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Predictors of Out-of-School Children in Ilorin, Nigeria: A Multinomial Logistic Regression Analysis

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Abstract

Nigeria has the highest number of out-of-school (OOS) children in the world. This paper examines the factors contributing to OOS prevalence among children in Ilorin, Nigeria, using a sample of 1972 children. The original data has been published without statistical analysis. Multinomial logistic regression (MLR) analysis was used to predict the likelihood of children being "never enrolled," a measure of being out-of-school, based on 18 independent variables culled from the literature. The MLR was significant (Chi-square = 119.09, $p < 0.001$) over the null hypothesis. Four variables were found to significantly contribute to the MLR model: age ($p < 0.001$), parents' educational status ($p < 0.05$), parents' current employment status ($p < 0.05$), and school location ($p < 0.001$). Additionally, the paper finds that older children and those residing in urban areas are more likely to be out of school. Older children often face social pressures and responsibilities that interfere with their ability to attend school regularly. Inadequate infrastructure and limited access to schools in urban areas can also restrict educational opportunities for children. Health issues, including chronic diseases and sexual issues, were identified as contributing factors to out-of-school prevalence, particularly among children and adolescents. Several diseases and conditions can significantly impact a student's ability to attend school regularly and participate fully in educational activities. Some recommendations were made.

Keywords: Out of school; logistic regression; Likelihood ratio, poverty; household income; statistics.

Introduction

Nigeria is undoubtedly the most populous country in Africa; however, it faces a daunting challenge concerning its education system. One of the most pressing issues is the high number of out-of-school (OOS) children and adolescents, which constitutes a significant impediment to the country's development. Globally, there are over 263 million OOS children in the world (Bello & Othman, 2020), and Nigeria has the highest percentage of OOS when compared with other countries. A recent book chapter estimated that Nigeria has about 20 million OOS (Owolabi, 2021), and the sudden increase was due to ongoing insurgency in northeast Nigeria. Regrettably, OOS prevalence is just one of the numerous consequences of security challenges in Nigeria (Adamu et al. 2021). Despite numerous efforts by the government and various organizations, the problem persists, demanding immediate attention and innovative solutions.

This article establishes the predictors of OOS children using variables from carefully surveyed data from Ilorin, Nigeria (Ojuolape & Mohd, 2022). Several factors contribute to the high number of OOS children in Nigeria, including poverty, cultural norms, religious beliefs, inadequate infrastructural facilities, funding, corruption, and security challenges. Addressing the issue of funding is key to resetting the prevailing narrative (Omodero & Nwangwa, 2020).

The persistently high number of OOS children in Nigeria has several detrimental consequences for both individuals and the nation. Without access to education, children face restricted opportunities for personal and

economic growth. This cycle of poverty perpetuates across generations. The OOS syndrome exacerbates disparities, hinders societal progress, and degrades the nation's intellectual potential. Illiteracy and lack of education can contribute to increased crime rates and foster susceptibility to extremist ideologies, jeopardizing the nation's security and stability. Insecurity in northeast Nigeria has resulted in destitution and internally displaced people, consequently worsening the prevalence of out-of-school children (Verlumun et al. 2022). Existing literature has noted that OOS children and adolescents are at high risk of underage marriage (Okoro & Nwogu, 2020), child hawking (Taiwo, 2022), youth radicalization (Amaka, 2020), pessimism about future life and career prospects (Olasupo & Idemudia, 2017), alcohol abuse, drinking problems, and intoxication (Dada et al. 2016), cigarette smoking (Gana et al. 2018), and substance abuse (Sarkingobir et al. 2020).

The Nigerian government, along with international organizations and NGOs, has initiated several programs and policies to address the issue of out-of-school children. Some of these efforts include the Universal Basic Education (UBE) Program launched in 1999, which aims to provide free basic education to all Nigerian children aged 6 to 15 years. However, implementation challenges and inadequate funding have hindered its effectiveness. Second, the conditional cash transfer (CCT) programs were introduced to incentivize families to send their children to school by providing financial support to families with school-going children. Lastly, efforts have been made to improve school facilities and provide a conducive learning environment. However, infrastructure challenges persist in many regions. The legal framework that backs up several legislations on the welfare of children in Nigeria is weak, and where they are implemented, they are often relegated by cultural and religious norms that are intrinsically embedded in the nation's dominant patriarchal system (Nwozor & Okhillu, 2022). Despite these efforts, funding challenges, government insensitivity, insecurity, and cultural and religious barriers continue to accelerate the prevalence of OOS in Nigeria.

This paper assessed familial factors that may predict OOS. Previous research has focused on non-familial causes, such as Nigeria's internally generated revenue (Adeleke & Alabede, 2022) and child labour (Omokhodion, 2015). Additionally, previous research has focused more on the sexual aspect of the consequences of OOS prevalence in Nigeria, including the prevalence and correlates of statutory and outright rape suffered by OOS children and adolescents (Kunnuji & Esiet, 2015), intimate sexual violence (Kunnuji, 2015), early sexual initiation or debut (Odeyemi et al. 2016) (often by coercion), and other forms of physical and sexual violence (Evans et al. 2023). Moreover, OOS children have been found to have higher odds of engaging in unprotected sexual intimacy (Adanikin et al. 2017) and are more vulnerable to sexual abuse and exploitation (Okeke et al. 2022), which often leads to teenage pregnancy (Chukwu et al. 2021).

Material and Methods

Data

The data details are provided in Ojuolape and Mohd (2022). The data was from the survey of 1120 households across the three senatorial districts in Kwara State, Nigeria. The data contained different variables that can be used to predict OOS.

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Variable Description

The data contained 19 variables (1 dependent and 18 independent). The detailed variable is presented in Table 1.

Table 1: List of Variables

Variable	Definition	Description and measurement
ESC	Enrolment Status of children aged between 0 and 17	1 = never enrolled; 2 = was enrolled and 3 = currently enrolled
Age	Age of the children	Measured in years (continuous)
Gender	Sex or gender of the children	0 = female; 1 = male
PED	Educational status attained by the parents	1 for minimum of secondary school education and 0 if otherwise
PCE	Parental current employment status	1 = only one parent is currently employed; 2 = both are employed and 3 = both are unemployed
EDC	Cost of education	Cost of school enrollment measured in Naira (continuous)
HIN	Household income	Measured in Naira (continuous)
INCE	Incentive for education	0 = none; 1 = available
Size	Size of the household	The number of people living in a house
GHOH	Gender of the head of household	0 = female and 1 = male
PGF	Whether the father has more than 1 wife	1 = polygamy and 0 = otherwise
HT	Household tribe	1 = Yoruba (majority tribe in the sample area and 0 = otherwise
BO	Birth order of the child in family	Continuous variable
DSCH	Distance from home to school	A continuous variable measured in kilometers
ATS	Easily accessibility to school	1 = easily accessible and 0 = otherwise
Location	The location of the school	0 = rural and 1 = urban
WTES	Willingness to enroll in school	0 = compulsion and 1 = willing
PIF	To determine if friends can influence the decision to enroll	1 = if friends are enrolled and 0 = otherwise
HLEAC	Highest level of education attained or completed by the child	1 = uneducated; 2 = primary education; 3 = secondary education; 4 = graduate and 5 = postgraduate

The Enrolment Status of children aged between 0 and 17 (ES) will be used as the dependent variable while the remaining 18 variables will serve as the predictors or independent variables.

Statistical Analysis

Multinomial logistic regression was used to predict ESC using the other 18 independent variables and p value equals 0.05 is considered significant.

Result

Demographic analysis

Out of 1972 children (respondents), 222 (11.3%) were never enrolled, 910 (46.1%) were previously enrolled, and 840 (42.6%) are currently enrolled in primary, secondary or tertiary educational institutions. 1261 (63.9%) are female, while 711 (36.1%) are male.

Multinomial Regression Analysis

Slight data cleansing was performed to ensure the data were suitable for applying multinomial logistic regression (MLR). The never enrolled value coded as 1 in ESC was used as the reference variable. This is the primary measure of OOS because the secondary category (previously enrolled) did not give a clear picture as whether the child is transiting from one level of education to another. Secondly, all the 18 independent variables were used as covariates despite some being discrete. The motive is that the research is about investigating the effects of the 18 variables in the manifestation of never enrolled which is the measure of OOS in this context.

The first result showed that the final model is a significant improvement over the null (intercept only) model; $\text{Chi} - \text{square} = 119.09, \text{df} = 36, \text{AIC} = 3762.346, \text{BIC} = 3974.645)$ and $(-2\text{Log likelihood} = 3686.346, \text{p} < 0.001)$. AIC is the Akaike information criterion and BIC is the Bayesian information criterion.

Pearson Chi-square test $(3930.863, \text{p} = 0.328)$ and Deviance Chi-square test $(3680.801, p = 0.992)$ showed that the model fits the data very well (good fit). The three measures of pseudo coefficient of determinations $(\text{Cox and Snell} = 0.059, \text{Nagelkerke} = 0.069, \text{McFadden} = 0.031$ are similar to the one of ordinary least square regression but caution will be exercised in their interpretation **(Vieira et al. 2023)**. Technically, the three measures indicate fit between 3 and 7 percent.

The likelihood ratio test is done to determine whether the extent of significant contributions of the 18 independent variables to the MLR model **(Table 2)**.

Table 2: Likelihood Ratio tests of the contribution of the 18 independent variables to the prediction of OOS children in Ilorin, Nigeria

	Model Fitting Criteria			Likelihood Ratio Tests		
Effect	AIC of Reduced Model	BIC of Reduced Model	-2 Log Likelihood of Reduced Model	Chi-Square	DF	P-value
Intercept	3760.451	3961.576	3688.451	2.105	2	0.349
Age	**3802.259**	**4003.384**	**3730.259**	**43.913**	**2**	**0.000**
Gender	3758.516	3959.641	3686.516	0.170	2	0.918
WTES	3760.091	3961.216	3688.091	1.745	2	0.418
PED	**3764.601**	**3965.726**	**3692.601**	**6.255**	**2**	**0.044**
PCE	**3767.567**	**3968.692**	**3695.567**	**9.221**	**2**	**0.010**
EDC	3758.882	3960.007	3686.882	0.536	2	0.765
HIN	3758.750	3959.875	3686.750	0.404	2	0.817
INCE	3759.514	3960.639	3687.514	1.168	2	0.558
Size	3759.205	3960.330	3687.205	0.859	2	0.651
GHOH	3759.851	3960.976	3687.851	1.505	2	0.471
PGF	3759.506	3960.631	3687.506	1.160	2	0.560
HT	3759.666	3960.791	3687.666	1.320	2	0.517
BO	3759.606	3960.731	3687.606	1.260	2	0.533
DSCH	3758.920	3960.045	3686.920	0.574	2	0.750
ATS	3759.363	3960.488	3687.363	1.017	2	0.601
PIF	3761.755	3962.880	3689.755	3.409	2	0.182
Location	**3781.732**	**3982.857**	**3709.732**	**23.386**	**2**	**0.000**
HLEAC	3758.564	3959.689	3686.564	0.218	2	0.897

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From **Table 2**, Likelihood Ratio tests revealed that only four (4) out of the eighteen (18) variables contributed significantly in the prediction of OOS children in Ilorin, Nigeria. The four variables are age ($p < 0.001$), PED ($p < 0.05$), PCE ($p < 0.05$) and location ($p < 0.001$) of the school.

The parameter estimate table provides information in comparing the values (previously enrolled and currently enrolled) of the dependent variable (ESC) against the reference value (never enrolled). These are shown in **Table 3** and **Table 4**.

Table 3: Parameter estimates of comparing was enrolled against never enrolled

Previously enrolled against never enrolled	**B**	**Std. Error**	**Wald**	**DF**	**P-value**	**Odds**
Intercept	0.835	0.579	2.079	1	0.149	
Age	**0.047**	**0.021**	**4.964**	**1**	**0.026**	**1.049**
Gender	0.060	0.159	0.142	1	0.707	1.062
WTES	0.097	0.172	0.317	1	0.573	1.101
PED	-0.046	0.213	0.047	1	0.828	0.955
PCE	**-0.183**	**0.086**	**4.472**	**1**	**0.034**	**0.833**
EDC	0	0	0.094	1	0.760	1
HIN	0	0	0.183	1	0.668	1
INCE	0.097	0.198	0.242	1	0.623	1.102
Size	0.032	0.060	0.276	1	0.599	1.032
GHOH	-0.105	0.184	0.322	1	0.570	0.901
PGF	0.172	0.171	1.020	1	0.313	1.188
HT	0.187	0.168	1.238	1	0.266	1.205
BO	-0.006	0.080	0.005	1	0.944	0.994
DSCH	-0.005	0.006	0.593	1	0.441	0.995
ATS	-0.102	0.183	0.313	1	0.576	0.903
PIF	0.343	0.213	2.576	1	0.109	1.409
Location	-0.229	0.178	1.656	1	0.198	0.795
HLEAC	-0.022	0.143	0.024	1	0.878	0.978

In comparing between previously enrolled and never enrolled, only 2 independent variables are significant. Age ($B = 0.047$, S.E. $= 0.021$, $p < 0.05$) and PCE ($B = -0.183$, S.E. $=0.086$, $p < 0.05$) are significant predictors and hence contributed appreciable to the model. The interpretation is that those children that are older are most likely to be previously enrolled than never enrolled. Secondly, those whose parents are unemployed are less likely to be previously enrolled than never enrolled.

Table 4: Parameter estimates of comparing currently enrolled against never enrolled

Currently enrolled against never enrolled	B	Std. Error	Wald	DF	P-value	Odds
Intercept	0.700	0.593	1.394	1	0.238	
Age	**0.129**	**0.023**	**32.500**	**1**	**0.000**	**1.137**
Gender	0.065	0.163	0.161	1	0.688	1.068
WTES	-0.049	0.175	0.079	1	0.779	0.952
PED	-0.346	0.213	2.640	1	0.104	0.707
PCE	**-0.263**	**0.088**	**8.907**	**1**	**0.003**	**0.769**
EDC	0	0	0.425	1	0.514	1
HIN	0	0	0.383	1	0.536	1
INCE	0.198	0.203	0.951	1	0.329	1.220
Size	0.054	0.062	0.776	1	0.378	1.056
GHOH	-0.205	0.187	1.198	1	0.274	0.815
PGF	0.182	0.175	1.081	1	0.298	1.200
HT	0.185	0.172	1.153	1	0.283	1.203
BO	-0.063	0.084	0.565	1	0.452	0.939
DSCH	-0.004	0.007	0.343	1	0.558	0.996
ATS	-0.180	0.188	0.915	1	0.339	0.836
PIF	0.142	0.215	0.438	1	0.508	1.153
Location	**-0.661**	**0.179**	**13.623**	**1**	**0.000**	**0.516**
HLEAC	0.020	0.146	0.019	1	0.890	1.020

In comparing between currently enrolled and never enrolled, only 3 independent variables are significant. Age (B = 0.129, S.E. = 0.023, $p < 0.0001$), PCE (B = -0.263, S.E. =0.088, $p < 0.05$) and location (B = -0.661, S.E. = 0.179, $p < 0.0001$) are significant predictors and hence contributed appreciable to the model. The interpretation is that those children that are older are most likely to be currently enrolled than never enrolled. Secondly, those whose parents are unemployed are less likely to be previously enrolled than never enrolled. Lastly, those who are in urban are less likely to be currently enrolled than never enrolled.

Discussion and Conclusion

This paper has successfully applied multinomial logistic regression in a sample of 1972 children in Ilorin to predict "never enrolled" which is a measure of out-of-school (OOS) using 18 predictors. Only four variables significantly contributed to the model. The variables are age, parents' educational status attained (PED), parents' current employment status (PCE), and the location of the school. The educational level of parents, particularly the mother, has been consistently found by several authors to be positively associated with a child's educational attainment (Hill et al. 2004). Parents with higher levels of educational attainment tend to value education more, understand its importance and consequences of not attaining it, and actively support their children's schooling (LaRocque et al. 2011). In addition, they have high odds of providing a conducive environment for learning and encourage their children to enroll and stay in school (Gever et al. 2021). Conversely, parents with lower levels of education may not fully comprehend the benefits of education or face challenges in supporting their children's education due to limited knowledge or resources (Lase et al. 2022). The employment status of parents, particularly if they are unemployed, semi-

employed or engaged in informal, low-paying or low-income jobs, can have a significant impact on a child's educational prospects. Economic constraints can make it difficult for parents to afford school fees, uniforms, textbooks, and other essential educational resources (Okwaraji et al. 2018). In such cases, children may be forced to drop out of school to contribute to family income through labor or work to support basic household needs (Oyelekan & Upahi, 2022). Additionally, irregular or long working hours can make it challenging for parents to actively engage in their children's education or provide the supervision and support needed for learning. It is important to note that these factors moderate, mediate or interact with other socioeconomic, cultural, and religious variables, leading to unusually high OOS rates. The interplay of poverty, cultural norms, gender disparities, lack of infrastructure, and systemic barriers also influences educational access and outcomes in developing countries.

The paper further found that older children and those in urban areas are most likely to be out of school. Older children are expected to work and contribute to the income of their families especially the male children. The older female children may be forced to marry early in order to be free from educational sponsorship from their parents. Infrastructure and availability of schools may be insufficient to accommodate all children in urban areas. This can result in limited access to education, especially for older children. Older children may need to travel longer distances to reach schools in urban areas, which can be challenging if the transportation options are limited or expensive (Opanuga et al. 2019). This can discourage regular school attendance. Older children might face additional social pressures and responsibilities, such as caring for younger siblings or contributing to household chores. Taking care of siblings with intellectual or developmental disabilities can also reduce the ability of the children to attend school (Ijezie et al. 2021). These obligations can interfere with their ability to attend school regularly. Health issues can contribute to out-of-school prevalence, particularly among children and adolescents. Several health conditions can significantly impact a student's ability to attend school regularly and participate fully in educational activities, chronic health issues like constant fever, diabetes (Adedotun et al. 2022), human African trypanosomiasis (Courtin et al. 2022), malaria (Okagbue et al. 2021b), typhoid fever, cancer (Okagbue et al. 2021a) and other communicable or diseases of poverty (Okagbue et al. 2022a; Sarkingobir et al. 2022). Sexual issues such as puberty (Oyewole et al. 2022), sexual maturation, menarche (Okagbue et al. 2022b), sexual violence and female genital cutting (Okagbue et al. 2020) can impair the chances of school enrollment especially in developing countries. However, keeping children in school is strongly associated with better mental and reproductive health and overall quality of life (De Neve et al. 2020). A lot of work is to be done to salvage the Nigerian children from the entrenched structural alienation that deprive them of access to education and a better life devoid of despair, hopelessness and destitution. Addressing these issues requires comprehensive approaches, such as improving access to quality education, providing financial support to disadvantaged families, promoting parental awareness and involvement, and implementing policies that alleviate poverty and create supportive environments for education (Nwokedi et al. 2020). Addressing the security issues in Nigeria will be a major step in reducing the prevalence of OOS (Ebubedike et al. 2022). Tackling child labor and street hawking will also be a step in the right direction in stemming the tide (Chukwudeh & Oduaran, 2021) and dethroning Nigeria from the top of the table of countries with the highest OOS in the world (Ferráns et al. 2022). Finally, religious and cultural norms that discourage education, especially for the girl child, according to Haruna & Nafisa (2021), must be suppressed.

Limitations of the Study

The data are restricted to Ilorin in Kwara State, which may limit generalizability to other regions of Nigeria, especially areas with different socio-cultural or security dynamics. Also, some relevant variables, such as quality of schooling, teachers' factors, and detailed health indicators, were not included in the model, which would have provided more insights.

Educational Implications and Policy Recommendations

The findings of this study have important implications for educational policy and practice in Nigeria and similar contexts. First, the strong influence of parental education and employment status suggests that interventions should extend beyond the school system to the household level. Policies that promote adult education, parental literacy, and economic empowerment are likely to improve children's school enrolment and retention (Fute et al., 2023).

Second, the role of age as a predictor indicates the need for targeted interventions for older children who are at higher risk of being out of school. Flexible learning options such as accelerated learning (AL) programmes, evening classes, and vocational pathways can help accommodate children who combine schooling with economic or domestic responsibilities.

Finally, the findings reinforce the need for integrated, multisectoral approaches. Education policies should be linked with health and social protection programmes (Banerjee et al., 2024), given that health conditions and socio-cultural pressures also influence school participation.

Conclusion

In conclusion, this study identifies age, parental education, parental employment, and school location as key predictors of out-of-school children in Ilorin, Nigeria. The findings show that children from less educated and economically disadvantaged households are more likely to be excluded from schooling. Older children and those in urban areas face additional risks due to social pressures, limited infrastructure, and competing responsibilities. Health challenges and cultural norms further contribute to exclusion. Addressing this issue requires integrated strategies, including poverty reduction, improved access to schools, and stronger policy implementation. Promoting inclusive education is essential for national development and reducing long-term social inequalities in Nigeria.

Directions for Further Research

Future research should adopt longitudinal designs to better capture causal pathways and transitions into and out of schooling. Such evidence-based approaches would clarify how factors such as age and parental employment dynamically influence educational trajectories in rural and northern Nigeria over time.

There is also a need for broader, nationally representative studies that incorporate geopolitical variations, especially in conflict-affected LGAs, IDPs, and remote or hard-to-reach areas. Comparative studies across geopolitical zones would provide more robust policy insights.

Further studies should also integrate additional variables, including school quality, teacher availability, learning outcomes, and psychosocial factors, to develop a more comprehensive predictive model.

Finally, mixed-methods research is also recommended to complement quantitative findings with qualitative insights into cultural norms, parental decision-making, and children's lived experiences.

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