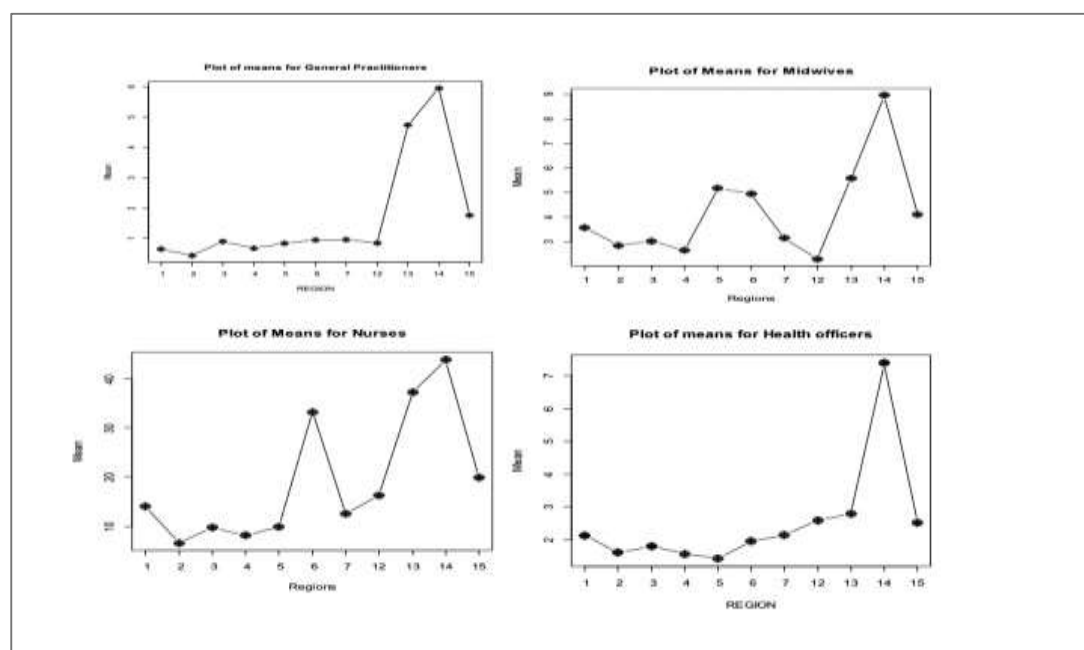
Figure 2 depicts the mean number of General practitioners, midwives, nurses, and health officers by region. On average, the number of physicians per facility in Addis Ababa was 6, followed by 5 in Harari and 2 in Dire Dawa. The mean number of physicians in Afar and Tigray was less than 1. The average number of nurses per facility in Addis Ababa was 44, followed by Harari (37), Benishangul-Gumuz (33), and Dire Dawa (20). For Oromia and Afar, these numbers were 8 and 7, respectively.

The average number of midwives per facility was 9 in Addis Ababa, followed by facilities from Harari, Somali, and Benishangul-Gumuz regions (5). This number was 2 and 1 from facilities in Afar and Gambela, respectively. On average, the highest number of health officers per facility was observed in Addis Ababa (7), and the lowest was in Somali (1). Based on the Kruskal-Wallis test and two-sample Wilcoxon Rank sum test, the median distribution of general practitioners, midwives, and health officers depicted statistically significant differences across regions, managing authority and location with a p-value of <0.001.

As shown in Table 2, the mean number of general practitioners per referral, general and primary

hospitals at national level was 62, 11 and 5, respectively; it was less than 1 at maternal child health (MCH) specialty centers, MCH specialty clinics and health centers. The mean number of nurses at the national level per referral hospital was 227, followed by general hospitals (59), primary hospitals (26), MCH specialty centers (9), MCH specialty clinics (3), health centers (8) and higher clinics (4). The highest mean number of midwives by facility type was observed in referral hospitals (28), followed by general hospitals (12), primary hospitals (7) and MCH specialty centers (4). For MCH specialty clinics, health centers and higher clinics the midwife mean was 3. The highest mean number of health officers by facility type was observed in referral hospitals (8), followed by general and primary hospitals (3). The lowest observed mean was found in MCH specialty and higher clinics (<1).

On average, health facilities owned by private-for-profit organizations had the highest number of physicians (4), nurses (22) and midwives (4). Similarly, facilities located in urban settings had higher numbers of physicians (3), nurses (20), midwives (5), and health officers (3), when compared to facilities from rural settings.



Note: X-axis Region 1=Tigray, 2=Afar, 3=Amhara, 4=Oromia, 5=Somali, 6=Benishangul-Gumuz, 7=Southern Nation and Nationalities People, 12=Gambela, 13=Harari, 14=Addis Ababa, 15=Dire Dawa.

Figure 2: Plot of means for general practitioners, midwives, nurses and health officers by region

Table 2: Availability of general practitioners, nurses, midwives and health officers by region, facility type, managing authority and location

	Number of facilities	General practitioners		Nurses		Midwives		Health officers	
		Total Number	Mean Number	Total Number	Mean Number	Total Number	Mean Number	Total Number	Mean Number
National Region	3,804	3,903	1	44,740	12	12,153	3	7,712	2
Tigray	255	168	1	3,574	14	911	4	545	2
Afar	77	34	<1	507	7	188	2	124	2
Amhara	876	790	1	8,515	10	2,610	3	1,581	2
Oromia	1,405	961	1	11,409	8	3,619	3	2,211	2
Somali	161	136	1	1,592	10	741	5	231	1
Benishangul-Gumuz	43	41	1	1,430	33	213	5	84	2
SNNP	773	744	1	9,666	13	2,327	3	1,655	2
Gambella	27	23	1	441	16	39	1	70	3
Harari	15	71	5	559	37	78	5	42	3
Addis Ababa	151	898	6	6,628	44	1,345	9	1,116	7
Dire Dawa	21	37	2	419	20	82	4	53	3
Facility Type									
Referral hospitals	30	1,845	62	6,813	227	826	28	225	8
General hospitals	103	1,123	11	6,088	59	1,214	12	288	3
Primary hospitals	160	853	5	4,121	26	1,113	7	408	3
MCH specialty centers	23	5	<1	210	9	101	4	12	1
Health centers	3,456	62	<1	27,407	8	8,819	3	6,769	2
MCH specialty clinics	16	5	<1	53	3	42	3	6	<1
Higher clinics	13	10	1	48	4	38	3	4	<1
Managing authority									
Public/government	3,662	3,513	1	42,068	11	11,621	3	7,543	2
Private-for-profit	83	340	4	1,795	22	314	4	75	1
Private-not-for-profit	59	50	1	877	15	218	4	94	2
Location									
Urban	1,497	3,795	3	29,341	20	7,258	5	4,456	3
Rural	2,307	108	<1	15,399	7	4,895	2	3,256	1

Table 3 shows the percent of health professionals with in-service training in basic EmONC (BEmONC), comprehensive EmONC (CEmONC) and for neonatal intensive care units (NICUs) by selected health cadre, region, facility type, managing authority, and location.

We observed a relatively equitable distribution of training. At the national level, the percent of in-service trained health professionals in BEmONC, CEmONC and NICU was 10%, 2% and 2%, respectively. At this same level we saw that more than half (57%) of

midwives and OB/GYNs (52%) had received training in BEmONC, followed by ESOs (23%), general surgeons/pediatricians (14%), neonatologists (12%), general practitioners/health officers (5%), and nurses (3%). Regarding CEmONC training, 57% of OB/GYNs had received this training followed by ESOs (38%), general surgeons (17%), pediatricians (13%), neonatologists (12%) general practitioners (4%), midwives (3%) and health officers/nurses (1%). For NICU training at facilities with a separate room, the highest percent was among OB/GYNs (40%), followed by pediatricians (29%), neonatologists (21%), ESOs (18%), general surgeons (16%), midwives (13%), general practitioners (6%), nurses (3%) and health officers (2%).

Region-wise, the percent of trained BEmONC health professionals was relatively high in Tigray and Afar (13%), followed by Oromia (12%), Somali (11%), and Gambela (10%) regions. The regions with the lowest percentage of BEmONC trained staff were

Benishangul-Gumuz and Harari (6%). The percent of in-service CEmONC trained health professionals was 4% in Tigray, followed by Addis Ababa and Somali (3%), and Gambella (2%) regions. For Benishangul-Gumuz and Harari, it was below 1%. The proportion of health professionals trained to work in a NICU was 8% in Tigray followed by Addis Ababa (7%), and Amhara, SNNP and Oromia (4%). Generally, the highest percent of trained health professionals in BEmONC was observed in MCH specialty centers (23%), followed by health facilities under private-for-profit management (13%) and facilities in rural settings (13%). Similarly, for trained health professionals in CEmONC, the highest percent was also observed in MCH specialty centers (17%), followed by private-for-profit (11%) and urban (2%) facilities. For health professionals trained to work in a NICU, the highest proportion was observed in MCH specialty centers (25%) and in private-for-profit facilities (14%).

Table 3: Percent of health cadres trained in BEmONC, CEmONC and NICU by health cadre, region, facility type, managing authority and location

	Total number of staff	Percent trained in BEmONC	Percent trained in CEmONC	Percent trained for NICU for facilities with separate room ¹
National	88,440	10%	2%	5%
Health Professionals				
General practitioners	3,903	5%	4%	6%
Obstetrician/Gynecologists	382	52%	57%	40%
General Surgeons	347	14%	17%	16%
Pediatricians	246	14%	13%	29%
Neonatologists	17	12%	12%	21%
Emergency Surgical Officers	476	23%	38%	18%
Nurses	44,740	3%	1%	3%
Midwives	12,153	57%	3%	13%
Health Officers	7,712	5%	1%	2%
Region				
Tigray	6,813	13%	4%	8%
Afar	1,101	13%	1%	1%
Amhara	17,934	10%	1%	4%
Oromia	23,218	12%	1%	4%
Somali	3,195	11%	3%	3%
Benishangul-Gumuz	2,082	6%	<1%	2%
SNNP	18,605	9%	1%	4%
Gambela	706	10%	2%	1%
Harari	1,003	6%	<1%	2%
Addis Ababa	12,998	9%	3%	7%
Dire Dawa	785	9%	1%	1%
Facility Type				
Referral/specialized hospitals	12,722	4%	1%	3%
General hospitals	11,570	9%	5%	7%
Primary hospitals	8,989	8%	2%	6%
MCH specialty centers	559	23%	17%	25%
Health centers	54,277	12%	<1%	1%
MCH specialty clinics	168	14%	8%	0%
Higher clinics	155	19%	5%	0%
Managing authority				
Public/government	8,3143	10%	1%	4%
Private-for-profit	3,654	13%	11%	14%
Private-not-for-profit	1,643	10%	3%	5%
Location				
Urban	59,167	9%	2%	5%
Rural	29,273	13%	<1%	5%

¹ 192 health facilities have a separate NICU room

Discussion

Our study assessed the status of human resources for health in Ethiopia, and looked specifically at the

availability, distribution and in-service training for emergency obstetric and newborn care based on data collected for the 2016 EmONC assessment. Our results showed that the country met national

FHMACA standards much more often than international ones. We observed that among some specific health cadres, there is a relatively equitable distribution across regions, location and managing authorities. However, very low percentages of these professionals had undergone in-service training in BEmONC, CEmONC and neonatal intensive care, all of which are critical to saving lives when a woman or her newborn develops or is born with severe complications.

Emergency obstetric and neonatal care assessments carried out in several countries in the region show that weak health systems are unable to prevent the deaths of thousands of women and newborns every year (Accorsi et al. 2017; Ministry of Health. Republic of Malawi 2015; UNFPA et al. 2017; USAID 2016). In Ethiopia, the system-wide approaches implemented over the past 20 years have aimed to reduce these numbers through the strategic and increasingly ambitious scaling up of capacity (FMOH 2015) (FMOH of Ethiopia 2010). This includes the building of infrastructure (Sabot et al. 2018), the opening of new health professional training institutions and a revision of certain curricula in order to shorten training times (Fieno et al. 2016; Girma et al. 2008). It has also included the development of the cadre of emergency surgical officer, who can provide emergency C-sections when no surgeon is available (Ghosh et al. 2017). Although the acceleration in training has allowed for a rapid increase in the numbers of nurses, midwives and other cadres (FMOH of Ethiopia 2011), this comes at a price. Reports of HRH that are insufficiently trained exist (Assefa et al. 2017), and our analysis points to gaps in training, specifically when it comes to knowledge about the EmONC signal functions.

Nurses, midwives, health officers and others need access to sufficient resources and adequate supervision (Couper et al. 2018; WHO 2017b). It is common throughout Africa, Asia and the Americas nurses, which represent the largest cadre in the country, receive public education but quickly move onto the private sector (Rispel and Moorman 2015). This might occur because public system nurses routinely have larger workloads, lower pay and more tenuous work stability than their private sector counterparts (Russo et al., 2018). Despite the reasons and the policies recently set by the FMOH (Abay 2018), we might conclude from table 2 that all cadres prefer to work in urban and not rural areas.

Health systems that have historically had low levels of physicians have given more decision-making and clinical power to nurses (Bergström and Lindh 2018), and this might be a way forward for the country. In addition, providing continuing education for them to become nurse practitioners, and developing opportunities so that midwives can

receive nursing degrees might be a non-financial incentive that could increase capacity among staff, as well as satisfaction, while also lowering attrition rates (Tuckett et al. 2015). In addition, the implementation of nursing or midwifery schools that use radio or other technology to provide distance training might facilitate the recruitment of local community members who not only speak local languages and understand the culture, but also have strong family ties to the region and would be less likely to move away to an urban center. This could be particularly useful for midwives in the regions of Oromia and SNNP. More targeted studies could identify where tele-nursing schools could be implemented.

Emergency Surgical Officers have saved the lives of thousands of women over the past 10 years (Ghosh et al. 2017), and have proven to be a valuable and effective step in the progressive realization of universal health coverage. However, there is a risk that, as the numbers of MDs increase, a fragmentation of the health system will lead to a two-tiered structure where urban and richer patients have access to physicians, while poorer and rural women only have access to ESOs. The FMOH must take steps to not only limit this possible fragmentation but also to include ESOs in teams of nurses, midwives and physicians so that they can work together to improve the overall maternal health of a population.

While it was heartening that a large percentage of MCH specialty centers reported having BEmONC-trained staff, other facilities that provided maternal and child services were not nearly as prepared. Progressive strengthening and the use of strategic resources, as well as better training for the human resources for health are needed. Federal-level plans must be sensitive to regional needs and strengthen facilities through the allocation of extra resources, funds, and manpower, especially in SNNP, B-Gumuz, Harari and Dire Dawa. At the health worker level, proportionately midwives were the cadre that most reported being trained to provide BEmONC services. Although this was also encouraging, it is important to note that Ethiopian midwives are not nurses, and so a continuing education plan that allows for further professionalization could further strengthen the care this cadre provides.

The main strength of this study lies in the comprehensive data collected from the 2016 EmONC assessment, which was a national census of all facilities that provided maternal care and delivery services. Information was available for all cadres that were working with maternity services across all regions, at all levels of facility care and in the public and private sector. However, staffing is often dynamic and we recognize that since the time of data collection, the availability, distribution

and in-service training of human resources for EmONC services have changed somewhat, but probably not to the extent that we would alter the interpretation of our results or modify our recommendations.

Conclusion

Strengthening the performance of a health system depends on more than increasing the overall numbers of the health workforce. This study suggests that national numerical standards are being met but key international standards are not. This is especially true for physicians, but also for nurses and midwives. In addition, relatively few health workers have received in-service specialty training such as EmONC and NICU. Although a large proportion of higher-level cadres like OB/GYNs and ESOs had trained in EmONC and NICU, mid-level health workers who attend most births, had much lower levels of specialized training.

The country's push for health system reform must continue with a focus on scaling up the numbers of HRH with a focus on the quality of the education that training schools and universities offer, as well as on the equitable distribution of all cadres. Finally, policy aimed at keeping HRH in the public sector must be implemented in order to prevent more health professionals from clustering in big cities and private facilities. This could be the next step in the development of comprehensive national benchmarks that help guarantee access to quality care for all expecting mothers. Future studies should focus on how the FMOH can strengthen HRH recruitment, retention, productivity and competence.

Declaration: We hereby declare that we are the sole authors of this manuscript and have not submitted this research manuscript at any other journal for publication.

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Competing interests: The authors declare that they have no competing interests.

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