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Health Workforce for 2016-2030: Will Nigeria have enough?

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ABSTRACT
Health workforce is made up of health workers which include all people engaged in the promotion, protection or improvement of the health of the population and they play a critical role in achieving effective health care delivery.
We sought to estimate the health workforce in Nigeria for 2016-2030 using the population growth rate from censuses and health workforce growth rate from data from the World health organization, World Health Organisation recommended doctors and nurses critical density and the Africa health workforce observatory database to estimate the potential supply gap. Nigeria's population will increase from 178.5 million in 2014 to 272.5 million by 2030. We found the range of estimated doctors (physicians) and nurses & midwives required for 2016-2030 to be between 422,018 and 621,205 with mean of 515,668. The range for doctors is 101,803 to 149,862 with mean of 124,394. The range of estimated Nurses and Midwives requirement is 320,216 to 471,353 with a mean of 391,274. We found the range of deficit for doctors and nurses & midwifes to be 30.86-33.45% (average- 32.16%.) and 26.09-29.5% (average- 27.68%) respectively during the study period with actual figure for doctors ranging from 31,413-50,120 while nurses is estimated to be 83,548-137,859 if no effort is made to upscale the present supply. Nigeria needs to improve on the health workforce supply to tackle the supply deficit in order to solve the heavy disease burden and turn the tide of health indicators in the positive direction.
Keywords: Health workforce, health care delivery, physicians' density, Nigeria

INTRODUCTION
Health workforce is an integral part of health system and plays critical role in achieving effective health care delivery [1-2]. It is basically made up of health workers, which has been defined as all people engaged in the promotion, protection or improvement of the health of the population [3-5]. According to World Health Organisation (WHO) health workforce are people who are "primarily engaged in action with the primary intent of enhancing health" diagnosing illnesses, healing, caring for people, monitoring health outcomes, supporting treatment adherence, providing medical information and preventing diseases[6-7].
Health workforce consists of physicians, nurses, midwives, dentists, pharmacists, laboratory workers, environment & public health workers, community health workers, other health workers and health management and support staff [8-10]. The availability of health workforce has been shown to have a strong positive correlation with positive health outcome [11-13]. Hence its availability and composition is used as an important indicator of the strength of health system. However, there is no general consensus on the optimal level of health workers needed for a population or that highest density levels of health workforce are not necessarily better [14].

Health workforce crisis can manifest as shortage which may be chronic or acute and misdistribution which may be geographic or professional. This crisis is seen globally, Nigeria and Africa inclusive [15]. Currently Nigeria is the most populous country in Africa, has the highest human resources for health in Africa comparable only to Egypt and South Africa [15]. In 2007, there were 52,408 doctors, 128,918 nurses, and 90,489 midwives registered, which translates into about 35 doctors and 86 nurses per 100,000 populations which was inadequate [16].This compares to a Sub-Saharan average of 15 doctors and 72 nurses per 100,000 population[6].

Inadequate health workforce would affect health status in any society; there would be ineffective tackling of the present HIV/AIDs pandemics, emerging Non Communicable Diseases (NCDs), high maternal mortality especially in developing countries due to inability to offer emergency obstetric care 24hours and general obstacle to achieving good societal health indicators [1,3,9,17]. The achievement of Millennium Development Goals (MDGs) is dependent on the availability of adequate health workforce [3]. Generally to have access to qualitative health care an adequate and qualitative health work force is needed [5].

The health workforce status of a country is one of the indicators of the quality of health care in that country and reflects in her rank her globally. In 49 countries identified by World Health Organisation (WHO) to be having insufficient density of doctors, nurses and midwives, Nigeria is in sixth position [13,18]. This study is essential to help health policy makers and planner plan health related needs of the population by satisfying the health system needs through objective information and evidence based findings. Furthermore the study would serve as a basis for determining the requirement for filling the potential gap for the same period.

METHODS

We used the term "doctor" interchangeably with "physician" throughout this study. Furthermore nurses were generally lumped together with midwives because of professionally similarity and cases of double qualification which is popular in Nigeria.Other health workers were left out of this study.

There is strong, well and widely documented relationship between health workforce density and skill mix involving doctors, nurses and midwives and health outcome of a community as a whole[9,14].These quantitative requirements were derived from expected health workforce density.

The National Population Commission Census figure (2006) was extrapolated over to the study years. Other database utilised include World Bank data base, World Health Organisation data base and African Health workforce observatory database. The national population growth rate, physicians and nurses' growth rate were obtained from African health workforce observatory database and previous studies [19].

WHO expect anything short of 23 when only doctors, nurses and midwifes are counted per 10,000 population or 2.28 health care professional/1000 would be unable to achieve adequate coverage rate for key primary health-care interventions prioritized by Millennium Development Goals(MDGs)[6,12].

Generally this is considered to be the minimum necessary to deliver essential health services [15]. This critical number affect health outcome.

World Health Report 2006 Suggests a Minimum Worker Density Threshold or critical threshold of 2.3 Workers (Doctors, Nurses and Midwives) Per 1000 Population or 23 per 10,000 Necessary. 0.55 doctors per 1000 population while 1.73nurses midwives per 1000 population have been recommended by some studies [21-23]. Thus the derivation of the health workforce requirement from density was used to estimate the doctors and nurses & midwives requirement for 2016-2030. Historical workforce growth rate was use to forecast availability in years under study.

The following terms were defined: physicians' density is the number of physicians per 10 000 population or per 1000[22]. Nurse density is the number of nurses per 10 000 population or per 1000[22].Total number of health workers per 10 000 or per 1000 population is the total number of physicians, nurses and midwives [22]. Nurse-physician ratio is the ratio of the number of nurses to physicians [22].

The figures were rounded up to the nearest whole number. Average growth rate used in computing is 2.8 % (average of 2006-2014)[24]. The last census in Nigeria put the total population (2006) at 140,431,790.

Using a growth rate of available figures would give an annualized growth rate of 2.52% of physician stock (1960-2009). There is dearth of health statistics in Nigeria like in other third world countries. It is must be

said such figure would be ambitious since average figure of national medical school graduates have never been more than 3,000/year 1991- 2008 and immigration have not demonstrate to be a significant conduit for replenishing doctor stock in Nigeria[19].

Table 1. Historical growth rate Growth rate of health workforce [19,24-26**]**

Year	1960	2002	2005	2006	2007	2009
Physician	1079	22000	39210	49612	55376	59,136

Table 2. Historical growth of health workforce [19,24-26**]**

Year	1960	2002	2005	2006	2007	2009
Nurses and Midwives	7,978	117,000	213,422	214,288	128,918	230,941

Using a growth rate of available figures would give an annualized growth rate of 2.48% for nurses and midwifes (1960-2009).

RESULTS

Table 3: Population Estimate, Health Workforce & Doctors 2016-2030

Year	Population estimate	Estimate of Doctors and Nurses minimum requirement(% Percentage of Doctors, Nurses And Midwives in estimated total population)	Estimate of Doctors requirement(% Percentage of Doctors in estimated total population)	Expected new addition to stock of doctors to meet requirement
2016	185,095,806	422,018(0.23)	101,803(0.55)	
2017	190,278,488	433,835(0.23)	104,653(0.55)	2,850
2018	195,606,286	445,982(0.23)	107,583(0.55)	2,930
2019	201,083,262	458,470(0.23)	110,596(0.55)	3,013
2020	206,713,594	471,307(0.23)	113,692(0.55)	3,096
2021	212,501,574	484,504(0.23)	116,876(0.55)	3,184
2022	218,451,618	498,070(0.23)	120,148(0.55)	3,272
2023	224,568,264	512,016(0.23)	123,513(0.55)	3,365
2024	230,856,175	526,352(0.23)	126,971(0.55)	3,458
2025	237,320,148	541,090(0.23)	130,526(0.55)	3,555
2026	243,965,112	556,240(0.23)	134,181(0.55)	3,655
2027	250,796,135	571,815(0.23)	137,938(0.55)	3,757
2028	257,818,427	587,826(0.23)	141,800(0.55)	3,862
2029	265,037,343	604,285(0.23)	145,771(0.55)	3,971
2030	272,458,388	621,205(0.23)	149,852(0.55)	4,081

The range requirement of doctors is 101,803 to 149,862 with mean of 124,394 while nurses & midwives required for 2016-2030(422,018 to 621,205) with mean of 515,668 (Table 3) .The expected new addition to stock from 2017 is expected to be 2,850 new doctors based on the population addition.

Table 4: Population Estimate and Health Workforce (Nurses & Midwives) 2016-2030

Year	Population estimate	Estimated Nurses & Midwives requirement (%Percentage of total estimated population)	Expected new addition to stock of Nurses & Midwives to meet requirement
2016	185,095,806	320,216(0.173)	
2017	190,278,488	329,182(0.173)	8,966
2018	195,606,286	338,399((0.173)	9,217
2019	201,083,262	347,874(0.173)	9,475
2020	206,713,594	357,615(0.173)	9,741
2021	212,501,574	367,628(0.173)	10,013
2022	218,451,618	377,921(0.173)	10,293
2023	224,568,264	388,503(0.173)	10,582
2024	230,856,175	399,381(0.173)	10,878
2025	237,320,148	410,564(0.173)	11,183
2026	243,965,112	422,060(0.173)	11,496
2027	250,796,135	433,877(0.173)	11,817
2028	257,818,427	446,026(0.173)	12,149
2029	265,037,343	458,515(0.173)	12,489
2030	272,458,388	471,353(0.173)	12,838

The range of estimated Nurses and Midwives requirement is 320,216 to 471,353. Mean -391,274 (Table 4). The expected new addition to stock from 2017 is expected to be new 8,966 Nurses and Midwives based on the population addition.

Table 5: Estimate supply gap of doctors

Year	Population estimate	Estimate of Doctors requirement	Estimate doctors availability	Estimated availability gap/deficit	Percentage deficit
2016	185,095,806	101,803	70,390	31,413	30.86
2017	190,278,488	104,653	72,164	32,489	31.04
2018	195,606,286	107,583	73,983	33,600	31.23
2019	201,083,262	110,596	75,847	34,749	31.42
2020	206,713,594	113,692	77,758	35,934	31.61
2021	212,501,574	116,876	79,718	37,158	31.79
2022	218,451,618	120,148	81,727	38,421	31.98
2023	224,568,264	123,513	83,786	39,727	32.16
2024	230,856,175	126,971	85,898	41,073	32.35
2025	237,320,148	130,526	88,062	42,464	32.53
2026	243,965,112	134,181	90,281	43,900	32.72
2027	250,796,135	137,938	92,556	45,382	32.90
2028	257,818,427	141,800	94,889	46,911	33.08
2029	265,037,343	145,771	97,280	48,491	33.27
2030	272,458,388	149,852	99,732	50,120	33.45

The range for the estimated potential deficit of 31,413 to 50,120doctors with average deficit is 40,122 (Table 5). The average deficit of doctors over the period is 32.16%.

Table 6: Estimate supply gap of Nurses & Midwives

Year	Population estimate	Estimated Nurses & Midwives requirement	Estimated Supply of Nurses & Midwives	Estimated availability gap	Percentage of deficit/gap
2016	185,095,806	320,216	236,668	83,548	26.09
2017	190,278,488	329,182	242,538	86,644	26.32
2018	195,606,286	338,399	248,553	89,846	26.55
2019	201,083,262	347,874	254,717	93,157	26.78
2020	206,713,594	357,615	261,034	96,581	27.01
2021	212,501,574	367,628	267,507	100,121	27.23
2022	218,451,618	377,921	274,142	103,779	27.46
2023	224,568,264	388,503	280,940	107,563	27.69
2024	230,856,175	399,381	287,908	111,473	27.91
2025	237,320,148	410,564	295,048	115,516	28.14
2026	243,965,112	422,060	302,365	119,695	28.36
2027	250,796,135	433,877	309,864	124,013	28.58
2028	257,818,427	446,026	317,548	128,478	28.81
2029	265,037,343	458,515	325,423	133,092	29.03
2030	272,458,388	471,353	333,494	137,859	29.25

The range of estimated potential deficit of nurses& midwives found was 83,548 – 137,859 and average deficit is 27.68% (Table 6).

DISCUSSIONS

Based on this projection, Nigerian population would have increased from 178.5 million in 2014 to 272.5 million by 2030; an increase of about 93.9 million people (with health needs) over 16 years. Our calculation was done by geometric method and the growth rate used was adopted from World Bank which has already adjusted for fertility and death rate. We believe the projection is robust enough considering the method used to arrive at the figure.

Using the World Health Report 2006 which suggested a minimum worker density threshold of 2.3 Workers (Doctors, Nurses and Midwives) per 1000 Population or 23 per 10,000 the requirement of Nigeria over the study period would be largely unmet significantly based on the current growth rate of the present stock of doctors and nurses & midwives [20].

Nigeria will need approximately 149,852 doctors and 471,353 nurses by the year 2030. With the available growth rate of Doctors/Nurses, by this same period only 99,120 doctors and 333,494 nurses will be available. This implies a shortage of about 50,120 doctors and 137,859 nurses. This translates to 33.45% gap in doctors' supply and 29.25% gap in nurses' supply. This figure is very far away from what is obtainable in some Organization for Economic Co-operation and Development (OECD) countries according to a study by Ono et al. [27].

Australia will have estimated gap of 2,701 doctors and 109,490 nurses by 2025 will have all Physicians deficit eradicated by 2014 and by 2030 there will be surplus and Japan will have a nurse surplus of about 14,000 by 2015. Compared to these examples, the supply gap of Nigeria would be cumulatively enormous if nothing is done.

A look at the trend in deficit shows a progressive trend with physician deficit increasing from 30.86 percent in 2016 to 33.45 percent in 2030. Similarly Nurses deficit rose from 26.09 percent in 2016 to 29.25 percent in 2030. With this trend if no conscious effort is made to reverse deficit, by 2030 the countries health indices will be much worse than it is now.

Although we did not study the adequacy across the states in Nigeria, this may be necessary because imbalance is an issue too in Nigeria particularly across the states [9, 28].

The study provides empirical evidence to support decision to be trained, sustained and retrained of health workforce in Nigeria. It would help advocacy for increase investment in pre-service training (intake and output), increase investment in training (intake and output), extension of retirement ages and possibly recruit from abroad to help bridge the gap. It helps address national inequality derived from non-availability of health workforce. WHO have consistently been using health workforce density to compare health work force adequacy.

The World Health Report 2006 calls for action on a wide range of human resources issues, including higher training output, better employment practices and the management of migration. It states that there are three main factors at work; the number of health workers, the distribution of health workers and wider policies. This study showed that similar demand would not change 2016-2030 if the present growth rate of available health force continues.

Based on accredited training space for doctors (2012) by the regulatory body of 2,725 the expected provision of doctors should be more than that figure [29]. This figure is less than the additional stock of doctors that would be needed in any year 2016-2030**.** It is also observed that effort would need to be made to keep adding to stock. As much as 4081 new doctors would be needed to cater for population growth comparing to the preceding year. These findings further reiterate the need for more training facilities and up scaling the present ones.

The inadequacy of medical doctors, nurse& midwives across Nigeria 2016-2030 is not likely to change and this would most likely affect the health indicators over the same period since health work force play a critical role in strengthening health system of any country.

RECOMMENDATIONS

Nigeria needs a well-coordinated health system reform policy if she is to meet minimally standard health. The reform policy should be robust enough to include restructuring in pattern of admission into tertiary institutions. This scenario whereby candidates' get admission into various academic courses is not in any way linked to demands of the society should cease. We recommend a central human resource planning body which among other things will program a continuous increase in number of health care workers through careful coordination and prediction of number of medical graduates.

The regulatory bodies should make more efforts to keep accurate records of their members, in the form of actively practicing, travelled abroad, demised, incapacitated, retired and out of practice. This will help in determining the exit rate of Nigerian health workers.

Also the health information system should be strengthened.

STRENGTHS AND WEAKNESSES OF THE STUDY

The figures are not corrected for possible migration however it is expected that the policy thrust of active recruitment of health workforce from developing countries as spearheaded by UK National Health Services may decrease the threat to manpower stock of nations like Nigeria. Although historical fraction lost to migration is 14% [30].

LIMITATIONS

The study did not put into consideration absorptive capacity of the country health system rather it is anticipated that the system would be scaled up to absorb this manpower requirement. Furthermore there are no data of health professional specific death rate and other specific data that would help determine professional stock growth rate. Population figure extrapolation was based on a single census figure conducted in 2006. It is assumed that the Nigerian population changes year by year is progressing constantly. These are also dearth of statistics on birth, death and migration rate to reveal the true and exact changes in Nigerian and health workforce populations.

The study did not take into account gap in different categorises of doctors and regional variation was not considered. The study made an assumption that no human or natural event which could interfere with population growth will occur in this period of study. All projections were made with geometric method

which may exaggerate errors in population size over the years. Inflow rate and Exit rate was not calculated because no reliable data on ground to serve as the basic for further projection.

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