How Vulnerable Living Conditions Drive School Dropout in Tanzania: A Causal Analysis with Moderating Factors

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Abstract
Dropout rates in Tanzanian secondary education hinder students from progressing to higher grades or completing the education cycle. This challenge undermines the government's efforts to ensure high completion rates, despite policies aimed at improving secondary education access and quality. This study examines the impact of vulnerable living environments on early school leaving in secondary education in Tanzania. The study analyses time series data on dropout rates from 2019 to 2022, assessing the influence of students' persistence in vulnerable environments on dropout trends. Using Generalised Least Squares (GLS) regression with a random effects model, the findings reveal that students living in vulnerable environments are more likely to drop out of school early. The issue is particularly pronounced in rural schools, which often face socioeconomic disadvantages. Also, the study finds that the severity of the problem intensifies with advancing school years, partly due to the dynamic nature of regional demographics. Based on these findings, the study recommends policy interventions, including revising school establishment policies, restructuring the fee-free education policy, enhancing healthcare services for students living in vulnerable environments, and encouraging low-income families to participate in income-generating activities reflecting their contexts.

Keywords: *Vulnerable environments, living conditions, school dropout, students, Tanzania*

Introduction

Education is universally acknowledged as a transformative tool for individual empowerment and national development (Mondal, 2023). However, millions of children worldwide continue encountering significant barriers preventing them from completing their education (Odeh et al., 2024). In Tanzania, school dropout rates remain a pressing concern, especially among students living in vulnerable conditions (Kalamba & Mpiza, 2024; Rugimbana & Mwila, 2023). These dropouts are driven by the intricate interplay of socio-economic, environmental, and systemic factors, which together create formidable challenges for children, forcing them to abandon their education

prematurely. This issue has far-reaching implications beyond the individual level. At the personal level, dropping out of school limits children's opportunities for economic mobility, social advancement, and overall well-being. At the national level, high dropout rates undermine efforts to build a skilled workforce, reduce inequality, and achieve sustainable development goals (Okoh et al., 2020). The problem is particularly acute in Tanzania, where systemic inefficiencies, entrenched poverty, and environmental adversities compound the vulnerabilities of children in marginalised communities.

Living conditions are important because they influence educational outcomes, including learning achievement, social cohesion, and overall learning experiences (Hosein et al., 2023). Vulnerable environments, characterised by families with low incomes, students living near or passing through areas with wild animals, reliance on marine transport, poor health conditions, and social instability, often impose significant challenges on students (Luo & Chen, 2020). Families struggling with financial hardships may prioritise immediate survival over long-term investments like education, leading to practices such as child labour or other income-generating activities. Systemic challenges within the education sector exacerbate these problems (Huber, 2023). For instance, high student-teacher ratios hinder individualised attention, making it especially difficult for students from disadvantaged backgrounds to meet academic demands. Moreover, the geographic location of schools plays a critical role, particularly in rural and remote areas where access is impeded by long travel distances, inadequate infrastructure, and a shortage of qualified teachers (Rodriguez et al., 2023). As Naylor et al. (2019) observed in the examination of structural inequalities faced by students from refugee backgrounds, these barriers disproportionately affect students from vulnerable communities, perpetuating cycles of exclusion and inequality.

In Tanzania, these challenges are deeply embedded in the national socio-economic context and reflect broader regional trends across Sub-Saharan Africa. Despite significant policy interventions, such as the introduction of fee-free education following Education Circular No. 3 of 2016 and the Education and Training Policy (ETP) 2014, revised in 2023, aimed at improving access to education, a varied combination of factors continues to hinder progress.

Poverty remains a critical barrier, limiting families' ability to afford school-related costs, such as uniforms, textbooks, learning materials, and school supplies like pens, pencils, rulers, bags, and notebooks, even when tuition is officially waived (Mutisya et al., 2021). Systemic inefficiencies, such as under-resourced schools, inadequate teacher training, and outdated curricula,

further exacerbate the issue (Ochieng & Yeonsung, 2021). Additionally, location-based disparities play a pivotal role; children in rural and remote areas often face limited access to schools, inadequate infrastructure, and higher opportunity costs associated with education, such as contributing to household labour (Delesalle, 2018). The cumulative impact of these challenges is evident in persistently high dropout rates, particularly among girls, who are disproportionately affected by sociocultural norms, early marriages, and teenage pregnancies. Recent studies, including those by Mnyawami et al. (2022) and John et al. (2015), highlight the urgency of addressing these multifaceted issues through targeted, context-specific interventions. Addressing these challenges requires comprehensive measures that not only tackle poverty and systemic inefficiencies but also enhance educational infrastructure and ensure equitable opportunities for all students. By prioritising these efforts, Tanzania can make significant strides toward inclusivity and sustainability in achieving universal education goals.

This study, therefore, seeks to explore how vulnerable living conditions contribute to school dropout rates in Tanzania through a comprehensive causal analysis that integrates socio-economic, systemic, and geographical perspectives. Specifically, it will investigate the experiences of students living in vulnerable environments characterised by poverty, inadequate household resources, and social instability. The analysis will also assess critical factors such as student-teacher ratios, school location, and the regional per capita Gross Domestic Product (GDP) to provide a holistic understanding of the issue. Examining the interplay between these variables, the study aims to understand school dropout in Tanzania, focusing on the role of vulnerable living conditions and moderating factors (rurality and time), and shedding light on the structural inequalities that perpetuate educational disparities. Additionally, the study will consider how contextual differences between urban and rural areas exacerbate vulnerabilities, further influencing school dropouts. The ultimate objective is to generate actionable, evidence-based policy recommendations addressing the persistence of students living in vulnerable environments as a key cause of dropout rates.

These recommendations will focus on fostering equitable access to quality education, improving school infrastructure, optimising resource allocation, and implementing targeted interventions for marginalised communities. In doing so, the study aspires to contribute meaningfully to Tanzania's socio-economic progress by promoting inclusive education as a cornerstone of sustainable development.

The Drivers of School Dropout

Vulnerable living conditions play a significant role in driving school dropout rates in Tanzania, as highlighted by John et al. (2015) and Kalamba & Mpiza

(2024). This phenomenon stems from a complex interplay of socio-economic, systemic, and geographical factors (Ochieng & Yeonsung, 2021). To explore these dynamics and their impact on educational outcomes, this study employs a comprehensive causal analysis framework, as recommended by Chaudhary & Singh (2022). At the heart of this investigation are the experiences of students living in vulnerable environments. These environments are often characterised by pervasive poverty (Mutisya et al., 2021), insufficient household resources (Naylor et al., 2019), and social instability (Luo & Chen, 2020). These factors collectively undermine students' ability to engage fully in their education, leading to increased dropout rates. In addition to socio-economic challenges, critical systemic factors also provide a broad perspective on the issue. Among these, student-teacher ratios stand out as a significant determinant, with Égert et al. (2020) highlighting how overcrowded classrooms reduce the quality of instruction and individual attention, particularly in resource-constrained settings. The geographical location of schools further compounds the problem, as observed by Delesalle (2018) and Rodriguez et al. (2023), with rural areas often suffering from poor infrastructure, limited accessibility, and inadequate school facilities. Lastly, the regional per capita Gross Domestic Product (GDP) is another critical variable, as it influences both the availability of educational resources and the broader socio-economic environment (Dancaková et al., 2021).

The debate surrounding the impact of socio-economic conditions on education highlights two key perspectives. On one hand, proponents of structural reform argue that poverty (Mutisya et al., 2021) and resource inequities (Naylor et al., 2019) are the primary drivers of school dropouts. Mutisya et al. (2021) examined wealth inequalities in access to education within urbanising Sub-Saharan Africa, concluding that significant disparities exist in urban settings, where children from impoverished communities are disproportionately disadvantaged. They emphasise the urgent need for strategic interventions and robust policy frameworks to address these inequalities, ensuring that children from low-income families have equitable access to education. Similarly, Naylor et al. (2019) analysed resource inequities in Australia, finding that refugee students face horizontal and vertical inequalities in accessing higher education. They highlight the necessity of targeted investments to reduce these disparities. These points align with the arguments of Kreisman (2017) and Wang & Zheng (2024), who advocate for improving teacher training and implementing poverty alleviation programs as holistic solutions to these systemic challenges. On the other hand, critics emphasise behavioural and cultural factors as equally pivotal contributors to school dropout rates. Scholars such as Bal (2018) and Bal & Trainor (2016) underscore the undervaluation of education in specific

communities, where cultural norms, early marriages, and child labour perpetuate educational disadvantages. These critics advocate for community-based interventions that address localised socio-cultural barriers, fostering a greater appreciation of education within affected communities.

Geographical disparities significantly exacerbate educational challenges, adding complexity to the debate on school dropout rates (Delesalle, 2018; Rodriguez et al., 2023). Rural areas in Tanzania face acute and persistent obstacles, including a lack of schools within accessible distances, poor road infrastructure (Asantemungu & Anicet, 2019), and limited access to electricity and digital learning tools (Mwinyi, 2024). These challenges often result in higher opportunity costs for rural families, who may prioritise labour contributions over education due to the difficulty of accessing schools. In contrast, urban regions, while offering better infrastructure and facilities, face their own set of challenges. Overcrowded classrooms, high student-teacher ratios, and significant economic inequalities, according to West and Meier (2020) continue to hinder equitable access to quality education. For example, students from economically disadvantaged urban communities often lack the financial means to fully benefit from the relatively better resources available, such as private tutoring or advanced learning materials. Supianto et al. (2023) compare education fairness policies in remote areas of Indonesia and Malaysia and point out that these differences raise important questions about how fair and effective the policies are. Their findings suggest that one-size-fits-all approaches are insufficient to address the diverse educational needs of different regions. Instead, tailored strategies that consider localised challenges and resource constraints are necessary to promote inclusivity and reduce disparities.

The study explores how vulnerable living conditions and moderating factors contribute to school dropout in Tanzania by highlighting structural inequalities. For example, high student-teacher ratios in economically disadvantaged areas may worsen dropout rates by limiting individualised support for struggling students. Similarly, the regional GDP may influence the availability of resources and infrastructure, affecting both access to and the quality of education. Considering contextual differences between urban and rural areas, the study will shed light on how location-based disparities exacerbate vulnerabilities. The findings are expected to contribute to ongoing debates by providing empirical evidence that bridges the gap between structural and cultural explanations for school dropouts. Ultimately, the study will generate actionable recommendations that balance systemic reforms with localised interventions, offering a pathway toward equitable and sustainable educational outcomes in Tanzania.

Social Capital Theory and School Dropout

The concept of social capital theory was developed and refined by prominent scholars. Pierre Bourdieu (1980s) introduced the concept, emphasising its relationship to economic, cultural, and symbolic capital. Coleman (1988) expanded on this by highlighting the role of social capital in educational outcomes, particularly focusing on the networks, norms, and relationships that facilitate actions within families and communities. Meanwhile, Putnam (1990) focused on the decline of civic engagement and its implications for social cohesion, education, and other societal outcomes. These theorists contributed complementary perspectives: Bourdieu examined power and inequality, Coleman emphasised the functional aspects of networks, and Putnam addressed the societal and communal dimensions of social capital. Applied to school dropout, this theory offers a framework to understand how social resource availability (or lack) impacts educational outcomes.

This theory connects social capital to school dropout by emphasising *family social capital,* particularly parental involvement and household stability. Parents who actively engage with their child's education, such as assisting with homework and participating in school events, create a supportive environment that significantly reduces the likelihood of dropout. Additionally, households with strong internal relationships provide emotional and logistical support, enabling students to navigate challenges more effectively and remain committed to their education. These aspects of family social capital serve as protective factors against school dropout, particularly in vulnerable living conditions. However, Simons and Steele (2020) noted that economic hardships or family disintegration can weaken family social capital, leading to lower levels of parental encouragement and reduced oversight of children's education. *Community social capital*, defined as social networks within communities characterised by norms, trust, and collective efficacy, also influences educational outcomes. Supportive communities where education is highly valued can reduce dropout rates through collective efforts, such as offering scholarships or mentoring programs (Busagara et al., 2024). Positive peer networks encourage school attendance, while disengaged peer groups increase dropout risks (Mishra, 2020). Research demonstrates that strong teacher-student bonds enhance institutional social capital by boosting student motivation and engagement. Inclusive and trust-based school environments provide a safety net, reducing the likelihood of dropout (Toyon, 2024). However, Sudrajat (2021) argued that in vulnerable living conditions, overcrowded or under-resourced schools often fail to establish these positive teacher-student relationships, leading to student disengagement. Consequently, social capital theory suggests that dropout rates are significantly influenced by the quality and quantity of social resources available at the family, community, and institutional levels. In

vulnerable living conditions, weakened social capital exacerbates risks, while strengthening these networks offers a pathway to improved educational outcomes.

Methodology

Research Approach

The study used a quantitative research approach, specifically a time series cross-sectional design featuring panel data from four waves from 2019 to 2022. It is a predictive study, observing the proportion of students dropping out due to the prevalence of students living in vulnerable environments across multiple time units. The assumption is that some students in Tanzanian secondary education fail to reach higher successive grades partly due to difficulties encountered in accessing schools, causing them to drop out of the school system.

Sample Size

The study's sample size comprises 184 districts of mainland Tanzania. The study covered all districts of mainland Tanzania, as PO-RALG documents regional data on education across the same districts. Thus, data are disaggregated to the district level as the lowest level of analysis of education data, which makes it difficult to obtain data at the school level. As such, selecting a few districts would have resulted in a problem of bias due to the inclusion of a small sample size. Additionally, the analysis covered four years (2019 – 2022) due to a lack of data on the persistence of students living in vulnerable environments in monitoring and evaluation reports published prior to this period.

Data and Sources

The study uses secondary school statistics documented by the Ministry of the President's Office, Regional Administration, and Local Governments (PO-RALG). The ministry is empowered to manage formal and non-formal education in the country, among other responsibilities, to monitor and evaluate the performance of pre-primary, primary, secondary, adult, and non-formal education. As such, the ministry issues annual performance reports comprising various school records, such as the number of registered schools in different jurisdictions in local governments, including cities, municipalities, towns, and district councils. The reports also publish data on student flows, such as enrolments, dropouts, transitions, and repetitions, to inform decision-making. Moreover, the study uses national accounts statistics published by the National Bureau of Statistics (NBS). The National Bureau of Statistics (NBS) organises time series data from the 2015 base year and updates it annually to incorporate changes in socio-economic developments. The national accounts compile data from different surveys such as Household

Budget Surveys (HBS), Integrated Labour Force Surveys (ILFS) and National Economic Surveys (NES), which document statistics on social and economic profiles of different regions of Tanzania.

Empirical Models

The study adopted two empirical models to draw inferences about the effect of the persistence of students living in vulnerable environments on dropout rates in secondary schools. The first model assumes that the greater the persistence of students living in vulnerable environments, the higher the dropout rates in schools. As such, the model suggests that increases in the proportion of students living in vulnerable learning environments heighten the number of students dropping out of the school system. Consequently, the following empirical strategy aided the estimation of the results.

$$DR_{drt} = \square + \beta SVE_{drt} + \gamma RGDPcap_{rt} + \delta SD_{irt} + \mu_t + \varepsilon_{rt} \quad [1]$$

Where DR_{drt} denotes dropout rate in district *d* in region *r* in year *t*, SVE_{drt} represents the percentage of students living in vulnerable environments enrolled in schools in district *d* in region *r* in year *t*, and $\gamma RGDPcap_{rt}$ is the regional per capita Gross Domestic Product (GDP) of region *r* in year *t*. δS_{rt} represents district *d* school characteristics in region *r* in year *t*, μ_t are regions' random effects, ε_{rt} is an idiosyncratic error term, β, γ, and δ are coefficients, and □ is the overall intercept. The second empirical model (equation 2) broadens the analysis to determine the heterogeneity effects of development in terms of urbanisation and changes in time. The predicted assumption is that the persistence of students living in vulnerable environments is moderated by districts' Socio-Economic Status (SES) due to being a city or municipal council. Moreover, the study assumes that the status of development in districts changes over time, resulting in a reduced number of students living in vulnerable environments due to advances in households' social and economic profiles. As such, the model incorporates the interaction term (UT) to capture the effect of districts' developments due to urbanisation across periods. The following empirical model aided the estimation of the results.

$$DR_{drt} = \square + \beta UT \bullet SVE_{drt} + \gamma RGDPcap_{rt} + \delta SD_{irt} + \mu_t + \varepsilon_{rt} \quad [2]$$

Where U denotes urbanisation and T is time in years, both interacting with the percentage of students enrolled in schools in a district. In this study, an urban area is either the city or municipal council, as they are mainly capital cities of the regions in Tanzania and tend to be more affluent than the district and town councils, with towns being their headquarters. The latter are also characterised by rurality, having a higher proportion of villages and rural

development challenges, characterised by higher incidences of poor living conditions that may hamper students' access to schooling. The rural-urban development gaps inform several aspects relating to living conditions, hence impacting students' learning environments.

Measurements

The study uses generalised least squares (GLS) regression analysis to estimate the causal influence of the persistence of students living in vulnerable environments on dropout rates in secondary schools. As such, the dropout rate is the dependent variable, and the percentage of students living in vulnerable environments is the independent variable. The study controls for the number of schools registered in the district, town, municipal or city councils, the student-qualified teacher ratio (SQTR) and the regional per capita GDP to account for district and regional characteristics. These proxies mediate the impact of the persistence of students living in vulnerable environments on dropout rates.

The dropout rate is the proportion of students enrolled in a given grade in a given school year who are no longer enrolled in the following school year. The authors adopted dropout metrics documented in secondary school statistics issued by PO-RALG from 2019 to 2022. Therefore, this measure clarifies the percentage of students who leave the school system without advancing to higher grades of secondary education in the country. The study postulates that the current status of dropout rates depends on various aspects, including the persistence of students living in vulnerable environments after controlling for region and district conditions.

Students living in vulnerable environments metrics – this is the proportion of enrolments of students living under different situations that might compromise their schooling. The data are published yearly by PO-RALG and are accessed through the public domain. They include situations such as families with poor income, students living or passing near wild animals, usage of marine transport to and from school, pupils being heads of households, as well as experiencing sickness for more than three months. This proxy uses enrolment data, disaggregating the number of students living in vulnerable environments as a share of total enrolments. The percentage of the disaggregated data of students living in situations identified above is thus an estimate of students living in vulnerable environments. The study considered this attribute an independent variable of the study, as increases in the number of students living in vulnerable environments contribute to increases in the number of dropouts. This will enlighten the magnitude of the effect to inform decisions on the schooling of students living in vulnerable environments.

Districts' school size – this proxy is given by the total number of schools registered in the district in a given school year. The assumption behind its use is that the government and private investors continue to establish schools in different areas of jurisdiction. This is critical towards navigating the reduced number of dropouts to account for situations relating to vulnerability, such as constructing schools in such areas. This controls the persistence of students living in vulnerable environments. This proxy is just the total number of government and non-government schools found in the area of jurisdiction, as documented in the education statistics published by PO-RALG.

Student Qualified Teacher Ratio (SQTR) is the proportion of trained teachers employed in a district in relation to the number of students enrolled in a school year in the same jurisdiction. This measure is included because the number of teachers available in a school helps reduce dropouts by providing specialised guidance to students living in vulnerable environments. PO-RALG uses this metric as one of the attributes to account for school inefficiency. This study adopts the same measure that is found in the yearly published school data for pre-primary, primary, secondary, adult, and non-formal education statistics released by PO-RALG.

Regional per capita GDP is a proxy for regional Socio-Economic Status (SES) to account for the average income earned by individuals living in a particular region in a given time. It is one of the development measures used to estimate individual spending levels; hence, it may reflect the poverty level of households in the country. Consequently, improved regional per capita GDP is significant for improving the living conditions of the inhabitants and the ability of households to spend on the schooling of students. The same also induces investments in education, as schools can be constructed closer to homesteads, reducing the risk of students moving long distances, which can lead to increased dropout rates. The National Bureau of Statistics (NBS) publishes this measurement.

Table 1: Variables, data sources, proxies and units of measurement

S/N	Variables	Proxy and unit of measurement	Source of data
1	Dropout Rate	Percentage of students dropping out in secondary education in districts	President's Office Regional Administration and Local Governments (PO-RALG) 2019-2022
2	Students living in vulnerable environments	Percentage of students living in vulnerable environments as a share of total enrolments in the district	President's Office Regional Administration and Local Governments (PO-RALG) 2019-2022
3	Districts' school size	Total number of registered secondary schools in the district	President's Office Regional Administration and Local Governments (PO-RALG) 2019-2022
4	Student Qualified Teacher Ratio (SQTR)	The ratio of registered qualified teachers to the number of students enrolled in the district	President's Office Regional Administration and Local Governments (PO-RALG) 2019-2022
5	Regional per capita GDP	An average amount of income earned (TZS in Millions) by individuals in the region in a given school year.	National Bureau of Statistics (Tanzania) 2017-2023.

Source*:* Authors' construction, 2025.

Robustness Checks

The study adopts time series analysis using random effects Generalised Least Squares (GLS) regression analysis to estimate the results based on both intuition and quantitative methods on the estimation of educational data. According to Theobald (2018), students' flow data varies over time partly due to changes in school variables such as enrolments, dropouts or transition from one grade to another. Thus, such variations narrow the probability of school data being independent. Additionally, the authors performed linearity tests using the Wald Chi-statistics, homoscedasticity checks by using robust standard errors, as well as random effects using Breusch and Pagan Lagrangian multiplier tests. Finally, the study adopts a random effects regression model because the dataset violates the condition of independence and satisfies the condition of being random through robustness analysis.

Results

The study investigated the causal relationship between students living in vulnerable environments and dropout rates within the school system across districts. It is hypothesised that the persistence of students living in vulnerable environments positively influences dropout rates in secondary

schools, with the effects varying based on levels of urbanisation over time. The findings, as summarised in Table 2, reveal several notable scenarios.

Table 2: The effect of students living in a vulnerable environment on dropout rate

Variables	1	2	3
SLVE	0.104***	0.0815**	0.0785**
	(0.038)	(0.038)	(0.031)
SLVExUrbanization		0.196	
		(0.135)	
Urbanisation (baseline)		-4.792***	
		(0.944)	
SLVEx2020			-0.00463
			(0.024)
2020 baseline			0.902***
			(0.292)
SLVEx2021			0.0231
			(0.035)
2021 baseline			0.978**
			(0.394)
SLVEx2022			-0.0004
			(0.052)
2022 baseline			1.226**
			(0.544)
N	736	736	736
R^2	0.16	0.23	0.2
rho	0.76	0.74	0.77

Note: SLVE = Students Living in Vulnerable Environments, N = Number of observations, R^2 = R-squared, rho = Composite Reliability. Robust standard errors are reported in parentheses.
* p<0.10, ** p<0.05, *** p<0.01

Table 2 presents the results on the influence of the persistence of students living in vulnerable environments on dropout rates in Tanzanian secondary schools. Column 1 shows that the persistence of students living in vulnerable environments increases the overall dropout rate by 0.1 points. Figure 1(a) illustrates that this effect is proportional for both rural and urban schools, as dropout rates rise with an increase in the number of students from vulnerable environments. However, rural schools experience significantly higher dropout rates than urban schools, as evidenced by the steeper slope for rural schools compared to urban schools.

This variation is confirmed by the heterogeneity effect of urbanisation presented in column 2, where the impact is more pronounced in rural schools, with an increase of 0.08 points in dropout rates. In contrast, the effect is ambiguous for urban schools. Additionally, the baseline results indicate that dropout rates decrease significantly by 4.8 points if a school is located in a municipal or city council area. This suggests that even without students from vulnerable environments, dropout rates are lower in urban localities, further

highlighting that rural schools bear a greater burden of dropouts. Figure 1(b) reveals that dropout rates increase as the proportion of students living in vulnerable environments exceeds 8%. The effect is particularly pronounced in rural schools, regardless of the percentage of such students, when accounting for the interaction between locality and the number of schools. Conversely, the impact in urban schools remains lower and is most evident between 6% and 8% of students living in vulnerable environments. Beyond this threshold, the effect becomes ambiguous. Overall, the findings suggest that rural schools are disproportionately affected by high dropout rates due to the persistence of students living in vulnerable environments. These localities appear to be characterised by conditions that exacerbate the challenges faced by such students.

The results indicate that the number of students dropping out of the school system increased over the years. As shown in Table 2 (column 3), the persistence of students living in vulnerable environments raised dropout rates by 0.08 points in 2019, though ambiguity is observed in subsequent school years. However, the positive slopes across all school years (see Figure 2) suggest that dropouts among students from vulnerable environments persisted throughout the period under review. The findings further reveal that dropout rates increased significantly as schools enrolled more students from vulnerable environments. This impact became more apparent in the years following 2019, indicating a worsening trend. The issue became particularly severe when schools enrolled more than 8% of students from vulnerable environments. As illustrated in Figure 2, the slope for 2021 is notably steeper than in other years, signifying higher dropout rates during that year, particularly among students living in vulnerable conditions. Despite this, the baseline coefficients remain positive across all school years, indicating an overall increase in dropout rates, even without accounting for the effect of students from vulnerable environments. Moreover, dropout rates rose progressively over the years (Table 2). These results suggest that dropout rates in Tanzanian secondary schools have persisted and worsened over time, irrespective of government initiatives to implement policies aimed at encouraging student retention. The findings underscore the need for more targeted interventions to address the underlying factors contributing to these trends.

Discussion of the Findings

The study examined the impact of students living in vulnerable environments on dropout rates in Tanzanian secondary schools. The findings indicate that as the number of students from such backgrounds increases, more students exit the school system prematurely. Similar trends have been observed in related studies, including John et al. (2015) and Kalamba and Mpiza (2024),

emphasising the persistence of this issue within Tanzania's secondary education system. In the Tanzanian context, vulnerable environments include factors such as low-income households, dependence on marine transport, proximity to wildlife-inhabited areas, chronic illness, or assuming household head responsibilities. These conditions often expose students to hardships, such as engaging in child labour, that increase the likelihood of school dropout (Huber, 2023). By applying social capital theory, we can understand these environments as devoid of the supportive networks and social resources commonly found in more stable communities. Social capital refers to the value derived from relationships and networks of trust and reciprocity within a community. Students in vulnerable environments often lack access to these networks, such as engaged parent groups, active school communities, and mentoring relationships, which could otherwise buffer against dropout risks. Despite government investments in social welfare, such as constructing schools and subsidising direct costs through the fee-free education policy, students in low-resource settings still face persistent barriers to completing secondary education. This is partly due to limited bonding and bridging social capital, which could otherwise connect students to opportunities and institutional support (Luo & Chen, 2020; Mutisya et al., 2021; Naylor et al., 2019).

Sustained illness, lasting more than three months, also contributes to school dropout. While Tanzania has introduced health initiatives such as Toto Afya Packages (TAPs) under the National Health Insurance Fund (NHIF), many families in vulnerable environments are unable to afford even marginally higher-standard packages. The lack of accessible healthcare further isolates these students. It deepens their vulnerability, again reflecting a lack of institutional and relational social capital to bridge the gap between policy and individual access. Additionally, students in remote or geographically challenging areas face accessibility issues, a point echoed in Luo and Chen (2020), who underscore how structural inequalities and residential backgrounds shape students' educational trajectories. These challenges are more acute in rural schools compared to urban ones. Rural areas experience higher dropout rates, driven by socio-economic disparities and limited school access. Rural communities often lack the bridging social capital found in urban centres, including institutional partnerships, active alumni networks, and parent-teacher associations, all of which help retain students in school. As Asantemungu and Anicet (2019) note, the absence of nearby schools makes families prioritise short-term economic survival over long-term education, especially through children's involvement in agriculture or fishing. Furthermore, persistent poverty in rural regions limits families' ability to meet even minimal school-related costs (Mwinyi, 2024; Supianto et al., 2023). Regional GDP differences mirror these economic disparities, with

better-developed regions providing more robust educational infrastructure (Delesalle, 2018; Rodriguez et al., 2023). Social capital theory underscores how resource-poor environments lack the institutional trust and community support systems necessary to sustain school engagement, reinforcing dropout patterns.

The findings further suggest that dropout rates increase over school years, partly due to demographic changes, such as rising numbers of students from vulnerable backgrounds. According to Pezzulo et al. (2022), factors like family size and parental education shift over time, contributing to higher enrollment rates and thereby increasing the strain on school systems. While policies like compulsory and fee-free education have succeeded in expanding access (Goldin et al., 2003), they have also brought more students from socially marginalised groups into the education system. Without corresponding growth in school-level support systems and social capital, such as mentoring programs, peer networks, and community-school partnerships, schools struggle to meet these students' needs, leading to inefficiencies and dropouts. Previous studies (Frostad et al., 2015; Schwab, 2018; Toyon, 2024) have shown that students from vulnerable environments are more likely to drop out due to a lack of supportive teacher-student relationships. Social capital theory explains this through the absence of bonding capital in school settings; students who feel disconnected or unsupported by peers and teachers are more likely to disengage. Under-resourced schools often lack the relational depth necessary to build trust and sustained engagement (Sudrajat, 2021), further contributing to dropout.

In summary, while economic, geographic, and health-related challenges clearly influence dropout rates, social capital theory reveals how the absence of supportive social structures, both within families and schools, amplifies these risks. Strengthening social networks and building trust-based relationships across school communities may serve as a critical pathway to mitigating dropout, especially for students in vulnerable environments. Addressing these deficits in social capital alongside material poverty is essential for reducing educational disparities and improving retention in Tanzanian secondary schools.

Conclusion and Recommendations

Students living in vulnerable environments in Tanzania contribute significantly to the high number of early school leavers. Rural schools and communities are disproportionately affected due to limited development, leading to students dropping out of secondary education before completion. This trend undermines government initiatives aimed at achieving a higher proportion of students completing the secondary education cycle, as

envisioned by the Sustainable Development Goals (SDGs), particularly SDG 4.3.1. The findings underscore the importance of investing in social capital through secondary education, as pervasive social, economic, and environmental challenges hinder students' ability to remain in school. Persistent vulnerabilities within communities weaken social capital development due to the scarcity of both the quality and quantity of social resources, as posited by social capital theory. Government efforts to strengthen secondary education provision have been commendable, including introducing the fee-free education policy and improving student healthcare services. However, students living in vulnerable environments remain disproportionately affected by dropouts and fail to fully benefit from these government subsidies, mainly due to pervasive poverty and the challenging conditions in which they live.

Therefore, this paper proposes several recommendations to improve retention rates for students living in vulnerable environments: First, the fee-free education policy should be revised to include provisions for covering maintenance costs, such as learning materials and other necessities, for students from low-income families. This would help alleviate financial burdens and support continued schooling. Second, sustained illnesses lasting more than three months significantly contribute to dropouts among students living in vulnerable environments. The Toto Healthcare Packages (TAPs) should be revised to offer zero-cost healthcare services for such students, ensuring better access to treatment and reducing the likelihood of absenteeism or dropouts. Third, a tracking system should be established to maintain a database of students living in vulnerable environments. This system would help identify students in need of healthcare subsidies and other targeted support, improving the effectiveness of interventions. Finally, many students face challenges accessing schools, particularly those relying on marine transport or travelling through areas with wild animals. School planning should account for such geographical and environmental diversities, ensuring that schools are constructed in locations that minimise these barriers and reduce dropout rates. Moreover, some students drop out due to the persistence of low-income families. Parents in low-income families should strive to participate in income-generating activities that reflect their contexts to minimise poverty levels. These efforts would help bridge educational gaps and contribute to achieving SDG 4, which aims to ensure inclusive and equitable quality education for all.

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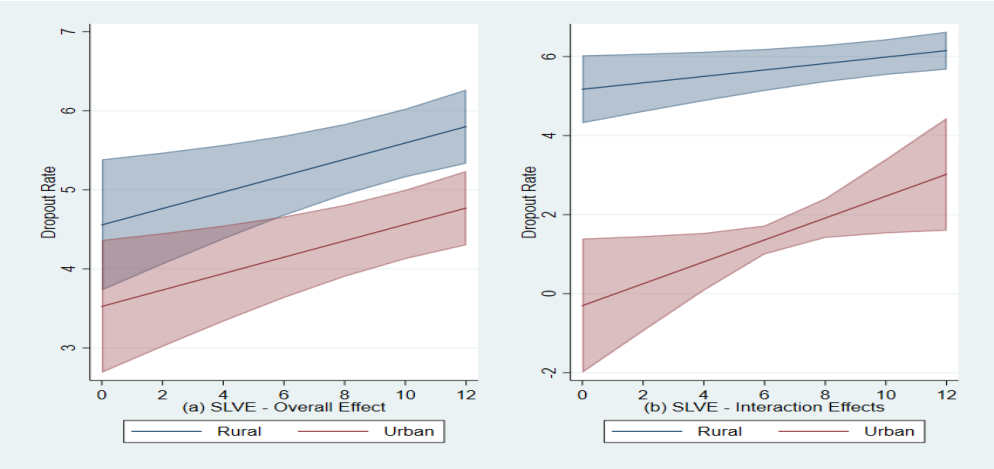
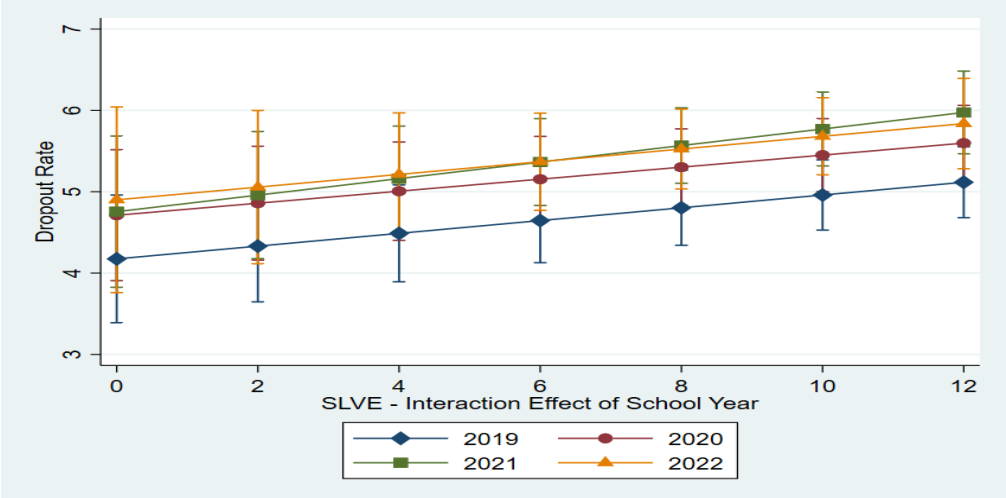
Appendices

Figure 1: The overall and interaction effect of SLVE on dropout rate due to rurality



Note: SLVE = Students Living in Vulnerable Environment. All predictive margins = 95%
Source: Authors' construction

Figure 2: The interaction effect of SLVE on dropout rate due to school year



Note: SLVE = Students Living in Vulnerable Environment. All predictive margins = 95%
Source: Authors' construction