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# MEASLES IMMUNIZATION COVERAGE IN KANO STATE, NIGERIA: A GEOGRAPHICAL ANALYSIS

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## Abstract

The study examined the spatio-temporal variations in the level of Measles immunization coverage in Kano State. To achieve that, ten years data on routine immunization coverage were sourced from the Emergency Operational Centre on Polio Eradication (EOC PE), Kano Office. Similarly record of target population of immunized children of each Local Government Area for each year of the study period, 2008 to 2014 was obtained from District Vaccine Data Management Tool (DVD-MT), World Health Organization, Kano Office. ArcGIS Version 9.3 was used to generate maps showing the spatial coverage of childhood immunization by Senatorial district and all the L.G.As in the state. Microsoft Excel 2007 was used generate the temporal pattern of routine immunization coverage and the results were presented in charts, which show the trend of the vaccine coverage in the state through the period of study. Column graphs were used to for the comparative analysis of the; immunization coverage in Metropolitan and Non-Metropolitan Local Government Areas over space and time, with a view to establishing the spatio-temporal pattern of the Expanded Programme on Immunization (EPI) target disease coverage. The results indicated that the total coverage of the vaccine through the period of analysis in Kano Central was 92%, in Kano North, was 91% and in Kano South, was 104%. On average, 95% of the children were immunized through the period of analysis. Finally, Kano metropolis had 92% of the coverage and 97% in the non-metropolis. The study recommends that, new strategies should be employed to increase the frequency of vaccinations at fixed centers, increase the number of fixed centers, increase the number of outreach sessions and target populations in LGA's with low coverage.

**Key words**: Immunization, Measles, Vaccination, Kano State

## 1.Introduction

Immunization is one of the greatest medical success stories in human history. Universal child immunization against vaccine-preventable diseases is recognized as one of the most cost-effective ways of reducing infant and child mortality in developing countries (WHO, 2008). Childhood immunization is the initiation of immunity through application of vaccine. Therefore, it is considered important for improving child survival. Most morbidity and mortality in children are due to vaccine preventable diseases such as measles, poliomyelitis, whooping cough, tuberculosis, diphtheria and tetanus (WHO, 2008).

Immunization is a proven tool for controlling and eliminating life threatening infectious diseases. It avoids suffering, disability and death. More than 10 million death occur globally in children less than 5 years of which 24% are due to vaccine preventable disease (Abdulkarim et al 2011). Immunization against childhood diseases such as measles is one of the most important means of preventing childhood morbidity and mortality. In recent times, vaccination has great impact on measles death from 2000 to 2005, more than 360 million children globally received measles vaccine. This has result in significant reduction in estimated global measles death. During this period in Africa, measles mortality decreased by 75%, but Nigeria

recorded a poor coverage of the vaccine. After that, there is rise in the coverage in 2006 to 32.70% from 25.30% in 2003 and 63.55% in 2010 but at that period Kano recorded the lowest coverage with 16.48% in the country, Enugu being the highest with 97.77% coverage (Ophori et al. 2014).

Immunization against vaccination preventable diseases (VPDs) through the Expanded Program on Immunization (EPI) is one of the most economical public health interventions available that contributes extensively to achieving the Millennium Development Goal, to reduce the mortality rate of children under five by two thirds between 1990 and 2015 (UNICEF, 2002). One of the very disturbing VPD is measles. Despite intense effort to eradicate it, measles still infect 30-40 million people worldwide and causes half a million death a year. It is the leading killer among vaccine preventable diseases and causes an estimated 44% of the 1.7 million vaccine preventable death among children each year (Ophori et al. 2014).

Measles is an acute, highly infectious viral disease that is transmitted from one person to another through respiratory droplets. In the absence of vaccination, measles is documented to have the capacity to infect virtually the entire population in a locality with the exception of isolated communities (Strebel *et al.*, 2004). Maternal antibodies act as a defensive mechanism all over the body just like the actively produced antibodies and are very active in defending infants against most infectious diseases including measles (Niewiesk, 2014).

The number of deaths due to measles has been a subject of considerable controversy for the past several years, mostly because of the inability to specify accurately the cause of death in children infected by measles and other, similar conditions (Dean *et al.*, 2006). The measles vaccine is administered as a single dose during the first year of life, usually at 9 months (but at 12-15 months in industrialized countries) (MCV). Key achievement of vaccination is more than 95% of population to develop immunity over a two-dose vaccination routine (Andre, Booy, Bock, *et al*, 2008). Immunization is an essential strategy for child survival and has proved to prevent more than 1.2 million deaths of children every year (Wolfson, Gasse, Lee-Martin, *et al.*, 2008; Malande, Munube, Afaayo, *et al*., 2019). In the absence of vaccination, the measles virus would infect almost 100 percent of the population, including most of the 688 million children under five in the developing world (Miller, 2000). Transmission can be blocked if population-based immunity exceeds approximately 93 percent, limiting cases only to importations. Control in many urban parts of Africa may be difficult, given that transmission is higher in densely populated environments with low levels of hygiene (Miller, 2000).

In practice, immunization coverage is mixed and far from universal for any of the key childhood vaccines, Nigeria has made significant progress over the last 40 years in vaccine coverage and campaigns especially for measles (Masresha, Braka, Onwu, *et al.* 2018). Shortfalls in basic vaccine coverage further hinder the uptake of new and underutilized vaccines, which protect against some of the greatest threats to children (e.g., pneumococcal disease and rotavirus) (WHO, 2004).

Stagnant and falling immunization rates in most sub-Saharan African countries has resulted in renewed international attention and ensuring that immunization programmes are effective and sustainable, have become key issues of policy debate (IDS, 2006). An important argument for child immunization is that, it leads to reduction of vaccine preventable death of children all over the world which in part

explains the gulf in child mortality rates between developed and developing countries. Awosika (2004) argues that the impact of immunization on the reduction of child morbidity and mortality in Nigeria is remarkable. Measles is a highly infectious disease accounting for the highest rate of morbidity and mortality than all the other Expanded Program on Immunization (EPI) target diseases (Monguno, 2010).

Findings from the various research show that despite the availability of the vaccine that protects eligible children from measles infection delivered through routine immunization, Nigeria and other developing countries still record sporadic outbreak of measles infection (Abubakar 2016). However, these sporadic outbreaks are often fatal with high morbidity and mortality especially in children under the age of five (5) years. In Nigeria it is clear that the severity of the measles is more in the northern part of the country, Kano State being among the prevalent. Related studies in the state relating to measles immunization are mostly clinical studies or studies with small area of coverage (Abdullahi 2018; Nas, Ali, Yahaya and Kabiru 2018; Gunnala, Ikechukwu. Ogbuanu, Oluwasegun, et al, 2016; Belloa, Hamza, Dalhat, Habib et al, 2016). This study looked at measles immunization coverage from the geographic point of view covering the whole state. The study primarily aims to assess the spatial and temporal variations in the level of measles immunization coverage in Kano State. From this broad aim, the following specific objectives were achieved:

i. Analysis of the temporal pattern of routine childhood measles immunization coverage in Kano State from 2007 to 2014
ii. Examination of the spatial coverage of routine measles immunization
iii. Comparism of the measles immunization coverage in metropolitan and non-metropolitan Local Government Areas over time and space with a view to establishing the spatio-temporal pattern of the measles coverage.

## 2. Materials and Methods

### 2.1 Study Area

Kano State is the second most populous State in Nigeria and the most populous in northern Nigeria. It comprises of 44 Local Governments Areas and has three senatorial districts as shown on figure 1.

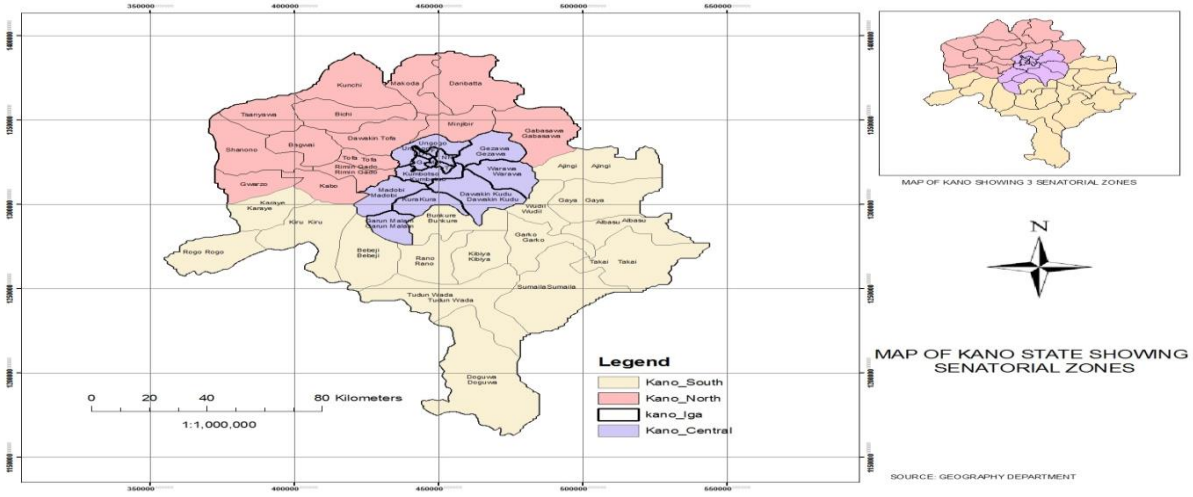


Figure1: Kano State Senatorial Zones
Source: GIS Unit, Bayero University Kano (2019)

In Kano, pattern of diseases and healthcare is similar to that of the country with infectious and parasitic disease dominating and is responsible for most of the morbidity and mortality in the State. The high maternal and child mortality rates reported for the state could easily be attributed to the fact that only 13% of deliveries in Kano were attended to by a skilled birth attendant, only 11% of deliveries in the state take place in a health care facility, only 6% of catchment populations receive required vaccination and more than half of children do not receive their immunizations (zero dose), (Kano State Government, 2010).

## 2.2 Methods

### 2.2.1 Data collection

Seven years retrospective routine immunization data were obtained from Emergency Operational Center on Polio Eradication (EOC PE), where official record of immunization is kept. EOCPE generates routine immunization data from all designated health facilities across the state where immunization service is provided, which is later collated on LGA basis. It is this record which was made available on LGA basis that was used for this study. Since estimating the percentage coverage in immunization requires that the target population of the area be known, the record for the target population for each LGA by each year was collected from the District Vaccine Data Management Tool (DVD-MT) World Health Organization, Kano Office.

### 2.2.2 Data analysis

To show the temporal pattern of childhood immunization coverage, Time Series analysis was used with the aid of Microsoft Excel 2007. This depicted the trends. Arc GIS Version 9.3 was used to produce all the maps. The analysis for the study was done at two scales or levels, one at senatorial level (north, central and south) and the other one at metropolitan and non-metropolitan LGAs.

## 3. Results and Discussion

### 3.1.Spatial Pattern of Measles Coverage

Measles vaccine received the highest coverage rate of all the other vaccines considered at that same period of study with 95% coverage rate. This has reached the target of 95% coverage in Nigeria (NDHS 2013). Highest coverage of 104% was observed in Kano South while Kano Central and Kano North recorded 92% and 91% respectively (Figure 2), as can be seen all the senatorial district have passed the target population of 80% minimum average and Kano South is even above the 95% average target (NDHS, 2013). This pattern could be explained by understanding the disease itself. This have informed parents decision to immunize their children hence the higher percentage of children immunized against Measles in the whole state; Kano Central, Kano North and Kano South. The reason for the high coverage in the South could be as a result of the high prevalence of the disease in the area due to poverty and malnutrition of the children therefore if contact with the disease will be more disastrous. Although measles vaccine coverage was higher than other vaccines, differences may still be observed between the zones. For instance 12% difference can be observed between Kano South and North and Central. As with the LGAs, differences were also observed for the coverage of

measles vaccine in the whole period of analysis. Almost all the LGAs have reached target some were even above. Fagge LGA for example have doubled the targeted population with 211% children being immunized which might be as a result of the large population in the area. Also high level of awareness about immunization is also likely to be responsible because Sabongari which is characterized by high population with heterogeneous culture is located in the LGA likewise major health facilities. Examples of these facilities include Infectious Disease hospital (IDH), Muhammad Jidda hospital, Nigerian Air force Hospital (NAF) and many others. This is followed by Tarauni LGA with 195%, then Ajingi LGA 168%, Rimin Gado LGA 154% and Gaya LGA 152%. The LGAs with least coverage of measles vaccines were Bichi LGA, Takai LGA and Tudun Wada LGA with 54%, 57% and 58% respectively (Figure 3).

This result is similar to that of Monguno (2010) in Borno, where by measles immunization recorded the highest coverage among any other vaccine throughout the 10 years period of study with 70% coverage rate. Even though 95% recorded in this study is higher than 70% coverage with 25%, and the 70% recorded in Borno has not attained the 80% coverage considered to be within safety limits by WHO (Bennette 1988), both the two results has shown similarity in terms of higher coverage of Measles among other vaccines. And differ in terms of regional variation because Monguno's result shows the highest coverage of Measles in Borno North and lowest in Borno Central but in Kano is vice-versa (Kano North recorded the lowest coverage and Kano South recorded the highest).

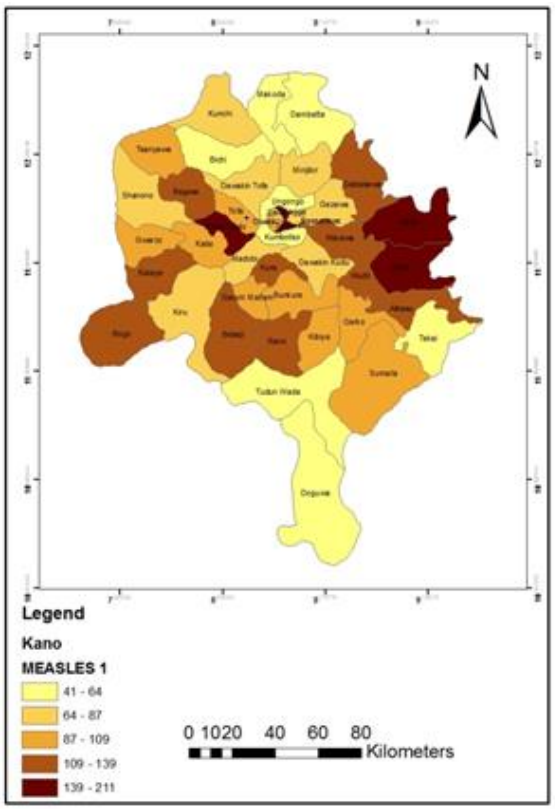


Figure 2: Spatial Pattern of Measles Immunization (in percentage) in Kano State 2008 –2014 by Local

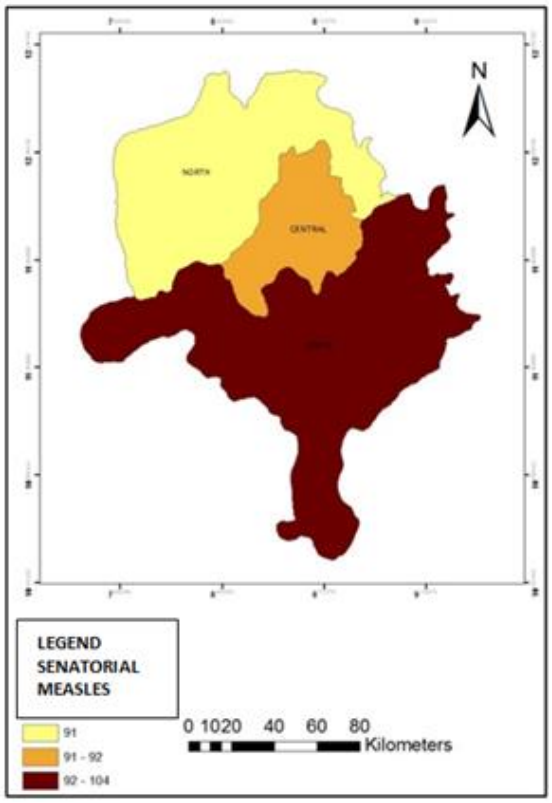


Figure 3: Spatial Pattern of Measles Immunization (In percentage) in Kano State 2008–2014 by Senatorial

Government Area Districts

### 3.1.1 Annual target and trends in measles immunization

An irregular trend appears to be a generally marked feature of measles in Kano State in the seven-year period of study, 2008-2014. Measles is a highly infectious disease accounting for the highest rate of morbidity and mortality than all the other EPI target diseases (Monguno, 2010). In Kano State available data indicate that 95% of the target population of children were immunized during the period of study.

The coverage for this vaccine was generally higher than any other vaccine at that period of study. With the exception of coverage in 2012 which was 54%, measles immunization coverage for the remaining years was consistently above 60% with the coverage in 2011 and 2013 being even above target. Measles vaccine coverage reached as high as 184% in 2011, the highest coverage for the entire vaccine during the period of study. And 117% in 2013, which was also the second highest coverage of measles vaccine during the period of study, (Figure 4). Two factors may be advanced for the very high coverage of measles immunization. Perhaps the most important is the practical effect of the disease itself; measles (*kyanda*) being infectious and very deadly disease, parents are most unwilling to take any chances to forgo its immunization. Perhaps it has been argued that in developing countries of the tropics such as Nigeria, measles might even lead to complications such as persistent diarrhea and blindness (Jones and Moon, 2000), a fact well known by most parents. Thus, even when other vaccines may be missed, measles vaccine may not be compromised by parents. Secondly, in addition to the routine immunization, measles campaigns were periodically arranged every 2 to 3 years. Mop up campaigns were carried out in areas of reported outbreak.

The result of 95% coverage between 2008 and 2014 is similar to that of Monguno in Borno State which recorded 70% coverage between 1998 and 2007 by recording the highest coverage of the vaccine among others. And the two results were also similar in terms of the rise and fall pattern between the years.

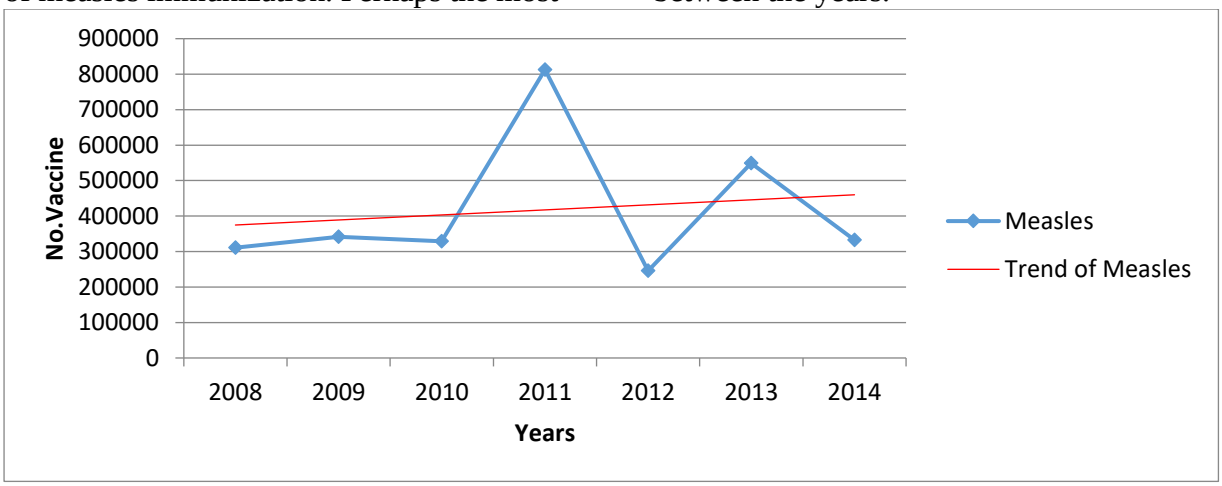


Figure 4: Kano State Annual Trend of Measles Coverage 2008-2014
Source: Computed based on data from Emergency Operational Centre on Polio Eradication Kano State (2014)

### 3.2 Spatio-Temporal Pattern of Measles Immunization Coverage

Kano non-metropolis recorded the highest coverage of measles vaccine with a difference of 5% to metropolis through the period of analysis. This might probably be as a result of high prevalence of the disease in the area due to the reasons mentioned earlier. Measles vaccine was administered to 92% of the target population of children in the metropolis, while 97% of the target population were been vaccinated in the non-metropolis. Differences were also observed between the years. In 2008 and 2009 Kano metropolis recorded the highest coverage with a difference of at least 30%, having 99% and 107% of the target population respectively while Kano non-metropolis recorded 69% and 72% respectively. In 2010, 2011, 2012, 2013 and 2014 Kano non-metropolis recorded the highest coverage, having 84%, 193%, 56%, 122% and 78% of their target population respectively, while Kano metropolis recorded 59%, 164%, 49%, 105% and 64% respectively (Figure 6). As could be seen low coverage of measles vaccine was observed in 2012 in both the metropolis and non-metropolis of less than 60% and in 2014, less than 80% for both and in 2010 only the metropolis. Measles vaccine in general was the only vaccine that had the highest coverage among the entire vaccines through the whole period of analysis in both within and outside the metropolis.

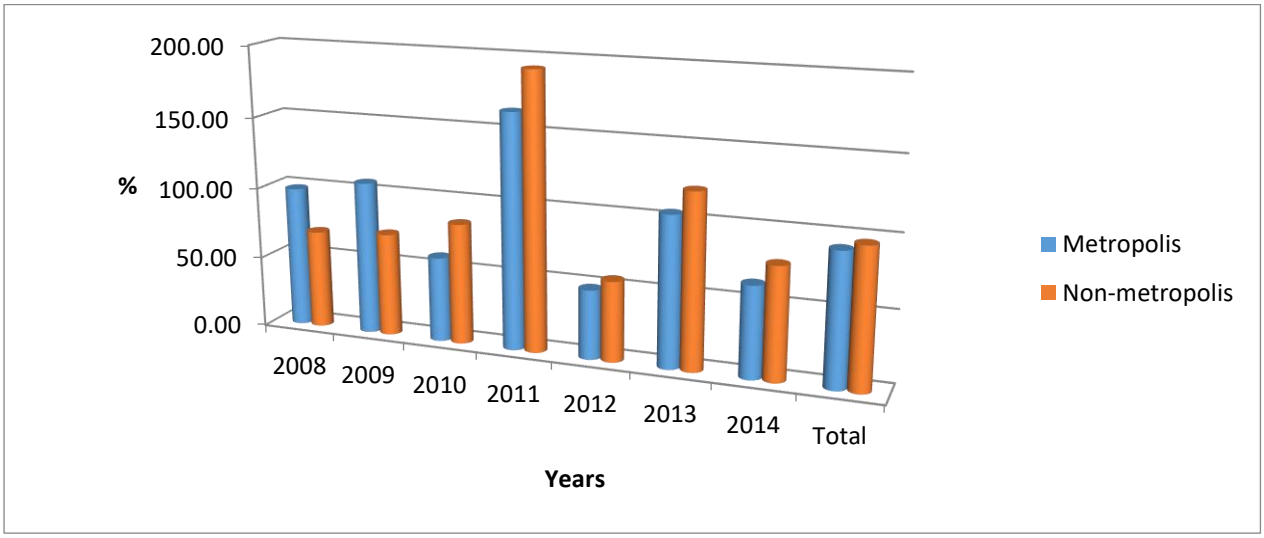


Figure 6: Spatio-temporal pattern of Measles vaccine between metropolitan and non-metropolitan area 2008-2014

### 4. Conclusion

Based on the findings, the following conclusions can be drawn.The spatial differences in the coverage of measles immunization in Kano State between the senatorial districts imply that there was high rate of awareness of people in all the three zones only for some few LGAs, about the practical effect of the disease itself (being infectious and very deadly disease) parents are most unwilling to take any chances to forgo its immunization. This has made all the three zones to pass the average target of 80%, even though some LGAs have recorded below that, for example Bichi LGA with 54%. This difference has implication about where to be putting more

emphasis in ensuring the uptake and availability of this vaccine.

The temporal variation in measles immunization in Kano State implies that, the year with low coverage of the vaccine, like 2012, there might be chances of having unhealthier children as a result of the disease outbreak, than other years of vaccine high coverage. Therefore, this irregular trend has implication that much attention is needed by all stakeholders to ensure the availability of the vaccine and immunization by mothers and that of health facilities in the study area. Also, high coverage of measles immunization in Kano metropolitan and non-metropolitan LGAs implies that there was high level of awareness of the danger caused by measles in children therefore parents in both Kano Metropolis and outside the metropolis take it seriously when immunizing their children against measles. That makes Kano State to reach the required target of 80% coverage considered to be within safety limits by WHO (Bennette 1988).

## 5. Policy Implications and Recommendations

Based on the conclusions the following recommendations are made.The link between education and healthcare utilization is obvious; policies that will promote raising the literacy level of women in matrimony are particularly required in Kano State. This would in addition to other occurring benefits, assist in intensifying measles immunization coverage in the long run.As a result of low coverage in some LGAs, new strategies should be employed by the state government to increase the frequency of vaccinations at fixed centres, increase the number of fixed centres and also increase the number of outreach sessions on target populations.

## References

Abdulkarim, A. A., Ibrahim, R. M., Fawi, A. O., Adebayo, O. A. and Johnson A. (2011) Vaccines and Immunization: the past, present and future in Nigeria. *Nigerian Journal of Paediatrics* **38**(4). DOI: 10.4314/nip.v38i4.72382

Abdullahi S. (2018) Factors Affecting Completion of Childhood Immunization in North West Nigeria. A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy Public Health Walden University

Abubakar, J. S. (2016) Trends of Measles in Nigeria: A Systematic Review. Department of Expanded Program on Immunization, World Health Organisation, Bauchi Zonal Office, Bauchi Nigeria. *Sahel Medical Journal* Vol.**19**.

Adamu, Y.M. (2004) Study of Community and Systematic Factors Affecting the uptake of Immunization in Nigeria (Kano State study report) submitted to Partnership for Transforming Health Systems in Nigeria (PATHS) Abuja.

Ali, M., Emch, M., Ashley. C. and Streathfield, P.K. (2001) Implementation of a Medical Geographic Information System: Concepts and Uses. *Journal of Population, Health and Nutrition* **19**(2): 100-110.

Andre, F. E., Booy, R., Bock, H. L., Clemens, J. et al. (2008)

Vaccination greatly reduces disease, disability, death and inequity worldwide. *Bulletin of the World Health Organization* 86:140–146.

Awosika, D. (2004) 'Forward' In Basic Guide for Routine Immunization Service Providers National Programme on Immunization. Abuja.

Bello, M. M., Hamza, M., Dalhat, M. M., Habib, Z. G., Yakasai, A. M., et al. (2016) Challenges of Immunization Coverage among a Semi Nomadic Population in Kano State, North West Nigeria. *International Journal of Sciences: Basic and Applied Research* **27(**3):186-193

Bennette, F.J. (1988) Community Diagnosis and Health Action: A Manual for Tropical Rural Areas. London: Macmillan.

Dean, T., Jamison, D.T., Feachem, R.G. and Makgoba, M.W. (2006) Disease and Mortality in Sub-Saharan Africa. 2nd edition, Jamison editors, Washington D.C.

Gunnala R, Ogbuanu IU, Adegoke OJ, Scobie HM, Uba BV, Wannemuehler KA, et al. (2016) Routine Vaccination Coverage in Northern Nigeria: Results from 40 District-Level Cluster Surveys, 2014-2015. *PLoS* ONE **11**(12): e0167835. doi:10.1371/journal.pone.0167835

Institute of Development Studies (2006) Polio Vaccines - Difficult to Swallow. The Story of a Controversy in Northern Nigeria. Working paper 261.

Malande, O. O., Munube, D., Afaayo R. N., Annet, K., Bodo B., Bakainaga, A., Ayebare, E., Njunwamukama, S., Mworozi, A. E. and Musyoki, M. A. (2019) Barriers to effective uptake and provision of immunization in a rural district in Uganda. *PloS one* 14:20212270, https://doi.org/10.1371/journal.pone.0212270

Masresha, B. G., Braka, F., Onwu, N. U., Oteri, J., Erbeto, T., Oladele, S., Sumaili, K., Aman-Oloniyo, A., Katsande, R. and Tegegn, S. G. 2018 Fall A. Progress Towards Measles Elimination in Nigeria: 2012 – 2016. *Journal of Immunology Sci*ence S (020): 135-139

Miller, M.A. (2000) Introducing a Deterministic Model to Estimate Global Measles Disease Burden. *Journal of International Infectious Diseases*, Vol.**4**: 14-20.

Monguno, A.K. (2010) A Geographical Analysis of Childhood Immunization Coverage in Borno State. Ph.D Thesis Submitted to the Department of Geography, Bayero University, Kano.

Nas F. S., Ali M., Yahaya A. and Kabiru A. G. (2016) Retrospective Study on Incidence of Measles in Kumbotso Kano, Northern Nigeria. *Virology & Immunology Journal* **2**(6): 000170.

Niewiesk, S. (2014). Maternal antibodies: clinical significance, mechanism of interference with immune responses, and possible vaccination strategies. *Frontiers in immunology*, *5*, 446. https://doi.org/10.3389/fimmu.2014.00446

Nigeria Demographic and Health Survey (2013) National Population Commission Federal Republic of Nigeria Abuja, Nigeria ICF International Rockville, Maryland, USA June 2014.

Ophori, E. A., Tula, M. Y., Azih, A. V., Okojie, R. and Ikpo, P. E. (2014) Current Trends of Immunization In Nigeria: Prospects and Challenges. *Tropical Medicine and Health* **42**(2):67-75.DOI: 10.2149/tmh.2013-13

Strebel, P.M., Papania and Halsey, N. (2004) Measles Vaccine. Philadelphia: Saunders.

UNICEF (2002) Annual Report (covering 2002). UNICEF Publications.

WHO (2004) World Health Report - Changing History. Geneva: WHO.

WHO (2008) Primary Health Care Now More than Ever, World health report 2008: Geneva.

Wolfson, L. J., Gasse, F., Lee-Martin, S-P., Lydon, P., Magan, A., Tibouti, A., *et al*. 2008 Estimating the costs of achieving the WHO-UNICEF global immunization vision and strategy, 2006–2015. Bull World Health Organ 86:27.