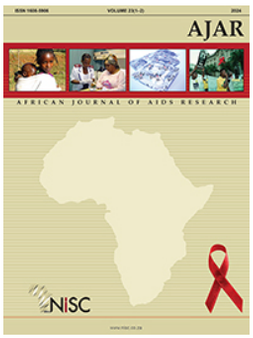

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Prevalence and neighbourhood determinants of early sexual debut and multiple sexual partnerships among young people in Rwanda, Ghana and South Africa

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Background: The consequences of engaging in risky sexual behaviours (RSB) can lead to HIV infection, sexually transmitted diseases and unintended pregnancy. The relationship between neighbourhood characteristics and youth involvement in RSB such as early sexual debut and multiple sexual partnerships has been of great concern to government, researchers and policymakers. However, there are very few empirical studies using demographic and health surveys to unpack the nature of this relationship in Rwanda, Ghana and South Africa. The objective of this study was to estimate the prevalence and determinants of early sexual debut and condom use, and to explore the neighbourhood factors associated with early sexual debut and condom use in Rwanda, Ghana and South Africa.

Methods: This was a cross-sectional study using the most recent Demographic and Health Survey Data (DHS 2014–2016) from Ghana, Rwanda and South Africa to investigate the relationship between neighbourhood characteristics and risky sexual behaviour among the youth.

Results: The prevalence of risky sexual behaviour in the three countries ranges from 56% (South Africa), 30% (Ghana) and 12% (Rwanda). Male youth in the 20-to-24-year-old category had increased odds of engaging in multiple sexual partnerships for the three countries (AOR 4.58; 95% CI 3.40–6.16), Rwanda (AOR 2.72; 95% CI 2.04–3.68) and South Africa (AOR 4.56; 95% CI 3.33–6.24). Meanwhile, at the community level, community education significantly increased the odds of age sexual debut among female adolescents by 50% (South Africa), and 46% (Ghana), while in Rwanda, this factor had decreased odds with higher community education.

Conclusion: To lower the incidence of risky sexual behaviour in the community, programmes aimed at appropriate policy options must be intensified. The implications of these findings is helpful for a developmental approach aimed at reaching Africa's long-term development goal of eliminating STIs among young people.

Keywords: Africa, community poverty, education, HIV and AIDS, media, youth

Background

The consequences of engaging in risky sexual behaviours (RSB) can lead to HIV infection, sexually transmitted diseases and unintended pregnancy (Lee et al., 2018). The emergence of various social and digital developments during the past decades, such as the rapid spread of new media, particularly the internet, has contributed to the increasing concerns about sexually transmitted infections (STIs), with a changing attitude towards sexual behaviour among young people. Adolescent sexual and reproductive health (ASRH) has become a main concern in the global health sector, particularly in many developing and less-developed countries because ASRH started with the prevention of unintended pregnancies in the 1960s and 1970s, and has moved on to the prevention of HIV (1980s), awareness about sexual abuse (1990s), and finally reflections on gender inequality in today's world (Olszewski & Crompton, 2020). Thus, increased attention has been given to this age group globally because it is a period of growth, transition and preparation for maturity (Roling et al., 2020).

Transitioning from childhood to early adulthood has been identified as one of the most crucial life transition stages for people (Hochberg & Konner, 2020). Studies have shown that throughout this stage, young individuals go through a lot of behavioural and attitudinal changes (Evans et al., 2018; Jindal-Snape et al., 2019; Lundgren et al., 2019). This stage could be considered an active stage that is marked by a mix of tension and excitement, particularly during the first sexual encounters (Yaya & Bishwajit, 2018). In addition, existing studies have indicated that sexuality is one of the earliest changes in this transition phase, and it has long-term consequences for the health and well-being of youth who engage in risky sexual behaviour (Ortiz-Echevarria et al., 2017; Friedman et al., 2020). These behaviours include no condom use, intergenerational sex, early sexual debut,

having multiple sexual partners and transactional sex. Moreover, these behaviours have affected the impact of some of the ASRH programmes, such as HIV testing and counselling, condom use initiatives, behavioural change and communication and voluntary male circumcision, which has remained at the top of the national agenda of many developing nations including Rwanda, Ghana and South Africa (Nikuze, 2022). The percentage of youth affected with STIs as a result of these behaviours, including HIV and AIDS is still an issue of concern in sub-Saharan Africa (SSA).

A World Health Organization (WHO) report indicated that, in the WHO African region, more than 60% of the general population was infected with STIs, including HIV and AIDS in 2021 (Ford et al., 2021), with young females between the ages of 15 and 24 years old having a large share of the infection. This percentage is among the highest in the world, and certainly the highest when compared to the other continents, bringing health ruin to many young people in SSA (Conroy et al., 2020). In Rwanda, a population-based HIV impact assessment (2018–2019) report indicated that 2% of HIV prevalence is due to young people between 15 and 24 years old (Nshimyiryo et al., 2019). The percentage increase in their assessment report was due to their engagement in early sexual debut and multiple sexual partners (Dine et al., 2021). Despite increased studies over the last two decades on the factors responsible for infectious diseases among young people in Rwanda, there has been no good improvement in young people's sexual and reproductive health (Nshimyiryo et al., 2019). In a similar vein, in a research study conducted in Ghana, 65.4% of the youth engaged in risky sexual behaviour, i.e. not using a condom during their last sexual encounter, and 51.8% of the sexually active youth started sex before 14 yers old (Dine et al., 2021). Additionally, in South Africa, 39% of the sexually active youth made their sexual debut before the age of 16, implying that young people are still engaging in risky sexual behaviour across the three countries, even amid programmes and policies geared towards addressing ASRH in Rwanda, Ghana and South Africa. The consequences of these sexual behaviours such as early sexual debut and multiple sexual partnerships have been documented to increase the risk of STIs including HIV and AIDS in SSA (Seff et al., 2021).

Many factors contribute to youth engagement in risky sexual behaviour such as early sexual debut and no condom use, including multiple sexual partners. Sexual behaviour is influenced by many factors like social and cultural factors which vary from generation to generation and society to society (Sharma & Vishwakarma, 2020). Sexual exposure during adolescence is a matter of grave concern due to the risk of transmission of STIs, including HIV and AIDS, unwanted pregnancy and adolescent parenthood (Sharma & Vishwakarma, 2020). Early sexual engagement prompting HIV infection brings concerns in many developing and underdeveloped countries (Kościańska, 2021). Akumiah and colleagues (2020) stated that there is a high level of neighbourhood factors influencing youth engagement in risky sexual behaviours using cross-sectional data through the analysis of demographic and health surveys of some countries (see also Kugbey et al., 2018). A report on adolescents and young adults in SSA showed that there is an association between neighbourhood poverty and early sexual debut across genders (Kugbey et al., 2018; Akumiah et al., 2020). Similarly, in another study in SSA that used a cross-sectional design, age, urban residence, educational attainment and media exposure at the individual level were associated with the likelihood of early sexual debut and multiple sexual partnerships (Kugbey et al., 2018). Another research study by Liu and colleagues {Not in reference list} found a link between neighbourhood factors and multiple sexual partnerships among youth (Odimegwu et al., 2019 {Why is this here after you say that Liu et al. are the ones reporting this information?}).

Adolescents and young individuals often get fascinated by mass media, friends and peer pressure without sufficient knowledge of prevention, which inspires them to indulge in hazardous pursuits such as smoking, alcohol or drug use and sexual activity. As a consequence, the implication of sexually transmitted diseases, including HIV and AIDS may be noteworthy among adolescents and young adults (Nshimyiryo et al., 2019). Numerous studies from other continents show that there are neighbourhood factors such as community poverty, family disruption due to single-parent families, female-headed households, high rates of divorce, residential instability due to migration and urbanisation, and racial or ethnic heterogeneity that are associated with condom use among young individuals (Odimegwu & Ugwu, 2022). These community mechanisms increase the complexity of community social organisation and undermine informal social networks (Mancini et al., 2018), social norms and social relations and control, thereby reducing the ability of communities to monitor youth behaviour, especially risky sexual behaviours. These factors could also lead to a loss of communal supervision, monitoring and control of deviant behaviour among youth, which consequently leads to high-risk behaviours. At the individual level, condom use among the youth is positively correlated with several factors such as age, education, employment status, self-worth, awareness about the advantages of condom use, anticipated infection risk of infections and the socio-economic status of households, whereas there is a negative association between sexual debut at an early age and transactional sex (Odimegwu & Ugwu, 2022). Given the above, the study was undertaken to understand the transitions in adolescent boys' and girls' high-risk sexual behaviour in Rwanda, Ghana and South Africa using Rwanda, Ghana and South Africa demographic health surveys (2014–2016). The main objectives of the study are to understand the prevalence and neighbourhood determinants in risky sexual behaviour among adolescent boys and girls in Rwanda, Ghana and South Africa over the last few years.

Methodology

Data sources

This study used data from recent demographic and health surveys from Ghana (2014), Rwanda (2015) and South Africa (2016), which were combined to maximise the sample size. These surveys were conducted over the last five years in each of the countries. However, apart from increasing the size of occurrences, one more additional benefit of merging three different surveys is that expanding the overall size of the sample is predicted to lead to decreased selection bias (Regmi et al., 2022). There were no differences in the sexual behaviour of male and female youth between survey years, so

the analysis was not affected by sexual behaviours changing over time. A separate analysis was conducted for females and males. This is based on the premise that gender differences in the norms for sexual behaviour exist, and factors associated with sexual relations vary by gender. In general, males tend to have more sexual partners than females (Odimegwu & Somefun, 2017; Thurman et al., 2018), and they also tend to use condoms more consistently than women during vaginal intercourse (Dwyer-Lindgren et al., 2019).

The sample consisted of sexually active (i.e. "active in the last four weeks") youth between 15 and 24 years old. The numbers of male youth surveyed in the three countries in our study were 1 428 (Ghana), 2 105 (Rwanda) and 1 268 (South Africa), giving a total of 4 801 young males. The numbers of female youths in the three countries used in our study were 2 472 (Ghana), 4 178 (Rwanda) and 2 621 (South Africa), giving a total of 9 271 young females. A total of 14 072 young people of 15 to 24 years old, male and female, from Ghana (3 900), Rwanda (6 283) and South Africa (3 889), were used in this study. For the purposes of this study, adolescence is defined as 15 to 24 years old. *Adolescence* is used interchangeably with *youth* or *young people*. The Demographic and Health Survey programme is a nationally representative, cross-sectional survey that is carried out in participating countries every five years, and employs a stratified random sampling strategy, with clusters serving as the primary sampling unit. The DHS selects households at random within each cluster. The clusters are defined as the selecting points consisting of enumeration areas distributed across urban and rural areas in the three countries used for this study. This study used data from a sub-sample of never-married young males and females of 15–24 years old from three sub-Saharan African regions: West Africa, East Africa and southern Africa.

Inclusion criteria for the countries selected

The inclusion of DHS data for the selected countries in this study was based on the availability of data on adolescents' risky sexual behaviour, as well as consistency in risky sexual behaviour in relation to neighbourhood variables.

Measurements of variables

Outcome variables

The sexual behaviours used in this study as the two outcome or dependent variables include multiple sexual partnerships and age at sexual debut. The details about multiple sexual partners in the year before the surveys was derived from the question: "In the past year, how many partners, if any, have you had sexual intercourse with?". This question was included in the analysis as a dichotomous variable coded "1" if a male or female youth reported to have engaged with multiple sexual partners in the 12 months before the surveys, and "0" otherwise. All youth who did not respond to the question were excluded. The interest was in the number of sexual partners because multiple sexual partnerships constitute the key pathways through which young people {This is an incomplete and therefore incomprehensible sentence. What are you trying to say?}. The age at first sexual intercourse (Van Ouytsel et al., 2018; Balbo & Barban, 2020) was derived from the question "How old were you when you had sex for the first time?". The responses were then grouped into age groups (15–17 years old [< 18 years old] and 18–24 years old [< 24 years old], and another section for "No sex" among the group 15 to 24 years old. These three categories were used to measure the age of sexual debut in this study.

Individual-level variables

The following individual-level explanatory variables were included as control variables based on existing studies. These variables include age, educational attainment, employment status and household size. Studies have shown that younger youths are at increased risk of HIV infection and as a result they often engage in unprotected sexual intercourse, making age an important variable (Odimegwu & Somefun, 2017; Odimegwu et al., 2019). Mutumba and colleagues (2018) found that the low rates of contraceptive use at first sex may be due to having less information about the access to contraceptive methods among young people, and other scholars believe that being an older youth should be associated with protective sexual behaviours as they are more likely to have better knowledge and experience, which may influence their condom or contraceptive behaviour. Ages of the respondents were categorised into two groups: 15 to 19 years old, and 20 to 24 years old. Education attainment was categorised as primary or less education, secondary, or higher education, Studies have shown that educated youth are more likely to be aware of reproductive health services, which may lead to healthier behaviours (Odimegwu & Somefun, 2017; Lee et al., 2018). The relationship between employment status and risky sexual behaviour can be difficult to predict at times because being employed can increase the proclivity to engage in risky behaviour by increasing exposure to opportunities that can be used to address occasional emotional and/or economic needs. Another explanatory variable was the household size categorised as 1–4, 5–6, or 7+ members.

Neighbourhood-level variables

The aggregation of sociodemographic factors such as education attainment, access to media and wealth status from the individual to neighbourhood-level was done due to its relevance to the study of risky sexual behaviour among young people at the neighbourhood level. There were a set of independent variables such as neighbourhood-level characteristics and geographical location of the respondent which were included in the analysis. The explanatory variables which were included in the study are neighbourhood poverty (calculated using the percentage of households in the poorest quintile of the wealth index, grouped into low [reference] and high [Imo & De Wet-Billings, 2023]). Previous research on the effect of wealth status on young people's sexual behaviour has yielded conflicting results (Imo & De Wet-Billings, 2023). Wealth can sometimes act as an enabler or compensatory factor, and the effects vary by gender.

Another explanatory variable was place of residence, defined as either rural or urban, as administratively defined by each of the countries surveyed. This variable was included because studies in sub-Saharan Africa have shown that youth in urban areas show higher levels of positive sexual behaviour due to the campaigns around HIV and AIDS through the media, access to condoms, including the

availability of public toilets and easy access to sexual and reproductive health services, including ART (Odimegwu & Somefun, 2017). A third variable of community education was defined as the level of educational attainment in the household, categorised as low or high. Community occupation was a variable categorised as "not working", "professional", sales or unspecified, agriculture and manual labour. Community media access was the final variable, defined as those who have access to radio in the community, and which was categorised as low or high. To make analyses and interpretations simpler and more meaningful, some variables were regrouped from their original categories in the dataset.

Data analysis

Data were weighted using the weighting factors of the demographic health surveys. Analysis was done using Stata version 17. The relationship between each of the outcome variables (early sexual debut and multiple sexual partnerships) and the independent variables were assessed using descriptive, bivariate and multivariable analysis. The effects of neighbourhood determinants on the two outcome variables were investigated using multilevel logistic regression analysis, with youth at level 1 nested in neighbourhoods at level 2. Model 1 (empty model) was fitted without any of the explanatory variables to test the random variability in the intercept and show the total variance in exposure to the two outcomes (early sexual debut and multiple sexual partners) among youth in different neighbourhoods.

Model 2 looked into the effects of determinants at the individual level. Model 3 looked at the effects of neighbourhoods, while Model 4 looked at the effects of both individual- and neighbourhood-level determinants, with the results of fixed effects shown as odds ratios at a 95% confidence level. To explain the proportion of variation and to compare the successive models, the inter-cluster correlation coefficient (ICC) for each model was calculated. These values were calculated using the formula ICC = σ^2/ (ðσ²+þπ² /3), where σ^2 is the estimated neighbourhood-level variance and 2 / 3 {Please ensure that the presentation of these figures is consistent and accurate} is the household variance. To demonstrate the power of the factors in the models in explaining the outcome variable, the proportional change in variance (PCV) was computed for each model concerning the empty model. The PCV was calculated as PCV = (V-Vi)/Ve, where Ve is the variance of the two outcomes in the empty model, and Vi is the variance in subsequent models. The two-level multilevel model with a binary response variable for a youth living in neighbourhood *j* is represented as follows:

$$\text{Log}\,[\pi ij/1-\pi ij] = \beta 0 + \beta 1X1ij + \ldots + \beta nXnij + \upsilon 0\, j + \varepsilon ij$$

Where πij is the probability that the *i*th never-married youth in the *j*th neighbourhood engaged in early sexual debut or multiple sexual partners (1 − πij) is the probability that they were not involved in either outcome, and 0 is the log odds of the intercept: β1, β2⁺,,,,,, βπ are the effect sizes by individual and neighbourhood-level variables: X1ij, X2ij,,,, X1ij are the independent variables at the individual and neighbourhood levels. υ0 j and εij are random errors at the individual and neighbourhood levels. {All these figures need to be thoroughly checked for accuracy and consistency, following the rules of statistical presentation as detailed in the Instructions to Authors for this journal}

Results

Profile of the study population

The descriptive analysis of the study population based on sex disaggregation is presented in Table 1. A total number of 14 072 never-married youth between 15 and 24 years old, (9 271 females and 4 801 males) were included in the analysis. The results showed that 60% of both female and male adolescents in Rwanda reported residing in a low poverty neighbourhood, compared to about 40% of both female and male adolescents in Ghana living in a neighbourhood with a high poverty level. Female youth in South Africa (34.6%) had the highest proportion of no media access, while only 10.5% of females in Rwanda had no access to media at the time of the survey. Apart from South Africa, which recorded the highest proportion of those living in a community with low education for males and females at more than 70%, the other countries had a little above 50% of those living in a community with low education. Most of the respondents were rural residents in all the countries surveyed. There was substantial representation across genders in all the countries surveyed.

The prevalence of risky adolescent sexual behaviour

In the three countries surveyed (see Figure 1), the rate of adolescents who reported to have multiple sexual partners ranges from 56% (South Africa) and 30% (Ghana) to 12% (Rwanda). Those that started their first sexual encounter between 18 and 24 years old were highest among South African male adolescents at 22%, while the lowest is Rwandan female adolescents at 11%. In all the countries surveyed, those who had not had sex before their 24th birthday ranged from 75% females (Rwanda), 49% females (Ghana), and 37% females (South Africa). Association with risky adolescent sexual behaviour and employment status was evident in all three countries surveyed. The proportion of those without any employment exposed to risky sexual behaviour ranges from 43% (Rwanda) and 45% (Ghana) to 84% in (South Africa).

In all the three countries surveyed (see Figure 2), it was found that more than 50% of adolescent males and females with secondary educational attainments had engaged in risky sexual behaviour, compared to 22% and 44% with a primary or lower educational attainment. The association of risky adolescent sexual behaviour with neighbourhood poverty level ranged from 70% females and 74% males (Rwanda) to more than 50% for both genders in South Africa and Ghana. A similar pattern was observed for community media access as more than 60% of adolescent males and females with regular access to media in Rwanda had engaged in risky sexual behaviour. While 50% of males and 47% of females (South Africa) to 49% of males and 69% of females (Ghana) with regular access to media had engaged in risky sexual behaviour. For those in a high-education community, the highest proportion was Rwanda with 46% females and 41% males. In all the countries surveyed, there was evidence of community characteristics influencing adolescents to engage in risky sexual behaviours.

Table 1 :Background characteristics of the respondents

	Ghana				Rwanda				South Africa			
	Female		Male		Female		Male		Female		Male	
Characteristics	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Respondent age (years)												
15–19	1 623	65.7	886	62	2 676	64.0	1 278	60.7	1 461	55.7	704	55.5
20–24	849	34.3	542	38	1 502	35.9	827	39.3	1 160	44.3	564	44.5
Employment status												
No	1 544	62.6	642	45	1 791	43.0	726	34.6	2 396	91.4	1 061	83.7
Yes	924	37.4	785	55	2 371	56.9	1 370	65.4	225	8.6	207	16.3
Respondent education attainment												
Primary and lower education	555	22.4	337	23.6	2 249	53.8	1 238	58.8	157	5.9	172	13.6
Secondary	1 817	73.5	1 034	72.4	1 855	44.4	813	38.6	2 306	87.9	1 045	82.4
Higher	100	4.0	57	4	74	1.8	54	2.6	158	6.0	51	4.0
Household size												
1–4	906	36.6	536	37.5	1 189	28.5	730	34.7	977	37.3	579	45.7
5–6	775	31.3	416	29.1	1 388	33.2	662	31.4	750	28.6	310	24.4
7 +	791	32	476	33.3	1 601	38.3	713	33.9	894	34.1	379	29.9
Neighbourhood poverty												
Low (wealth low)	1 400	56.6	715	51	2 910	69.6	1 554	73.8	1 441	54.9	665	52.4
High (wealth high)	1 072	43.4	713	49.9	1 268	30.3	551	26.2	1 180	45.0	603	47.6
Community media access												
No access	462	18.7	125	8.7	437	10.5	200	9.51	908	34.6	293	23.1
Not regular	812	33.0	318	22.3	836	20.0	229	10.9	482	18.4	337	26.6
Regularly	1 198	48.5	985	69	2 900	69.5	1 674	79.6	1 231	46.9	638	50.3
Community occupation												
Not working	1 469	59.4	561	39.3	1 436	34.4	693	33	2 336	89.1	988	77.9
Professionals	115	4.6	71	4.9	59	1.4	35	1.7	113	4.3	30	2.4
Sales/unspecified	434	17.6	97	6.8	252	6.0	120	5.7	15	0.6	13	1.0
Agriculture	270	10.9	461	32.3	2 267	54.4	922	43.9	33	1.3	53	4.2
Manual	183	7.4	236	16.5	155	3.7	330	15.7	124	4.7	184	14.5
Community education												
Low	1 718	69.5	991	69.4	2 249	53.8	1 238	58.8	1 910	72.9	1 001	78.9
High	754	30.5	437	30.6	1,929	46.2	867	41.2	711	27.1	267	21.0
Place of residence												
Urban	1 254	50.7	653	45.7	1 201	28.7	558	26.5	1 393	53.1	594	46.8
Rural	1 218	49.3	775	54.3	2 977	71.2	1 547	73.5	1 228	46.8	674	53.1

Source: (DHS) Ghana 2014; Rwanda 2015 and South Africa 2016

Predictors of risky adolescent sexual behaviour

The association between background characteristics and multiple sexual partnerships is presented in Table 2. The odds of having multiple sexual partners increased as age increased in all three countries surveyed. After adjusting for all the other variables, female respondents in the 20 to 24-year-old age category were significantly more likely to have multiple sexual partners compared to those between 15 and 19 years old in Ghana (AOR 3.72; 95% CI 2.93), Rwanda (AOR 2.77; 95% CI 2.26–3.40) and South Africa (AOR 5.19; 95% CI 4.25–6.33). Those with higher education attainments in Ghana and Rwanda were significantly associated with lower odds of engaging in multiple sexual partnerships (AOR 0.74; 95% CI 0.44–1.24; AOR 0.14; 95% CI 0.04–0.46). Meanwhile, female adolescents from a household of five to six members in Ghana (AOR 0.82; 95% CI 0.66–1.03) and Rwanda (AOR 0.74; 95% CI 0.58–0.98) were less likely to have multiple sexual partners compared

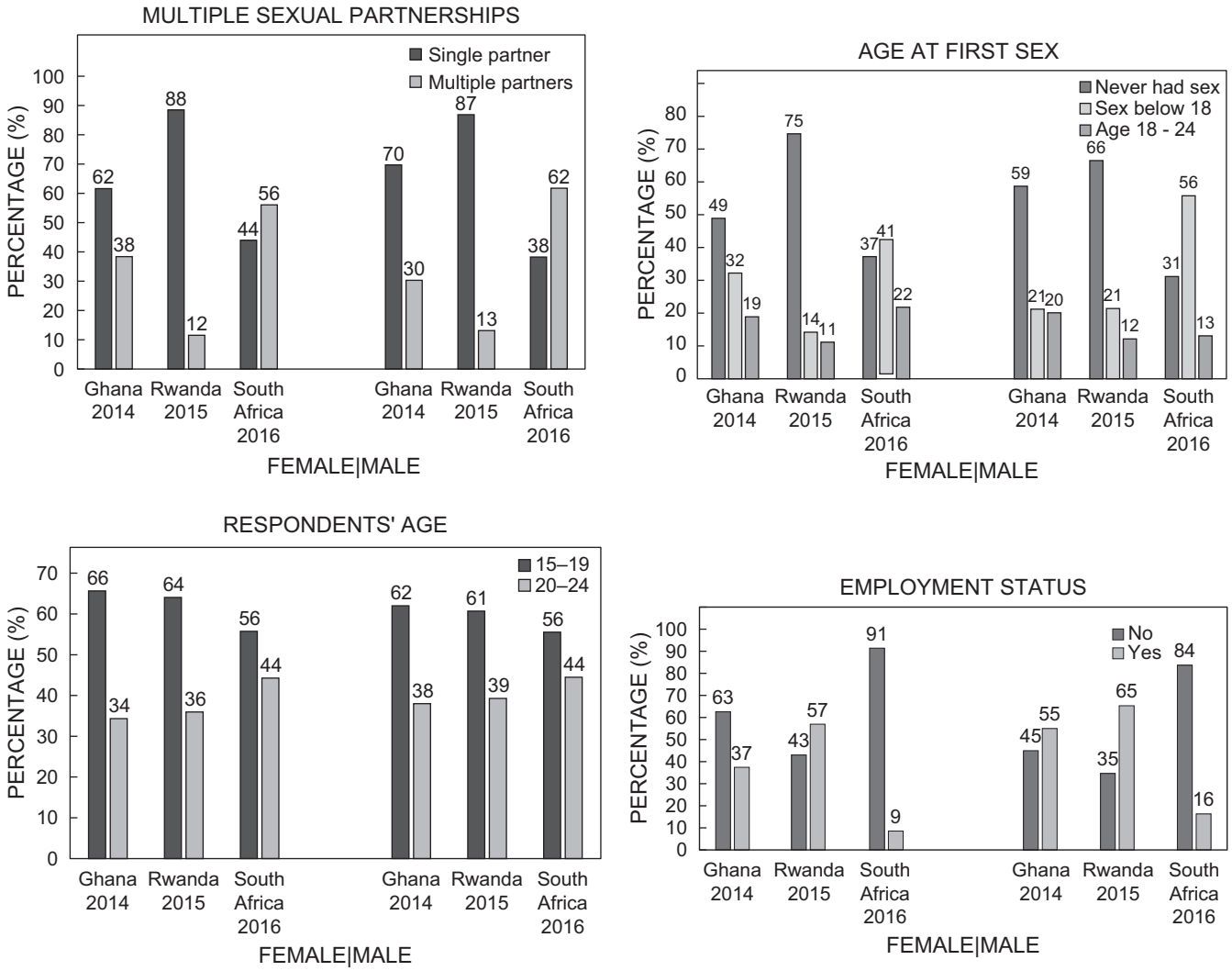

Figure 1: Prevalence of adolescent risky sexual behaviour by multiple sexual partners, age at first sex, respondents' age and employment status

Source: (DHS) Ghana 2014; Rwanda 2015 and South Africa 2016

to those in South Africa (AOR 1.03; 95% CI 0.83–1.227) with the likelihood of having multiple sexual partners.

The association between background characteristics of male adolescents and multiple sexual partnerships is also presented in Table 2. The odds of having multiple sexual partners increased as age increased in all three countries surveyed. After adjusting for all the other variables, male respondents in the 20 to 24 age category were significantly more likely to have multiple sexual partners compared to those in the 15 to 19 year old group: Ghana (AOR 4.58; 95% CI 3.40–6.16); Rwanda (AOR 2.72; 95% CI 2.04–3.68) and South Africa (AOR 4.56; 95% CI 3.33–6.24). Again, employed male adolescents in South Africa (AOR 0.57; 95% CI 0.25–1.28) were less likely to engage in multiple sexual partnerships, unlike those in Ghana (AOR 2.63; 95% CI 1.42–4.88) and Rwanda (AOR 1.60; 95% CI 0.60–4.25). Education was found to be associated with multiple sexual partnerships among male adolescents in South Africa and Ghana, with those with secondary education being 2.26 and 1.28 times more likely to have multiple sexual partners. Meanwhile, male adolescents from a household size of five to six in all three countries were unlikely to have multiple sexual partners compared to those from one to four household members.

The association between background characteristics of female adolescents and age at first sex is presented in Table 3. The odds of age at first sex among female adolescents increased as age increased in all three countries surveyed. After adjusting for all the other variables, female respondents in the 20 to 24 age category were significantly associated with age at first sex compared to those between 15 and 19 years old: Ghana (AOR 6.38; 95% CI 5.07–8.04), Rwanda (AOR 3.32; 95% CI 0.84–3.87) and South Africa (AOR 10.12; 95% CI 7.96–12.87). Education was found to be associated with age at first sex among female adolescents in South Africa and Ghana at 1.45 and 1.22 times odds among those with a secondary education, only those in Rwanda showed no association at the age at first sex. However, there was no association with age at first sex with those from a household of five to six members in Ghana. There was an association with age at first sex in Rwanda and South Africa among those from a household size of five to six members.

The association between background characteristics of male adolescents and age at first sex is also presented in

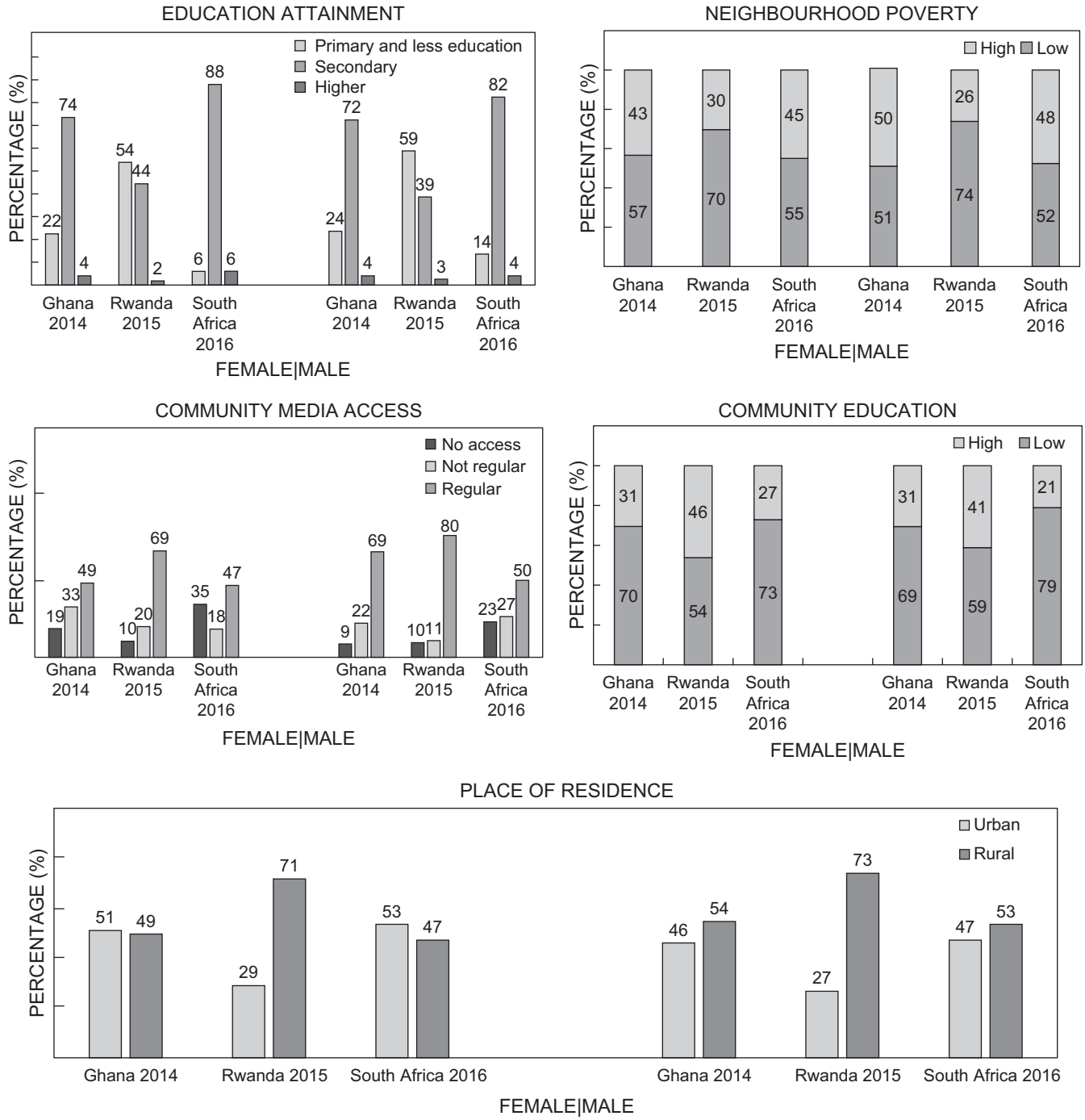

Figure 2: Prevalence of risky sexual behaviour by education, neighbourhood poverty, community education, community media access and place of residence

Source: (DHS) Ghana 2014; Rwanda 2015 and South Africa 2016

Table 3. The Table shows that the odds of age at first sex among male adolescents increase as age increases in all three countries surveyed. After adjusting for all the other variables, male respondents in the 20 to 24 age category were significantly associated with age at first sex compared to those between 15 and 19 years: Ghana (AOR 6.23; 95% CI 4.67–8.32), Rwanda (AOR 2.49; 95% CI 2.03–3.06) and South Africa (AOR 6.30; 95% CI 4.37–9.10). Also, male adolescents with employment in Ghana (AOR 1.85; 95% CI 1.05–3.27) and Rwanda (AOR 1.32; 95% CI 0.67–2.58) were more likely to be associated with age at first sex, unlike those in South Africa (AOR 0.84; 95% CI 0.34–2.08) who were less likely to be associated with age at first sex than those without any employment. Education was found to be associated with age at first sex among male adolescents in South Africa and Ghana at 2.48 and 1.52 odds among those with secondary education. Only those in Rwanda showed no association with age at first sex. There was no association between age at first sex with household size in all three countries surveyed among male adolescents.

Table 2: Odds ratios of multiple sexual partners by selected background characteristic among youth

	Ghana (female)		Rwanda (female)		South Africa (female)		Ghana (male)		Rwanda (male)		South Africa (male)	
	OR	**AOR**	**OR**	**AOR**	**OR**	**AOR**	**OR**	**AOR**	**OR**	**AOR**	**OR**	**AOR**
Respondent age												
15–19 (reference category)	1	1	1	1	1	1	1	1	1	1	1	1
20–24	3.93*** (3.29–4.68)	3.7***(2.93–4.44)	2.89*** (2.38–3.50)	2.77*** 2.26–3.40)	6.31*** (5.29–7.54)	5.19*** (4.25–6.33)	6.37*** (4.97–8.16)	4.58*** (3.40–6.16)	3.42*** (2.62–4.47)	2.72*** (2.04–3.63)	0.14*** (0.10–0.18)	4.56*** (3.33–6.24)
Employment status												
No (reference category)	1	1	1	1	1	1	1	1	1	1	1	1
Yes	1.96*** (1.65–2.32)	0.67 (0.40–1.09)	1.65*** (1.35–2.02)	0.98 (0.70–1.37)	3.06*** (2.21–4.25)	0.89 (0.41–1.93)	3.47*** (2.70–4.47)	2.63** (1.42–4.88)	1.98*** (1.47–2.67)	1.60 (0.60–4.25	3.76*** (2.55–5.54)	0.57 (0.25–1.28)
Respondent education attainment												
Primary and less education (reference category)	1	1	1	1	1	1	1	1	1	1	1	1
Secondary	1.32 (1.07–1.60)	1.17 (0.92–1.47)	0.88 (0.72–1.06)	0.83 (0.67–1.04)	1.79*** (1.29–2.49)	1.57* (1.09–2.26)	1.58** (1.18–2.10)	1.28* (0.89–1.85)	1.00 (0.77–1.31)	0.82 (0.60–1.11)	2.86*** (2.04–3.98)	2.26*** (1.55–3.28)
Higher	1.79 (1.16–2.75)	0.74(0.44–1.24)	0.30* (0.09–0.96)	0.14** (0.04–0.46)	3.90*** (2.43–6.28)	1.19 (0.68–2.10)	4.09*** (2.29–7.32)	1.73* (0.83–3.60)	0.30* (0.09–3.76)	0.84 (0.39–1.78)	25.69*** (7.69–85.87)	5.88 (1.59–21.70)
Household size												
1–4 (reference category)	1	1	1	1	1	1	1	1	1	1	1	1
5–6	0.69*** (0.58–0.850	0.82(0.66–1.02)	0.69** (0.54–0.88)	0.74* (0.58–0.96)	0.89 (0.73–1.08)	1.03 (0.83–1.27)	0.43*** (0.32–0.58)	0.67*(0.48–0.94)	0.63*** (0.46–0.87)	0.79 (0.56–1.10)	0.67* (0.50–0.99)	0.83 (0.59–1.14)
7+	0.58*** (0.47–0.70)	0.65*** (0.52–0.80)	0.82 (0.65–1.02)	0.90 (0.71–1.15)	1.08 (0.89–1.29)	1.22 (0.99–1.49)	0.44*** (0.33–0.58)	0.68*(0.49–0.93)	0.83 (0.61–1.11)	1.04 (0.76–1.43)	0.76* (0.58–0.99)	0.87 (0.64–1.18)

Source: (DHS) Ghana 2014; Rwanda 2015 and South Africa 2016; Reference category: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 3: Odds ratios of age at first sex by selected background characteristics among youths

	Ghana (Female)		Rwanda (Female)		South Africa (Female)		Ghana (Male)		Rwanda (Male)		South Africa (Male)	
	OR	**AOR**	**OR**	**AOR**	**OR**	**AOR**	**OR**	**AOR**	**OR**	**AOR**	**OR**	**AOR**
Respondent age												
15–19 (reference category)	1	1	1	1	1	1	1	1	1	1	1	1
20–24	6.38*** (5.26–7.73)	6.38*** (5.07–8.04)	3.27*** (2.83–3.78)	3.32*** (0.84–3.87)	11.69*** (9.44–14.67)	10.12*** (7.96–12.87)	8.53*** (6.68–10.88)	6.23***(4.67–8.32)	3.05*** (2.53–3.68)	2.49*** (2.03–3.06)	9.88*** (7.13–13.68)	6.30*** (4.37–9.10)
Employment status												
No (reference category)	1	1	1	1	1	1	1	1	1	1	1	1
Yes	2.07 *** (1.75–2.44)	0.71 (0.42–1.20)	1.83*** (1.57–2.11)	1.05 (0.81–1.36)	4.60*** (3.07–6.90)	1.53 (0.62–3.78)	2.94*** (2.35–3.67)	1.85* (1.05–3.27)	1.98*** (1.62–2.43)	1.32 (0.67–2.58)	5.11*** (3.17–8.24)	0.84 (0.34–2.08)
Respondent education attainment												
Primary or less education (reference category)	1	1	1	1	1	1	1	1	1	1	1	1
Secondary	1.44*** (1.19–1.74)	1.22 (0.97–1.53)	0.71*** (0.61–0.82)	0.66*** (0.56–0.78)	1.64** (1.18–2.27)	1.45* (0.99–2.11)	1.86*** (1.43-2.42)	1.52* (1.07–2.15)	1.07 (0.89–1.30)	0.99*** (0.80–1.25)	3.17*** (2.27–4.40)	2.48*** (1.70–3.60)
Higher	1.92** (1.25–2.97)	0.47 (0.28–0.82)	0.69 (0.39–1.23)	0.32*** (0.17–0.58)	3.89*** (2.36–6.39)	0.82 (0.44–1.54)	5.66*** (3.06–10.45)	1.59 (0.74–3.40)	1.79* (1.03–3.09	0.94 (0.50–1.74)	63.16*** (8.53–46.70)	10.01** (1.28–84.40)
Household size												
1–4 (reference category)	1	1	1	1	1	1	1	1	1	1	1	1
5–6	0.67*** (0.56–0.81	0.82 (0.66–1.02)	0.92 (0.77–1.10)	1.01 (0.84–1.23)	0.87 (0.72–1.06)	1.01 (0.80–1.27)	0.40*** (0.31–0.53)	0.61** (0.45–0.84)	0.78* (0.62–0.98)	0.96 (0.75–1.22)	0.68** (0.50–0.92)	0.86 (0.61–1.20)
7 +	0.53*** (1.27–1.66)	0.60*** (0.48–0.75)	0.96 (0.80–1.13)	1.11 (0.92–1.34)	1.13 (0.93–1.36)	1.30** (1.04–1.64)	0.37*** (0.29–0.48)	0.54*** (0.40–0.74)	0.74 (0.59–0.92)	0.89 (0.70–1.13)	0.74* (0.50–0.99)	0.87 (0.63–1.20)

Source: (DHS) Ghana 2014; Rwanda 2015 and South Africa 2016, Reference category. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$, aOR 95% CI)

Table 4: Multilevel logistic regression analysis of multiple sexual partnerships among female adolescents

	Model1: Null model			Model 2: Individual			Model 3: Neighbourhood		
	Ghana aOR (95% CrI)	Rwanda aOR (95% CrI)	South Africa aOR (95% CrI)	Ghana aOR (95% CrI)	Rwanda aOR (95% CrI)	South Africa aOR (95% CrI)	Ghana aOR (95% CrI)	Rwanda aOR (95% CrI)	South Africa aOR (95% CrI)
Respondent age									
15–19				1	1	1			
20–24				4.08***	3.14***	6.42***			
Employment status									
No				1	1	1			
Yes				1.54***	1.37	1.43*			
Respondent education attainment									
Primary and less education				1	1	1			
Secondary				1.15	0.79*	1.57*			
Higher				0.18	0.14**	1.46			
Household size									
1–4				1	1	1			
5–6				0.84	0.73*	1.04			
7 +				0.66**	0.91	1.24			
Neighbourhood poverty									
Low							1	1	1
High							0.99	1.03	1.54***
Community media access									
No access							1	1	1
Not regular							1.14	0.86	0.72
Regularly							1.01	0.70*	0.84
Community occupation									
Not working							1	1	1
Professionals							2.13***	2.01	1.47
Sales/unspecified							2.55***	2.38***	5.15*
Agriculture							1.45**	2.03***	11.16***
Manual							3.94***	3.39***	2.58***
Community education									
Low							1	1	1
High							2.04***	0.95	3.53***
Place of residence									
Urban							1	1	1
Rural							1.37**	0.43***	1.13
Random effects		**Null**			**Individual**			**Neighbourhood**	
Community variance (SE)	0.018756	0.60848	0.410184	0.6944607	0.711216	0.419383	0.699517	0.534234	0.460199
VPC = ICC (%)	0.05	0.10	0.05	0.13	0.13	0.05	0.13	0.08	0.06
Explained variation PCV (%)	Ref	Ref.	Ref.	-9.65	-31.74	-4.31	-11.05	21.09	-24.31
Log-Likelihood	-1792.84	-1483.68	-1792.84	-1479.999	-1395.99	-1549.95	-1549.37	-1433.16	-1674.63
Model fit statistics									
AIC	3589.682	2971.352	3589.682	2975.997	2807.974	3115.891	3120.745	2888.313	3371.264
BIC	3601.424	2984.027	3601.424	3022.486	2858.642	3162.861	3184.7	2957.987	3435.848

Source: (DHS) Ghana 2014; Rwanda 2015 and South Africa 2016, Reference category. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Multilevel regression analysis of multiple sexual partnerships among male and female adolescents

Table 4 presents the results of the multilevel regression analysis of the risk of engaging in multiple sexual partnerships in all the countries surveyed among female adolescents. The results indicate that the test statistics were significant, thus showing evidence that the between-neighbourhoods variance is non-zero, as was revealed by the variance partition coefficient (VPC) values. Therefore, the total variance in the risk of engaging in multiple sexual partners among female adolescents as a result of differences between neighbourhoods ranged from 5% (Ghana) to 10% (Rwanda) and 5% (South Africa). It was discovered that the variations decreased after controlling for individuals (Model 2) and neighbourhoods (Model 3). More so, there were significant compositional effects as shown in Table 6 {It is illogical and confusing to name tables out of sequence, i.e. this one is mentioned BEFORE Table 5. Is this correct?}. For instance, female adolescents living in high neighbourhood poverty significantly increased the odds of multiple sexual partnerships by 54% (South Africa) and 3% (Rwanda). There were 99% lower odds of engaging in multiple sexual partnerships among female adolescents living in high neighbourhood poverty in Ghana compared to those living in low poverty neighbourhoods. Additionally, the results revealed that there were 14% and 1% (Ghana) of those without regular access to community media have multiple sexual partners compared to those with no access {The grammar is wrong and so the intended meaning of this sentence is lost. What are you trying to say in plain language?}. However, youth from South Africa and Rwanda had lower odds of having multiple sexual partners among female adolescents with regular access to community media.

Furthermore, the results showed strong significant effects with community occupation. For instance, female adolescents working in agriculture increased the odds of having multiple sexual partners by 16% (South Africa), 3% (Rwanda) and 45% (Ghana). Again, community education increased the odds of engaging in multiple sexual partners among female adolescents by 53% (South Africa), to 4% (Ghana). Meanwhile, the higher the community education in Rwanda, the lower the odds of engaging in multiple sexual partners among female adolescents. The results from the three countries indicated that female adolescents living in rural areas had a higher level of exposure to multiple sexual partners in South Africa and Ghana, although the result was not significant. However, Rwanda had significantly lower odds of multiple sexual partners among female adolescents residing in rural areas compared to those residing in urban areas.

The results presented in Table 5 reveal the risk of engaging in multiple sexual partnerships among male adolescents in all the countries surveyed. The results indicate that the test statistics were significant, hence, it is evidence that the between-neighbourhoods variance is non-zero, as was revealed on the variance partition coefficient (VPC) values. Therefore, the total variance in the risk of engaging in multiple sexual partners among male adolescents as a result of differences that exist between neighbourhoods ranged from 15% (Ghana) to 11% (Rwanda) and 14% (South Africa). It was discovered that the variations decreased after controlling for individual (Model 2) and neighbourhood (Model 3) characteristics. More so, there were significant compositional effects (see Table 5). For example, male adolescents living in high neighbourhood poverty significantly increased the odds of multiple sexual partnerships by 45% (South Africa), to 55% (Rwanda) and 45% (Ghana), compared to those living in low poverty neighbourhoods. Additionally, the results revealed community media access significantly increased the odds of multiple sexual partnerships among male adolescents with regular access in Ghana and Rwanda. Also, there was a 63% (Ghana), to 48% (Rwanda) and 33% {is this number for South Africa?} increase in the odds among male adolescents without regular access to community media, though this was not significant. Furthermore, the results showed strong significant effects with community occupation. For instance, male adolescents in the category of professionals significantly increased the odds of having multiple sexual partners by 60% (South Africa), 23% (Rwanda) and 97% (Ghana).

Again, community education significantly increased the odds of engaging in multiple sexual partners among male adolescents by 23% (South Africa), to 20% (Ghana). Meanwhile, the higher the community education in Rwanda, the lower the odds of engaging in multiple sexual partners among male adolescents. The results from the three countries indicated that male adolescents living in rural areas had a higher level of exposure to multiple sexual partners in South Africa, Rwanda and Ghana, although the result was not significant in South Africa.

In Table 6, the results of age at first sex in all the countries surveyed among female adolescents are presented. The test of statistics was significant, as the result of variance partition coefficient (VPC) values indicated that the between-neighbourhoods variance is non-zero. Therefore, the total variance in age at first sex among female adolescents as a result of differences that existed between neighbourhoods ranged from 15% (Ghana) to 11% (Rwanda) and 14% (South Africa). After controlling for individual (Model 2) and neighbourhood (Model 3) characteristics, the variations decreased.

The results indicate that there were significant compositional effects (see Table 7). For instance, adolescent females living in high neighbourhood poverty in South Africa significantly increased the age of first sex to 81%. In addition, there were increased odds of 8% in Ghana, though not significant, compared to female adolescents in Rwanda with lower odds of age at first sex at 98%.

Among all the countries, the results reveal that access to community media significantly reduced the odds of age at first sex, except in Ghana, where female adolescents had an increased likelihood of age at first sex among those without regular access to community media, though this was not significant. Furthermore, the results showed strong significant effects with community occupation. For instance, female adolescents in all the categories of occupation significantly increased the odds of age at first sex. Again, community education significantly increased the odds of age at first sex among female adolescents by 50% (South Africa), or 46% (Ghana). Meanwhile, the higher the community education in Rwanda, the lower the odds of age at first sex among female adolescents. The results from the three countries indicate that female adolescents living in rural areas had a higher level of exposure to age at first sex

Table 5: Multilevel logistic regression analysis of multiple sexual partnerships among male adolescents

	Model1: Null Model			Model 2: Individual			Model 3: Neighbourhood		
	Ghana AOR (95% CI)	Rwanda AOR (95% CI)	South Africa AOR (95% CI)	Ghana AOR (95% CI)	Rwanda AOR (95% CI)	South Africa AOR (95% CI)	Ghana AOR (95% CI)	Rwanda AOR (95% CrI)	South Africa aOR (95% CrI)
Respondent age (years)									
15–19				1	1	1			
20–24				5.80***	3.09***	6.59***			
Employment status									
No				1	1	1			
Yes				3.28***	1.69**	1.74*			
Respondent education attainment									
Primary and less education				1	1	1			
Secondary				1.64	1.09	2.63***			
Higher				2.22*	1.31	9.08***			
Household size									
1–4				1	1	1			
5–6				0.61	0.75	0.67*			
7 +				0.60*	1.04	0.76*			
Neighbourhood poverty									
Low							1	1	1
High							0.45***	0.55**	1.45*
Community media access									
No access							1	1	1
Not regular							1.63	1.48	1.33
Regularly							1.90*	2.86**	1.39
Community occupation									
Not working							1	1	1
Professionals							3.97***	3.23*	4.60*
Sales/unspecified							7.03***	2.64***	0.92
Agriculture							2.95***	2.11***	1.7
Manual							7.68***	2.81***	6.33***
Community education									
Low							1	1	1
High							2.20***	0.98	5.23***
Place of residence									
urban							1	1	1
Rural							1.55*	0.55***	1.03
Random effects		**Null**			**Individual**			**Neighbourhood**	
Community variance (SE)	0.749914	0.633636	0.744414	0.821268	0.551064	0.81616	0.68273	0.387579	0.749803
VPC = ICC (%)	0.15	0.11	0.14	0.17	0.08	0.17	0.12	0.04	0.15
Explained variation PCV (%)	Ref.	Ref.	Ref.	-16.54	22.31	-16.80	14.99	59.85	-1.24
Log-likelihood	-865.326	-812.999	-835.986	-709.142	-763.781	-703.161	-758.634	-766.76	-750.068
Model fit statistics									
AIC	1734.651	1629.997	1675.972	1432.284	1543.563	1420.322	1539.268	1555.519	1522.136
BIC	1745.179	1641.301	1686.263	1469.127	1588.745	1456.339	1597.157	1617.656	1578.734

Source: (DHS) Ghana 2014; Rwanda 2015 and South Africa 2016, Reference category. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 6: Multilevel logistic regression analysis of age at first sex among female adolescents

	Model 1: Null			Model 2: Individual			Model 3: Neighbourhood		
	Ghana AOR (95% CI)	Rwanda AOR (95% CI)	South Africa AOR (95% CI)	Ghana AOR (95% CI)	Rwanda AOR (95% CI)	South Africa AOR (95% CI)	Ghana AOR (95% CI)	Rwanda AOR (95% CI)	South Africa aOR (95% CrI)
Respondent age									
15–19				1	1	1			
20–24				7.96***	3.59***	13.47***			
Employment status									
No				1	1	1			
Yes				1.51***	1.47***	1.77*			
Respondent education attainment									
Primary and less education				1	1	1			
Secondary				1.14	0.62***	1.43			
Higher				0.41***	0.32***	0.99			
Household size									
1–4				1	1	1			
5–6				0.85	1.02	1.06			
7 +				0.62***	1.09	1.38			
Neighbourhood poverty									
Low							1	1	1
High							1.08	0.98	1.81***
Community media access									
No access							1	1	1
Not regular							1.18	0.85	0.74*
Regularly							1.03	0.71	0.81*
Community occupation									
Not working							1	1	1
Professionals							2.13***	2.09*	1.80*
Sales/unspecified							2.72***	2.53***	0.11
Agriculture							1.36*	2.19***	3.73***
Manual							4.97***	2.50***	8.24
Community education									
Low							1	1	
High							2.63***	0.46***	4.50***
Place of residence									
Urban							1	1	1
Rural							1.41*	0.78**	1.12
Random effects		**Null**			**Individual**			**Neighbourhood**	
Community variance (SE)	0.42589	0.1916	0.27593	0.52216	0.29283	0.37927	0.48958	0.15424	0.33546
VPC = ICC (%)	0.11	0.06	0.08	0.14	0.08	0.10	0.13	0.04	0.09
Explained variation PCV (%)	Ref	Ref.	Ref.	-19.5	-48.5	-33.5	-13.02	18.6	-19.5
Log-likelihood	-1688.7	-2353.9	-1720.3	-1451.7	-2172.5	-1366.3	-1588.5	-2259.2	-1575.5
Model fit statistics									
AIC	3381.4	4711.8	3444.6	2919.3	4361.0	2748.6	3198.9	4540.4	3170.9
BIC	3393.0	4724.5	3456.3	2965.8	4411.7	2795.6	3262.8	4610.1	3229.6

Source: (DHS) Ghana 2014; Rwanda 2015 and South Africa 2016, Reference category. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

in South Africa, Rwanda and Ghana, although the results were not significant in South Africa.

The results of age at first sex in all the countries surveyed among male adolescents are presented in Table 7. The test of statistics was significant, as the result of variance partition coefficient (VPC) values indicated that the between-neighbourhoods variance is non-zero. Therefore, the total variance in age at first sex among male adolescents as a result of differences that existed between neighbourhoods ranged from 14% (Ghana) to 12% (Rwanda) and 17% (South Africa). In addition, after controlling for individual (Model 2) and neighbourhood (Model 3) characteristics, the variations decreased.

The results further reveal that there were significant compositional effects. For example, adolescent males living in high neighbourhood poverty in South Africa significantly increased the age of first sex by 26%. The results indicate that there was no association with age at first sex in Ghana and Rwanda among females in high neighbourhood poverty compared to those in low neighbourhood poverty. In all the countries, the results reveal that community media access significantly increased the odds of age at first sex among those that regularly, or not regularly, accessed community media, except in Ghana among male adolescents without regular access to community media.

Furthermore, the results show strong significant effects with community occupation. For instance, male adolescents in all the categories of occupation significantly increased the odds of age at first sex. Again, community education significantly increased the odds of age at first sex among male adolescents by 50% (South Africa) and 46% (Ghana). Meanwhile, the higher the community education in Rwanda, the higher the odds of age at first sex among male adolescents, although this was not significant. The results from the three countries indicate that male adolescents living in rural areas had a higher level of exposure to age at first sex in South Africa and Ghana, although the results were insignificant in South Africa compared to those in Rwanda with 66% significantly lower odds of age at first sex.

Discussion

In this study, we used data from population-based sample surveys and a multilevel approach to assess the prevalence and neighbourhood determinants of engagement of young people at an early age in first sex and multiple sexual partnerships in three African countries that cut across the western, eastern and southern African regions. Our analysis of nationally weighted and representative survey data of the three countries showed that a high proportion of male and female adolescents who were exposed to sexual risk behaviours were those below 18 years old. Reports of early sexual debut and multiple sexual partnerships have exposed this young productive age cohort to the risk of sexually transmitted infections, including HIV and AIDS. We found that male adolescents were more likely to report the age at which they started having sexual intercourse and multiple sexual partnerships than their female counterparts. These findings are in line with previous observations that revealed that male adolescents tend to indulge in risky sexual behaviours (Alemu et al., 2007; Fennie & Laas, 2014; Odimegwu & Somefun, 2017). The power inequalities embedded in most African communities that allow men to have control over women could explain the high engagement of male adolescents in sexual risk-taking (Morgan & Niraula, 1995; Odimegwu & Somefun, 2017; Odimegwu & Ugwu, 2022). Furthermore, in patriarchal societies, especially in sub-Saharan Africa in which chastity and marital fidelity are emphasised for women, men are usually allowed to engage in sexual freedom before marriage. These practices have been in existence for ages and further complicate the issue of sexual and reproductive health rights of young people in Africa, especially female adolescents, hence, undermining the efforts by governments and non-governmental organisations to curb diseases associated with risky sexual practices on the continent.

Additionally, the high values of intra-cluster correlations observed in the results emphasise the importance of neighbourhood variables in the engagement of young people in the risky sexual behaviour of multiple sexual partnerships and early sexual debut. Earlier research on the impact of communities on youth development showed little attention to the effect of social disorganisation factors on youth transition, especially their sexual risk practices (Brown et al., 2009; Lalor & McElvaney, 2010). However, our findings establish various pathways through which neighbourhood factors influence sexual risk-taking among male and female adolescents in all the countries surveyed. The findings have great implications for STI prevention in SSA, particularly among young people whose activities might not be monitored as a result of the prevalence of social disorganisation factors in their communities. This is because there is a tendency that the current sex education programmes, particularly at the community level, are insufficient in addressing variables that predispose young people to engage in sexual risk-taking. Thus, attitudinal change towards positive sexual behaviour becomes problematic.

Unlike previous studies (le Roux Booysen & Summerton, 2002; Jonas et al., 2016; Muche et al., 2017), our findings reveal that adolescent sexual risk-taking could be compounded as a result of an association between community occupations, poverty and media access. This association may be explained by the possibility that adolescents from a community with high-level employment (e.g. doctors, lawyers, engineers, etc.) and residing in low-poverty neighbourhoods, despite having better media access (e.g. family radio, television, internet, etc.), but without better household control over media use (Darteh et al., 2020) tend to engage in risky sexual behaviours. This finding was expected considering the proportion of young people found in the neighbourhood with adequate media access, but without proper control either from their parents or guardians. As a result, while awareness of sexual and reproductive health safety and risk reduction measures such as early sexual debut and multiple sexual partnerships without a condom is high, this knowledge is not well utilised among the youth due to limited control over media content in the community.

Regarding community education, there was a strong relationship between community education and risky adolescent sexual behaviour. In Ghana and South Africa,

Table 7: Multilevel logistic analysis of age at first sex among male adolescents

	Model 1: Null			Model 2: Individual			Model 3: Neighbourhood		
	Ghana AOR (95% CI)	Rwanda AOR (95% CI)	South Africa AOR (95% CI)	Ghana AOR (95% CI)	Rwanda AOR (95% CI)	South Africa AOR (95% CI)	Ghana AOR (95% CI)	Rwanda AOR (95% CI)	South Africa aOR (95% Crl)
Respondent age									
15–19				1	1	1			
20–24				8.41***	2.94***	10.07***			
Employment status									
No				1	1	1			
Yes				2.70***	1.84***	2.24			
Respondent education attainment									
Primary and less education				1	1	1			
Secondary				1.98***	1.15	3.34***			
Higher				2.27*	1.27	18.24			
Household size									
1–4				1	1	1			
5–6				0.56***	0.94	0.81			
7 +				0.48***	0.88	0.88			
Neighbourhood poverty									
Low							1	1	1
High							0.56***	0.7	1.26
Community media access									
No access							1	1	1
Not regular							0.99	1.46	1.53*
Regularly							1.28	2.29***	1.39
Community occupation									
Not working							1	1	1
Professionals							4.12***	2.93**	11.87*
Sales/unspecified							6.52***	3.14***	1.24
Agriculture							2.83***	2.19***	2.32*
Manual							6.99***	3.68***	7.66***
Community education									
Low							1	1	1
High							2.83***	1.16	6.44***
Place of residence									
Urban							1	1	1
Rural							1.11	0.66*	1.09
Random effects		**Null**			**Individual**			**Neighbourhood**	
Community variance (SE)	0.72849	0.44826	0.66001	0.81416	0.45336	1.04597	0.68178	0.36022	0.75527
VPC = ICC (%)	0.14	0.12	0.17	0.17	0.12	0.24	0.12	0.10	0.19
Explained variation PCV (%)	Ref.	Ref.	Ref.	-20.73	-1.00	-44.37	10.87	-82.30	-11.74
Log-likelihood	-955.39	-1326.9	-777.04	-745.58	-1241.5	-625.78	-837.31	-1256.4	-692.81
Model fit statistics									
AIC	1914.77	2657.83	1558.08	1505.16	2499	1265.55	1696.62	2534.84	1407.62
BIC	1925.3	2669.14	1568.37	1542	2544.17	1301.57	1754.51	2596.98	1464.22

Source: (DHS) Ghana 2014; Rwanda 2015 and South Africa 2016, Reference category. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

community education increased the likelihood of engaging in risky sexual behaviour, which is consistent with a study conducted in Ghana and Kenya (Ssewanyana et al., 2020; Atorkey & Owiredua, 2021), which found that community literacy levels influence adolescents to engage in risky sexual behaviour. This may be linked to the unique community's cultural and religious practices conflicting with the global goals and policies on adolescents' sexual behaviour. This finding exposed a gap in the transmission of knowledge in a disorganised neighbourhood with highly literate individuals. While this explanation remains open for further interrogation, one implication of the findings is the effects of globalisation on the traditional method of learning (i.e. within the family) to a dependency on the conventional style of learning (formal education).

According to the findings, coming from a relatively large household decreases the probability of participating in risky sexual behaviour. Considering the population of young adolescents who live in non-poor neighbourhoods, this result was expected. As a result, parents' household social standing may act as a protective factor for young people engaging in risky sexual behaviours, such as multiple sexual partners (Biyase & Zwane, 2018; Ajayi & Okeke, 2019; Govender et al., 2019; Odimegwu et al., 2019), while also improving their self-confidence and self-autonomy in sexual relationships (Regmi et al., 2022).

Regarding the place of residence, the findings show an association between the place of residence and exposure to risky sexual behaviours among young people in some of the countries surveyed. For example, our multilevel results reveal that adolescents residing in rural neighbourhoods have a higher prevalence of engaging in risky sexual behaviour compared to their counterparts residing in urban neighbourhoods, except in Rwanda, where adolescents residing in rural areas have a lower likelihood of engaging in risky sexual behaviour. This result is not surprising because potential partners or sponsors of adolescent sexual and reproductive health programmes and the information about youth risky sexual behaviours were more visible in the urban areas. It could also mean that the information about youth involvement in risky sexual behaviours available in rural neighbourhoods is not well utilised due to limited monitoring of youth activities at the community level, suggesting that neighbourhood characteristics contribute to a high prevalence of risky sexual conduct among adolescents. As a result, this research backs earlier findings that prevention-and-sensitisation-to-risky-sex programmes do not ensure a change in behaviour patterns (Doyle et al., 2010; Odimegwu & Somefun, 2017; Odimegwu & Ugwu, 2022). Future research should investigate how limited media availability and poverty are linked to risky adolescent sexual behaviours in communities with a high number of literate parents since community media access and education were found to have a lower correlation with risky sexual behaviour among young people in the study.

The results demonstrated an association between social disorganisation factors (neighbourhood variables) and high-risk sexual behaviour among the youth. Thus, neighbourhood factors were evident in reporting risky sexual behaviour among the youth in all countries surveyed. According to the findings of this study, the more social disorganisation risk factors in the neighbourhood, the higher the percentage of adolescent males' and females' involvement in early sexual debut and multiple sexual partners. As a result, our findings support the notion that an increase in neighbourhood risk factors in the environment where youths live may result in early sexual debut and multiple sexual partners. In fact, a correlation is observed to exist, implying that increasing neighbourhood risk factors increases reports of early multiple sexual partners. This finding is a unique contribution of this study to the existing literature on adolescent sexual behaviour in the three countries studied. This is critical in informing the design of programmes aimed at preventing a high STI burden and unwanted pregnancy, particularly at the neighbourhood level. To change adolescent sexual behaviour such as early sexual debut and having multiple sexual partners, interventions at the community level must address social disorganisation risk factors such as the neighbourhood variables identified in this study for the three countries to provide a solid model for designing effective interventions.

Limitations

The study has some limitations. First, because the data came from a cross-sectional survey, no causal conclusions could be drawn about whether factors associated with risky sexual behaviours can predict behaviours over time. Second, data collected on self-reported sexual behaviours may be biased or inaccurate because females may under-report the number of sexual partners for cultural reasons, whereas males may over-report because it reinforces their masculinity. Third, the current study was limited to never-married young individuals in Ghana, Rwanda and South Africa, so there are some limits to the study. This restriction on never-married young individuals may have a high risk of bias or discordance when it comes to neighbourhood measures impacting early sexual debut and multiple sexual engagements. Despite these limitations, the findings are critical for more strategic policies and programmes in preventing sexually transmitted infections, including HIV, and monitoring intervention programmes to control the epidemic's spread, particularly among never-married young people in the three countries studied.

Conclusion

The study has established that the prevalence of risky sexual behaviour is high in South Africa and Ghana, with both individual and neighbourhood-level factors such as age, educational level, employment status, community poverty, community media access and community education contributing to the increase of risky sexual behaviour among young people. With these results, there is a need to strengthen sexual and reproductive health intervention programmes among young people in South Africa and Ghana, particularly at the community level where the outcome of this research such as early sexual debut and multiple sexual partnerships are more prevalent. Further research combining qualitative investigations is highly recommended to gain a deeper knowledge of the neighbourhood's predictor elements of higher-risk sexual

behaviour among adolescent males and females in SSA. Policymakers should create programmes that help young people grasp the seriousness of the risks connected with early sexual debut and multiple sexual partnerships to make better decisions about their sex lives.

Policy implications

The findings of this study on the influence of neighbourhood determinants of risky sexual behaviour (early sexual debut and multiple sexual partners) have several policy implications for future HIV and AIDS prevention among never-married young people in Ghana, Rwanda and South Africa. The findings could inform and help policymakers to consider appropriate policy options to reduce the prevalence of high-risk sexual behaviour, especially at the community level in sub-Sahara Africa. Additionally, in line with Ridgeway et al.'s (2021) observation, understanding the risk of early sexual debut and multiple sexual partners among young people becomes an essential step toward reducing the spread of the HIV and AIDS epidemic

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Authors' contributions

NHU: Conceptualisation of the study accessed and used the dataset, literature review, statistical analysis and interpretation, drafting the manuscript; COO: revision for intellectual inputs. All authors read and approved the final manuscript.

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Availability of data and materials

The Ghana Demographic and Health Survey (2014), the Rwanda Demographic and Health Survey (2015) and the South Africa Demographic and Health Survey (2016) datasets are available at https://www.dhsprogram.com/data/dataset.

Ethics approval and consent to participate

The data used for the analysis was obtained from a secondary dataset from Ghana, Rwanda and South Africa with all identifier information removed. The survey was approved by the Ethics Committee of the Micro at Calverton in the USA and by the National Ethics Committee of each of the countries surveyed. All study participants gave informed consent before participation and all information was collected confidentially. The datasets were downloaded from the DHS website, and the data is publicly available, and unrestricted re-use for further analysis by researchers is permitted via open licence. Requisite permission in accessing and usage of the dataset was obtained from the MEASURE-DHS archive. All methods used in this study are in compliance with the Ghana Statistics Service, the National Institute of Statistics of Rwanda and Statistics South Africa guidelines.

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