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Geographical analysis of gender disparity in out-of-school children in Nigeria

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Abstract
There are over 10 million children of primary school age out-of-school in Nigeria. Thus, school non-attendance is still a major problem in the country. A few studies have been done to understand the causes. Nevertheless, there is a dearth of studies that have examined the gender variations in out-of-school children (OOSC) and the underlying predictors across the country. Investigating the gender dimension of school non-attendance will enhance gender specific policies as the causes of school non-attendance are likely to vary between gender and across states or regions. To this end, this study conducts a spatial analysis to determine the geographical differences in OOSC, the hotspots of OOSC, and the underlying predictors using spatial statistical techniques. Contrary to the widely held opinion, findings indicate that more boys are out-of-school than girls. Across the country, the northern region accounts for a significant percentage of OOSC. The state-level analysis shows that Bauchi State is the hotspot for male school non-attendance while Sokoto, Kebbi, and Niger States are the hotspots for female school non-attendance. Evidence from the spatial analysis indicates that poverty is a significant predictor of OOSC majorly in the northwest and northeast regions of the country. The study recommends the need to alleviate poverty to improve school enrolment and the expansion of back-to-school programs for out-of-school boys.

Keywords Out-of-school children · Gender · Poverty · Spatial analysis · Nigeria

1 Introduction

According to the United Nations (2018), out-of-school children (OOSC) are those kids that are yet to be enrolled in any formal education, excluding pre-primary education. About 244 million children are out-of-school in a recent report published by UNESCO (2022), of which 118.5 million were girls and 125.5 boys.

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This staggering figure shows that many of the countries globally, especially low-income countries are not on track in achieving the sustainable development goal 4, whose focus is to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all by 2030. Interestingly, sub-Saharan Africa accounts for a significant proportion (98 million) of out-of-school children (OOSC) worldwide (UNESCO, 2022). The rising cases of OOSC have been attributed to the lack of political will by the government in promoting quality education in most developing countries, heightened insecurity, and the prevalent poor socio-economic conditions. As expected, the burden of OOSC such as the shortage of skilled manpower, high level of illiteracy, and crime are more felt in sub-Saharan Africa.

More worrisome is the fact that Nigeria has the highest number of OOSC in the world (UNICEF, 2018) despite the numerous policies put in place by the government to check the increasing rates (Adeleke & Alabede, 2022). Notable among these policies are the Universal Primary Education and the Universal Basic Education whose goals are to provide free, universal, and compulsory education for every Nigerian Child (Centre for Public Impact, 2017). Although the schemes are laudable and they have been able to improve school enrolment, OOSC is still a major problem in Nigeria with about 10 million children out of school (UNESCO, 2022). In fact, it has been estimated that for every five of the world's OOSC, one is from Nigeria (UNESCO, 2022). This appalling situation has spurred interest among researchers from various disciplines to investigate the causes and to proffer solutions to the high prevalence of OOSC due to its negative effect on national development.

Research on OOSC in Nigeria and globally have identified the influence of various socio-economic factors (Adeleke & Alabede, 2022; Ndanusa et al., 2021; Okoh et al., 2020; Ali et al., 2021; Erhieyovewe, 2020). Nevertheless, there is a dearth of studies that have examined the gender differences in OOSC. The few studies that have investigated the gender dimension of OOSC have been carried out at the sub-unit levels of the country such as the local government, region, or individual state (Kazeem et al., 2010; Sambo and Gyang, 2019; Idoko, 2021; Ewoh-Odoyi, 2021; Abubakar, 2023; Oritsema, 2021; Babatunde et al., 2018; Fareo, 2019; Odenigbo, 2019; Alhassan & Odame, 2015; Tilak, 2002; Johannes, 2005; Lloyd et al., 2005; King et al., 2015; Faughnan, 2016; Dunga & Mafini, 2019). For instance, the study of Odame (2015) in the northern region of Ghana credited the gender inequality in basic education to poverty, socio-cultural practices such as boy child preference, and polygamy. Elsewhere in four Indian States of Bihar, Uttar Pradesh, Kerala, and Maharashtra, evidence suggests that the preference for male child is responsible for many cases of female school non-attendance (Tilak, 2002).

In rural Pakistan, Lloyd et al. (2005) found that rural location is a limiting factor for female access to formal education than for boys. Equally, a gender analysis of children's schooling decision in rural and urban Cameroon was influenced by parental education and income (Johannes, 2005). This is in line with the findings of Faughnan (2016) in northern Uganda where poverty and parental limited financial capacity were responsible for school non-attendance for boys and girls. Similarly, findings from the study of King et al. (2015) in rural Western Kenya re-echoed the influence of poverty on children being out-of-school. In Zomba, Malawi, higher

percentage of girls were out-of-school due to insufficient household income (Dunga & Mafini, 2019).

In Nigeria, the study of Idoko (2021) based on in-depth interview and focus group discussion in five communities in Katsina, Niger, and Bauchi found that a significant number of girls are out-of-school due to poverty and the problem of insecurity. In other words, school remains expensive for the poor due to their inability to afford the indirect cost of education (Adeleke & Alabede, 2022). Furthermore, Babatunde et al. (2018) provided empirical evidence on gender inequality in schooling among children in Kwara State. Specifically, the result of the Gini-coefficient showed that low level of parental education and poor income earning are responsible for school non-attendance between genders, though the impact was more on the girl child. In a related line of study, Abubakar (2023) attributed the high rate of school non-attendance among girls in Yobe State to poor parental education and poverty. Earlier findings on existing gender differences in OOSC were equally reinforced by Fareo (2019) in the author's analysis of OOSC in Maiha Local Government Area in Adamawa State. Reasons for school non-attendance between genders are low income of parents and parental unemployment.

From the forgoing, no study to the best of my knowledge has examined the spatial heterogeneity in OOSC along gender divide and the underlying predictors using nationally representative data in Nigeria. This approach is essential because school non-attendance is a product of socioeconomic inequalities that are widespread across the country, and the magnitude of effect is likely to vary between genders. Besides, state-level disparities between genders in school non-attendance and the underlying predictors which were obscured in earlier studies will be uncovered through spatial analysis of nationally representative data that allows for a more efficient and gender-specific policy interventions in curtailing school non-attendance. To this end, the objectives of this study are to (1) examine the spatial differences in OOSC between genders across the states in Nigeria (2) determine the spatial hot spots of OOSC for both gender and (3) identify the underlying predictors of school non-attendance between genders.

2 Methodology

2.1 Data source and measurement

OOSC are children in the official primary school age range of six to eleven years who are not enrolled in school. The data on OOSC expressed as a percentage of children of primary school age (6–11 years) in each of the 36 states and the Federal Capital Territory, Abuja, was obtained from the most recent report of the Universal Basic Education Commission (UBEC) (2018). UBEC is a federal government agency saddled with the responsibility of coordinating all aspects of universal basic education program implementation. To collect comprehensive basic education data in Nigeria, the commission covered all levels of basic education in the 774 local government areas of the country. All public and private primary schools were also captured in the exercise. With assistance from the State

Universal Basic Education Board (SUBEB) and other educational agencies, Form A3 was administered by the enumerators or field officials to heads of all the primary schools in the 774 local government areas to collect data that are important to basic education delivery. Among other information, the Form A3 captured information on pupil enrolment by level, year, sex, age, and class. Thus, the commission's computation of OOSC is the difference between the total number of children of primary school age in each state and the number of in-school children.

Based on the report of the commission, 6,340,621 boys and 3,853,297 girls between the ages of 6–11 years had no access to formal education. The report also indicated that as of 2018, Nigeria had 40,841,946 children of primary school age comprising 21,546,523 for male and 19,295,423 for female. State-level data for the total number of children that are out-of-school and children of primary school age are also contained in the report. Seven explanatory variables for school non-attendance were adopted in this study based on their identification in literature and the availability of datasets. These variables are stated below and the rationale for their usage:

1. *Poverty:* This was measured as the percentage of population living on less than $1.90 a day (international poverty line), and this data was sourced from the records of the National Bureau of Statistics, 2018. A few studies have shown that poverty impacts negatively on the education of children. As noted by Dickerson and Popli (2012), children from poor homes are majorly out-of-school due to the inability of their parents and guardians to sponsor their education. This assertion was further corroborated in the study of Adeleke and Alabede (2022) that poverty results in school non-attendance because of the inability of parents to afford the indirect cost of education such as the purchase of books and uniforms.
2. *Unemployment:* Unemployment was defined as the percentage of the population without a job and this data was obtained from the United Nations Human Development Report 2018. Because unemployment results in the loss of income, it has been established to be a predictor of school non-attendance since it limits the ability of parents and caregivers to take care of the educational and materials needs of the child (Lehti et al., 2019).
3. *Literacy rate:* The data on the percentage of adult population that can read and write was gotten from the United Nations Human Development Report 2018. Studies have shown that parental educational status is correlated with children's out-of-school statuses. For children whose parents are educated, they have a better chance of being enrolled in school because educated parents know the importance of education (Ersado, 2005). On the other hand, some uneducated parents may treat the education of their children with levity, and this may deny them access to formal education.
4. *Per capita income:* The information on income earned per head was sourced from the United Nations Human Development Report 2018. There is no doubt that parental income earning plays a major role in the educational pursuit of a child. Children from households with low income or limited financial means are mostly at risk of missing out of school due to their parent's incapability to pay

for basic educational materials and other costs associated with education such as uniforms, transportation, and other after school care (Gennetian et al., 2018).

5. *Inflation rate:* Inflation rate was measured based on the consumer price index, with the data obtained from the records of the National Bureau of Statistics, 2018. The rapid increase in the prices of food and other essential commodities have been proven to be associated with the educational attainment of a child. During inflation, households, especially low-income families, are usually at the receiving end as they spend a major share of their income on food and other perceived essential commodities leaving nothing to finance the education of their children (Witte et al., 2013).
6. *Population density:* This was calculated as residents per square mile. Educational infrastructure and the presence of qualified teachers that are likely to encourage school attendance have been found to be concentrated in high density areas (Romanillos & García-Palomares, 2018). Thus, the denser an area, the more likely it is to have many of its children in school. Nevertheless, the fact that most densely populated areas in developing countries such as Nigeria are characterized by low quality of life, low per capita income, and unemployment (Adeleke, 2023) makes it a platform that negatively impacts children school attendance.
7. *Foreign direct investment:* The data on foreign direct investment inflows (FDI) per state was derived from the National Bureau of Statistics, 2018. The ability of FDI to attract cash inflow into the economy has a positive effect on the establishment of schools and the upgrade of existing ones and this has been established to improve school enrolment (Suyanto et al., 2009). In other words, the lack of FDI inflow could have negative consequences on the provision of educational infrastructure which could discourage school enrolment.

2.2 Statistical analysis

To achieve the objectives of the study, relevant descriptive and spatial inferential statistical techniques were used. First, the choropleth map was used to visualize gender differences in out-of-school children across the country. The map provides information on the geographical areas, regions, and states where a significant number of male and female children are out-of-school. Consequent to the mapping of OOSC, the hotspots and cold spots of OOSC for male and female was determined using the local Getis Ord spatial statistical technique. The local Getis Ord identifies statistically significant spatial clusters of high values (hot spots) and low values (cold spots) by searching for above and below concentrations of a given phenomenon. A high z-score and a small p-value for a feature indicate a spatial clustering of high values while a low negative z-score and small p-value indicate spatial clustering of low values. The higher the z-score, the more intense the clustering (Ord & Getis, 1995).

For this study, hotspots are the states or regions that have above average number of OOSC in the country for either male or female or both while cold spots are locations with below average number of OOSC for either male or female or both. Thus, from this analysis, one or more of the below outcomes are possible:

1. A state or region could be a hot spot for both male and female school non-attendance. Nevertheless, the intensity of clustering is likely to differ between genders.
2. A state or region could be a hot spot for female school non-attendance and a cold spot for male school non-attendance.
3. A state or region could be a hot spot for male school non-attendance and a cold spot for female school non-attendance.
4. A state or region could also be a cold spot for both male and female school non-attendance.

Hence, the strength of the local Getis Ord analysis is that it draws attention to where gender disparity in OOSC is significant or a major problem in Nigeria.

The OLS regression and the geographically weighted regression (GWR) statistical techniques were applied to determine the geographical disparity in OOSC for male and female. The OLS regression describes the relationship between one or more independent quantitative variables and a dependent variable. It also has the power to eliminate redundant variables or multicollinearity in variables based on the Variance Inflation Factor that is equal to or greater than 7.5. Because the OLS regression is a global model, it assumes that the predictor(s) of the outcome variable are the same over a geographical area, and this is regarded as its limitation. In reality, the effect of the predictors on the outcome variable is likely to vary across a country due to the differences in geographical compositions. The OLS regression diagnostic tests are the Koenker statistic (KS) for the detection of spatial non-stationarity when KS is significant, Studentised Breusch Pagan examines the presence of homoscedasticity, and Jarque Bera (JB) checks for the presence of normality when JB is significant.

The OLS regression confirms spatial non-stationarity in the relationship between OOSC and the predictors for both genders based on the Koenker statistic that is significant, and this necessitated the use of the GWR to explain the observed spatial dependence. The GWR is a spatial analysis technique that takes non-stationary variables into consideration and models the local relationships between these predictors and the outcome variable of interest (Fotheringham et al., 2002).

Two GWR models, one for male and the other for female was developed with the below equations:

$$y_{1(\text{male})} = \beta_0(u_i, v_i) + \sum \beta_k(u_i, v_i)x_{ik} + \varepsilon_i \tag{1}$$

where y_1 is the dependent variable (percentage of OOSC male), β_k is the standardised coefficient, x_{ik} the independent variables denoted by poverty, per capita income, literacy rate, unemployment rate, inflation rate, foreign direct investment, and population density, (u_i, v_i) the co-ordinate location of i while ε_i is the error term.

$$y_{3(\text{female})} = \beta_0(u_i, v_i) + \sum \beta_k(u_i, v_i)x_{ik} + \varepsilon_i \tag{2}$$

where y_2 is the dependent variable (percentage of OOSC female), β_k is the standardised coefficient, x_{ik} the independent variables denoted by poverty, per

capita income, literacy rate, unemployment rate, inflation rate, foreign direct investment, and population density, (u_i, v_i) the co-ordinate location of i while ε_i is the error term.

3 Results

Regional variations in school non-attendance between male and female children of primary school age are noticeable between the northern (female 20.80%, male 30.15%) and southern (female 18.23%, male 28.20%) regions of Nigeria. For both genders, the northern region accounts for a significant percentage of OOSC when compared to the southern region. Specifically, the northeast is responsible for a significant percentage (38%) of male school non-attendance while the northcentral has the largest percentage of OOSC for female (26%) (Fig. 1). In general, there were more boys among OOSC than girls across the various regions of the country.

The state-level geographical distribution in OOSC for both gender, male and female are presented in Figs. 2, 3 and 4. Figure 2 shows a north–south gradient in OOSC rates for both genders. The states in the northern region with high OOSC rates are Yobe (43.44%), Taraba (41.52%), Zamfara (41.13%), Sokoto (33.98%), and Plateau (33.72%). Meanwhile, only Rivers State in the southern region has a high OOSC rate at 33.98%. Generally, many of the states in the southern region have low OOSC rates with the lowest figure recorded in Lagos state at 10.20%.

As per Fig. 3, six states have a high concentration of school non-attendance for male. These states are Yobe (53%), Plateau (48%), Borno (45%), Zamfara (41%), Taraba (40%), and Rivers (46%). On the other hand, Edo (4%) and Niger (7%) States have the lowest cases of school non-attendance for male children of primary

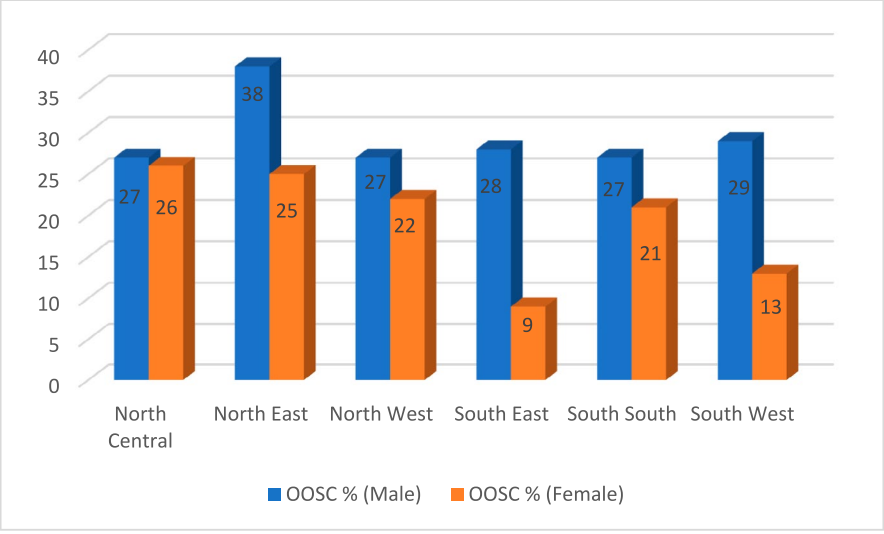

Fig. 1 Regional distribution of male and female school non-attendance

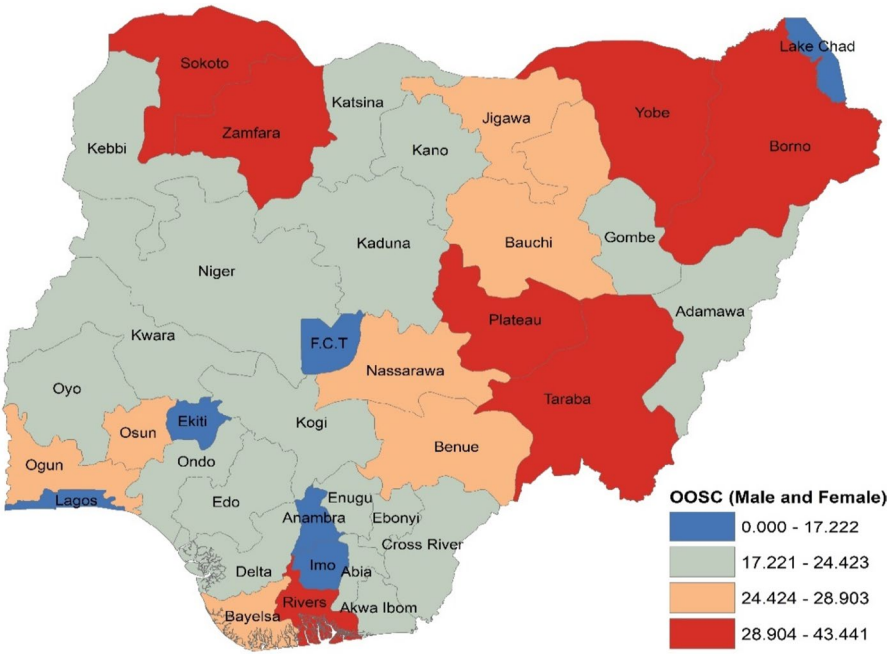

Fig. 2 Geographical distribution of OOSC for male and female

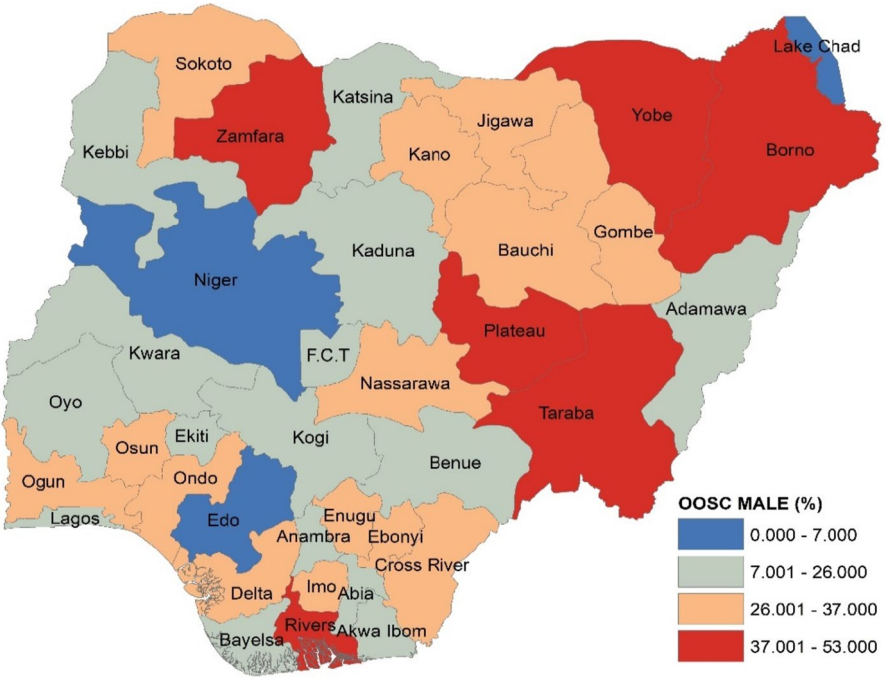

Fig. 3 Geographical distribution of OOSC (Male)

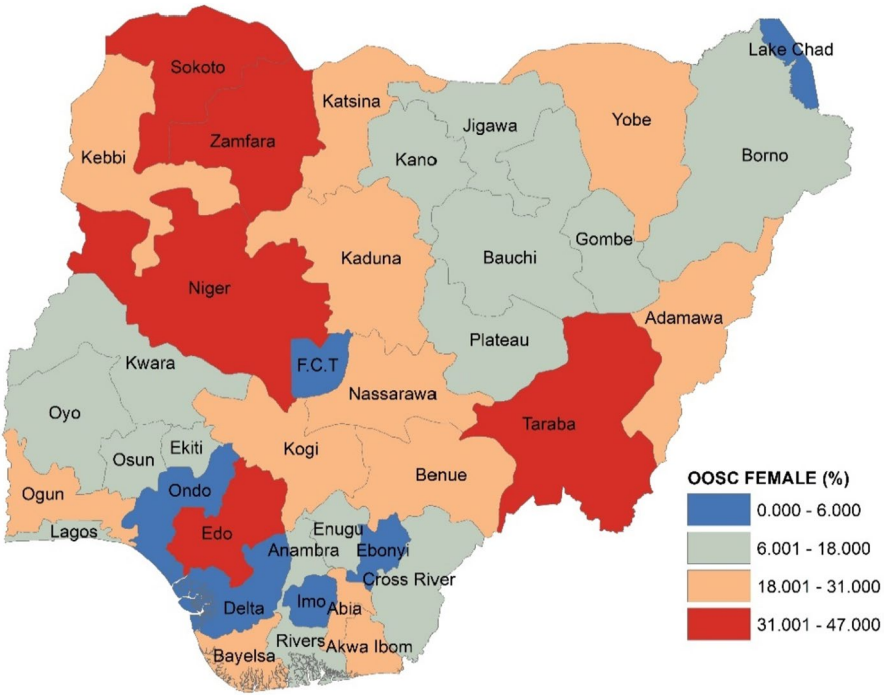

Fig. 4 Geographical distribution of OOSC (Female)

school age. With regards to the geographical distribution of OOSC for female, significant concentration of school non-attendance was noticed in five states, and they are Sokoto (47%), Taraba (43%), Zamfara (41%), Niger (38%), and Edo (4%). Conversely, Ondo (1%), Delta (1%), the Federal Capital Territory, Abuja (3%), Imo (4%), and Ebonyi (6%) account for the lowest figures of female school non-attendance (Fig. 4). It can also be seen from Figs. 3 and 4 that across the country, there are more boys out-of-school than girls. Of the 36 states and the Federal Capital Territory, Abuja, twenty-six states have a larger percentage of boys out-of-school. The proportion of girls who are out-of-school was higher than that of boys in only eleven states.

Further to the examination of the geographical distribution of OOSC along gender divide, the study determined the states with above average number of OOSC for both genders and where gender disparity in OOSC is intense through the hot and cold spot analysis. Results show that Sokoto ($z = 1.961$; $p = 0.049$), Zamfara ($z = 1.871$; $p = 0.014$), Yobe ($z = 2.433$; $p = 0.038$), Taraba ($z = 2.274$; $p = 0.022$), and Plateau ($z = 2.068$; $p = 0.038$) States are the hotspots of OOSC for both genders (Fig. 5). However, Bauchi, Sokoto, Kebbi, and Niger, all in the northern region, are the only states with intense gender disparity in school non-attendance (Figs. 6 and 7). Specifically, while Bauchi State is the hot spot ($z = 1.714$; $p = 0.030$) for male school non-attendance because it has a larger proportion of its boys out-of-school than girls (Fig. 6), it is a cold spot (z-1.714;

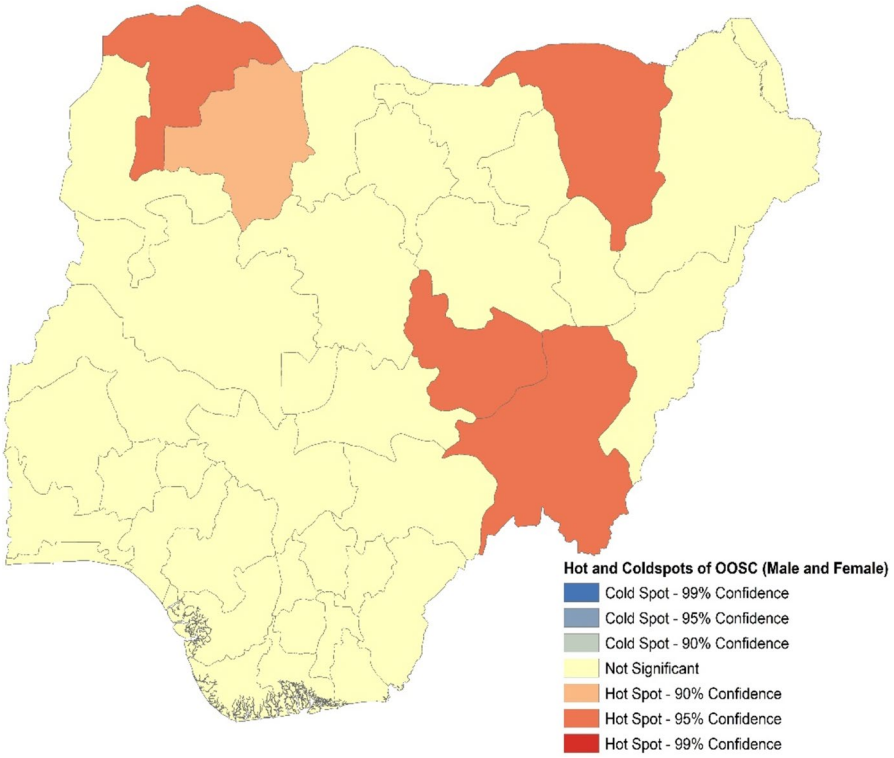

Fig. 5 Hot and cold spots of OOSC for male and female

0.02) for female school non-attendance (Fig. 7). On the other hand, Sokoto ($z = 1.991$; $p = 0.043$), Kebbi ($z = 2.037$, $p = 0.041$), and Niger States ($z = 1.785$; $p = 0.042$) are the hotspots of female school non-attendance (Fig. 7). This also connotes that these states are cold spots for male school non-attendance (Fig. 6). Although Sokoto, Kebbi, and Niger States are the hotspots of school non-attendance for female, the gender disparity is more skewed towards female in Kebbi State based on the z-score of 2.037 and p value of 0.041.

Tables 1 and 2 present the results of the OLS regression on the predictors of OOSC for both male and female. Poverty is the only variable significantly associated with school non-attendance for both genders. However, an observation of the standardized regression beta coefficient indicates that poverty has more effect on female school non-attendance than for male. At a significant level of 0.01, every 1 percent increase in poverty results in 0.292 percent increase in female school non-attendance (Table 1) compared to 0.220 percent for male (Table 2). In other words, poverty has a varying effect on school non-attendance for both genders. Based on the R^2, the models are moderately strong with poverty explaining 54.3 percent and 52.4 percent of female and male school non-attendance, respectively. Nonetheless, spatial non-stationarity was present in the relationship

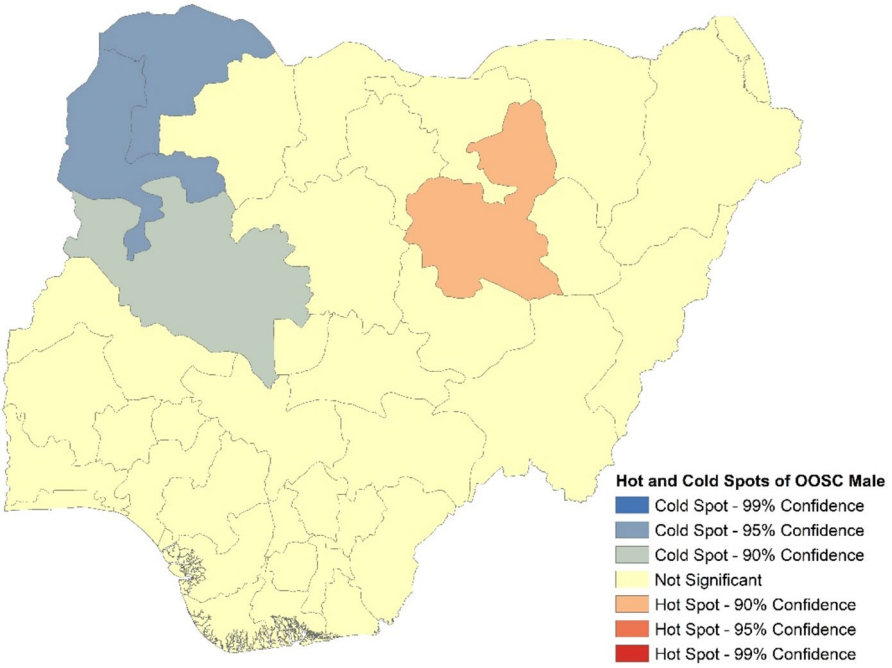

Fig. 6 Hot and cold spots of OOSC for Male

between poverty and OOSC based on the significant Koenker statistic (Tables 1 and 2). This shows that a more robust statistical technique is needed to unpack the observed spatial dependence.

The results of the GWR are presented in Tables 3 and 4 and Figs. 8 and 9. Based on the improvement in the AIC values and the R^2 (Tables 3 and 4), the GWR is a better model fit to the OLS regression. Figure 8 depicts east–west gradient in the relationship between poverty and male school non-attendance across the country with a coefficient value between 0.000 and 0.470. It can also be seen from the map that there are seven states where poverty has more influence on male school non-attendance. Interestingly, all the states except Jigawa are in northeast Nigeria, and they are Borno, Yobe, Gombe, Adamawa, Taraba, and Bauchi. Meanwhile, poverty has the least effect on OOSC in southwest Nigeria. Figure 9 shows the spatial relationship between poverty and female school non-attendance with a coefficient value of between 0.000 and 0.598. The result shows that the impact of poverty on female school non-attendance is more felt in Sokoto, Kebbi, Zamfara, Katsina, Kano, and Kaduna in northwest Nigeria, and Niger State in the north central. In contrast, its effect is minimal among many of the states in southwest Nigeria.

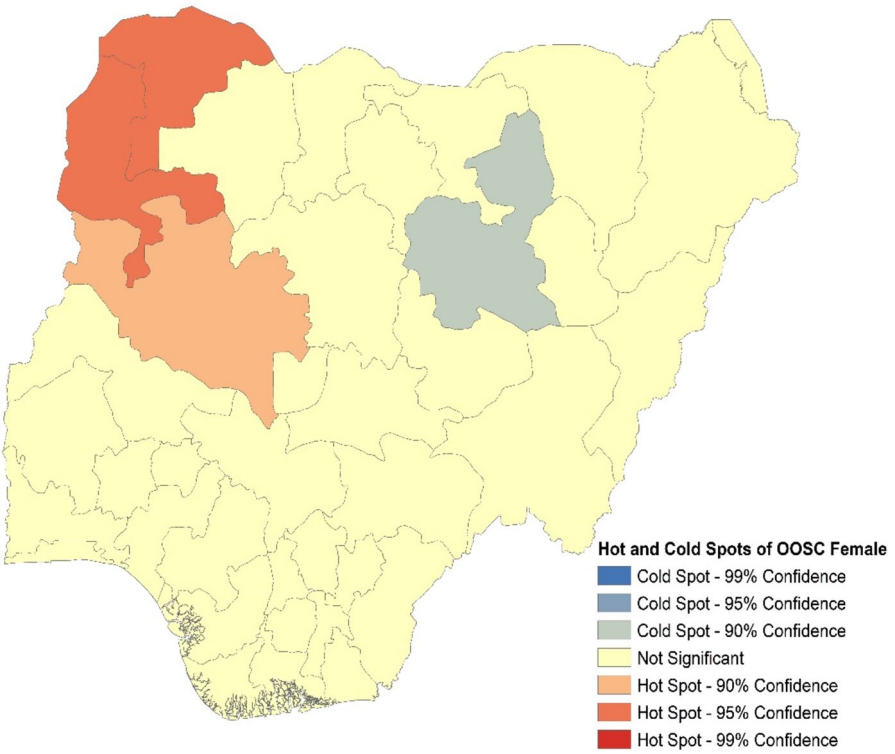

Fig. 7 Hot and cold spots of OOSC for Female

Table 1 Summary of OLS regression results for OOSC (Male)

Variable	Standardised Coefficient	Std error	T Stat	Probability	Robust SE	Robust T	VIF
Intercept	14.560	7.808	1.864	0.072	8.582	1.696	-
Poverty	0.220**	0.097	2.263	0.031	0.103	2.136	1.217
Inflation	-0.000	0.012	-0.057	0.954	0.005	-0.125	1.135
Population Density	0.001	0.005	0.254	0.800	0.002	0.614	1.612
Unemployment Rate	0.194	0.152	1.277	0.211	0.124	1.571	1.195
Literacy Rate	-0.022	0.057	-0.394	0.696	0.058	-0.389	1.160
Income	-0.000	0.001	-0.141	0.888	0.000	-0.279	1.611
FDI	-0.000	0.000	-0.408	0.685	0.000	0.484	1.080
OLS Diagnostics							
Koenker Statistics 5.294 ($p < 0.05$)							
Jarque Bera 0.859 ($p < 0.05$)							
R-Squared 52.4							
AIC 306.844							

Significant at $p < 0.01$**

Table 2 Summary of OLS regression results for OOSC (Female)

Variable	Standardised Coefficient	Std error	T Stat	Probability	Robust SE	Robust T	VIF
Intercept	10.554	7.851	1.344	0.188	6.483	1.627	-
Poverty	0.292**	0.098	2.976	0.005	0.092	3.167	1.217
Inflation	-0.003	0.012	-0.285	0.776	0.009	-0.383	1.135
Population Density	-0.001	0.005	-0.225	0.822	0.004	-0.285	1.612
Unemployment Rate	-0.087	0.153	-0.572	0.571	0.119	-0.735	1.195
Literacy Rate	-0.036	0.058	-0.618	0.541	0.056	-0.634	1.160
Income	-0.000	0.001	-0.327	0.745	0.001	-0.323	1.611
FDI	0.000	0.000	0.545	0.589	0.000	1.534	1.080
OLS Diagnostics							
Koenker Statistic 5.072 ($p < 0.05$)							
Jarque Bera 1.929 ($p < 0.05$)							
R-Squared 54.3							
AIC 307.260							

Significant at $p < 0.01$**

Table 3 GWR Summary of results for OOSC (Male)

Diagnostics	Score
R^2	61.921
Adj R^2	55.301
AICc	285.630

Table 4 GWR Summary of results for OOSC (Female)

Diagnostics	Score
R^2	64.446
Adj R^2	57.223
AICc	291.700

4 Discussion

This study examined the geographical disparity in OOSC in Nigeria with a few interesting findings. The empirical analysis shows that the northern region is not only the hotspot for school non-attendance, but it also has a larger proportion of OOSC for both genders relative to the southern region. This has been attributed to a combination of factors such as the prevalence of child marriage influenced by socio-cultural practices, high levels of insecurity such as banditry and Boko-haram insurgency, and the effect of religion that manifests in the desire for Quranic education to conventional education (Oyekan et al., 2023). The result of this study also reveals that more boys are out of school than girls. This contrasts with most studies that reported a higher percentage of school non-attendance for the girl child (Sambo and Gyang,

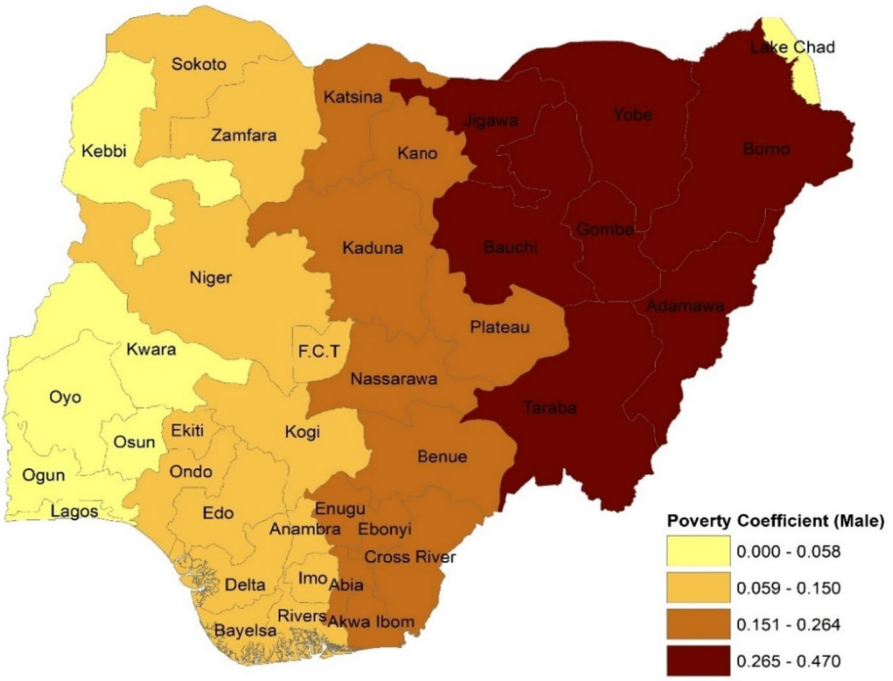

Fig. 8 Spatial relationship between poverty and OOSC for male

2019; Babatunde et al., 2018; Ewoh-Odoyi, 2021; Abubakar, 2023; Idoko, 2021). A possible reason for this difference in finding could be attributed to the fact that most of these studies relied on a small sample size for their studies which fails to capture the true picture of gender disparity in school non-attendance in the country.

The fact that more boys are among OOSC than girls could be due to several factors. First, in the last decade, many of the intervention programs to improve school enrolment such as the girls' education project, strategy for the acceleration of girls' education in Nigeria (SAGEN), the girl's education program, enhancing girls' basic education in northern Nigeria (EGBENN), transforming the education for girls in Nigeria (TEGIN), among others, have largely focused on girls. This is because the male child has always been viewed as more educationally advantageous than their female counterparts (Isibor, 2012). The common adage that when you educate a girl, you educate a nation also shows the premium placed on girls' education. Another possible reason for school non-attendance for boys could be the preference for trade apprenticeship over formal education, especially in the southeast region. According to Oyekan et al. (2023), it is a common practice for parents in the southeast to withdraw their male children from school at an early age to join the labor market because it is believed apprenticeship or entrepreneurship is a means to economic prosperity.

From the statistical analysis, all the states detected as the hotspots for OOSC are in the northeast and northwest regions, except for Niger State in the northcentral. The OLS regression and the GWR confirm the effect of poverty on gender

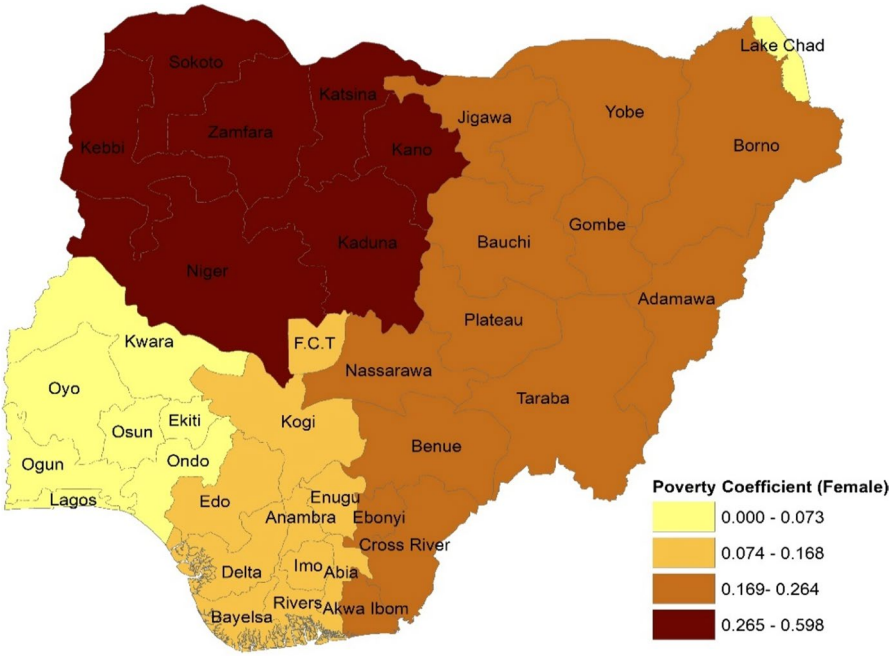

Fig. 9 Spatial relationship between poverty and OOSC for female

disparity in OOSC in these regions. In a recent report released by the World Bank (2022), Northern Nigeria has the largest share of people living in poverty (63%) and this is more endemic in the northwest and northeast of Nigeria. The high poverty rate in these regions has been attributed to the high levels of insecurity majorly caused by terrorist activities, illiteracy, unemployment, and its unfavorable location to the coast which has limited industrialization, to mention a few (Adeleke et al., 2022). Poverty affects school non-attendance among male and female children in northern Nigeria in several ways. Poverty stricken families often struggle to meet basic needs, including food, shelter, and healthcare. The lack of financial resources can make it challenging for these families to provide necessary educational resources and support for their children. As a result, children from impoverished homes may be unable to afford essential school supplies, uniforms, or transportation, which may keep them out of school.

Poverty is closely associated with inadequate access to healthcare facilities and proper nutrition (Venter, 2022). Children living in poverty are more susceptible to malnutrition, illness, and chronic health conditions which are widespread in the northeast and northwest regions of the country. For example, the northeast and northwest have one of the highest cases of malnutrition among children globally (Amare et al., 2018). No doubt, poor health conditions necessitated by poverty is likely to interrupt the education of children. Similar findings on the effect of poverty on school non-attendance has been reported in Ghana (Iddrisu, 2014),

Zimbabwe (Magwa and Rosemary, 2016), the United States (Jefferson, 2017), England (Flouri & Midouhas, 2016), among others.

5 Study limitations

Despite the findings of this study, there are limitations which are acknowledged. First, the findings of this study with respect to gender differences in OOSC may not reflect the current reality based on the 2018 data used. Nevertheless, it must be noted that this is the most recent data on OOSC at the state-level in the country and the study has potential to guide policy formulation regarding tackling the challenges of OOSC in Nigeria. Future studies could build on the current study when more recent data on OOSC at the state-level is made available by the relevant agencies. Additionally, some equally important variables such as religion, ethnicity, insecurity, child's disability, and socio-cultural factors that have been established in the extant literature as predictors of school non-attendance among children (Abdullahi, 2014; Finning et al., 2020; Oyekan et al., 2023) were not investigated in this study due to the absence of state-level data. These factors and others could be examined in future research to have a comprehensive insight into the predictors of gender disparity in OOSC in Nigeria. Finally, it is important to note that the predictors of OOSC are multifactorial. Hence, caution is advised when interpreting the study's findings with respect to poverty.

6 Conclusion

OOSC is still a major problem in Nigeria, and this varies significantly between genders. Interestingly, more boys are out-of-school than girls contrary to the widely held opinion that girls are often marginalized educationally. Socio-economic disadvantaged locations are more associated with school non-attendance, especially the northeast and northwest regions of Nigeria with one of the poorest socio-economic indices in the country. In other words, socio-economic disadvantaged states or regions will continue to account for a major share of OOSC if adequate policies are not formulated. The observed regional/geographical disparity in OOSC was largely due to poverty, with its effect on OOSC strongest in the northern region. Based on the findings of this study, the following policies are recommended. Like the myriads of school enrolment intervention programs focused on the girl-child, the boy-child should also be of interest to government and policy makers. The national campaign on back-to-school for the boy-child launched in the southeast by the Federal Government should be extended to other regions of the country. That said, the challenge of girl-child education should also be of concern to the government. To mitigate the effect of poverty on children's education, the government should focus on providing financial support to families in need in the form of cash transfers to poor families mostly in the northeast and northwest of Nigeria. Similar policy has been implemented in Mexico with positive effect on school enrolment. The government should

also show the political will in making education affordable and accessible to the citizens.

Author's contribution Richard Adeleke was involved in the study design, conception, analysis, write up and interpretation of results.

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Data availability Data will be made available on request.

Declarations

Conflict of interest There is no conflict of interest.

Informed consent Not applicable. Only secondary data were used.

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