

## Paediatric Association of Nigeria (PAN)

## Paediatrician workforce in Nigeria and impact on child health.

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**Abstract Objective:** To determine the number and distribution of paediatricians in Nigeria. It also aims to determine the association between paediatrician workforce and under five mortality (U5MR) and immunization coverage across the six geopolitical zones of the country.

**Methods:** The part II fellowship examination pass list of the West African College of Physicians and the National Postgraduate Medical College and the register and financial records of the Paediatric Association of Nigeria were searched for the purpose of the study. Using a structured questionnaire, personal and professional data was obtained from members at the 2011 Annual Paediatric Association of Nigeria Conference or via the Association's website, email network and phone calls to Departments of Paediatrics in institutions (private and public) across the Country. Data on the paediatricians residing within Nigeria was then extracted from the comprehensive database and subsequently analyzed. Population data, mortality and immunization rates were obtained from the National Population Commission census and their most recent National Demographic health survey in Nigeria. Correlations were drawn between number of paediatricians and U5MR and diphtheria-pertussis-tetanus (DPT) vaccine coverage.

**Results:** There were 492 practicing paediatricians in Nigeria at the end of year 2011, comprising 282 (57.3%) males and 210 (42.7%) females; 476 (96.7%). Majority (84.7%) worked for the government with 97% of them in hospi-

tal settings, mostly tertiary centres (344=88%). Lagos State had the highest number (85; 17.9%) of practicing paediatricians followed by the Federal Capital Territory with 37 (7.8%) paediatricians. More than two thirds of the paediatricians (336; 70.6%) were practicing in the southern part of the country. The average child: paediatrician ratio was 157,878:1 for the country. The North East zone had the highest child-to-paediatrician ratio (718,412:1) while South West had the lowest ratio (95,682:1). Higher absolute numbers of paediatricians in each zone were associated with lower U5MR (Spearman  $\rho=-0.94$ ,  $p=0.0048$ ), accounting for 84% of the variability among zones. Higher ratios of child-to-paediatrician were significantly associated with higher U5MR (Spearman  $\rho=0.82$ ,  $p=0.04$ , linear  $R^2=0.73$ ) and marginally with lower DPT coverage by geopolitical zone (Spearman  $\rho=-0.77$ ,  $p=0.07$ , linear  $R^2=0.59$ ).

**Conclusion:** The study reveals that the number of paediatricians in Nigeria is grossly inadequate with a huge child-to-paediatrician ratio. There is also an uneven distribution of the paediatricians with higher numbers in the southern states. Zones of the country with lower child-to-paediatrician ratios also experienced lower U5MR. There is a need to train more paediatricians in Nigeria and promote an even distribution of the paediatrician workforce

**Key words:** Paediatrician, workforce, child-to-paediatrician ratio, under-5 mortality, immunization, childhealth, Nigeria

## Introduction

In Nigeria, UNICEF and WHO reported infant and under-five mortality rates as 88/1000 live births and 143/1000 live births respectively by the end of 2010.<sup>1</sup> About half of global under-five deaths occur in only five countries: India, Nigeria, Democratic Republic of the Congo, Pakistan and China. India (22 percent) and Nigeria (11 percent) together account for a third of all under-five deaths worldwide.<sup>2</sup> Immunizations are one of the most cost effective public health interventions known to man because vaccines save lives and promote child survival. WHO-UNICEF estimates for Nigeria show that in 2009, the proportion of 1 year-olds who received the required 3<sup>rd</sup> dose of the combined diphtheria, pertussis and tetanus (DPT3) vaccine usually given at 14 weeks of age was only 42%<sup>1</sup> and national DPT3 coverage rate for any single year has never risen above 60% in the last twenty years. By the end of 2010, only two countries in sub-Saharan Africa – Malawi and Madagascar are reported to be on track to achieve Millennium Development Goal 4 which is reduction by two thirds between 1990 and 2015, the mortality rate in children younger than five years<sup>3</sup>

Crucial to improvement in the health indices of any country is her health manpower. For child health the highest level of care is provided by paediatricians. They not only provide promotive, preventive and curative services, they also help train the country's needed manpower in child health. The quality of life of a child could be improved by access to a trained paediatrician. The current number of paediatricians residing and practicing in Nigeria is not known. Secondly, the distribution of the available paediatricians in the country is also unknown and this may have huge implications for service delivery. Determining such data will not only inform current recommendations but will provide basis for future projections of workforce requirements and tracking of trends. Therefore the objectives of this study were to determine the number and distribution of paediatricians in Nigeria and correlation between the number and child health indices such as U5MR and DPT3 vaccine coverage.

## Methodology

**Definition:** A paediatrician was defined as a doctor who had passed the part II paediatric fellowship examination of either the West African College of Physicians or National Postgraduate Medical College or has been duly certified by an equivalent body from other countries.

### *Paediatrician Count*

A structured questionnaire requesting for data on name, sex, current practice location, fellowship obtained, year of fellowship, area of interest/subspecialty, telephone number and email address was distributed to ordinary members of Paediatric Association of Nigeria (PAN) via email and subsequently at the January 2011 annual

Paediatric Association of Nigeria Conference in Abuja, Nigeria. In addition, the registration and financial records of the Association were reviewed for more names and personal information of paediatricians in Nigeria. We also obtained the names of all who had passed the part II fellowship examination of either the West African College of Physicians or National Postgraduate medical college from the two Colleges. Various paediatricians located at different parts of the country were thereafter contacted by the PAN secretariat either personally or by telephone to verify obtained information about the paediatricians. We also contacted Nigerian paediatricians in Diaspora for additional verification of our database. After compiling the list of all paediatricians in Nigeria which included Nigerian paediatricians in diaspora, it was circulated via electronic mails to all members of PAN for corrections or additions. This process helped us to identify and exclude the paediatricians who had died and those who were retired. Data collection was censored by 31<sup>st</sup> December 2011.

Data analysis was restricted to paediatricians residing in Nigeria. Except when noted, all analyses conducted included only paediatricians in active practice, regardless of the type of practice (clinical care, public health or administrative).

### *Population and Demographics*

Data were analyzed for the country as a whole, the six geopolitical zones, the 36 states and the Federal capital territory (FCT). The zones and their component States are: North Central (Benue, FCT, Kogi, Kwara, Nasarawa, Niger and Plateau); North East (Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe); North West (Kaduna, Katsina, Kano, Kebbi, Sokoto and Jigawa); South East (Abia, Anambra, Ebonyi, Enugu and Imo); South South (Akwa Ibom, Bayelsa, Cross-River, Delta, Edo and Rivers); and South West (Ekiti, Lagos, Osun, Ondo, Ogun and Oyo).

The total population of Nigeria was estimated using the National Population Commission figure of 167 million for the year 2011 and assumed that 45% of the population is <15 years old based on Nigeria Demographic and Health Survey (NDHS) 2008.<sup>4,5</sup> Estimates of the population by states as at the end 2011 were based on projections from the National Population Commission 2006 census at 3.2% annual growth.<sup>6</sup> The U5MR (per 1000 live births) and the DPT3 vaccination coverage for each of the six geopolitical zones of Nigeria were obtained from the NDHS 2008.<sup>5</sup> These population values were used to calculate the ratio of children <15 years to the number of paediatricians in each state, each geopolitical zone and the country as a whole.

### *Statistical Analysis*

Data were analyzed using Microsoft Office Excel 2010 and SAS version 9.3 (SAS Institute, Cary, NC, USA). Categorical variables were summarized as frequency, mean, percentage or ratio. Ecological (zone-level) associations between childhood mortality, DPT vaccination

coverage and ratio of children/paediatrician were conducted using Spearman rank correlations due to the small number of zones (n=6). Curvilinear relationships were observed that suggested linearity on a natural log scale; therefore, the child-to-paediatrician ratio was natural-log transformed and regressed upon mortality and DPT coverage by zone, with adjusted  $R^2$  and p-values presented from those models.

## Results

### General

There were 492 paediatricians in Nigeria as at the end of 2011. This consisted of 282 (57.3%) males and 210 (42.7%) females giving a male female ratio of 1.3:1. Retired paediatricians numbered 16 (3.3%) leaving 476 (96.7%) actively practicing paediatricians in the work force. A large proportion of the paediatricians (90%) received their fellowship from either the National Post-graduate Medical College or the West African College of Physicians.

### Primary employment setting

A large proportion (403=84.7%) of the paediatricians worked for the government with only 69 (14.5%) working primarily in the private sector and 4 (0.8%) with international agencies.

**Government:** Majority (391=97%) of the paediatricians employed by the government worked in hospital settings

with 3% of them working as non-hospital based public servants. Assessing the distribution by level of care hospital showed that 88% (344) worked at tertiary hospitals while 11.3% (44) and 0.8% (3) worked in secondary and primary level hospitals.

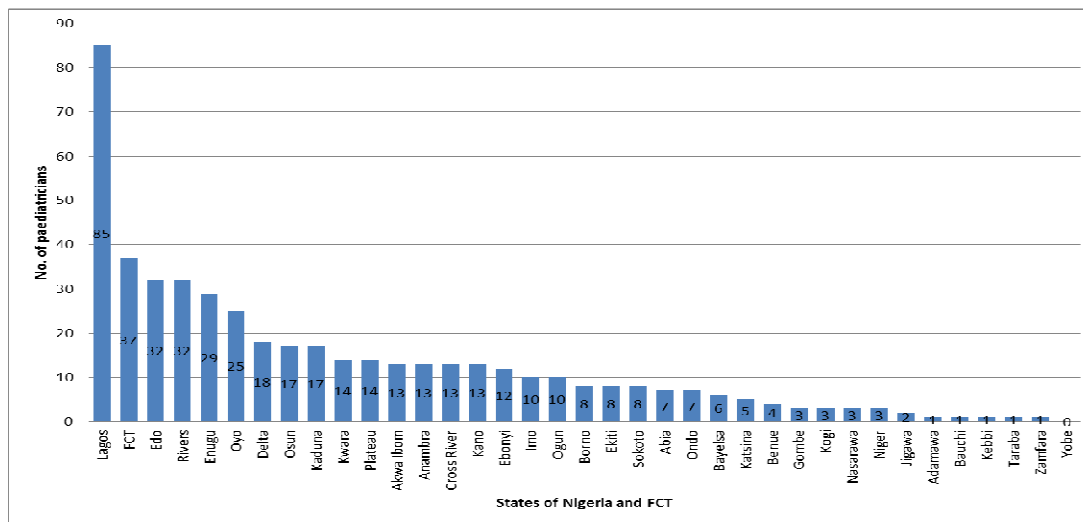
**Private sector:** Sixty nine paediatricians who worked exclusively in the private sector were located primarily in ten states of the Federation and the FCT. The largest concentration of these paediatricians was in Lagos State with 42 (60.9%) and Rivers State with 10 (14.5%). Paediatricians primarily working in the private sector make up 46.7% and 31.3% of the paediatricians work force in Lagos and Rivers States respectively. FCT had five while each of the other eight States had three or fewer privately practicing paediatricians.

### Practice location and geographical Distribution

**State distribution:** Figure 1 shows uneven distribution of the paediatrician work force in the 36 states and FCT with Lagos State having the highest number (85=17.9%) of practicing paediatricians followed by FCT with 37 (7.8%) paediatricians. Yobe State with a children population of 1, 240,795 had no paediatrician.

**Regional/Zonal Distribution:** More than two thirds of the paediatricians (336=70.6%) were practicing in the southern part of the country. Figure 2 shows an uneven distribution among the six zones with the South West having the highest number of paediatricians (152) followed by the South South zone (114); within zones, there is also an uneven distribution by state.

**Fig 1:** Number of practicing paediatricians in the 36 States and FCT.



### Population and Demographics

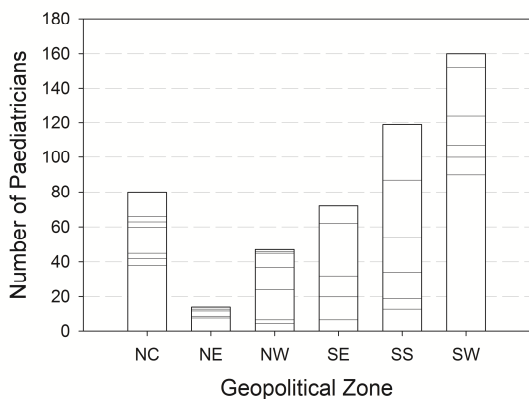
There were 476 documented paediatricians practicing in a population of 75.15 million children less than 15 years of age. This equaled a National ratio of 157,878 children per paediatrician.

**States:** Figure 3 demonstrates the number of paediatricians by state and population. Lagos and Kano states had the largest populations but Kano state unlike Lagos

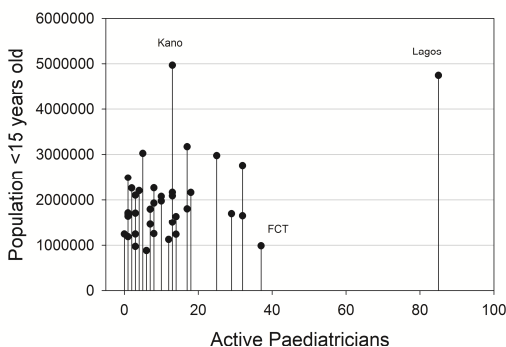
had much fewer paediatricians. Figure 4 illustrates states, zonal and National child-to-paediatrician ratios. Five states in the South and two from the North zones had child-to-paediatrician ratios below 100,000 but no state in the country had a ratio lower than 25,000. Twenty two states (59.5%) had ratios above the National children per paediatrician ratio of 157,878. The smallest ratio was in FCT with 26,659 children per paediatrician while the highest ratio was in Bauchi state with 2,487,313 children per paediatrician. Neither the number

of paediatricians in each state (Spearman  $\rho=0.23$ ,  $p=0.17$ ) nor the ratio of children per paediatrician (Spearman  $\rho=0.15$ ,  $p=0.39$ ) was correlated with the total population of children <15 years in each state.

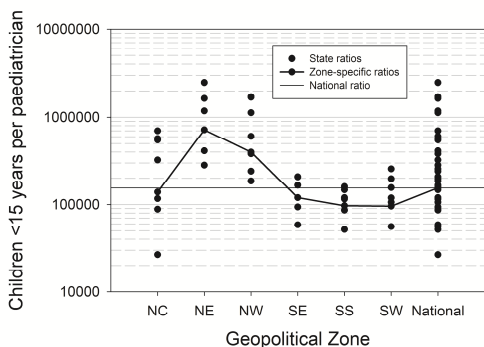
**Fig 2:** Distribution of Paediatricians in the six geopolitical zones of Nigeria.



**Fig 3:** Actively practicing paediatricians by State and population.



**Fig 4:** Average ratio of children<15years/paediatrician – National, Zonal and in the States of Nigeria.



**Zones:** There were wide variations in the average child-to-paediatrician ratios in each of the six geopolitical zones with a trending towards lower ratios in the South zones as shown in Figure 4. The North East had the highest average ratio (718,412:1) while South West had the lowest average ratio (95,682:1). Figure 5 shows

mapping of the child-to-paediatrician ratios by zone.

**Fig 5:** Mapping of average children per paediatrician ratios in the six Zones in Nigeria



Legend

- >600,000 Red
- >400,000-600,000 Yellow
- >200,000-400,000 Light green
- ≤200,000 Dark green

*Under five mortality and DPT vaccine coverage*

Higher absolute number of paediatricians in each zone was associated with lower under U5MR ( $\rho=-0.94$ ,  $p=0.0048$ ), accounting for 84% of the variability among zones. Higher numbers of paediatricians were not significantly associated with higher DPT3 coverage by geopolitical zone ( $\rho=0.60$ ,  $p=0.21$ ).

Higher child-to-paediatrician ratio was significantly associated with higher U5MR ( $\rho=0.82$ ,  $p=0.04$ , linear  $R^2=0.73$ ) and marginally lower DPT coverage by geopolitical zone ( $\rho=-0.77$ ,  $p=0.07$ , linear  $R^2=0.59$ ). However, a curvilinear relationship was observed between the child-to-paediatrician ratio and the childhood health outcomes, so the natural-log transformed ratio was regressed against the outcomes (Figure 6). Adjusted  $R^2$  values from these models indicated that 80% of the variability among zones in U5MR ( $p=0.01$ ) and 82% of the variability in DPT3 coverage ( $p=0.008$ ) are explained by the log of child-to-paediatrician ratio in each zone.

When under-five mortality figures for each zone from Nigeria Multiple Indicator Cluster Survey (MICS) 2011 report<sup>7</sup> were used for the correlation rather than the NDHS 2008 report figures, findings were similar (data not shown).

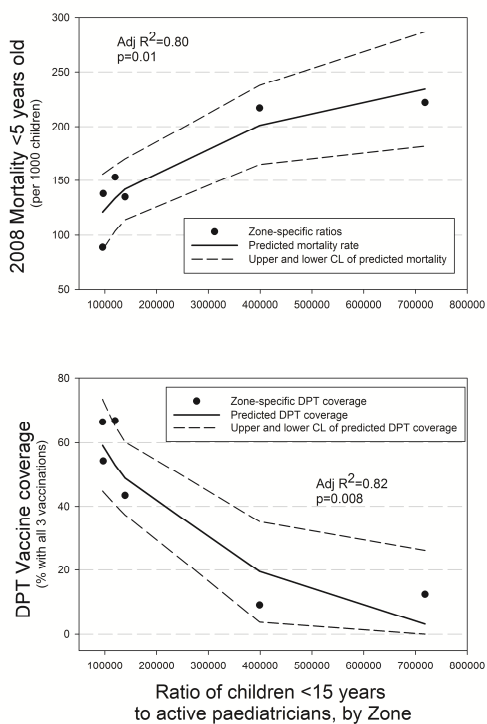
**Discussion**

*Total number and trend/ College contribution/ population ratio*

There were 492 paediatricians in Nigeria as at December 31<sup>st</sup>, 2011. The establishment of two postgraduate medical Colleges in the country has contributed greatly to this number as 90% of the paediatricians obtained their

training from these Colleges. The number of paediatricians currently practicing was however 476. WHO reports 55,356 physicians in Nigeria by end of 2010 with a physician population ratio of 4 per 10,000; less than their recommended 1 per 600 population.<sup>8</sup> Our data shows that practicing paediatricians in the country are less than one percent of the physicians in Nigeria. The absolute number of paediatricians in Nigeria diminished beside the national child-to-paediatrician ratio of one per 157,878 children less than 15 years thus revealing inadequate supply of paediatricians. In contrast, the American board of pediatrics reported a ratio of 1400 children to one paediatrician in the United States in 2011.<sup>9</sup>

**Fig 6:** Relationship of zonal child: paediatrician ratios and child related outcomes



The reason for the mismatch of paediatrician growth and population growth in Nigeria is multifactorial. One of the known workforce challenges is international migration. Incidentally, Nigerian paediatricians registered with the American Medical Association (AMA) in 2003 numbered 427.<sup>10</sup> It is also important to note that not all paediatricians in the USA are members of AMA. Hagopian et al reported that more than 23% of America's physicians received their medical training outside the USA and that 5,334 of them were from sub-Saharan Africa with 86% originating from Nigeria, South Africa and Ghana.<sup>11</sup> Also, a slow process in the training pathway for paediatricians may partly explain the shortage. This could be either due to inadequate enrolment of doctors or low percentage of graduations from the training programme or both. However, entry into the paediatric residency training programme in Nigerian institutions is very competitive with more applicants than available training positions in the institutions. A review of results of the examinations for Fellowship of the National

Postgraduate Medical College (1972-84) showed that the College had produced a total of 145 Fellows during the period. Of these 36, 34, 27 and 13 respectively were in internal medicine, obstetrics and gynaecology, general surgery and paediatrics.<sup>12</sup> Also from March 2008 to March 2012, the pass rate in paediatrics at the part I examinations of the National postgraduate Medical College has remained below 33% with the lowest rate being 12.7%. This indicates that outflow from the programme is also a problem with a similar trend in the West African College of Physicians. To improve the paediatric work force in the country, obstacles to a faster pace of completion of the Fellowship programme need to be addressed by the Colleges, training institutions, trainers and the trainees.

### Gender

When the Paediatric Association of Nigeria was inaugurated in 1969, the founding core members consisted of ten men and one woman.<sup>13</sup> This gender ratio has changed drastically with women constituting 42.7% of the paediatrician workforce of Nigeria compared to 9% in 1969. This trend is also experienced in other countries such as Japan and the USA.<sup>14, 15</sup> For Nigeria, this is a healthy trend as its society is very diverse in culture, languages and religious inclination which reflects in client's physician gender preferences.

### Setting of Practice - Government/Private

A large proportion (87.5%) of paediatricians in Nigeria is employed by the government at tertiary institutions where they provide specialized care for children and engage in teaching paediatrics at both undergraduate and postgraduate levels. This result is consistent with findings in other low and middle income countries.<sup>16</sup> Although these centres of employment are designated tertiary, some primary care is often still provided by the paediatricians. In addition, these paediatricians from the tertiary institutions are involved with primary level of care through advocacy, voluntary work or as consultants to the private sector and international agencies focused on child health. Although only 14.5% of the paediatricians work primarily in the private sector, it is noteworthy that the two cities with the highest number have high wealthy populations. Lagos State is the major economic hub of the nation with most industries, national and multinational organizations. This has resulted in an increased presence of large private medical practices, multinational companies and Banks with employee health-care facilities that attract paediatricians to the private sector thus complimenting the efforts of government in providing health care.

### Geographical spread- State/Zones

There was an uneven distribution of paediatricians across the country with states in the south having more paediatricians than states in the north. The pattern of distribution of the paediatricians from our data is probably a reflection of the educational situation in the

country as a whole. For example In the year 1999, the rate of participation of 14 year-olds in schools in the south of Nigeria was 85% while the northern zones had only about 40 percent except for the North-Central with 71percent.<sup>17</sup> Also the presence of a teaching hospital in a state contributed to more paediatricians in that state. All the states with ten or more paediatricians had teaching hospitals while only 26.3% of the states with less than ten paediatricians had teaching hospitals. Similarly, there is a wide variation of the child-to-paediatrician ratio across the states with more than 90 fold variation in some instances. Factors other than the educational attainment and presence of public-funded tertiary hospitals may also explain the wide variations between states and between zones. The economic activity and affluence of the state may also have an influence on the number of paediatricians per state. For example, states such as Lagos, Rivers and the FCT which have huge economic and political activities have the highest numbers of paediatricians and the largest pool of paediatricians in the private sector, reflecting the high purchasing power of the residents. The FCT also enjoys a relative lower population which makes their child-to-paediatrician ratio more favourable. In contrast states with low gross domestic products such as Yobe, Zamfara and Taraba had the lowest number of paediatricians. This is not limited to paediatricians alone. Nigeria's health workforce profile for 2007 similarly reported that health workers are poorly distributed and in favour of urban, southern, tertiary health care services delivery and curative care.<sup>18</sup> Like other high cadre professionals such as lawyers and engineers, paediatricians may be attracted to states where their services could be paid for. This trend of uneven distribution is in keeping with reports from WHO<sup>16</sup> and is not peculiar to Nigeria or developing countries. Developed countries with data on paediatric workforce have reported similar findings with a leaning towards urban or large cities.<sup>9, 19</sup>

To improve the paediatrician distribution across the states and zones in the country, the state governments should sponsor doctors for postgraduate training in paediatrics and have these doctors work for the state afterwards. This does not have to be limited to indigenes of the state in question. The state governments should also encourage paediatricians to come to their states for sabbatical leaves by providing good working and welfare conditions. PAN can be a focal point for such partnerships. Providing adequate security is however paramount in view of the recent security challenges in the country.

#### *Impact on child health*

Our data suggest that areas of the country with lower child-to-paediatrician ratios also experience lower U5MR and lower DPT3 vaccination coverage. However, other multiple factors such as living standards, wealth, cultures and beliefs, education and urban residence also simultaneously impact both the paediatrician distribution and health outcomes. Indeed, in the recent survey of parents' reasons given for lack of vaccination

of their children, access to a health facility or health professional was listed only 15% of the time among rural dwellers.<sup>5</sup> Thus, in planning public health interventions, other concerns should be addressed besides access to facility and/or professional.

One of the strengths of this study is that a detailed and comprehensive method for identifying and locating paediatricians in Nigeria has resulted in the first national census of paediatricians. Further, the present study was able to correlate paediatrician distribution with population distributions and childhood outcomes in all areas of Nigeria. Despite the significant strengths of this study, some limitations should be noted. First, we relied on an estimate that 45% of the population in all states is under age 15, which is the national proportion. State and zone level estimates of child-to-paediatrician ratios would change somewhat if this assumption is inaccurate. Second, relationships between paediatrician distribution and child outcomes are assessed at the broad geopolitical zone level, not at the level of the individual, or even the states. Thus, we are not able to determine whether individual children experiencing specific outcomes saw a paediatrician or not, or even had a paediatrician nearby. We are also limited in our ability to determine whether the presence of paediatricians in an area of the country is a cause of improved outcomes among children, or is a surrogate measure for other important factors.

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#### **Conclusion**

Paediatricians are grossly inadequate in Nigeria with huge child-to-paediatrician ratios. There is also uneven distribution of the paediatricians with higher numbers in the southern states with either teaching hospitals or increased wealth. Zones of the country with lower child-to-paediatrician ratios also experience lower childhood mortality rates and higher DPT vaccination coverage. Postgraduate medical training Colleges including both trainers and trainees and the government have roles to play in reducing the high child-to-paediatrician ratios in Nigeria.

#### **Authors' contributions**

The study was conceived by all the authors except WJG. Data was collected by all authors except BMR and WJG. EEN and WJG analyzed the data while EEN wrote the initial draft of the manuscript. All authors reviewed and approved the final manuscript for submission.

**Conflict of Interest:** None.

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## Paediatric Association of Nigeria Executive Committee Members 2010 - 2012.

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