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Density of nurses and midwives in sub-Saharan Africa: Trends analysis over the period 2004–2016

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Abstract

Aim: To analyse the trends of density rates of nurses and midwives per population in sub-Saharan Africa over the period from 2004 to 2016.

Background: Nursing, the largest health care workforce, is actively contributing to the achievement of the Sustainable Development Goals. The African continent is one of the most affected areas by the differences in the density of nurses and midwives indicator.

Methods: Joinpoint regression analysis was applied to identify significant changes in trends of the density of nurses and midwives from the 50 countries of sub-Saharan Africa.

Results: From 2004 to 2013, the density of nurses and midwives in sub-Saharan Africa increased significantly from 5.6 to 12.44 per 10,000 population, although it exhibited a increasing trend of a magnitude of 8.3% until 2013 that does not continue from that year.

Conclusions: Only seven countries show an increasing trend, although in the case of the rest, they do not present any trend that suggests a change in this indicator in the short term.

Implications for Nursing Management: From a macrolevel nursing management point of view, our study shows the importance of implementing actions that contribute to the increase of the nursing workforce in Africa, essential to achieve the Sustainable Development Goals.

KEYWORDS
joinpoint regression analysis, midwives, nurses, ratio, sub-Saharan Africa

1 | BACKGROUND

Member states of the United Nations (UN) General Assembly adopted in 2015, 17 Sustainable Development Goals (SDGs), calling on all countries to end poverty, redress inequality, and undertake climate change by 2030, with health as the common thread linking all SDGs (UN, 2018). Nursing, the largest health care workforce, is actively contributing to achievement of the SDGs through practice, research, education and policy (Porta et al., 2019).

Nurses are distinguished for providing direct attention to the population and for leading health education strategies, contributing to public health through the prevention of disease and the promotion of community health and, therefore, improving the overall health of the population (Guilamo-Ramos et al., 2021). Furthermore, nursing practice has a great influence on the SDG, which is considered social determinants of health, as those related with education and poverty, because of its impact on people's health conditions and quality of life (International Council of Nursing [ICN], 2017). In this regard, the report 'Triple Impact of Nursing' (All-Party Parliamentary Group on Global Health, 2016) stated that increasing the number of nurses will have the wider triple impact of improving health, promoting gender equality and supporting economic growth.

The number of nurses and midwives in each country is monitored with the help of an indicator called 'density of nurses and midwives'. This indicator refers to the number of nurses and midwives per 10,000 population in a given national area (World Health Organization [WHO], 2018a). Health worker density is one of the indicators described in the WHO Global reference list of 100 core health indicators and is designated as an indicator for the SDG 3 (WHO, 2018b). Measuring and monitoring the density of health care workers are crucial for understanding the available resources in a health system, identifying the reality of each region in addition to determining the potential improvement of health service conditions.

Despite there is no defined standard to establish an acceptable level of density of nurses and midwives, the WHO reported that "countries with less than 23 health care professionals per 10,000 population don't reach adequate coverage rates" (WHO, 2009, p. 95). According to this report, the average worldwide is 28 nurses per 10,000 inhabitants, ranging from just 11 per 10,000 population in the African Region to 79 in the Europe Region. The latest figures reported by WHO show that more than 55% of the member countries have less than 40 nurses per 10,000 population. However, about 23% of these countries have less than 10 nurses per 10,000 population. Estimates for 2030 rely on the decline in the shortage of nurses (from 9 to 7.6 million), except in African and Eastern Mediterranean Regions where they will get worse (WHO, 2021).

The African continent is one of the most affected areas by the decline of health care workforce and particularly of nurses (Drennan & Ross, 2019). According to the latest available data, the most predominant situation is countries with densities below 20. The sub-Saharan Africa region encompasses, for the most part, countries with densities below 10 nurses per 10,000 inhabitants. Today, numerous countries in this region present values below five, and even countries with densities close to one nurse per 10,000 inhabitants can be found, and that despite the national strategic plans for human health resources approved in these countries (Afriyie et al., 2019).

Applying standardized methodologies to determine the density of nurses and midwives in sub-Saharan Africa may offer data to analyse this issue in greater depth. However, to date, no studies have examined this aspect using standardized methodologies. Therefore, the aim of this study was to use official data to analyse the trends in density rates of nurses and midwives per population ratio in sub-Saharan Africa over the period from 2004 to 2016.

2 | METHODS

The data were extracted from the WHO statistical data which is generated by African Health Statistics website (African Health Stats, 2019). The data compilation was carried out from routine administrative information systems, population censuses and health facility assessments. The database was updated on 14 March 2019.

We used data from nurses and midwives per 10,000 population (NPP) rates from the 50 countries of sub-Saharan Africa over the period 2004–2016. The study of the trends included 12 countries of this region, because we needed countries that had records for a minimum of 7 years in order to estimate their trends. These countries were Burkina Faso, Gambia, Mali, Nigeria, Ethiopia, Madagascar, Mauritius, Seychelles, Kenya, Mozambique, Botswana and South Africa. For each of these countries, available data included 7 or more years for the period under analysis. For the other countries of sub-Saharan Africa, we only presented data collected from WHO, but we could not include them in the individual trend analysis.

Adhering to WHO methodology, NPP rate was defined as the amount of the number of nurses and midwives during the year expressed per 10,000 inhabitants. The median of nurses and midwives per 10,000 population was calculated for all the data of each year and each country and for all countries of Africa with the objective to acquire a global idea of the trends during the study period of the whole region.

Furthermore, additional analyses was conducted to examine NPP trends dividing sub-Saharan Africa into four geographical regions: West Africa (Benin, Burkina Faso, Cape Verde, Ivory Coast, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo and Mauritania); Central Africa (Angola, Cameroon, Central African Republic, Chad, Congo, Democratic Republic of Congo, Equatorial Guinea, Gabon and Sao Tomé & Principe); East Africa (Ethiopia, Eritrea, Djibuti, Somalia, Madagascar, Mauritius, Comoros, Seychelles, Uganda, Kenya, Burundi, Tanzania, Sudan, Mozambique, Malawi, Zambia and Zimbabwe); and Southern Africa (Botswana, Lesotho, Namibia, Eswatini [previously Swaziland] and South Africa). South Sudan, Eswatini and Rwanda were excluded from these analyses due to the lack of data for these countries. We did not impute or extrapolate missing data.

Joinpoint regression analysis was used as the statistical method to analyse significant changes in NPP trends. These analyses identified

inflection points (called 'joinpoints') at which there were significant changes in the slope of the linear trend (Kim et al., 2000). To determine the number of joinpoints (from zero joinpoint, representing a straight line, to a maximum of four joinpoints), a series of permutation tests with Bonferroni adjustment were used to control the error probability of each of the multiple tests. In this analysis, the NPP rate was the dependent variable, and the year was the independent variable. On the other hand, to determine the annual percent change (APC), which described the magnitude of the change for each of the identified trends, and the average annual percent changes (AAPCs), which describe the average APC over the 2004–2016 interval, a log-lineal model is used. For each APC and AAPC the corresponding 95% confidence intervals (95% CIs) were calculated. Statistical significance was defined as a *p* value smaller than .05 in all the analyses. All the analyses were carried out using Joinpoint regression software (version 4.6.0.0) developed by the National Cancer Institute, USA.

3 | RESULTS

Data of NPP in sub-Saharan Africa and the studied countries are shown in Table 1.

The NPP rates were significantly higher in South Africa, Seychelles, Mauritius, Botswana, and Namibia, with a ratio greater than 24 nurses and midwives per 10,000 population in all included years. As more unfortunate countries, those with lower ratios were Somalia and Madagascar with less than three nurses and midwives per 10,000 population in all included years.

3.1 | Analysis of the density of nurses and midwives in sub-Saharan Africa

During the study period, there was a statistically significant trend in NPP in sub-Saharan Africa with one identifiable joinpoint (Figure 1). From 2004 to 2013, the NPP ratio in sub-Saharan Africa increased significantly from 5.6 to 12.44 per 10,000 population (APC = 8.3%; 95% CI from 3.4% to 13%), although the APC exhibited a declining trend not statistically significant from 2013 to 2016 (APC = −14.6%; 95% CI from −33.5% to 9.8%).

3.2 | Analysis of the density of nurses and midwives by region

Among the different regions, the highest nurses and midwives rate per population was recorded in Southern Africa in every year under study (mean = 37.62 nurses and midwives per 10,000 population), peaking in 2015 (50.39 per 10,000) as shown in Table 1. In contrast, the lowest rates were found in Central Africa (mean = 6.51 per 10,000) showing the lowest rate in 2012 (2.8 per 10,000).

As illustrated in Figure 2 and Table 2, in the period from 2004 to 2016, Southern Africa showed a significant increasing trend (AAPC = 4.7%; 95% CI from 2.8 to 6.7). On the other hand, East Africa region presented an statistically significant joinpoint trend, divided in two slopes, the first increasing one from 2004 to 2013 (APC = 12.0% 95% CI from 4.2 to 20.0) and the second, decreasing one, from 2013 to 2016 (APC = −20.2%; 95% CI from −45.1 to 16). The Central Africa and the West Africa regions presented no statistically significant trends.

3.3 | Analysis of density of nurses and midwives by country

According to the individual country analysis (Table 3), eight of the 12 countries showed significant trends: Gambia, Nigeria, Ethiopia, Madagascar, Mauritius, Kenia, Botswana and South Africa. Data from Gambia (AAPC = 11.0%; 95% CI from 7.6 to 14.5), Kenya (AAPC = 14.6%; 95% CI from 3.2 to 27.6) and Botswana (AAPC = 1.8%; 95% CI from 0.6 to 3.0) in the 2004–2016 period revealed a no joinpoint increasing trend model but conversely, Madagascar showed a decreasing trend for the same period (AAPC = −6.0%; 95% CI from −8.3 to −3.7).

Nigeria presented a significant joinpoint with a negative trend from 2005 to 2009 period (APC = −5.0%; 95% CI from −6.4 to −3.6) and the second segment (2009–2013) with a positive trend (APC = 2.9%; 95% CI from 1.2 to 4.7). Ethiopia also presented a significant joinpoint with a positive trend with an abrupt increase from 2008 to 2016 period (APC = 18.7%; 95% CI from 13.3 to 24.3). In the analysis made for Mauritius, a significant joinpoint included a first decreasing period from 2004 to 2008 (APC = −8.3% 95% CI from −9.8 to −6.8) and a second increasing period from 2008 to 2015 (APC = 3.5%; 95% CI from 2.8 to 4.2). Similarly, NPP in South Africa fitted to one joinpoint model. The APC for the first period from 2004 to 2014 was 2.7% (95% CI from 2.6 to 2.8) and 1.7% (95% CI from 0.4 to 2.1) for the second period (2014–2016) (Figure 3).

The rest of the countries did not satisfy the significance level; that is, there were no periods when the NPP rate changed significantly.

4 | DISCUSSION

This study shows that although the number of nurses and midwives in sub-Saharan Africa has increased from 2004 to 2013, there is not a trend that will continue from 2013. This absence of increase of recent years is not in line with the need manifested at the international level in relation to health care workforce in sub-Saharan Africa. Although 11% of the world's population live in this region, its health spending is less than 1% of the world's financial resources on health and it only counts on 3% of the global health workforce (Anyangwe & Mtonga, 2007).

The Southern Africa region is undoubtedly the one with the most advantageous situation within the continent, not only because it has the highest ratios but also because it is the only one that shows a growing trend, although moderate. The rest of the regions

TABLE 1 NPP ratio by country

	Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Region	West Africa	4.99	5.07	10.04	6.16	4.51	6.72	7.77	5.08	6.8	12.64	8.99	8.82	5.70
	Benin	7.74				8.20				6.8	6.32			6.14
	Burkina Faso	5.03				3.71	4.04	5.54	5.56	6.31			2.40	5.70
	Cape Verde						9.98	10.80	10.68	10.72	11.42		12.27	
	Ivory Coast	5.66	4.90			4.73			4.65			8.52		
	Gambia	4.96	5.06	5.05	8.20	8.88				13.80			16.29	
	Ghana	9.39				9.80	10.44	9.18			15.91			15.49
	Guinea	4.64												3.84
	Guinea-Bissau	7.93				6.43	6.86		5.50				14	
	Liberia	3.25				2.67		4.57					1.01	
	Malí	6.72			2.10		4.43	4.45	3.67	3.76				3.82
	Niger	2.14				1.38	2.04				2.41	3.10		
	Nigeria		15.36	15.02	14.98	14.96	10.76	13.56			14.52			
	Senegal	3				4.30					13.85		7.75	3.13
	Sierra Leone	4.61				1.60		2.85	2.76			9.96		
	Togo	3.50			4.12	2.94		14.43					2.98	
	Mauritania	6.22					6.56	7.76				9.46	9.89	10.34
Region	Central Africa	7.24	5.39	6.76	6.63	4.43	4.10	6.27	13.38	2.8	2.89		11.32	6.96
	Central African Republic	3.97				1.92	2.49						2.04	
	Chad	2.57		1.81						2.80	3.08			3.63
	Dem. Rep. of Congo						4.10				4.70			
	Angola	9.79					13.12							
	Cameroon	15.35	3.84		4.47		3.92	5.36	9.33					
	Ecuatorial Guinea	3.73												5
	Gabon	4.68												25.80
	Congo	10.18		13.66	8.78				17.43					
	Sao Tomé & Principe	20.26											20.60	
	Zambia		6.94	6.75		6.94	7.05	7.17						8.92
Region	East Africa	5.17	5.75	2.95	7.64	5.27	3.96	7.17	11.83	10.56	13.44	8.45	8.30	6.80
	Ethiopia	2.08	2.45	2.26	2.24	2.01	2.51							8.40
	Eritrea	6.49												
	Dyibuti	3.84	5.746									5.35		
	Somalia			0.90								0.61		

(Continues)

TABLE 1 (Continued)

	Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	Madagascar	2.85	3.50	3.02	2.94	2.81	2.43	2.23	2.17	2.17		1.05		
	Mauritius	37.87			26.74	27.43	28.13	28.84	29.33	29.81	31.57	32.81	33.83	
	Comoros	9.84	5.62				7.02			9.21				
	Seychelles	72	44	46	46	45		45		45				
	Uganda	6.88	13.18							11.35			6.30	
	Burundi	1.87						6.81						6.80
	Kenia	4.60				3.59	3.96	7.17	14.15	14.15	14.44	15.42		
	Tanzania	3.68		2.32						4.24		4.13		
	Sudan	10.44		10.55	10.06	9.84						12.06	8.30	
	Mozambique	3.04		2.88	5.21		3.84	3.92	3.81	3.92	4.01			4.43
	Malawi	5.73				2.73	3.27							2.52
	Zambia		6.94	6.75		6.94	7.05	7.17						8.92
	Zimbabue						12.06	12.08	11.83	10.56	12.43	11.54		
Region	Southern Africa	28.28	31.63	33.23	30.11	35.53	36.45	28.86	36.96	37.38	48.49	49.59	50.39	42.16
	Botswana	25.98	24.07	26.56	30.11	28.85	29.37	28.86	28.35	27.83				33.00
	Lesoto	5.855						6.50						
	Namibia	30.58			27.64									
	South Africa	38.23	39.17	39.89	40.88	42.21	43.51	44.79	45.57	46.93	48.48	49.58	50.39	51.31

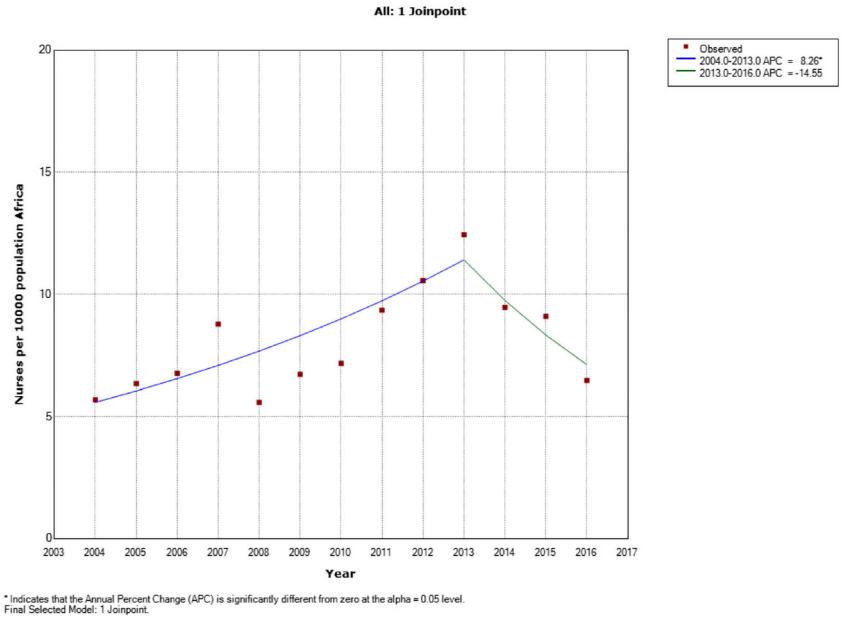

FIGURE 1 Global trend in NPP rate in sub-Saharan Africa (2004–2016)

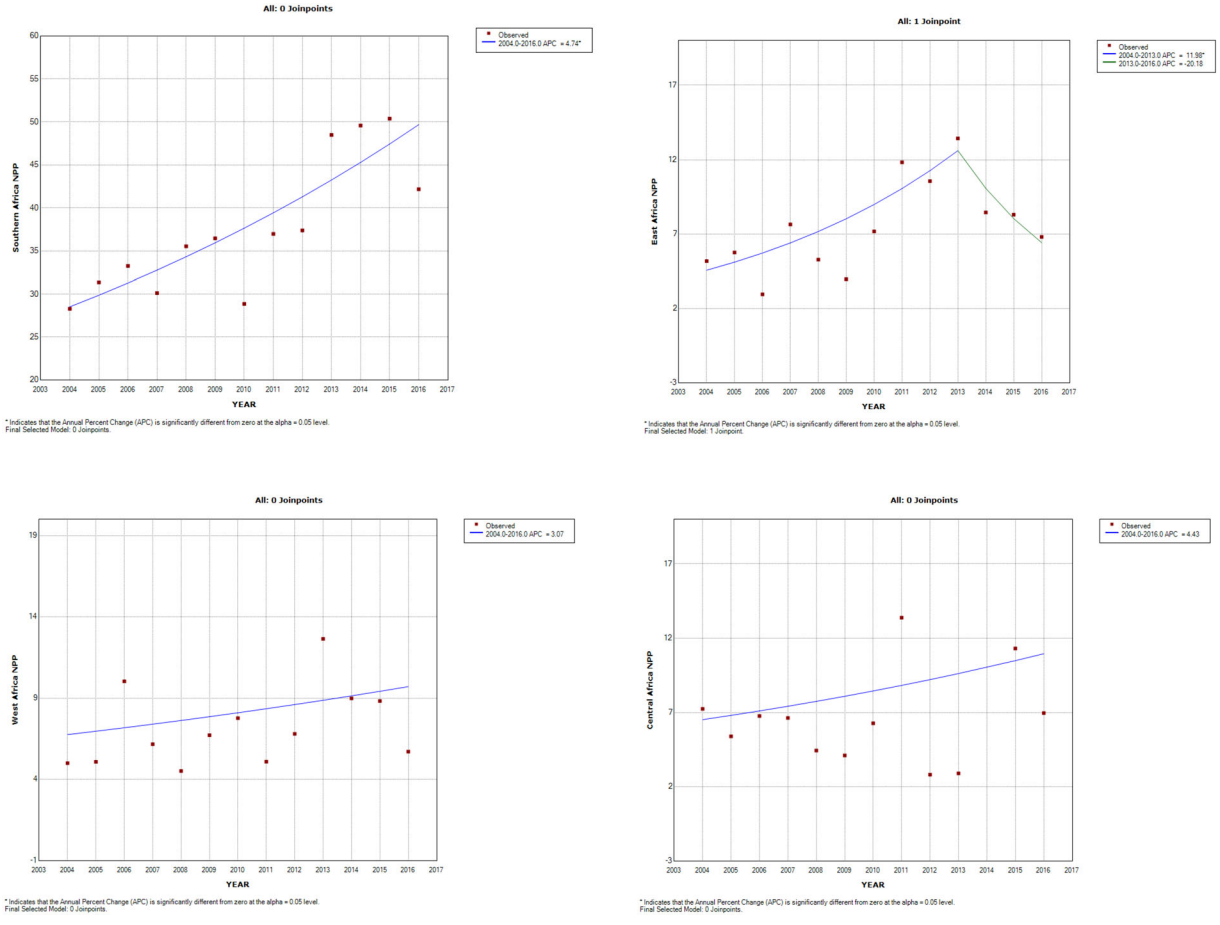

FIGURE 2 NPP rate trend in Southern Africa, East Africa, Central Africa and West Africa (2004–2016)

either do not show clear trends and remain unchanged (as in the case of Central Africa and West Africa) or show an increasing trend followed by a very marked decreasing trend from 2013 (East Africa). Therefore, these regions are in a situation of extreme vulnerability in relation to the nurses and midwives per 10,000 population rates.

TABLE 2 Joinpoint analysis of NPP rate trend per region in Sub-Saharan Africa (2004–2016)

	All study period		Trend 1		Trend 2	
	Range of Years	AAPC (95% CI)	Range of years	APC (95% CI)	Range of years	APC (95% CI)
Africa	2004–2016	**2.0 (−4.0 to 8.4)**	**2004–2013**	**8.3* (3.4 to 13.3)**	**2013–2016**	**−14.6 (−33.5 to 9.8)**
Southern Africa	2004–2016	4.74* (2.8 to 6.7)	—		—	
East Africa	2004–2016	**2.9 (−6.1 to 12.8)**	**2004–2013**	**12.0* (4.2 to 20.4)**	**2013–2016**	**−20.2 (−45.1 to 16)**
Central Africa	2004–2016	4.4 (−2.5 to 11.9)	—		—	
West Africa	2004–2016	**3.1 (−2.4 to 8.9)**	—		—	

Abbreviations: APC, annual percent change; AAPC, average annual percent change; CI, confidence interval.
*$p < .05$.

TABLE 3 Joinpoint Analysis of NPP rate trend per Country (2004–2016)

	All study period		Trend 1		Trend 2	
	Range of years	AAPC (95% CI)	Range of years	APC (95% CI)	Range of years	APC (95% CI)
Burkina Faso	2004–2016	1.31 (−4.3 to 7.2)	—		—	
Gambia	2004–2015	11.0* (7.6 to 14.5)	—		—	
Mali	2004–2016	−5.3 (−5.1 to 2.7)	—		—	
Nigeria	2005–2013	−1.3 (−5.1 to 6.8)	2005–2009	−5.0* (−6.4 to −3.6)	2009–2013	2.9* (1.2 to 4.7)
Ethiopia	2004–2016	14.1* (10.5 to 17.9)	2004–2008	−1.9 (−16.5 to 15.2)	2008–2016	18.7* (13.3 to 24.3)
Madagascar	2004–2014	−6.0* (−8.3 to −3.7)	—		—	
Mauritius	2004–2015	−0.4 (−2.8 to 2.1)	2004–2008	−8.3* (−9.8 to −6.8)	2008–2015	3.5* (2.8 to 4.2)
Seychelles	2004–2012	−5.2 (−11.4 to 1.3)	—		—	
Kenya	2004–2014	14.6* (3.2 to 27.3)	—		—	
Mozambique	2004–2016	1.0 (−3.2 to 5.3)	—		—	
Botswana	2004–2016	1.8* (0.6 to 3.0)	—		—	
South Africa	2004–2016	2.6* (2.5 to 2.7)	2004–2014	2.7* (2.6 to 2.8)	2014–2016	1.7* (0.4 to 2.1)

Abbreviations: APC, annual percent change; AAPC, average annual percent change; CI, confidence interval.
*$p < .05$.

The WHO estimates the need for an increase of almost 140% to meet the threshold (WHO, 2006). Thus, in global terms, the number of nurses should go from 1 million to 1.5 million between 2013 and 2030, but the number required to meet the needs will increase from 1.8 to 2.8 million (WHO, 2016). That is, the shortage of nurses will increase faster than their presence and this, aggravated by the absence of trend in some cases or decreasing trend in others, identified since 2013.

Furthermore, the data show that 45 of the 50 countries of sub-Saharan Africa have NPP ratios lower than the worldwide average of 28 nurses per 10,000 inhabitants (WHO, 2009). Most countries are far below the minimum accepted limit. Only the Seychelles, South Africa, Mauritius, Namibia and Botswana have a density of nurses and midwives above the average worldwide.

In addition to this negative finding, there are only seven countries with an increasing trend (Gambia, Kenya, Botswana, Nigeria, South Africa, Ethiopia and Mauritius), although in the rest, either the trend is decreasing or does not present any trend that suggests a change in this indicator in the short term. Consequently, some authors suggest that despite the need expressed to focus efforts on policies to increase and consolidate health care workforce, there are problems that make it difficult to achieve these objectives, such as ineffective retention strategies, insufficient investment in human resources, lack of incentives, lack of education reforms and inability to translate policy into action (WHO et al., 2011).

The highest nurses per population ratios still appear in the most geographically privileged regions, like Southern Africa (Botswana, Lesoto, Namibia and South Africa). Specifically, Botswana and South Africa have some of the highest NPP ratios on the continent. In addition, both presented significant increasing trends in the NPP ratio, although moderate. South Africa has a constant upward trend, so it seems that the results of the overall human resource development strategy envisaged by the National Health Insurance since 2006 and particularly the nursing strategy implemented in 2008 have been positive (Rispel & Barron, 2012). These strategies included training and capacity building initiatives, community service for health professionals and the implementation of various financial incentives (Rispel & Barron, 2012).

Nonetheless, South Africa suffers pronounced differences in rates of morbidity and mortality and in access to the health system,

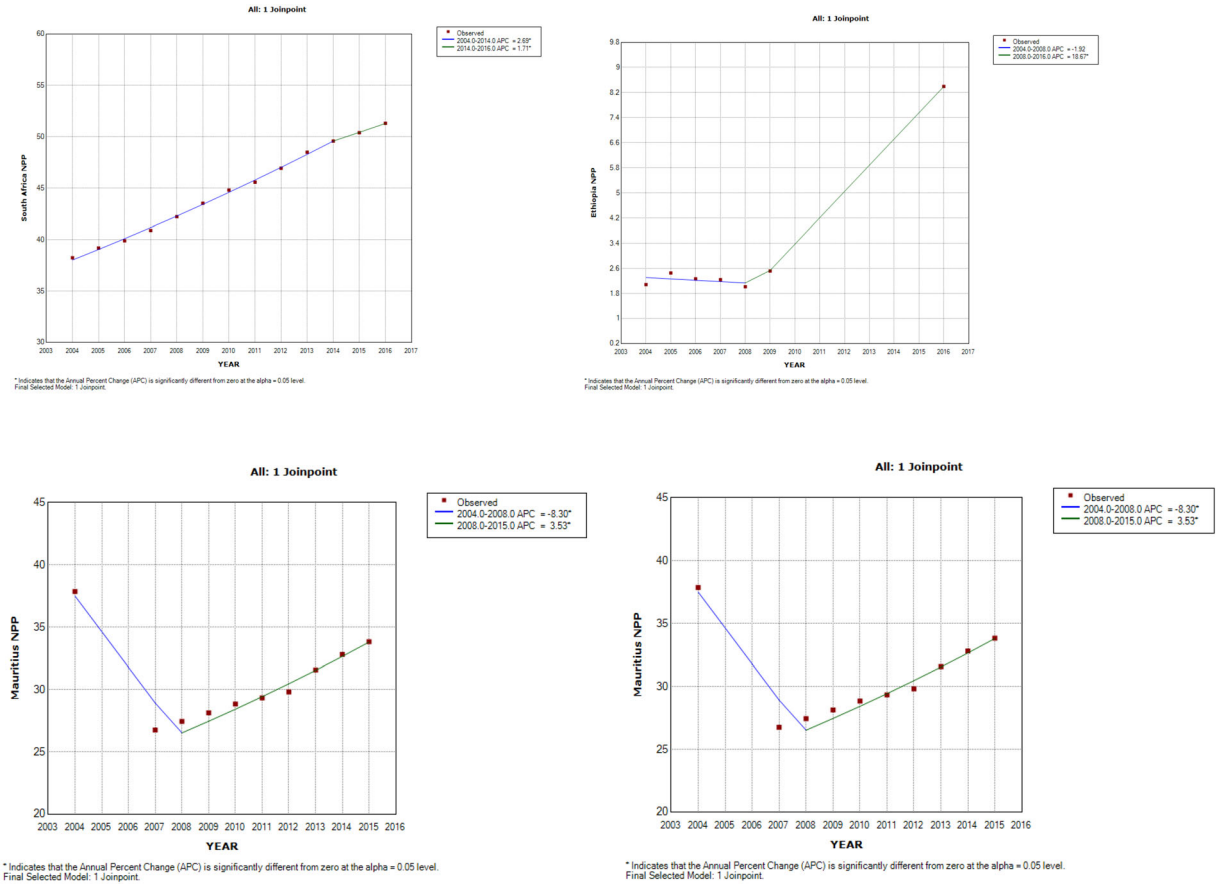

FIGURE 3 NPP rate trend in South Africa, Ethiopia, Madagascar and Mauritius (2004–2016)

between races, between provinces and between men and women (Coovadia et al., 2009). This leads to think that the analysis of the NPP ratio should go beyond the global figure, because despite having a high density, the reality of South Africa is that there is a maldistribution of staff, with an important migratory movement of nurses from the public to the private sector (Coovadia et al., 2009). The same occurs in Botswana, another of the countries with the highest NPP ratio, where the density of nurses and midwives in rural districts are significantly lower than in urban districts (26 vs. 77 per 10,000 population in 2012) (Nkomazana et al., 2014).

Factors for the withdrawal of health workers in rural areas are several, including the limited options for career progression and the lack of amenities or incentives. On the other hand, due to the low salaries perceived by health care workers in sub-Saharan Africa, in urban areas, these professionals often develop unauthorized private practice to complete their income (Anyangwe & Mtonga, 2007). In this line, evidence suggests that in some countries of sub-Saharan Africa, the areas with a higher level of staff shortages are the primary care sector, the poorest regions or those with a low-level health facilities, in a manner that the staffing is inversely related to poverty and level of need (Willcox et al., 2015).

Two of the other countries with the best NPP ratios are Mauritius and Seychelles, belonging to the East African region. In Mauritius, a small island in the Indian Ocean, recruitment to nursing is facilitated by increased access to higher education for women in recent years and by political and social changes with an increased competition for employment in the public health sector (Hollup, 2012). In addition to this, nursing education in Mauritius is considered a paid employment; thus, nursing students receive a salary during their education and clinical practice, which has proven to be an important factor for recruitment (Hollup, 2012). Nevertheless, in the case of Mauritius, establishing a trend model is particularly difficult due to the influence of the first value in 2004 followed by a 2-year data gap. Consequently, the outlier record is influencing the overall trend of the country, providing a two-slope trend with inverse direction, although it presents a clear increasing trend since 2008.

Seychelles, for its part, an archipelago in the Indian Ocean, has experienced significant social and economic progress in recent decades. The development of a comprehensive health care infrastructure, with universal access to health, free primary care, and good sanitation, water and hygiene supply has improved the population's health (Shamlaye et al., 2020; WHO, Regional Office for Africa, 2016). Nurses are the main axis of the health system and lead most of the health programmes. And even as it is an archipelago, nurses are the only health personnel in the peripheral islands (Agricole et al., 2014), aspects that can be related to the high NPPs. However, this country did not present significant trends of the nurse–population ratio.

It is also in the East Africa region where we find three of the countries with the most disadvantaged NPP ratios: Somalia, Madagascar and Ethiopia. In the case of Somalia, with less than 1 nurse per 10,000 inhabitants, apart from being one of the poorest countries on the planet, it suffered a civil war in the 80s and in the 90s, in which hospitals and health centres were devastated and many health care professionals were killed or became refugees (Ismail, 2011). The country still strives today to rebuild health facilities and to increase the number of health care workers (Crichton, 2013). On the other hand, Madagascar not only presents very low numbers of nurses per 10,000 population, but it also shows a clear downward trend. It seems that the advances produced in the last years in nursing education and in the nursing profession, including the establishment of professional bodies, are insufficient (Plager & Razaonandrianina, 2009).

The case of Ethiopia is different, because there is a clear upward trend between 2008 and 2016, going from 2 to 8.4 NPP ratio. In recent years, the country has implemented policies to strengthen motivation and retention of the diploma-level nursing workforce, such as the implementation of nursing specialty training programmes at a bachelors' degree level (Ministry of Health [MoH], 2016). The aim today is to meet the 2025 benchmark set by the WHO for Sub-Saharan Africa: 2.3 per 1,000 population, as the minimum threshold of health professionals to population ratio (MoH, 2015, 2016).

In this region, another of the countries presented a clearly positive trend: Kenya. This positive trend, which goes from three to four nurses and midwives per 1,000 population to 15, seems to coincide with the launch of the denominated emergency hiring plan. The aim of this plan was to remediate acute nursing shortages in remote and underserved areas, through the use of public–private partnerships to fund and increase nursing worker deployment (Gross et al., 2010; Reynolds et al., 2013).

In the case of the West Africa Region, Gambia and Nigeria are the countries that showed positive trends. Gambia has gone from 7.6 nurses and midwives per 1,000 population in 2004 to 14.5 in 2016. In 2005, the government of this country launched a 'health workforce plan' that detailed a 15-year strategy to ensure adequate, appropriate, well-trained human resources at all levels of the health system in accordance with National priorities, Poverty reduction strategy and Millennium Development Goals (Omar Toure et al., 2005). With regard to Nigeria, the positive trend, which started in 2009, should be taken with caution, because it is based on the appearance, in that year, of a figure below the data reported up to that moment, which may be a consequence of some error in the logs. Nigeria has serious problems retaining its nurses in the country; some of the reasons for their emigration are the search for the improvement of their economic possibilities, better work environments and career progress opportunities (Salami et al., 2016).

One of the main problems in Africa is the tendency of health workers to emigrate in search of better conditions (Kopolo-Munjanja et al., 2005). Nurses not only seek alternatives outside of Africa but also move to other countries within the continent, seeking better working conditions. It is worthy of note that a good proportion of the health workforce in the Americas originates from sub-Saharan Africa (Anyangwe & Mtonga, 2007).

In addition to the nursing emigration rate, other factors should be taken into consideration to approach the shortage of human resources for nursing, such as the places where nursing students are trained (Griffiths et al., 2018). Indeed, according to Anyangwe and Mtonga (2007), among the key problems contributing to the shortages are the insufficient training opportunities. As WHO noted, the recommendation for improving the health care needs is to manage and to provide nursing colleges and schools with their own human resources (Hayes-Bautista et al., 2016).

Finally, it should be noted that it is difficult to interpret the trends due to the few records available in most of the countries. Moreover, an additional factor to consider is the missing data from countries such as South Sudan, Eswatini and Rwanda that did not have published any information. Therefore, it is difficult to carry out an exhaustive and reliable analysis. Further investigation is recommended in order to overcome the incomplete datasets and the issues encountered in the study.

5 | CONCLUSIONS

The present study contributes to mapping the density of nurses and midwives in sub-Saharan Africa, promoting a global view of the reality and needs related to nursing human resources in this region. Our study indicates that the distribution of nurses and midwives varies among sub-Saharan African countries. Although a few countries present ratios higher than the average worldwide (Seychelles, South Africa, Mauritius, Namibia and Botswana), the majority of them are far below the minimum accepted limit. Moreover, only seven countries show an increasing trend, although in the case of the rest, either the trend is decreasing or they do not present any trend that suggests a change in this indicator in the short term. Certainly, the most advantaged region is South Africa, with the best rates and trends of growth.

In those countries with increasing trends, different factors might have influenced the improvement of NPP ratios, such as training and capacity building initiatives, and the implementation of various financial incentives policies to strengthen motivation and retention of the nursing workforce. From a public health perspective, these findings support the enhancement of strategies to address the current nursing workforce in these countries.

5.1 | Implications for nursing management

This study contributes to nursing management science by presenting an analysis about sub-Saharan African nurses per population ratio trends. These findings suggest that the nursing workforce in Africa is below the rest of the countries in the world. Even though until 2013 data showed an increasing trend, the reality demonstrates that this trend has not been maintained from years 2013 to 2017. Therefore,

from a macrolevel nursing management point of view, our study shows the importance of implementing actions that contribute to the increase of the nursing workforce in Africa, fundamentally considering that nursing workforce is essential to achieve the SDGs. Indeed, the attainment of the SDGs in these countries faces major impediments on account of the health workforce crisis. For this reason, the influential leadership which nurse managers can and should exercise at high levels of the health system, as well as a political leadership, seems essential.

Success cases that show positive trends in the NPP ratio may serve as inspiration for the management of other countries, when implementing measures to improve the density of nurses and midwives' figures. Although each country is unique, there are some possible solutions for addressing the overall shortage, the maldistribution and the low productivity of health workers in sub-Saharan Africa. Some of these solutions are to increase investment in pre-service training (workers with basic clinical skills), improve income and living wage, extend retirement ages, recruit from abroad and achieve a more appropriate mix of skills (Anyangwe & Mtonga, 2007). A similar effort should also be observed among African governments towards a more accountable approach to the implementation of health policy and professional regulations for nurses and midwives.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

ETHICAL APPROVAL

An ethical approval was not required because the data were obtained from the public databases of the World Health Organization.

DATA AVAILABILITY STATEMENT

Data derived from public domain resources

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