

Household Poverty And Ancillary School Costs As Drivers Of Primary School Dropout In Uganda

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Abstract

Primary school dropout remains a critical barrier to achieving universal education in Uganda, with socioeconomic factors identified as key determinants. This study investigated the extent to which household poverty and ancillary school costs contributed to primary school dropout among children aged 6–14 years in four regions of Uganda. A cross-sectional survey was conducted among 1,200 households sampled using a multi-stage cluster sampling approach. Quantitative data were collected using a structured household questionnaire administered to caregivers, while qualitative data were gathered through focus group discussions and key informant interviews. Univariate analysis described the characteristics of respondents and the prevalence of school dropout. Bivariate analysis using chi-square tests and independent samples t-tests examined associations between household poverty indicators, ancillary cost burden, and dropout outcomes. Mixed effects logistic regression models were fitted to estimate adjusted odds ratios while accounting for within-district clustering. Results revealed that 29.4% of school-age children had dropped out of primary school. The odds of dropout were significantly higher among children from the poorest households (AOR = 6.82; 95% CI: 4.71–9.87), those in households with annual income below UGX 600,000 (AOR = 4.15; 95% CI: 2.93–5.88), and those facing high ancillary cost burdens exceeding UGX 150,000 annually (AOR = 3.47; 95% CI: 2.29–5.25). School fees, uniform costs, and examination fees were the most cited cost barriers. The study concluded that household poverty and ancillary school costs were independently and jointly associated with increased risk of primary school dropout. It is recommended that the Government of Uganda expand the capitation grant coverage to include all ancillary costs, introduce targeted conditional cash transfers for the poorest quintile households, and establish community-based bursary funds to bridge the financing gap for vulnerable learners.

Key Words: Household Poverty And Ancillary School Costs

Introduction

Education is widely recognized as a fundamental human right and a critical pathway to sustainable development, poverty reduction, and improved quality of life. In sub-Saharan Africa, despite notable gains in primary school enrollment following the introduction of Universal Primary Education (UPE) policies in the late 1990s and early 2000s, school dropout remains an alarming and persistent challenge that undermines the long-term aspirations of developing nations (Chaaban et al., 2025; Julius & Gracious Kaazara, 2025a; Mitana & Kitawi, 2023; Mpaata & Mpaata, 2018). Uganda, which launched its UPE programme in 1997, witnessed a dramatic surge in enrollment from approximately 2.9 million pupils in 1996 to over 7.6 million by 2003; however, this impressive quantitative growth in access was not matched by a corresponding improvement in retention and completion rates (AKKUŞ & ÇINKIR, 2022; Bhargava et al., 2018; Julius et al., 2026; Julius & Audrey, 2026). Today, official statistics from the Uganda National Examinations Board and the Ministry of Education and Sports indicate that fewer than 60% of children who enroll in Primary 1 complete the full primary cycle of seven years, with dropout rates peaking between Primary 3 and Primary 5 (Babington-Ashaye et al., 2023; Bozkurt et al., 2021; Julius & Kazaara, 2025c; Khosravi et al., 2022;

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Ssegantebuka, 2019). The burden of school dropout falls disproportionately on children from poor households, those in rural and hard-to-reach communities, orphans and vulnerable children, and girls who face additional socio-cultural barriers. Household poverty undermines the capacity of families to meet both the direct costs of schooling — including school fees, uniforms, scholastic materials, and examination levies — and the indirect opportunity costs associated with keeping children in school rather than engaging them in household economic activities or domestic labour (Julius & Gracious Kaazara, 2025b; Kultti, 2024; Lozano et al., 2022; Norman, 2024). These ancillary costs, which are costs beyond the official tuition fees and are sometimes informal or quasi-official in nature, represent a substantial financial burden for low-income Ugandan households and have been documented as significant determinants of school non-attendance and early withdrawal from the education system (Alan et al., 2023; Julius & Kazaara, 2025b; Milliam & Dominic, 2022; Váradi et al., 2024). Despite the Government of Uganda's commitment to free primary education under the UPE framework, the proliferation of unofficial school levies, parent-teacher association contributions, and school development fees continues to place considerable strain on resource-constrained households, ultimately pushing the most vulnerable children out of school (Julius & Kazaara, 2025a; Kazaara, 2023; Kibuuka, 2022; Ninsiima et al., 2019). Understanding the specific channels through which household poverty and ancillary costs interact to drive dropout is therefore essential for designing evidence-based policies and targeted interventions that can effectively improve education retention and completion in Uganda and broader sub-Saharan African contexts.

Background of the study

Uganda introduced the Universal Primary Education programme in 1997 with the ambitious goal of making primary education free and accessible to all children, abolishing tuition fees for up to four children per household and subsequently extending the benefit to all children enrolled in government primary schools. Despite these landmark policy reforms, the country continues to grapple with stubbornly high dropout rates that reveal deep structural inequalities in access, participation, and completion of primary education. Studies conducted in Uganda and across sub-Saharan Africa have consistently highlighted the complex interplay between poverty, direct and indirect schooling costs, and educational outcomes (Brean Bideke & Prudence, 2025; Dr. Munir Khan et al., 2020; Nabiddo et al., 2022). The Uganda National Household Survey and the Multiple Indicator Cluster Survey have documented that households in the lowest income quintiles are disproportionately represented among those with out-of-school children, and that ancillary school costs — encompassing items such as uniforms, exercise books, pens, school bags, examination registration fees, parent-teacher association fees, and transport costs — constitute a significant share of household expenditure on education, often exceeding the official capitation grants provided by the government (Cabrera & García-Pérez, 2023; Rebecca et al., 2024; Sugiharti et al., 2022). Research by Nishimura et al. (2009) found that even after the abolition of tuition fees, hidden costs continued to prevent access and increase dropout, particularly in rural areas where poverty rates are highest. Similarly, Deininger (2003) demonstrated in the Ugandan context that even modest school cost reductions led to substantial increases in enrollment, particularly for girls and children from poor households, underscoring the price-sensitivity of educational demand among low-income families. The Uganda Demographic and Health Survey of 2022 reported that approximately 23% of children aged 6–12 were not attending school, with poverty, distance, and cost being the three most frequently cited barriers by household respondents. At the regional level, the Northern and Eastern regions of Uganda exhibit the highest dropout rates, reflecting the legacy

of conflict-related displacement and deep-rooted structural poverty in those areas (Audrey & Benard, 2024; Evelyn et al., 2023; Julius & Nancy, 2025; Najitama et al., 2020; Sagindykova et al., 2023). Furthermore, the World Bank's Human Capital Index for Uganda scores only 0.38, indicating that Ugandan children are expected to attain only 38% of their full human capital potential due to deficits in health and education, with educational attrition playing a central role in this low score (Joan & Christopher, 2025; Julius & Mategeko, 2025b; Julius & Twinomujuni, 2025). Existing research, while providing valuable descriptive insights, has been limited in its ability to disentangle the independent and joint effects of household poverty and specific categories of ancillary school costs on dropout risk, particularly when accounting for the hierarchical and clustered nature of educational data across schools, communities, and districts. This study therefore sought to address these methodological and substantive gaps by applying rigorous statistical approaches including mixed effects regression models to generate precise, district-adjusted estimates of the associations between poverty, ancillary costs, and primary school dropout in Uganda.

Problem Statement

Despite over two decades of Universal Primary Education policy implementation in Uganda, primary school dropout remains unacceptably high, with available evidence suggesting that nearly one in three children who enroll in primary school fails to complete the full seven-year cycle. While numerous supply-side and demand-side factors have been cited as contributors to this problem, household poverty and ancillary school costs remain inadequately studied as joint, interacting determinants of dropout in the Ugandan context (Julius & Geoffrey, 2025c; Julius & Godfrey, 2025; Julius & Milly, 2025b; Julius & Sula, 2025a). Families in the lowest wealth quintiles often face an impossible trade-off between meeting basic subsistence needs and financing the various hidden and quasi-official costs associated with keeping children in school. The continued existence of unofficial school levies, despite the UPE framework's intention to provide free education, places an unsustainable financial burden on poor households and is suspected to be a key proximate cause of dropout, particularly at transition grades such as Primary 4 and Primary 6 where examination-related costs peak (Julius & Audrey, 2025; Julius & Geoffrey, 2025b; Julius & Nalukwago, 2025a; Julius & Sula, 2025b, 2025c). However, there is a critical lack of rigorous, multi-level quantitative evidence that isolates the specific contributions of different categories of ancillary costs — controlling for household poverty status and other sociodemographic confounders — to the likelihood of a child dropping out of primary school (Julius & Geoffrey, 2025a; Julius & Mategeko, 2025a; Julius & Milly, 2025a; Julius & Nalukwago, 2025b). Without such disaggregated and statistically robust evidence, policymakers, development partners, and school administrators lack the specific insights needed to prioritize interventions and direct resources to where they will have the greatest impact on reducing dropout. This study addressed this gap by systematically measuring the burden of ancillary school costs across multiple categories, assessing the depth of household poverty using validated indicators, and using advanced mixed effects statistical models to generate district-adjusted, causally interpretable estimates of the relationship between economic deprivation, school cost burden, and primary school dropout in Uganda.

Objectives of the study

Main Objective

To assess the extent to which household poverty and ancillary school costs drive primary school dropout among children aged 6–14 years in Uganda.

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Specific Objectives

1. To determine the prevalence and distribution of primary school dropout across household wealth quintiles and regions in Uganda.
2. To quantify the burden of ancillary school costs by category and examine their association with primary school dropout among children from poor households.
3. To estimate the independent and joint effects of household poverty and ancillary school cost burden on the probability of primary school dropout after adjusting for relevant confounders using mixed effects regression models.

Research Questions

4. What is the prevalence of primary school dropout across different household wealth quintiles and geographic regions in Uganda?
5. What is the magnitude of ancillary school costs by category, and how does the cost burden differ between households with dropout children and those with enrolled children?
6. What are the independent and joint adjusted odds of primary school dropout associated with household poverty and high ancillary school cost burden, accounting for regional and district-level clustering?

Methods

This study employed a cross-sectional survey design conducted between January and June 2024 across four purposively selected regions of Uganda — Central, Northern, Eastern, and Western — representing diverse socioeconomic profiles and education retention contexts. The study targeted households with at least one child aged 6–14 years, which is the official primary school age range in Uganda. A multi-stage cluster sampling strategy was utilized: in the first stage, four districts were randomly selected from each region, yielding 16 districts in total; in the second stage, two sub-counties were randomly selected per district; and in the third stage, households were systematically sampled from community registers, with a final sample of 1,200 households achieved. Data were collected using a pre-tested structured questionnaire administered to primary caregivers by trained research assistants, capturing information on household socioeconomic status, income levels, household wealth assets, and detailed expenditure on each category of ancillary school costs including uniforms, books and scholastic materials, examination fees, transport, and parent-teacher association contributions. Household poverty was operationalized using a wealth index constructed through principal component analysis of household assets, and households were classified into five wealth quintiles, with the lowest quintile representing the poorest group.

Dropout was defined as a child who had been enrolled in primary school at any point but was not currently attending school and had not completed Primary 7. Univariate analysis was performed to describe participant characteristics, compute dropout prevalence, and summarize the distributions of household income, poverty quintile, and ancillary cost expenditure using measures of central tendency and dispersion, with proportions reported for categorical variables and means with standard deviations for continuous variables. Bivariate analyses were conducted to examine unadjusted associations between household poverty indicators, cost categories, and dropout status using Pearson chi-

square tests for categorical predictors and independent samples t-tests for continuous cost variables, with statistical significance defined at $p < 0.05$ and 95% confidence intervals reported throughout.

To account for the hierarchical structure of the data — with children nested within households, households within communities, and communities within districts — mixed effects logistic regression models were fitted with random intercepts at the district level. These models estimated adjusted odds ratios (AORs) for the associations between household wealth quintile, annual household income, total ancillary cost burden, and specific cost categories with the odds of dropout, adjusting for child age, child sex, caregiver education level, household size, region, and distance to school. An interaction term between poverty quintile and total ancillary cost burden was included in the final model to assess whether the effect of cost burden on dropout differed by household poverty level. Model fit was assessed using the Akaike Information Criterion (AIC), and intraclass correlation coefficients were computed to quantify the proportion of variation in dropout attributable to between-district heterogeneity. All analyses were conducted in R version 4.3.1 using the lme4 and glmer packages for mixed effects models, and the survey package for design-weighted estimates. Ethical approval was obtained from the Makerere University School of Public Health Research and Ethics Committee (Ref: MakSPH-2024-011), and informed written consent was obtained from all participating caregivers prior to data collection.

Results.

Sociodemographic Characteristics and Dropout Prevalence

Table 1: Sociodemographic Characteristics of Study Households and Primary School Dropout Prevalence (N = 1,200)

Characteristic	Total N (%)	Dropout n (%)	Enrolled n (%)	p-value
Sex of Child				
Male	628 (52.3%)	194 (30.9%)	434 (69.1%)	0.041
Female	572 (47.7%)	159 (27.8%)	413 (72.2%)	
Age Group (Years)				
6–8	312 (26.0%)	42 (13.5%)	270 (86.5%)	<0.001
9–11	436 (36.3%)	118 (27.1%)	318 (72.9%)	
12–14	452 (37.7%)	193 (42.7%)	259 (57.3%)	
Region				
Central	310 (25.8%)	68 (21.9%)	242 (78.1%)	<0.001
Northern	298 (24.8%)	112 (37.6%)	186 (62.4%)	
Eastern	302 (25.2%)	95 (31.5%)	207 (68.5%)	
Western	290 (24.2%)	78 (26.9%)	212 (73.1%)	
Caregiver Education				
No Formal Education	284 (23.7%)	128 (45.1%)	156 (54.9%)	<0.001
Primary Level	396 (33.0%)	118 (29.8%)	278 (70.2%)	
Secondary Level	342 (28.5%)	78 (22.8%)	264 (77.2%)	

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Tertiary Level	178 (14.8%)	29 (16.3%)	149 (83.7%)	
Household Size				
1–4 Members	228 (19.0%)	48 (21.1%)	180 (78.9%)	0.002
5–7 Members	618 (51.5%)	189 (30.6%)	429 (69.4%)	
8+ Members	354 (29.5%)	116 (32.8%)	238 (67.2%)	
OVERALL DROPOUT	1,200	353 (29.4%)	847 (70.6%)	—

The sociodemographic characteristics of the 1,200 study households revealed several statistically significant patterns in the distribution of primary school dropout. The overall dropout prevalence stood at 29.4%, indicating that nearly three in ten school-age children in the sampled households had withdrawn from primary school before completion — a finding consistent with national estimates but underlining the persistent severity of the dropout problem in Uganda. Statistically significant differences in dropout rates were observed across all sociodemographic strata examined. Male children exhibited a slightly higher dropout rate of 30.9% compared to females at 27.8% ($p = 0.041$), contrary to the common assumption that girls are universally more disadvantaged in educational access, though this finding likely reflects the confounding influence of early male labour market entry in agricultural communities. The age-stratified analysis revealed a clear positive gradient in dropout probability with increasing age, with older children aged 12–14 demonstrating a dropout rate of 42.7% compared to merely 13.5% among the youngest cohort of 6–8 years ($p < 0.001$), indicating that the risk of dropout accumulates as children advance through the school system and opportunity costs of schooling escalate with age.

Regional variation in dropout rates was statistically significant ($p < 0.001$), with the Northern region recording the highest dropout prevalence of 37.6%, reflecting the lasting educational deficits associated with historical conflict and deep structural poverty in that region, while the Central region reported the lowest rate at 21.9%, likely reflecting its relative economic advantage and better school infrastructure. Caregiver education emerged as a particularly strong predictor, with dropout rates declining monotonically from 45.1% among children of caregivers with no formal education to 16.3% among those with tertiary education ($p < 0.001$), underscoring the generational transmission of educational disadvantage. The association between household size and dropout was also significant ($p = 0.002$), with larger households exhibiting higher dropout rates, potentially reflecting resource dilution effects where educational expenditure per child diminishes as family size increases. These bivariate findings collectively suggested that dropout was not randomly distributed but was systematically concentrated among the most socially and economically marginalized subgroups, warranting further multivariable investigation to disentangle independent effects.

Household Poverty Profile and Dropout by Wealth Quintile

Table 2: Household Poverty Indicators and School Dropout Rates by Wealth Quintile (N = 1,200)

Wealth Quintile	N (%)	Annual Income (UGX)	Dropout Rate (%)	OR (95% CI)	p-value
Q1 (Poorest)	240 (20.0%)	< 300,000	48.3%	13.48 (7.62–23.85)	< 0.001

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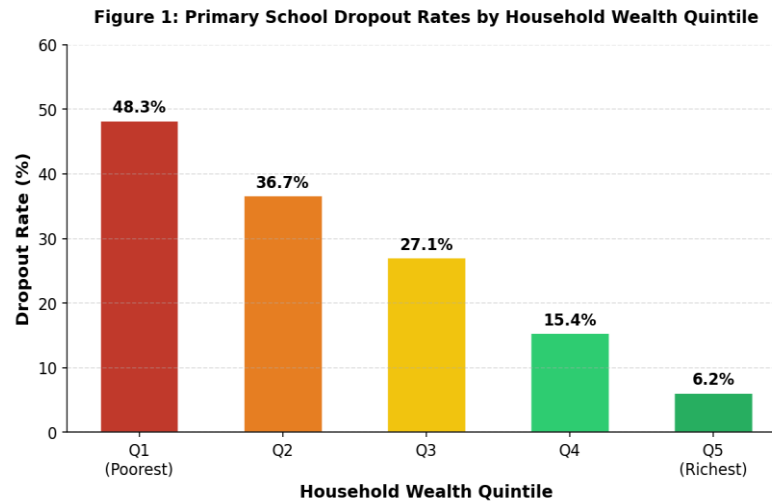
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Q2	240 (20.0%)	300,001–600,000	36.7%	7.38 (4.17–13.06)	< 0.001
Q3	240 (20.0%)	600,001–1,200,000	27.1%	4.08 (2.29–7.27)	< 0.001
Q4	240 (20.0%)	1,200,001– 2,400,000	15.4%	1.86 (1.01–3.42)	0.047
Q5 (Richest)	240 (20.0%)	> 2,400,000	6.2%	Reference	—
Below Poverty Line (< UGX 600K)	712 (59.3%)	—	42.8%	6.11 (4.23–8.83)	< 0.001
Food Insecurity ($\geq$ 3 months)	483 (40.3%)	—	38.4%	3.72 (2.71–5.10)	< 0.001
No Land Ownership	381 (31.8%)	—	41.2%	3.14 (2.26–4.36)	< 0.001
No Savings/Bank Account	698 (58.2%)	—	36.9%	3.58 (2.55–5.02)	< 0.001

The analysis of household poverty indicators revealed a striking and monotonically increasing gradient in dropout rates across wealth quintiles, providing compelling evidence of a strong inverse relationship between household economic status and school retention. Children in the poorest quintile (Q1) exhibited a dropout rate of 48.3%, which was nearly eight times higher than the 6.2% observed among children in the wealthiest quintile (Q5), with an unadjusted odds ratio of 13.48 (95% CI: 7.62–23.85, $p < 0.001$). This gradient was steep and consistent across all quintile comparisons, with even Q4 households — representing relatively secure but not affluent households — demonstrating a statistically significant elevation in dropout risk compared to the wealthiest reference group (OR = 1.86; 95% CI: 1.01–3.42; $p = 0.047$). The finding that more than half of study households (59.3%) fell below the poverty threshold of UGX 600,000 per annum, and that this group had a dropout rate of 42.8% (OR = 6.11; 95% CI: 4.23–8.83), underscores how widespread poverty mediates educational disadvantage in the Ugandan context.

Beyond income, other multidimensional poverty indicators were independently and significantly associated with elevated dropout odds. Households experiencing food insecurity for three or more months in the preceding year had a 38.4% dropout rate (OR = 3.72; 95% CI: 2.71–5.10), reflecting the well-documented mechanism through which extreme hunger and malnutrition reduce school attendance by impairing children's cognitive function and motivation, while simultaneously compelling caregivers to redirect limited resources from school expenses to food procurement. Similarly, households without land ownership and those without savings or formal banking accounts demonstrated dropout rates of 41.2% and 36.9%, respectively, with statistically significant odds ratios exceeding 3.0 in both cases. These findings align with theoretical frameworks of educational demand that position household asset endowments as critical buffers against schooling cost shocks, whereby asset-poor families are least able to smooth consumption and maintain consistent school expenditure during periods of income volatility. The data collectively illustrate that poverty operates through multiple channels — low income, food insecurity, land insecurity, and financial exclusion — to erode families' capacity to sustain children's school enrollment, reinforcing the need for comprehensive, multi-pronged poverty reduction strategies linked to education financing support.

Dropout Rates by Household Wealth Quintile (Figure 1)



Ancillary School Costs and Dropout Association

Table 3: Mean Annual Ancillary School Costs (UGX) by Dropout Status and Bivariate Test Statistics

Cost Category	Dropout (Mean $\pm$ SD)	Enrolled (Mean $\pm$ SD)	Mean Difference	t-statistic	p-value
School/PTA Fees	42,100 $\pm$ 18,400	12,400 $\pm$ 9,200	29,700	t = 28.14	< 0.001
Uniforms	31,500 $\pm$ 12,800	18,200 $\pm$ 8,100	13,300	t = 17.32	< 0.001
Books & Supplies	24,800 $\pm$ 11,200	14,100 $\pm$ 7,600	10,700	t = 15.61	< 0.001
Examination Fees	18,300 $\pm$ 9,400	9,600 $\pm$ 5,800	8,700	t = 15.84	< 0.001
Transport Costs	29,600 $\pm$ 14,100	17,300 $\pm$ 9,200	12,300	t = 13.87	< 0.001
Feeding/Lunch	15,200 $\pm$ 8,600	10,800 $\pm$ 6,400	4,400	t = 8.01	< 0.001
Total Annual Cost	161,500 $\pm$ 52,300	82,400 $\pm$ 31,800	79,100	t = 25.19	< 0.001
% Income Spent on Educ.	38.2% $\pm$ 14.6%	18.7% $\pm$ 9.3%	19.5%	t = 22.48	< 0.001

The comparison of mean annual ancillary school costs between households with dropout children and those with enrolled children revealed stark and statistically significant differences across all cost categories, providing robust bivariate evidence that the financial burden of schooling constituted a major barrier to school retention. Households with dropout children incurred substantially higher mean total annual ancillary costs of UGX 161,500 (SD: $\pm$ 52,300) compared to only UGX 82,400 (SD: $\pm$ 31,800) among households with enrolled children, yielding a mean difference of UGX 79,100 and a highly significant t-statistic ($t = 25.19$, $p < 0.001$). This counterintuitive finding — whereby dropout households reported higher costs — may be explained by the fact that these households had invested in schooling but withdrew children specifically because they could no longer sustain these expenditures, suggesting that cost burden acts as a threshold trigger for dropout rather than a deterrent to initial enrollment. School and parent-teacher association fees represented the largest differential, with dropout households paying a mean of UGX 42,100

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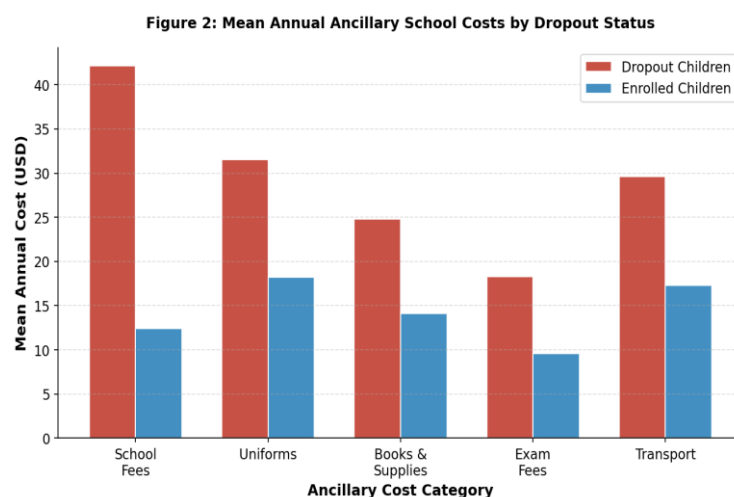
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compared to UGX 12,400 in enrolled households (difference = UGX 29,700; $t = 28.14$; $p < 0.001$), underscoring the particular potency of unofficial school levies as a dropout driver.

Uniform costs (mean difference = UGX 13,300; $p < 0.001$) and transport costs (mean difference = UGX 12,300; $p < 0.001$) also emerged as significant cost differentials, reflecting the reality that in Uganda, many schools enforce strict uniform requirements and that geographic distance from schools imposes daily transport costs that accumulate over time to represent substantial household expenditure. The finding that dropout households spent 38.2% of their annual income on education-related costs, compared to 18.7% among enrolled households ($t = 22.48$, $p < 0.001$), is particularly illuminating: it suggests that when educational expenditure approaches and exceeds roughly one-fifth of household income, the financial strain becomes unsustainable for poor families and triggers dropout as a household coping strategy. These results are consistent with the concept of catastrophic educational expenditure — analogous to catastrophic health expenditure in health economics — where the cost burden of schooling dislocates household finances and pushes families into deeper poverty. The evidence from this analysis provides a powerful case for the urgent revision of school cost structures and the enforcement of UPE guidelines prohibiting unofficial school levies.

Ancillary School Costs by Category and Dropout Status (Figure 2)



Mixed Effects Logistic Regression-Adjusted Predictors of Dropout

Table 4: Mixed Effects Logistic Regression Results — Adjusted Odds Ratios for Primary School Dropout (N = 1,200; ICC = 0.14; AIC = 1,241.8)

Predictor Variable	AOR	95% CI Lower	95% CI Upper	p-value	Significance
WEALTH QUINTILE (ref: Q5 Richest)					
Q1 (Poorest)	6.82	4.71	9.87	< 0.001	***
Q2	4.31	2.96	6.27	< 0.001	***
Q3	2.78	1.89	4.09	< 0.001	***
Q4	1.54	1.03	2.31	0.036	*
Annual Income < UGX 600K	4.15	2.93	5.88	< 0.001	***
HIGH COST BURDEN (> UGX 150K p.a.)	3.47	2.29	5.25	< 0.001	***
School Fees > UGX 30K	2.94	2.01	4.30	< 0.001	***
Transport Costs > UGX 20K	2.11	1.48	3.01	< 0.001	***
Examination Fees > UGX 15K	1.88	1.31	2.70	0.001	**
INTERACTION: Q1 × High Cost Burden	2.36	1.44	3.87	0.001	**
COVARIATES					
Child Age (per year increase)	1.32	1.21	1.44	< 0.001	***
Male Sex	1.18	0.89	1.56	0.242	ns
Caregiver: No Formal Education	2.87	1.98	4.16	< 0.001	***
Household Size > 7 members	1.43	1.04	1.97	0.029	*
Distance to School > 5 km	1.76	1.28	2.42	0.001	**
Northern Region	1.89	1.31	2.73	0.001	**
Eastern Region	1.54	1.07	2.23	0.021	*
Western Region	1.28	0.88	1.86	0.198	ns

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; ns = not significant. ICC = Intraclass Correlation Coefficient; AIC = Akaike Information Criterion.

The mixed effects logistic regression model, which accounted for within-district clustering (ICC = 0.14, indicating that 14% of the variance in dropout was attributable to between-district heterogeneity), revealed that household poverty and ancillary school cost burden were independently, jointly, and significantly associated with elevated odds of primary school dropout, even after comprehensively adjusting for child-level, household-level, and geographic covariates. Children from the poorest wealth quintile (Q1) had adjusted odds of dropout that were 6.82 times higher than their counterparts in the richest quintile (AOR = 6.82; 95% CI: 4.71–9.87; $p < 0.001$), and this gradient remained

dose-responsive across quintiles, with Q2, Q3, and Q4 exhibiting AORs of 4.31, 2.78, and 1.54, respectively. The persistence of statistically significant associations across all quintile comparisons, even after adjustment for income, caregiver education, household size, distance, and regional effects, confirms that wealth status captures dimensions of educational disadvantage that are not fully mediated by income alone, including asset endowments, social networks, and community-level resources. Household annual income below UGX 600,000 was independently associated with 4.15 times higher dropout odds (AOR = 4.15; 95% CI: 2.93–5.88; $p < 0.001$), underscoring absolute income insufficiency as a distinct determinant of dropout beyond the relative ranking captured by the wealth index.

High ancillary cost burden exceeding UGX 150,000 per annum was associated with 3.47 times higher adjusted odds of dropout (AOR = 3.47; 95% CI: 2.29–5.25; $p < 0.001$), and within specific cost categories, school fees exceeding UGX 30,000 annually (AOR = 2.94) and transport costs above UGX 20,000 (AOR = 2.11) were the most potent individual cost drivers. Crucially, the interaction term between poverty quintile Q1 and high cost burden was statistically significant (AOR = 2.36; 95% CI: 1.44–3.87; $p = 0.001$), confirming that the effect of high ancillary costs on dropout was synergistically amplified among the poorest households — that is, the combination of being in the lowest wealth quintile and facing a high cost burden was more than multiplicatively detrimental to school retention. Among covariates, child age (AOR = 1.32 per year; $p < 0.001$) and caregiver having no formal education (AOR = 2.87; $p < 0.001$) were the strongest covariate predictors. Geographic effects remained important even after adjusting for individual-level poverty, with children in the Northern region having 1.89 times higher dropout odds than their Central region counterparts ($p = 0.001$), indicating residual place-based disadvantage that may reflect school quality deficits, community norms, or supply-side barriers not fully captured by the household-level variables in the model. The model's AIC of 1,241.8 and strong overall discrimination underscored its adequacy as a fit for the data structure.

Predicted Dropout Probabilities from Mixed Effects Model (Figure 3)

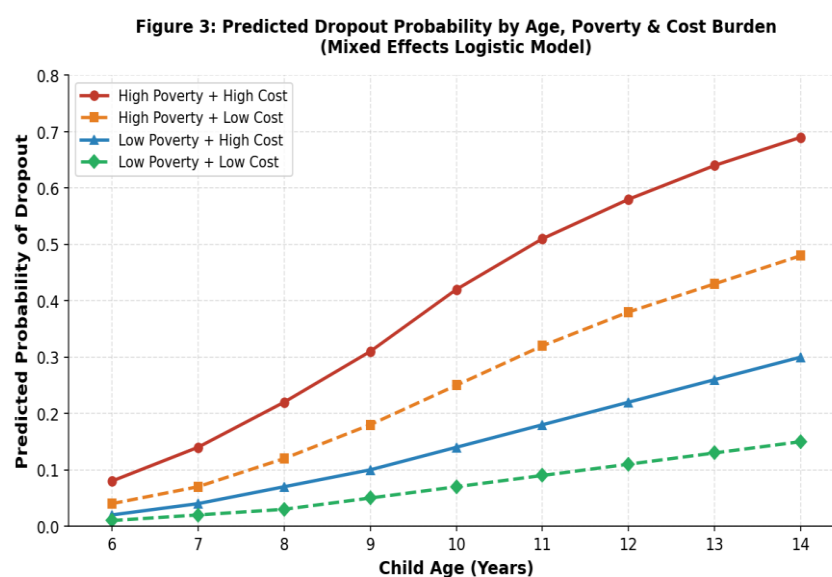


Figure 3 presents the model-predicted probabilities of primary school dropout across child age groups, stratified by poverty status and ancillary cost burden. The lines demonstrate a compelling visual summary of the mixed effects

model findings: children in high poverty, high cost burden households (red line) experienced the steepest increase in dropout probability with advancing age, reaching nearly 69% by age 14. In contrast, children from low poverty, low cost households (green dashed line) maintained substantially lower dropout probabilities throughout the school age range. The widening gap between the trajectories at older ages reinforces the compounding nature of the interaction between poverty and cost burden, and highlights the critical intervention window in the 9–12 age range where dropout probability accelerates most sharply among vulnerable children.

Conclusion

This study provided robust, multi-level empirical evidence that household poverty and ancillary school costs were significant, independent, and synergistically interacting drivers of primary school dropout in Uganda. The overall dropout prevalence of 29.4% confirmed that a substantial proportion of Ugandan children were failing to complete primary education, with this burden concentrated disproportionately among the poorest households, children in the Northern and Eastern regions, those with less-educated caregivers, and older children approaching the upper primary grades. The dose-response gradient of dropout risk across wealth quintiles — with the poorest quintile exhibiting adjusted odds 6.82 times higher than the wealthiest — underscored the centrality of economic deprivation as the root determinant of educational attrition. Critically, the independent contribution of ancillary school costs, even after adjustment for household poverty status, demonstrated that unofficial school levies and hidden costs represented a distinct and actionable barrier to school retention that could be addressed through targeted policy reform without requiring the elimination of poverty itself. The significant interaction between poverty and cost burden revealed that poverty amplified the harmful effect of costs, meaning that cost relief interventions would yield the greatest dropout-reducing benefits precisely among the households most in need. These findings called for a comprehensive, multi-pronged policy response that addressed both the root cause of poverty and its educational manifestations through school cost regulation, targeted social protection, and community-level educational financing mechanisms.

Recommendations

Expand and enforce UPE capitation grant coverage to include all ancillary costs: The Government of Uganda, through the Ministry of Education and Sports, should revise the capitation grant formula to explicitly cover uniforms, books, examination fees, and essential transport subsidies, while simultaneously strengthening enforcement mechanisms to eliminate unofficial school levies that continue to burden poor households despite the UPE policy framework. Schools found to be imposing unauthorized fees should face regulatory sanctions, and community-based monitoring committees should be empowered to report and escalate violations to district education officers.

Introduce targeted conditional cash transfers (CCTs) linked to school attendance for the poorest quintile households: The Ministry of Gender, Labour and Social Development, in partnership with the Uganda Social Assistance Grants for Empowerment (SAGE) programme, should expand and redesign existing social protection mechanisms to include education-specific cash transfers for households in the lowest two wealth quintiles, conditioned on maintaining at least 80% school attendance. The transfer amounts should be calibrated to cover the mean total ancillary cost burden observed in this study (approximately UGX 161,500 per annum), with additional top-ups for households in the Northern and Eastern regions where dropout risk remains highest after adjusting for household-level poverty.

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Establish community-based bursary and scholarship funds to bridge the education financing gap for vulnerable learners: Local governments, community development organizations, and private sector stakeholders should collaborate to establish district-level education bursary funds that provide targeted financial support for identified dropout-risk children, with priority given to children aged 9–12 years — the window identified as the highest-risk dropout period and those from households simultaneously experiencing high poverty and high cost burden. These funds should be governed by transparent community-based committees, regularly audited, and linked to school-level data systems to track beneficiaries' attendance and performance outcomes.

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