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Decomposing Rural-Urban Inequalities in Adolescent Fertility in Tanzania: Evidence from the 2022 Tanzania Population and Housing Census

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ABSTRACT

Adolescent fertility remains a major public health and demographic concern in many developing countries, including Tanzania. This study examines the determinants of adolescent fertility and quantifies the contribution of socio-economic and demographic factors to rural–urban disparities in adolescent childbearing in Tanzania. The study uses data from the 2022 Tanzania Population and Housing Census. It applies the Fairlie decomposition technique to explain the extent to which differences in characteristics between rural and urban adolescents account for the observed fertility gap. The results show that several factors significantly influence adolescent fertility, including the adolescent's age, marital status, education level, household wealth, household size, age of the household head, education level of the household head, and sex of the household head. Marital status and age of adolescents are the strongest predictors of adolescent childbearing, indicating that early marriage substantially increases the likelihood of early fertility. Higher educational attainment and improved household wealth are associated with a lower probability of adolescent childbearing. The decomposition results reveal that adolescents in rural areas are significantly more likely to have given birth compared to their urban counterparts. Differences in household wealth, marital status of adolescents, and education level of adolescents explain a large proportion of the rural–urban fertility gap. The findings highlight the importance of addressing socio-economic inequalities, expanding educational opportunities for girls, delaying early marriage, and improving access to

adolescent-friendly reproductive health services. Targeted interventions focusing on rural communities are essential to reduce adolescent fertility and narrow rural–urban disparities in Tanzania.

1. Introduction

Adolescent fertility remains a significant demographic and public health challenge in many developing countries, including Tanzania. Defined as childbearing among girls aged 15–19 years, it contributes substantially to overall fertility and has far-reaching consequences for maternal and child health, education, and socio-economic development. Early childbearing is associated with higher risks of maternal morbidity and mortality, low birth weight, neonatal deaths, and interrupted education, which perpetuate cycles of poverty and gender inequality.

In 2019, adolescents aged 15–19 in developing countries experienced roughly 21 million pregnancies, nearly half of which were unintended. These unintended pregnancies resulted in about 12 million live births, while an estimated 55% ended in abortion, many of them unsafe due to limited access to reproductive health services (WHO, 2024; Sully et al., 2020 & Darroch et al.). In lower-middle-income countries, more than half of unintended adolescent pregnancies terminate in unsafe abortions (Sully et al., 2020). Although teenage birth rates have declined globally, sub-Saharan Africa continues to report over 100 births per 1,000 women, with an estimated 6.1 million births annually among girls aged 15–19 (UN, 2019).

In Tanzania, adolescent fertility remains a persistent health challenge despite overall reductions in fertility. According to TDHS-MIS 2022, the proportion of women aged 15–19 who have ever been pregnant decreased from 27% in 2015–16 to 22% in 2022. Fertility is higher in rural areas (25%) than in urban areas (16%), reflecting disparities shaped by early marriage, lower educational attainment, limited access to reproductive health services, poverty, and cultural norms. In contrast, urban adolescents benefit from better access to education, sexual and reproductive health information, and modern contraceptives.

The 2022 Population and Housing Census reported an Adolescent Fertility Rate (AFR) of 77 births per 1,000 women aged 15–19 nationwide, with rural areas at 95 births per 1,000 women and urban areas at 45 births per 1,000 women. Adolescent fertility contributes 1.7% to the Total Fertility Rate (TFR) at the national level.

Evidence from other Sub-Saharan African countries and beyond reinforces these patterns. In Nigeria, Salawu et al. (2025) found that education, marital timing, and contraceptive use were key drivers of teenage pregnancy, while Okoli et al. (2022) highlighted its concentration among poor adolescents. In Uganda, Basigirenda, M. (2024) identified education, wealth, marital status, and reproductive behaviours as major determinants, and in Zambia, Phiri et al. (2023) emphasised the protective effects of literacy, delayed sexual debut, and family planning.

Similar patterns were observed in South Africa (Amoateng et al., 2022), Papua New Guinea (Li et al., 2023), and multi-country analyses in sub-Saharan Africa (Mekonen, 2024; Shasha et al., 2023; Ayalew, 2022), showing that socio-economic and educational inequalities consistently increase adolescent fertility risk. These studies relied on nationally representative data (mainly DHS). They applied advanced statistical tools, including multilevel regression, decomposition, and concentration indices, highlighting the relevance of decomposing data in Tanzania using the 2022 Population and Housing Census.

Within Tanzania, existing studies show that adolescent fertility is strongly influenced by poor knowledge of sexual and reproductive health, low socio-economic status, peer pressure, education, and rural residence (Machange & Temba, 2024; Stephano et al., 2025). However, they do not quantify the contribution of these factors to the rural–urban fertility gap. This gap justifies the proposed study, which will use the 2022 Population and Housing Census and a decomposition approach to measure the extent to which differences in demographic and socio-economic characteristics explain rural–urban inequalities in adolescent fertility. The study provides updated, nationally representative evidence to guide targeted policies aimed at reducing teenage fertility and narrowing rural–urban disparities in Tanzania.

Despite global declines in adolescent fertility, Tanzania continues to experience teenage childbearing, particularly in rural areas, where the Adolescent Fertility Rate (AFR) is more than double that of urban areas (95 vs 45 births per 1,000 women aged 15–19) (2022 Tanzania Population and Housing Census). Early childbearing in Tanzania is influenced by multiple and interrelated factors, including low educational attainment, poverty, limited access to reproductive health services, early marriage, and socio-cultural norms, which contribute to adverse maternal and child health outcomes, disrupted education, and cycles of poverty.

While previous studies have identified these determinants (Machange & Temba, 2024; Stephano et al., 2025), there is limited evidence quantifying their relative contributions to rural–urban disparities in adolescent fertility. This knowledge gap undermines the design of targeted interventions to reduce teenage fertility and address inequalities between rural and urban areas. Therefore, there is a critical need for a decomposition analysis using nationally representative data from the 2022 Population and Housing Census to determine how differences in demographic and socio-economic characteristics explain rural–urban disparities in adolescent fertility in Tanzania.

2. Methodology

2.1 Study area

This study was conducted in the United Republic of Tanzania, located in East Africa at approximately 6.3690° S and 34.8888° E. According to the 2022 Tanzania Population and Housing Census, the country had a total population of 61,741,120, comprising 30,053,130 males and 31,687,990 females. The census further reported 14,152,803 private households, of which 5,605,470 (39.6%) were located in urban areas and 8,547,333 (60.4%) in rural areas.

The study area was selected because of marked differences in adolescent fertility between rural and urban areas. In Tanzania, the Adolescent Fertility Rate (AFR) is estimated at 77 births per 1,000 women aged 15–19 years. However, this rate varies substantially by place of residence, with rural areas recording a much higher rate (about 95 births per 1,000 women aged 15–19 years) compared to urban areas (about 45 births per 1,000 women aged 15–19 years) (NBS and OCGS, 2025). Furthermore, adolescent fertility accounts for approximately 1.7 per cent of the national Total Fertility Rate (TFR) (NBS and OCGS, 2025). These statistics highlight the importance of examining adolescent fertility patterns in the Tanzanian context.

2.2. Research Design

This study employed a cross-sectional research design to analyse differences in adolescent fertility in Tanzania. The data used in this study were derived from the 2022 Tanzania Population and Housing Census (TPHC), conducted by the Tanzania National Bureau of Statistics (NBS) and the Office of the Chief Government Statistician (OCGS) in Zanzibar. The TPHC collects information on various social, economic, and demographic variables; relevant variables were selected for this study.

The target population for this study consisted of all women aged 15–19 years in Tanzania in 2022 living in private households. The accessible population comprised all women aged 15–19 years enumerated in the 2022 Tanzania Population and Housing Census. The analysis used a 30% sample of the census microdata released by the National Bureau of Statistics (Tanzania). From this dataset, the final analytical sample comprised 314,377 adolescent women aged 15–19 years, who were classified into two groups: those who had ever given birth and those who had never given birth at the time of the census.

2.3. Study Variables

In this study, **having ever given birth** was used as the dependent variable and was measured as a binary outcome. The variable was categorised into two groups: **1 = Yes (adolescent fertility present in the household) and 0 = No (adolescent fertility absent in the household).**

The independent variables included the education level of the adolescent, age of the adolescent, marital status of the adolescent, sex of the household head, age of the household head, education level of the household head, marital status of the household head, employment status of the household head, household size, and wealth index. In addition, the place of residence (urban or rural) was included as a grouping variable. These variables were selected based on empirical evidence from previous studies and their availability in the 2022 Tanzania Population and Housing Census (TPHC) dataset.

2.4 Methods of Data Analysis

To decompose the rural-urban inequalities in adolescent fertility in Tanzania, this study employed the Fairlie decomposition method, which is well-suited for binary outcome variables. The technique decomposes the difference in the probability of adolescent fertility between two groups (urban vs rural) into two components: (i) a part explained by differences in observable characteristics (endowments), and (ii) an unexplained part, often attributed to differences in the effects of these characteristics or unobserved factors.

The decomposition equation can be expressed as follows:

$$Y_U^- — Y_R^- = \sum_{I=1}^{N^U}\left[\frac{F\left(X_i^U\hat{\beta}\right)}{N^U}\right] - \sum_{j=1}^{N^R}\left[\frac{F\left(X_j^R\hat{\beta}\right)}{N^R}\right]$$

Where:

Y_U^- and Y_R^- . These are the average predicted probabilities of adolescent fertility for Urban (U) and Rural (R), respectively.

X_i^U and X_j^R These are the observed characteristics of individuals in the urban and rural samples.

$\hat{\beta}$ These are the estimated coefficients from a pooled logistic regression model.

F(.) is the logistic cumulative distribution function.

The total difference $Y_U^- — Y_R^-$ is then decomposed into:

Explained (Endowment) Component**:** The portion attributable to differences in observable characteristics (education level of adolescent, age of adolescent, marital status of adolescent, sex of household head, age of household head, education level of household head, marital status of household head, employment status of household head, household size, and wealth index) between rural and urban households.

Unexplained Component**:** The portion attributable to differences in the effects (coefficients) of those characteristics or unobserved variables, such as preferences, access to markets, or policy environments.

The explained component helps identify which characteristics contribute most to the rural-urban gap in adolescent fertility. In contrast, the unexplained component may reflect structural inequalities, discrimination, or omitted factors not captured in the model.

In the Fairlie decomposition method, a positive overall rural–urban disparity in adolescent fertility indicates that adolescent fertility is higher in rural areas than in urban areas. When the disparity is defined as rural minus urban, a negative coefficient for a given variable implies that the variable contributes to explaining or widening the observed rural disadvantage in adolescent fertility. In contrast, a positive coefficient indicates that the variable reduces rural–urban disparity. Thus, variables with negative contributions increase the observed inequality, whereas variables with positive contributions narrow the inequality between rural and urban adolescents.

3. Results and Discussion

3.1 Results

3.1.1 Characteristics of the Respondents

The results in Table 1 show that 14.22 per cent of adolescents aged 15–19 had ever given birth, while 85.78 per cent had not. The results indicate that although the majority of adolescents have not entered motherhood, a considerable proportion have already experienced childbearing, highlighting the persistence of early fertility in Tanzania. Such levels suggest that adolescent childbearing remains an important demographic and public health issue that may affect educational attainment, labour market participation, and long-term well-being of young women.

The distribution of adolescents by education level shows that most have attained at least secondary education, reflecting improvements in educational access in Tanzania. However, the presence of nearly 10% of adolescents who never attended school may increase vulnerability to early childbearing because limited education is often associated with lower awareness of reproductive health and fewer economic opportunities.

Most adolescents were never married (80.6%), while 16.47% were married, 2.23% were living together (cohabiting), and very small proportions were divorced (0.43%), separated (0.24%), or widowed (0.03%). These results suggest that formal marriage during adolescence still exists in Tanzania, although the majority remain unmarried. Since marriage is strongly associated with childbearing in many contexts, the relatively high proportion of married adolescents may contribute significantly to adolescent fertility levels.

The age distribution is fairly balanced across ages 15–19. The slightly higher proportion of adolescents aged 18 years (21.41%) suggests that older adolescents form a larger share of the sample. Since fertility risk increases with age within adolescence, older adolescents are more likely to have already experienced childbearing.

Table 1: Characteristics of Adolescents

Variable	N (314,377)	Percentage (%)
Ever Gave Birth		
Yes	44,715	14.22
No	269,662	85.78
Education Level of Adolescent		
Never attending	30,332	9.65
Primary	108,011	34.36

Secondary	173,172	55.08
University	2,862	0.91
Marital Status of Adolescent		
Never Married	253,388	80.6
Married	51,783	16.47
Living Together	7,000	2.23
Divorced	1,359	0.43
Separated	742	0.24
Widowed	105	0.03
Age of Adolescence		
15	62,536	19.89
16	64,257	20.44
17	63,638	20.24
18	67,314	21.41
19	56,632	18.01

Source: TPHC (2022)

Results in Table 2 show that most households were headed by employed individuals (82.66%), while unemployed individuals headed 17.34%. The finding indicates that a large proportion of adolescents live in households with some form of economic activity. However, unemployment among household heads may reduce household resources and increase adolescents' vulnerability to early marriage and early fertility.

The majority of households were headed by males (60.92%), while females headed 39.08%. The relatively high proportion of female-headed households may reflect widowhood, separation, or labour migration of male partners. Household headship structure may influence adolescent reproductive behaviour through economic conditions and parental supervision.

Most household heads had primary education (59.22%), suggesting that their educational attainment is generally low to moderate, with a majority having only primary education. Lower parental education is often associated with limited access to reproductive health information and fewer socio-economic opportunities, which may influence adolescent fertility behaviour.

A large majority of household heads were married (72.05%), which indicates that most adolescents live in households with married heads, which may influence family norms and expectations regarding marriage and childbearing. The results show that 61.70% of adolescents reside in rural areas, while 38.30% live in urban areas. The results indicate that the majority of adolescents in the sample come from rural areas. Rural areas often have higher levels of adolescent fertility due to lower access to

education, reproductive health services, and economic opportunities, which justifies the focus of this study on rural-urban fertility differences.

The wealth distribution shows some variation across quintiles. The largest proportion of adolescents belongs to the richest quintile (25.03%), indicating some economic heterogeneity within the sample. Household wealth is an important determinant of adolescent fertility because wealthier households often provide better access to education and reproductive health services.

The average age of household heads is 45.58 years, suggesting that most households are headed by middle-aged adults who may exert significant influence on adolescent behaviour and decision-making. The average household size is 6.99 members, indicating relatively large households. Large household sizes may affect adolescents through resource constraints or family dynamics that influence education and reproductive decisions.

Table 2: Characteristics of Households

Variable	N (314,377)	Percentage (%)
Employment Status of Household Head		
Employed	259,862	82.66
Unemployed	54,515	17.34
Sex of Household Head		
Male	191,534	60.92
Female	122,843	39.08
Education Level of Household Head		
Never attending	61,533	19.57
Primary	186,186	59.22
Secondary	42,271	13.45
University	24,387	7.76
Marital Status of Household Head		
Never Married	21,579	6.86
Married	226,484	72.05
Living Together	18,576	5.91
Divorced	12,024	3.82
Separated	7,004	2.23
Widowed	28,697	9.13
Place of Residence		
Urban	120,402	38.30
Rural	193,975	61.70
Wealth Index of Household		
First Quintile	52,449	16.68
Second Quintile	63,225	20.11
Third Quintile	60,861	19.36
Fourth Quintile	59,166	18.82

Fifth Quintile			78,676		25.03

Summary Statistics

Variable	Obs.	Mean	Std. dev.	Min	Max
Age of Household Head	314,377	45.58	15.18	7	97
Household Size	314,377	6.99	4.26	1	99

Source: TPHC (2022)

3.1.2 Fairlie Decomposition of the Variations in Adolescent Fertility between Rural and Urban

3.1.2.1 Logistic Regression

Table 3 presents the results of the binary logistic regression model examining the determinants of whether an adolescent has ever given birth in Tanzania. The overall model is statistically significant (LR ch2(5) = 93,037.91, $p < 0.001$), indicating that the explanatory variables jointly account for variations in adolescent fertility. The Pseudo R^2 value of 0.3618 suggests that approximately 36.2% of the variation in adolescent childbearing is explained by the variables included in the model, indicating a relatively good model fit.

The sex of the household head has a positive, statistically significant coefficient ($\beta = 0.0882$, $p < 0.001$), indicating that adolescents residing in male-headed households are more likely to have ever given birth than those in female-headed households. The age of the household head is negatively associated with adolescent fertility ($\beta = -0.0101$, $p < 0.001$), indicating that adolescents living in households headed by older individuals are less likely to experience early childbearing. This may reflect greater parental experience, supervision, and guidance in households headed by older adults.

The education level of the household head has a negative and significant effect on adolescent fertility ($\beta = -0.0563$, $p < 0.001$), suggesting that higher educational attainment among household heads reduces the likelihood of adolescent childbearing. Educated household heads may be better informed about reproductive health issues and place greater emphasis on education and future opportunities for adolescents.

Both marital status and employment status of the household head are statistically significant predictors of adolescent fertility. The marital status of the household head has a positive coefficient ($\beta = 0.0120$, $p = 0.045$), indicating a slight increase in the likelihood of adolescent childbearing among adolescents living in households with a married household head. Employment status of the

household head has a negative coefficient (β = -0.0417, p = 0.014), suggesting that adolescents living in households headed by employed individuals are less likely to have ever given birth, possibly due to improved economic stability and access to resources.

Household size is positively and significantly associated with adolescent fertility (β = 0.0182, p < 0.001), indicating that adolescents from larger households are more likely to have ever given birth. Larger households may face resource constraints and reduced parental monitoring, thereby increasing vulnerability to early pregnancy. Similarly, the household wealth index exhibits a negative, highly significant relationship with adolescent fertility (β = -0.2086, p < 0.001), suggesting that adolescents from wealthier households are less likely to experience early childbearing. Greater economic resources may facilitate continued schooling and access to reproductive health information and services.

Age is one of the strongest predictors of adolescent fertility (β = 0.7726, p < 0.001), indicating that the likelihood of having given birth increases substantially with age within the adolescent age group. The adolescent's marital status also has a strong positive effect (β = 1.4181, p < 0.001), suggesting that married adolescents are significantly more likely to have ever given birth than their unmarried counterparts. This finding suggests a strong association between marriage and adolescent childbearing, reflecting the close relationship between union formation and fertility behavior in Tanzania.

Adolescents' educational attainment is negatively associated with adolescent fertility (β = -0.4202, p < 0.001), indicating that higher educational attainment substantially reduces the likelihood of early childbearing. Education may delay marriage, improve knowledge of reproductive health, and enhance future aspirations, thereby discouraging early fertility.

Place of residence is also a significant determinant of adolescent fertility (β = 0.1463, p < 0.001). The positive coefficient indicates that adolescents residing in rural areas are more likely to have ever given birth than those in urban areas. This finding may reflect disparities in access to education, reproductive health services, and economic opportunities between areas of residence.

Table 3: Results for Binary Logistic Regression

Variable	Coefficient	Std. Err.	Z	P>z
Sex of HH	0.0882	0.0148	5.9800	0.0000
Age of HH	-0.0101	0.0005	-20.5100	0.0000
Education Level of HH	-0.0563	0.0071	-7.9500	0.0000

Marital Status of HH	0.0120	0.0060	2.0000	0.0450
Employment Status of HH	-0.0417	0.0170	-2.4500	0.0140
Household Size	0.0182	0.0014	12.8400	0.0000
Wealth Index	-0.2086	0.0061	-34.4300	0.0000
Age of Adolescence	0.7726	0.0060	129.5300	0.0000
Marital Status of Adolescent	1.4181	0.0115	123.2500	0.0000
Education Level of Adolescent	-0.4202	0.0069	-61.0000	0.0000
Place of Residence	0.1463	0.0172	8.5300	0.0000
Constant	-15.6663	0.1144	-136.9200	0.0000

Number of observations =314,364
LR chi2(5) =93037.91
Prob > chi2 = 0.0000
Log likelihood = -82056.709
Pseudo R^2 = 0.3618

Source: TPHC (2022)

3.1.2.2 Non-linear decomposition by location

Table 4 presents the Fairlie decomposition results for the rural–urban differences in adolescent fertility in Tanzania. The results show that the probability of an adolescent ever giving birth is higher in rural areas (17.92%) than in urban areas (8.27%), resulting in a rural–urban fertility gap of 0.0965. This finding indicates that adolescent childbearing remains substantially more prevalent in rural areas.

The total explained component is 0.1192, indicating that differences in socioeconomic and demographic characteristics between rural and urban adolescents account for a substantial share of the disparity. Because the explained component exceeds the total observed gap, the unexplained component is negative (-0.0227), obtained as the difference between the overall gap (0.0965) and the explained component (0.1192).

This negative, unexplained component suggests that unobserved factors, behavioural differences, contextual influences, or differences in the effects of characteristics between rural and urban areas partially offset the disadvantage associated with rural adolescents. If rural and urban adolescents differed only in their observed characteristics, the fertility gap would be even larger than it is.

The household wealth index is the largest contributor, explaining 35.98% of the rural–urban gap. The finding indicates that differences in household economic status between rural and urban areas play a major role in explaining variations in adolescent fertility. Rural adolescents are more likely to live in poorer households, which increases the risk of early childbearing.

Adolescents' marital status is the second-largest contributor to the rural–urban fertility gap, accounting for 34.27% of the disparity. This finding indicates a strong association between marital status and adolescent fertility. However, because the data are cross-sectional, the direction of the

relationship cannot be established. Marriage may increase the likelihood of childbearing, but pregnancy or childbearing may also lead to marriage. Therefore, the results should be interpreted as reflecting an association rather than a causal effect.

The education level of adolescents explains 26.17% of the rural–urban gap, indicating that differences in educational attainment between rural and urban adolescents are a key determinant of early childbearing. Urban adolescents are more likely to attain higher levels of education, which delays fertility. Other variables make smaller contributions. The education level of the household head explains 6.97% of the gap, while household size accounts for 3.43%, suggesting that household socio-economic characteristics also play a role.

In contrast, the age of adolescents contributes −6.71%, indicating that differences in age composition between rural and urban adolescents slightly reduce the observed fertility gap. Overall, the results show that socio-economic inequalities, particularly differences in wealth, education, and marital status, are the main drivers of rural–urban disparities in adolescent fertility in Tanzania.

Table 4: Decomposition of the Variations in Adolescent Fertility between Rural and Urban

Number of obs.	314,364
Number of observations in Rural	193,971
Number of observations in Urban	120,393
Probability- Urban	0.0827
Probability-Rural	0.1792
Difference (Rural-Urban Gap)	0.0965
Total explained	0.1192

Variable	Coefficient	Std. Err.	Z	P>z	Percentage
Sex of HH	0.00030	0.00009	3.26000	0.00100	-0.25
Age of HH	-0.00009	0.00006	-1.59000	0.11100	0.07
Education Level of HH	-0.00831	0.00069	-12.13000	0.00000	6.97
Marital Status of HH	-0.00005	0.00004	-1.40000	0.16300	0.04
Employment Status of HH	-0.00001	0.00001	-0.97000	0.33100	0.01
Household Size	-0.00409	0.00040	-10.35000	0.00000	3.43
Wealth Index	-0.04289	0.00170	-25.17000	0.00000	35.98
Age of Adolescence	0.00800	0.00044	18.22000	0.00000	-6.71
Marital Status of Adolescent	-0.04085	0.00068	-60.02000	0.00000	34.27
Education Level of Adolescent	-0.03119	0.00080	-38.87000	0.00000	26.17

Source: TPHC (2022)

3.1.3 Model Diagnostic and Goodness-of-Fit Assessment

Several diagnostic tests in Table 5 were conducted to assess the adequacy and predictive performance of the binary logistic regression model.

The model specification was evaluated using the link test. The results show that both the predicted value (_hat) and its squared term (_hatsq) are statistically significant ($p < 0.001$). Ideally, only the predicted value should be significant, while the squared term should be insignificant. The significance of _hatsq suggests the possibility of model misspecification, omitted variables, non-linear relationships, or other forms of specification error. However, given the large sample size, the link test may detect even minor departures from the ideal model specification.

The Hosmer–Lemeshow goodness-of-fit test was used to examine the agreement between observed and predicted probabilities. The test produced a chi-square statistic of 1174.66 ($p < 0.001$), indicating a statistically significant difference between observed and expected outcomes across risk groups. Although this result formally suggests a lack of perfect fit, the Hosmer–Lemeshow test is highly sensitive to large sample sizes. With more than 314,000 observations, even very small discrepancies between observed and predicted values are likely to result in statistically significant test results. Therefore, the Hosmer–Lemeshow result should be interpreted cautiously and considered alongside other model performance measures.

The classification table indicates that the model correctly classified 88.79% of all observations. The model achieved a specificity of 96.13%, indicating a strong ability to identify adolescents who had never given birth correctly. The sensitivity was 44.57%, suggesting limited ability to identify adolescents who had ever given birth correctly. The positive predictive value was 65.62%, while the negative predictive value was 91.27%. Overall, these results indicate good classification performance, particularly for identifying non-childbearing adolescents.

Further, the Receiver Operating Characteristic (ROC) analysis yielded an Area Under the Curve (AUC) of 0.8984. An AUC value close to 1 indicates excellent discriminatory power, while a value of 0.5 indicates no discrimination. The obtained AUC of 0.8984 demonstrates that the model has excellent ability to distinguish between adolescents who had ever given birth and those who had not. According to commonly accepted guidelines, an AUC above 0.80 is considered very good, while an AUC above 0.90 approaches outstanding discrimination.

Furthermore, despite the significant Hosmer–Lemeshow and link test results, which may partly reflect the extremely large sample size, the high classification accuracy (88.79%) and excellent

discriminatory ability (AUC = 0.8984) indicate that the logistic regression model performs well and is suitable for identifying the determinants of adolescent fertility in Tanzania.

Table 5: Model Diagnostic Tests

Diagnostic Measure	Value
Number of Observations	314,364.0000
LR χ^2	93,037.9100
Prob > χ^2	0.0000
Pseudo R^2	0.3618
Hosmer–Lemeshow χ^2 (8)	1,174.6600
Hosmer–Lemeshow p-value	0.0000
Classification Accuracy	0.8879
Sensitivity	0.4457
Specificity	0.9613
AUC (ROC Curve)	0.8984

3.2 Discussion of the Results

The findings of this study provide empirical evidence on the determinants of adolescent fertility in Tanzania and explain the rural–urban disparities observed in adolescent childbearing. The results confirm that adolescent fertility remains closely linked to socio-economic and demographic inequalities, consistent with the concerns highlighted in the introduction regarding the persistence of teenage childbearing in Tanzania and other developing countries.

The binary logistic regression results show that adolescents' age, marital status, education level, household wealth, household size, household head's education level, household head's sex, and household head's age significantly influence the likelihood of adolescent childbearing. Among these factors, adolescents' marital status and age emerge as the strongest predictors of early childbearing. This finding aligns with the evidence presented in the introduction that early marriage remains a major driver of adolescent fertility in developing countries. In Tanzania, marriage often marks the socially accepted beginning of childbearing, which explains the strong positive association between marital status and adolescent fertility. Similar findings have been reported in Nigeria by Salawu et al. (2025) and in Uganda by Basigirenda (2024), who identified marital timing as one of the most important predictors of teenage pregnancy.

Education also plays a critical protective role in reducing adolescent fertility. The regression results indicate that higher educational attainment among adolescents significantly reduces the likelihood of early childbearing. The result supports the argument in the introduction that education delays

marriage and improves adolescents' knowledge of sexual and reproductive health. The result is consistent with previous studies in Sub-Saharan Africa, which found that educated adolescents are more likely to postpone childbearing and pursue economic opportunities (Amoateng et al., 2022; Mekonen, 2024; Ayalew, 2022). In the Tanzanian context, this finding reinforces earlier studies by Machange and Temba (2024) and Stephano et al. (2025), which reported that lower levels of education are strongly associated with teenage pregnancy.

Household socio-economic characteristics also play a significant role in shaping adolescent fertility outcomes. The study finds that household wealth significantly reduces the likelihood of adolescent childbearing, indicating that adolescents from poorer households face a higher risk of early pregnancy. Poverty can limit educational opportunities and access to reproductive health services, which increases vulnerability to early fertility. This finding supports earlier evidence from Nigeria and Zambia, where teenage pregnancy was found to be concentrated among economically disadvantaged adolescents (Okoli et al., 2022; Phiri et al., 2023). Similarly, the positive relationship between household size and adolescent fertility may reflect economic pressures and limited parental supervision in large households, thereby increasing adolescents' vulnerability to early childbearing.

The Fairlie decomposition results further explain the rural–urban disparities in adolescent fertility observed in Tanzania. The findings show that adolescents in rural areas are significantly more likely to have given birth compared to those in urban areas. This result supports national statistics reported in the introduction, which show that the Adolescent Fertility Rate is considerably higher in rural areas than in urban areas. The decomposition analysis reveals that a substantial portion of this rural–urban fertility gap can be explained by differences in household wealth, marital status of adolescents, and education level of adolescents.

Among these factors, household wealth is the largest contributor to the rural–urban gap, indicating that economic inequality between rural and urban households plays a central role in shaping adolescent fertility outcomes. Rural adolescents are more likely to live in poorer households, which may limit their access to education, reproductive health services, and economic opportunities. This finding supports earlier studies highlighting the concentration of adolescent fertility among poorer populations in Sub-Saharan Africa (Shasha et al., 2023; Mekonen, 2024).

Adolescents' marital status is another major contributor to the rural–urban disparity. Higher rates of early marriage in rural areas significantly increase adolescent fertility levels. This finding reflects the

influence of cultural norms and traditional practices that encourage early marriage and early childbearing in rural communities. Similar patterns have been observed in Zambia and Uganda, where early marriage remains a key factor driving rural teenage fertility (Phiri et al., 2023; Basigirenda, 2024).

Differences in educational attainment between rural and urban adolescents also explain a large share of the fertility gap. Urban adolescents generally have better access to secondary and higher education, which delays marriage and reduces the likelihood of early pregnancy. This finding reinforces global evidence that education is one of the most effective strategies for reducing adolescent fertility and improving reproductive health outcomes.

Overall, the results confirm that socio-economic inequalities, educational disparities, and early marriage are the main factors driving rural–urban differences in adolescent fertility in Tanzania. These findings highlight the importance of policies that improve access to education, reduce poverty, and delay early marriage, particularly in rural areas. Addressing these structural inequalities will be critical for reducing teenage childbearing and achieving broader goals related to maternal health, gender equality, and sustainable development.

4. Conclusion and Recommendations

4.1 Conclusion

This study examined the determinants of adolescent fertility and decomposed the rural–urban disparities in adolescent childbearing in Tanzania using data from the 2022 Tanzania Population and Housing Census. The results confirm that adolescent fertility remains a significant demographic and public health concern, particularly in rural areas where the likelihood of adolescent childbearing is substantially higher than in urban areas.

The binary logistic regression analysis identified several significant determinants of adolescent fertility, including the adolescent's age, marital status, education level, household wealth, household size, age of the household head, education level of the household head, and sex of the household head. Among these factors, marital status and age of adolescents were the strongest predictors of adolescent childbearing, indicating that early marriage and increasing age within adolescence significantly increase the likelihood of early fertility. Conversely, higher levels of education and improved household economic status significantly reduce the risk of adolescent childbearing.

The Fairlie decomposition analysis further revealed that the rural–urban gap in adolescent fertility is largely explained by differences in household wealth, adolescent education level, and adolescent marital status. These factors account for a substantial proportion of the observed disparity between rural and urban areas. The findings suggest that adolescents in rural areas are more vulnerable to early childbearing due to lower socio-economic status, lower educational attainment, and higher prevalence of early marriage. Overall, the study demonstrates that rural–urban inequalities in adolescent fertility are strongly linked to broader socio-economic and educational disparities. Addressing these structural inequalities is essential for reducing adolescent fertility and improving reproductive health outcomes among young women in Tanzania.

4.2 Recommendations

Based on the findings of this study, several policy interventions are recommended to reduce adolescent fertility and address rural–urban disparities in Tanzania.

i. The government should continue strengthening policies promoting universal access to secondary education for girls, particularly in rural areas. Programs aimed at preventing school dropout and supporting girls to complete secondary education should be prioritised.

ii. The government should strengthen enforcement of existing laws on the minimum legal age of marriage and implement community-based awareness programs to discourage early marriage.

iii. Improving access to sexual and reproductive health information and services is essential for reducing unintended pregnancies among adolescents. Health facilities should expand adolescent-friendly services, including 18 counselling, family planning, and reproductive health education, particularly in rural areas where access remains limited.

iv. The decomposition results show that household wealth is the largest contributor to rural–urban disparities in adolescent fertility. Therefore, policies aimed at reducing poverty and improving economic opportunities in rural areas should be strengthened.

v. Community engagement programs should be implemented to improve knowledge and attitudes toward adolescent reproductive health, especially among parents, community leaders, and adolescents themselves. Increasing awareness about the risks associated with

early childbearing can help shift social norms that encourage early marriage and early pregnancy.

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