Individual and Community Effects and Adolescent Reproductive Health Transitions in West Africa

Abstract

Although a growing number of studies have examined the impact of aggregate levels of education and neighborhood characteristics on contraceptive use and fertility, many of these studies have mixed results. Using data from recent Demographic and Health Surveys (DHS) for multiple countries in Western Africa, we examine the effect of aggregate levels of education in the community and other neighborhood characteristics on the timing of union formation and first births of adolescents. The results show that aggregate levels of education in the community are significant predictors of union formation, and first childbearing. Individual-level women's education also significantly predicts union formation and childbearing. We interpret the results within the literature on neighborhood characteristics and health and in the context of policy debates that are based on Goals 3 and 4 of the United Nations Sustainable Development Goals (SGDs) as well as prospects for achieving a demographic dividend in sub-Saharan Africa.

Introduction

Research has shown that women with more education have lower fertility than their less educated counterparts (Caldwell, 1980; Jejeebhoy, 1995; Lloyd, Kaufman and Hewitt, 2000; Bongaarts, 2010; Kravdal, 2002, Eloundou-Enyegue and Stokes, 2004; Channon and Harper, 2019). Educated women are more motivated to avoid the opportunity cost of an unwanted childbirth; are more likely to have a low desired family size preference; be more willing to have a high incidence of modern contraceptive use; and demonstrate an overall autonomy over reproductive health decision-making processes (Jejeebhoy, 1995; Bongaarts, 2010). These are means through which mass education was predicted to have an impact on the overall timing of fertility decrease in sub-Saharan Africa (SSA) (Caldwell, 1980).

However, after more than four decades of mass education policies, family planning programs, and international interventions to lower fertility in the region; some countries in SSA still have the highest fertility and birthrate-(4.6 births per woman on average and as high as 6.8 in Niger)-more than anywhere else in the world (compared to a world average of 2.5 births) (UN World Population Prospects, 2022). The pace of fertility decline has been slower than other Lower-Middle-Income countries (LMIC) at the earlier stages of their evolution (Bongaarts, 2013; Shapiro and Gebreselassie, 2008). Simultaneously, the SSA region has the highest rates of exclusion and poor-quality education. As of 2023, one-third of the way to the 2030 deadline for achieving the United Nations Sustainable Development Goals (SGDs), over one-fifth of children between the ages of about 6 and 11 are out of school. This percentage is followed by one-third of youth between the ages of about 12 and 14. According to UNESCO Institute for Statistics (UIS) data, 60% of youth between the ages of about 15 and 17 are not in school (UIS, 2019).

Similarly, of the 17 countries in the world where girls have not yet caught up with boys in school enrolment, 12 are in the SSA region (UNESCO, 2020).

Thus, it is a foregone conclusion that without urgent action and consideration, the reversal of progress caused by the COVID-19 Pandemic; educational attainment will get worse- as the region faces a rising demand for education due to a rapidly growing school-age population. The implications of these trends on fertility and education are such that the working-age population is being deprived of the skills necessary to contribute to the acceleration of economic growth and the ability to benefit from the so-called "demographic dividend", which is which refers to the accelerated economic growth that can happen as the population age structure changes (mainly through fertility decline), together with strategic investments in education, health, economic policy, and governance (PRB, 2013; Lutz et al. 2019).

Although much work has been done over the last several decades on the determinants of fertility and the impact of women's educational attainment and empowerment on fertility in the mold of the demographic transition theory; not much is known about whether the neighborhood educational context within which women live in SSA will continue to influence their fertility above and beyond that of their own individual education. Out of the few studies that have been conducted thus far, findings (Kebede; Striessnig and Goujon, 2022) yield mixed results (see Kravdal, 2000; 2002). Moreover, the underlining mechanisms through which the neighborhood educational context affects reproductive health especially for the outcomes examined in this study (union formation and first birth) for adolescents are much less explored.

In this study, we draw from adolescent life-course family development perspectives and community effects on adolescent transitions to examine the effects of the aggregate level of education in the community and other neighborhood characteristics on the timing of women's age during their first marriages and cohabitations, hereafter known as union formation. We account for the individual education of women aged 18 and under and other characteristics such as urbanization. We situate our study in Western Africa, the region with the highest fertility in the world and the lowest educational attainment, especially for girls.

We interpret the results of our analysis within the context of policy debates on Sustainable Development Goals (SGDs), particularly Goal 3 on health and well-being, and Goal 4 on quality education; as well as the prospects for achieving a demographic dividend through reproductive health and educational policies.

Literature Review, Theory, and Conceptual Framework

The literature on the relationship between women's education and fertility starts with the classical demographic transition theory, which predicts fertility decline in mostly European settings in association with the level of economic development. As parents increase their investment in children in response to increased survival prospects; when opportunities for wage employment and high returns on education and longevity are presented, fertility declines in tandem (Lloyd, Kaufman, and Hewitt, 2000; Bongaarts and Watkins, 1996; Becker, 1960).

Building on this classical transitional model, Caldwell (1980) advocated for compulsory mass schooling in developing countries, particularly in the SSA region. According to Caldwell (1980), there were five pathways through which mass schooling, guaranteed by the state, will change fertility and reproductive outcomes: (1) reduce the time children work for the family in

or outside the home, (2) raise the cost of children, (3) create social norms on childhood as a stage of dependency, (4) speed up cultural change and create new cultures and (5) propagate western middle-class values across the developing world (Caldwell, 1980; Jejeebhoy, 1995). The last three mechanisms, Caldwell (1980) hypothesized, would be universal and affect all parents, children, and the community simultaneously, irrespective of individual educational attainment. Thus, a key element of Caldwell's framework is the aggregate-level effects of mass schooling on fertility as a condition for fertility decline.

A growing number of studies have examined the impact of aggregate-levels of education and neighborhood characteristics on contraceptive use and fertility (Tienda, Dias and Smith, 1985; Lesthaeghe and Vanderhoeft, 1985; Hirschman and Guest, 1990; Kravdal 2000; 2002; Axinn and Barber, 2001; DeRose and Kravdal, 2007; Benefo, 2006; Morsound and Kravdal, 2003). Most of these studies come to similar conclusions: that the average education of women in a community is associated with cumulative fertility and contraceptive use, accounting for women's individual characteristics.

However, the findings differ substantially and, in some instances, are mixed. For example, it is not clear if the effects of aggregate levels of education in the community remain after accounting for urbanization and the literacy levels of the community (the ability to not just read and write, but to identify, understand, communicate and compute using printed and written materials (UNESCO)). Are community effects more likely among women with low literacy or high levels of literacy? (Kravdal, 2002; Jejeebhoy, 1995). Also, at what levels of literacy does community education increase fertility by undermining traditional fertility

inhibiting norms such as the length of breast feeding and post-partum abstinence (Lesthaeghe and Vanderhoeft, 1985; Benefo, 2006). For example, in the 1970s and 80s women with a few years of schooling had higher fertility than those who never attended, and fertility decline was only associated with advanced schooling (Page and Lesthaeghe, 1981; Schultz, 1993). Similarly, Jeejebhoy (1995) concluded that a small amount of education leads to a decline in the duration of breastfeeding and to a lesser extent, post-partum abstinence, although this impact is stronger at higher levels of education. Similarly, in countries with higher levels of women's literacy, primary education is more likely to affect fertility negatively thereby making the impact of secondary education particularly sharper (Kravdal, 2000; Jejeebhoy, 1995). Johnson-Hanks (2003) finds that in Cameroon, premarital fertility is higher among women who have had schooling than among those who have not. Recently, research on cohort trends in educational attainment and fertility has found that current stalls in fertility are explained by earlier stalls in female education (Kebede, Goujon and Lutz, 2019) during the 1970s and 80s.Moreover, the underlining mechanisms and pathways of the negative effect of community education and other neighborhood characteristics on reproductive behavior, especially for adolescent girls in sub-Saharan Africa, has received scant attention.

Several mechanisms have been put forth to explain why a woman's fertility behavior can be influenced by the education of other women in the community. First, diffusion theories highlight the role of social learning and social influence through social interaction in the community (Montgomery and Casterline, 1993, 1996; Bongaarts and Watkins, 1996; Kohler, 2001; Benefo, 2006; Kravdal, 2002; DeRose and Kravdal, 2007). Social learning refers to the acquisition of information from others, whereas social influence refers to the power that

individuals exercise over each other through authority, deference, and social conformity pressures (Montgomery and Casterline, 1996). Schooling alters the values of women and their ways of seeing the world, bringing them awareness of the opportunity cost of childbearing. Through their informal networks, educated women act as sources of information on fertility control, modern contraceptive use, and smaller family sizes. Through social support, social pressure, and the need to gain social approval, educated women diffuse new lifestyles and ideas (use of contraception, low preferred family size, less use of children as labor etc.) to other women irrespective of their level of education (Montgomery & Casterline, 1996; Benefo, 2006). This spill over from other people's education may affect the fertility of uneducated women in that community different from that of uneducated women elsewhere (Kravdal 2002).

Another mechanism discussed in the literature are broader economic transformations. Overtime, a rise in average community education means less reliance on child labor as the agricultural sector is modernized and more women assume employment in other sectors of the economy. As women's incomes increase in the community, attitudes towards women's work, their rights and obligations may change. Spending per child will rise higher than before, thereby discouraging early marriage and fertility (Duflo, 2005; DeRose and Kravdal, 2007). The overall normative environment that ensues, as aggregate education increases in the community will motivate individual women to regulate their fertility and use modern contraception.

Current demographic transitions in West Africa offer a unique opportunity to build on prior studies linking average education of women in a community to reduced fertility. The few studies on the net effects of aggregate education, as indicated above, are inconclusive (e.g., Kravdal, 2000; Lesthaeghe et al., 1985) and did not focus on adolescent girls. Given that at least

half of youth between the ages of 15 and 17 in sub-Saharan Africa are not in school, with girls facing the biggest barriers (UNESCO 2019), analyzing the proximate determinants of fertility that determine the timing of adolescent transitions – marriage and cohabitation and first birth is of not only academic interest but a policy imperative.

Conceptual Framework and Hypotheses

This analysis draws from *life course family development perspectives* which have been used variously by psychologists (individual life span theory), sociologists of the family (family development theory) and demographers (life course theory) to explain the changing form and structural development of the individuals in the context of a family and how family experiences overtime influence later life outcomes such as cohabitation, marriage, fertility, and divorce (White, Glen and Martin, 2015).

This framework is critical to this analysis as it underscores the role of school in the timing of entry into adulthood for young girls whose experience of school often occurs early in childhood and involves much more than the school experience (Lloyd and Mensch, 1999). Thus, in this framework, we account for the broader structural context of society- political, economic, social, cultural, community and environmental conditions- that affect the health and well-being of adolescents.

The life course perspective can be combined with Easterlin's microeconomic model of fertility (Easterlin and Crimmins, 1985) to illuminate the biological and sociological mechanisms through which aggregate, or community levels of education affects adolescent transitions to adulthood. For example, all the three proximate determinants specified by Easterlin - supply of

children, demand for children and the cost of fertility regulation are context and community specific and are influenced by educational levels.

In SSA, cohabitation, marriage and childbearing are very stressful events in lives of adolescents and their families particularly in Western Africa where poverty levels are high, unemployment is rampant and quality education especially at the primary level is low and not universal. Secondary education, although available, is often unaffordable to all, political strife in the region is also rife and rapid climate change leads to erratic rainfall, food shortages and desertification (Partey, et al. 2018). In these dire economic circumstances, the supply of children, in the context of low contraceptive prevalence and restrictive abortion services, is high compared to the demand for children. The economic hardships that result from high fertility makes adolescent girls, who are given out early in marriage, a potential source of dowry income in rural areas where the status of women is low (Walker, 2012).

On factors influencing the cost of and obstacles to deliberate fertility regulation, previous research has shown that countries with small amounts of education (less than completed primary school) that are associated with a decline in fertility at the individual level, are also the countries with mass education (Jejeebhoy, 1995). This is because in general, a shift towards smaller families tends to occur in parallel with the introduction of mass education (Caldwell, 1980). Thus, community education offsets the cost of and obstacles to deliberate fertility regulation. Through mechanisms of social interaction and diffusion of innovations, young women with just a few years of schooling in communities where the aggregate levels of education are high will adopt norms of marriage postponement and delayed childbearing.

Our culminating hypotheses posits that community education (and other neighborhood characteristics) will exert a negative influence on union formation and first birth of adolescents in western Africa, net of individual education and urbanization.

Data and Methods

This study used the latest secondary data from the Demographic and Health Survey (DHS) for eight countries in Western Africa – Ghana- 2014, Burkina-Faso 2010, Niger 2012, Nigeria 2018, Mali 2018, Senegal 2011, Cote D'Ivoire 2012 and Benin 2018. Three of these countries not only have the highest prevalence of child marriage and adolescent fertility but also the lowest literacy rates (Niger, Mali and Burkina-Faso) globally (UNICEF, 2014; World Population Review, 2022). For example, in Niger, a country considered to be in the pre-transitional stage of the demographic transition, total fertility rate (TFR) is 6.7 births per woman and adolescent fertility is about 180.5 births per 1000 women. In Nigeria, Benin and Burkina-Faso, TFRs are well above 4.5 (5.1 in Nigeria, 4.9 in Benin and 4.7 in Burkina-Faso) (UN World Population Prospects, 2022). All three countries are considered to be in the second stages of the fertility transition (Roser and Ortiz, 2016).. Senegal and Ivory Coast both have a TFR of 4.4 and are considered in the second stage of the demographic transition, along with Ghana, which, has the lowest fertility in the region (TFR of 3.6). Thus, these eight countries provide an assessment of aggregate education-fertility relationship and the state of fertility transition in the region.

The DHS surveys use a two-stage sample design. In the first stage, stratified sampling techniques are used to select clusters as the primary sampling unit (PSU). The second stage

involves a systematic sampling of households within each PSU. We restrict our sample to females aged under 19 years at the time of the survey who responded to questions related to the start dates of their first birth, marriage, or cohabitation. Since the sample is not self-weighting at the national and sub-sample levels, weighting factors (provided in the data) are used to produce results that are proportional at the national level and account for unequal probability of selection.

Variable Measurements

Dependent Variables

There are two dependent outcomes in this study. The first is the timing of the first live birth. For this variable, women were asked the month and year of each of their births, whether still alive or not, starting with their first birth. The analysis is based on the year of their first birth. This variable was coded as time-varying for dynamic modeling using event history techniques. The second dependent variable is the timing of the start of first union. Like the timing of first birth, the DHS questionnaire asked women if they had been married or had lived with a man only once or more than once. For women who had been married or had lived with a man only once, they were asked to provide the month and year they started living with their husband/partner, and for women who had been married or had lived with a man more than once, they were asked the month and year they started living with the first husband/partner. The analysis is therefore based on the year of the start of first union. Thus, both dependent outcomes are time varying.

Independent Variables

Community Variables

We use two variables to capture aggregate levels of education and employment in the community. The first is the percentage of educated women in the community. This variable was constructed by aggregating (finding the average scores) of the individual educational attainment variable by the primary sampling unit (PSU). The mean scores where then recoded into low, medium, and high to represent the aggregate level of educational attainment in each PSU (community).

The second aggregate level variable is the percentage of working women in the community. These two community variables have been demonstrated to be associated with fertility (Kravdal, 2002; Adedini et al., 2014). We use individual educational attainment (No education, primary education and secondary or higher) as a key independent variable to examine the impact of community variables on the dependent outcomes.

Covariates

The DHS surveys collected information on the characteristics of respondents at the time of the survey. We include variables on the place of residence (urban or rural) to capture the effect of urbanization. The wealth index of the household, which is constructed using Principal Component Analysis is included as a composite measure of household wealth. It combines information on household source of drinking water, type of toilet, material of principal floor, walls, roof and cooking fuel and household possessions such as electricity, TV, radio, vehicles, and agricultural land into an index (for more information on how DHS calculates the Wealth Index, see Rutstein and Rojas 2006). The index is coded in quintiles (poorest, poorer, middle, richer, richest). The sex of the head of the household is included as a proxy for women's

empowerment. Research has shown that women's empowerment (decision-making power) is associated with high social expenditures (health, education, food, etc.) (Garcia-Penalosa and Konte, 2014). Another study has shown that social expenditures (education, health, and food) realized by female-headed households are higher than those realized by male-headed households after controlling for observed characteristics (covariates) (Mabali, Kinda and Mallaye, 2022).

We include, whether respondents read newspapers/magazines, use the radio, and watch TV to capture diffusion of reproductive health norms outside of school settings. Many studies have concluded that exposure to radio, television and print media (mass media) is significantly associated with reproductive behavior even with other controls (Westoff and Bankole, 1997; Westoff and Koffman, 2014).

All the covariates are dichotomous, fixed or are time invariant. Although all the covariates were based on information on the current characteristics of respondents and the dependent outcomes are time varying; we assume that these characteristics are less likely to be influenced by any changes affecting adolescents. We also include a variable for the duration/time i.e., years of risk from age 10 to marriage or cohabitation and to first birth or interview if censored (right censored- if the study occurred before the event).

Statistical Model

Standard survival analyses and multi-level discrete-time logistic regression models are used. As indicated, the main dependent outcome of interest is whether a woman has had a first birth or is in union. The risk of childbearing and union formation begins at age 10 (a few

respondents were given into marriage in Niger and Mali by age 10). Women who did not experience a birth are censored at the year of interview. The duration of risk is measured in years and included as a covariate. The discrete-time model is based on person year risk of the events and is estimated using a logistic function (Allison, 2010; Singer and Willett, 2003).

To examine the impact of community variables and individual covariates on to time to union formation and first birth, we fit multilevel binary logistic regression, due to the hierarchical nature of the data (individual women are nested within clusters and households), failure to control for the correlation resulting from characteristics of women within the same cluster and household as well as aggregating the community variables at the cluster level will result in biased standard errors and estimates. We applied appropriate sampling weights (level weights) that correspond to each stage of sampling in DHS surveys at the multivariate level. Results show that omitting level-weights may lead to underestimating the variation between level-2 units (at the cluster level and household level).

We fit the multilevel discrete-time logistic regression models using the GLIMMIX procedure in SAS. Two-level random intercept models from the two-stage sampling design with the PSU and sampling weights were applied (for more information on multilevel modelling using DHS data see [46]). A check for multicollinearity was conducted using the variance inflation factor (VIF) and all the variable used had less than 4 (VIF) and tolerance value lower than 0.25 (1/VIF) suggesting little to no multicollinearity.

Results

Descriptive Results

Descriptive weighted frequencies of union formation, first childbirth, community, and individual-level socio-economic variables of respondents in all the four countries of the study are provided on Table 1. Union formation of adolescents (married or living with a man) varies substantially across the countries, ranging from 4.2 percent in Ghana to 60 percent in Niger. Burkina-Faso and Nigeria have a relatively high child marriage rate of 24 and 21 percent respectively. Likewise, 73 percent of adolescents in Niger have given birth compared to only 7 percent in Ghana and 12 percent in both Burkina-Faso and Nigeria. On community-level education, Niger has the lowest level of aggregate education in the community (42 percent), followed by Nigeria (35 percent). While Ghana and Burkina-Faso seem to have the highest level of community education. On aggregate level of working women in the community, there seem to be a similar percentage of high aggregate level of women in all the four countries (about 28 across all the countries).

On individual-level characteristics, Ghana has the highest level of adolescents with secondary or higher education (71 percent) and the lowest percent with no education (4 percent). Likewise, Niger has the highest percent with no education (64 percent) and lowest with secondary or higher education (19 percent). On the wealth quintile scores, Ghana seems to have a high representation of those in the first and second quintile- poorest and poorer- 44 percent, while Burkina-Faso has the lowest 32 percent.

On the other covariates, Ghana has the highest level of urban residents (48 percent), and Niger has the highest level of rural residents (78 percent). Finally, on measures to account for the diffusion of reproductive norms outside of school, 11 percent of adolescents read a newspaper in Ghana compared to 4 percent in Niger and Nigeria. A higher percentage (45 percent) listen to the radio in Ghana compared to 22 percent in Nigeria. Eighty percent watch television in Ghana compared to 30 percent in Burkina-Faso and 32 percent in Nigeria.

Table 2 presents bivariate distributions of the dependent outcomes and covariates. Both dependent outcomes decrease with higher levels of education. For example, only 2 and 5 percent of adolescents with a secondary or higher education are in a union or have started childbearing in Ghana compared to 20 and 13 percent of adolescents who have not been to school. The frequencies are however higher in Niger (19 and 11 percent respectively) than in the other countries. Similarly, the wealth of a household also reduces the likelihood of both outcomes. This is clearly demonstrated in all countries but comparatively higher in Burkina-Faso and Niger than in Ghana and Nigeria. These relationships were statistically significant given the Chi-square value ($P<0.05$). Male headed households seem to be related to higher proportions of union formation in Burkina-Faso (26 percent), Niger (61 percent) and Nigeria (24 percent) compared to female headed households (14, and 49 and 7 percent respectively). Urban residence is also associated with lower proportions of the dependent outcomes compared to rural residence, as is with reading a newspaper (except in Burkina-Faso) and listening to the radio in Ghana, Niger and Nigeria as well as watching TV in Burkina-Faso, Niger, and Nigeria.

Figure 1-4 display similar patterns between the community-level variable (community education and the level of working women) and the dependent outcomes. Community-level variables are negatively associated with union formation and first childbearing in all the countries except in Ghana and Burkina-Faso where the community-level of women working, and union formation is not significant.

Multivariate Results

Table 3 presents odds ratios of full models predicting the ***probability of first birth*** in the eight Western African countries analyzed. No aggregate-level variables are statistically significant in predicting the probability of first birth in nearly all the countries except, Nigeria and Niger which are both high fertility countries. In Nigeria a high level of education in a community (at the secondary or higher level) increases the odds of first birth by about three-fold (OR; 3; P<0.05). Likewise, in Niger, a medium level of women working outside the household in the community increases the odds of first birth by about twice (OR; 2.05; P<0.05).

On individual characteristics that influence the probability of first birth, women's individual level of education at the secondary or higher level in Burkina-Faso decreases the odds of first birth. The odds of having a first birth for women under 19, in Burkina-Faso with secondary or higher education is 62 percent less (OR, 0.38; P<0.05) compared to women with no education. In contrast, primary education seems to increase the odds of first childbearing in Senegal. The odd of experiencing childbirth for women with a primary education are 2.34 times higher compared to women without an education. The impact of individual women's education on first birth of teenagers in the rest of the countries are, surprisingly, not statistically significant.

At the household level, the wealth index, which is a measure of socio-economic status, decreases the odds of first birth at the richest quintile in Nigeria and Benin (OR, 0.25; $p<0.05$ respectively). In Senegal, the wealth index decreases the risk of first birth at all quintiles compared to the poorest.

Other characteristics such as living in urban areas, the sex of the household head, reading the newspaper and listening to radio were not statistically significant in predicting the probability of first birth among teenagers. Only, watching TV reduces the risk of first birth in Nigeria. The odds of first childbearing for teenagers who report watching TV in Nigeria are 0.36 less (a 64 percent decrease) than those who do not.

Table 4 presents odds ratios of full models predicting the ***probability of cohabitation and marriage (union formation)*** in the eight countries analyzed. Aggregate-levels of education in a community significantly decreases the odds of union formation in some of the higher fertility countries in the regions such as Mali (OR, 0.47), Nigeria (OR, 0.39), Benin (OR, 0.34), Burkina-Faso (OR, 0.63) and Cote D'Iviore (OR, 0.44). In Nigeria, for example, the odds of union formation decrease by about 61 percent. Similarly, a high aggregate level of women working in the community reduces the odds of union formation in Burkina-Faso (OR, 0.68). But in Mali, it increases the odds. Women living in communities with a high proportion of women in the labor force, are 1.70 times more likely to be in a cohabiting or marital union.

Surprisingly, community characteristics are not significant predictors of union formation in Niger, which has the highest fertility- (TFR, 6.7). In Ghana which has the lowest fertility (TFR, 3.6) in the region and in Senegal, which has fertility like Burkina Faso (TFR, 4.7) community characteristics are not significant.

On individual characteristics that influence the probability of union formation, women's level of education at both the primary and secondary level significantly decreases the odds of union formation in all eight countries. For example, in Ghana, there is a 78 percent decrease (OR, 0.22; P<0.01) in the odds of union formation for women educated at the primary level compared to those with no education. At the secondary level, there is a 90 percent decrease (OR, 0.10 P<0.05) in the odds of union formation in Ghana. The corresponding odds at the secondary or higher level are statistically significant in all countries included in this study.

Household socio-economic status is not a significant predictor of union formation in Ghana and Burkina-Faso. In all other countries, the wealth index has some form of statistical significance with union formation. For example, in Niger, it significantly increases the odds of union formation at the richest quintile, while it decreases the odds of union formation in Benin. The odds of birth of women who reside in the richest households in Niger are 2.12 times than those in the poorest households. In Nigeria, however, there is a 20 percent decrease (OR 0.80; P<0.05) in the odds of union formation in the richest households. All the other categories of the wealth index have increase odds of union formation.

On other characteristics, residing in a female headed household reduces the risk of union formation in Nigeria (OR 0.58), but not in Ghana, Burkina-Faso, and Niger. Rural residence also makes union formation more likely than urban residence in Niger and Nigeria (Odds=3.22 and 1.63 respectively).

Finally, reading the newspaper reduces the odds of union formation only in Nigeria (OR 0.42; p<0.05). Likewise, listening to the radio increases the odds of union formation in Burkina-Faso

and Nigeria (OR; 1.52 and 1.74 respectively). Watching TV reduces the odds in Burkina-Faso and Niger (OR; 0.63 and 0.53 respectively). In sum, aggregate-level variables and individual women's education are significant predictors of union formation in West Africa.

Discussion

The global decline in fertility emerges as an extraordinary cultural convergence in human history. While women in many parts of the world limit their births to two or fewer children, on average, women in sub-Saharan Africa, especially in Western Africa, give birth to four to six children. This article explored how community-level characteristics such as aggregate education levels and female workforce participation, which act as proxies for the cultural transmission of shared norms and values, influence fertility outcomes such as union formation and first childbearing among adolescent women in Western Africa.

Our study demonstrates that the education level of other adolescent women in the community negatively influences individual women's decision to enter a union or be married. Specifically, in higher fertility countries of Western Africa such as Nigeria and Mali (excluding Niger, which has simultaneously one of lowest girl's education and highest rate of girl-child marriage), young women were less likely to enter a union if they resided in a moderately to highly educated community. This contrasted with communities having lower levels of aggregate education.

Additionally, greater levels of women working outside the household significantly reduced the likelihood of union formation, albeit predominantly observed in specific countries like Burkina-Faso and Benin both of which have high fertility. Conversely in Mali, which has one

of the highest child marriage rates, such increased workforce participation elevated the odds of union formation.

Contrary to previous research, we did not observe a significant negative effect of community-level characteristics on the first childbearing of adolescents in any of the studied countries. In fact, in some countries like Nigeria and Niger, the odds of first childbearing increased with higher levels of aggregate education and female workforce participation (Kravdal 2002, 2012). However, consistent with previous studies, women's own educational attainment decreased the odds of union formation in all the studied countries (Bongaarts, 2020). These results, overall, underscore that individual characteristics alone are inadequate for a comprehensive understanding of the mechanisms driving fertility decline in high fertility countries.

First, our findings align with studies that suggest that people learn from the behavior of others, and the social and cultural diffusion as well as the transmission of values and norms that drive fertility decline may hold relevance in comprehending the adolescent reproductive health outcome in countries with higher fertility rates in sub-Saharan Africa (Kravdal 2002, 2012).

If aggregate-levels of education in a community are important to delay the initiation of sexual unions of adolescents (which is linked to early start of childbearing) compared to the impact of just individual educational attainment, then the fertility transition in higher fertility countries will respond to increased investments in women’s education beyond the primary level.

While there is progress on school enrollment of girls at the primary level (World Bank, 2023), other indicators such as the low status of women, pronatalist attitudes, gender norms

and cultural barriers as well as poor access to and low prevalence of effective contraception are lagging because the overall average level of aggregate education in the region is still low.

Caldwell's (1980) key argument of compulsory mass schooling as a condition for fertility decline in SSA is premised on increasing the aggregate-levels of education within a few years of schooling, presumably at the primary level. However, the slow pace of economic development in SSA (compared to other less developed regions) and low investments in secondary education and healthcare, especially in western Africa keeps the opportunity cost of childbearing low and thus high fertility (Bongaarts, 2017; 2008). Higher investment in human capital of young girls in the community and the high opportunity cost of childbearing will make other women more conscious of keeping girls in school beyond primary level and engender middle-class values such as individual rights and women's empowerment as well as induce overall cultural change as advocated by Caldwell (1980).

Second, as argued in the literature and the conceptual framework, adolescent critical role transitions (getting married and first parenthood) in West Africa occur in the context of poverty, civil strife, violence, as well as climate change and uncertainty. Within these challenging social contexts, adolescents who live in communities with higher levels of education may be exposed to certain norms and attitudes through social interactions which delay these critical transitions. The stock of knowledge available to their communities accompanied by the level of urbanization that regulates the frequency in which new ideas circulate and economic resources at the community's disposal tends to have an impact on adolescent critical role transitions irrespective of their own individual education (Kebede, Striessnig and Goujon, 2022).

Similarly, adolescents tend to imitate the reproductive behaviors prevalent in their community simply to gain acceptance and avoid criticism from others (Kravdal, 2002). This is strong in resource-constrained societies; where informal support networks represent the main form of insurance, making individuals more likely to conform to values and attitudes shared by the community (Caldwell and Caldwell, 1987; Kebede; Striessnig and Goujon 2022).

Third, the use of the life course family development perspectives allows for the examination of how varying events- union formation and first childbirth- within the lives of adolescents and their timing are accounted for by the changing historical context of family and economic development. In much of West Africa, high hopes of economic development after independence from colonial rule fizzled quickly in the 1970s, allowing Bretton Woods Institutions such as the World Bank (WB) and International Monetary Fund (IMF) to advocate and impose Structural Adjustment Policies (SAPs) in the 1980s. These SAPs emphasized microeconomic stabilization, privatization, and free market economies (Heidhues and Obare, 2011). However, SAPs did not lead to rapid economic development including education, leaving families in poverty and educational and health institutions further weakened (Loewenson, 1993). Despite economic expansion in the decades thereafter, economic growth rates in most of the countries in the region is lagging and poverty and fertility remain high. This has all occurred amid violence, civil strife, and terrorism in the Sahel as well as the threefold planetary challenges of climate change, biodiversity depletion, and waste and pollution.

Thus, to accelerate economic development and human capital at the community level, governments and community development partners must emphasize women's education at the

secondary level and improving their access to reproductive health services, over priorities such as gross national income, microeconomic stabilization, and life expectancy etc.

Affordable sexual and reproductive healthcare should be accessible at the community level for young people and their families. Only then can the drivers of fertility decline, (compulsory mass schooling as advocated by Caldwell (1980) and the supply, demand as well as the cost of fertility regulation as stipulated by Easterlin and Crimmins (1985), propel the region to achieve Goal 3 (ensure health and well-being for all at all ages) and Goal 4 (ensure quality education for all) - of the SGDs. These goals were already off track in Africa before the COVID-19 pandemic. Needless to say, the pandemic, has further derailed progress by interruptions of reproductive health services for most vulnerable groups including poor and adolescent girls. Educational loss due to school closures, lack of access to virtual learning as an alternative, as well as reduced government funding for health and education (Sachs et al. 2021) are all factors that threaten these goals.

This study has limitations. Its cross-sectional design and the differential selection of individuals among communities, along with other indirect neighborhood factors, hinder our ability to draw causal inferences (Duncan and Raudenbush, 1999; Winship and Morgan, 1999). Similarly, our study is unable to clarify if neighborhood differences are due to characteristics of the areas or differences in the types of people living in different areas. Thus, there is need for further research to distinguish between context and composition when analyzing community effects on adolescent transitions. Nonetheless, community effects have been effective in fertility, contraceptive use, and fertility desires, offering valuable insights for addressing

adolescent transitions with significant policy implications for development, especially concerning the SDGs.

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Table 1: Weighted Frequencies of Union Formation and First Births Status, Community, and Individual-level Characteristics of Adolescents in Western Africa

Variable	Ghana	Burkina-Faso	Niger	Nigeria
Union Formation				
Yes	4.2	24.24	59.66	20.85
No	95.8	75.76	40.34	79.15
First Births				
Yes	7	11.68	73.05	11.46
No	93	88.32	26.95	88.54
Community-level Characteristics				
% Of women educated				
Low	27.63	32.17	42.01	34.81
Medium	35.44	29.94	30.92	34.68
High	36.93	37.89	27.07	30.51
% Of working women				
Low	32.38	41.98	41.05	37.31
Medium	38.59	30.72	30.7	33.89
High	28.04	27.31	28.25	28.8
Individual-level Characteristics				
Respondent's Education				
None	4.13	54.11	63.46	26.38
Primary	24.67	22.38	17.12	10.95
Secondary/higher	71.2	23.43	19.29	62.67
Wealth Index				
Poorest	21.62	15.72	15.78	17.62
Poorer	22.39	16.78	18.43	21.04
Middle	19.1	17.32	19.08	20.52
Richer	18.13	18.97	21.45	21.14
Richest	18.76	31.21	25.27	19.67
Sex of Household Head				
Male	59.97	89.27	86.63	82.37
Female	40.03	10.73	13.37	17.63
Place of Residence				
Urban	48.42	33.87	21.89	44.56
Rural	51.58	66.13	78.11	55.44
Read Newspaper				
Yes	11.06	6.69	3.74	3.63

No	88.94	93.31	96.26	96.37
Listen to Radio				
Yes	44.99	41.9	35.2	22.15
No	55.01	58.1	64.8	77.85
Watch TV				
Yes	48.2	29.74	79.9	31.91
No	51.8	70.26	20.05	68.09
N	1337	2690	1570	7162

Source: Demographic and Health Surveys

Table 2: Bivariate Distribution of Union Formation and First Childbearing Status of Adolescents by Individual-Level Characteristics

	Ghana		Burkina-Faso		Niger		Nigeria	
Variable	**Union Formation**	**Childbearing**	**Union Formation**	**Childbearing**	**Union Formation**	**Childbearing**	**Union Formation**	**Childbearing**
Individual-level Characteristics								
Respondent's Education								
None	20.09*	12.46	36.16*	16.79*	74.69*	34.66*	56.52*	28.44*
Primary	7.24*	12.26*	13.43*	8.64*	50.02*	16.96*	23.48	13.34
Secondary/higher	2.23*	4.86*	7.1*	2.8*	18.87*	10.64*	5.37*	3.98*
Wealth Index								
Poorest	6.97*	7.73	32.1*	15.32*	70.26*	35.33*	41.19*	21.60*
Poorer	5.24	15.78*	36.1*	16.2*	70.73*	34.83*	35.84*	18.5*
Middle	3.78	4.29	30.07*	14.97*	72.83*	29.75	18.78*	11.58
Richer	2.8	3.24*	23.78	12.27	65*	27.56	8.27*	5.13*
Richest	1.54*	2.07*	10.94*	5.21*	30.48*	13.34*	2.27*	1.5*
Sex of Household Health								
Male	5.1	6.01	25.49*	11.83	61.38*	26.57	23.91*	12.71*
Female	2.85*	8.49	13.84*	10.43	48.5*	29.41	6.54*	5.6*
Place of Residence								
Urban	2.44*	5.13*	11.43*	14.58*	19.71*	9.23*	7.16*	4.84*
Rural	5.85*	8.75*	30.8*	6*	70.85*	31.92*	31.85*	16.77*
Read Newspaper								
Yes	0	1.48*	25.62*	2.18*	7.61*	4.32*	2.21*	2.44*
No	4.72*	7.69*	4.92*	12.36*	61.68*	27.83*	21.55*	11.8*
Listen to Radio								
Yes	4.64	5.48*	24.87	12.23	53.86*	23.64*	14.37*	8.11*
No	3.66	8.25*	23.78	11.27	62.81*	28.75*	22.69*	12.41*
Watch TV								

Yes	5.19	5.75	11.06*	5.74*	25.16*	9.86*	5.54*	3.7*
No	3.14	8.17	29.82*	14.19*	68.31*	31.24*	28.02*	15.09*
N	1337	1337	2690	2690	1570	1570	7162	7162

Source: Demographic and Health Surveys

Column Percentages do not add up to 100

Table 3: Odds Ratios of Discrete-time Logistic Regression Estimates of First Childbearing Among Adolescents in Ghana, Burkina-Faso, Niger, and Nigeria

	Full Model			
Variables	**Ghana**	**Burkina-Faso**	**Niger**	**Nigeria**
Community-level characteristics	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
% Of women educated				
Low	1	1	1	1
Medium	1.33 (0.67, 2.66)	1.57 (0.75, 3.28)	0.85 (0.42, 1.70)	1.72 (0.76, 3.91)
High	1.72 (0.60, 4.90)	1.9 (0.80, 4.61)	1.27 (0.45, 3.57)	3 (1.07, 8.50) *
% Of working women				
Low	1	1	1	1
Medium	1.06 (0.51, 2.23)	1.24 (0.61, 2.53)	2.05 (1.01, 4.13) *	1.77 (0.83, 3.77)
High	1.2 (0.56, 2.60)	1.11 (0.50, 2.50)	1.51 (0.66, 3.45)	1.74 (0.83, 3.66)
				1.96
Individual-level characteristics				
Respondent's Education				
None	1	1	1	1
Primary	2.92 (0.73, 11.78)	1.73 (0.92, 3.30)	0.97 (0.44, 2.13)	1.96 (0.80, 4.80)
Secondary/higher	1.58 (0.38, 6.60)	0.38 (0.17, 0.84) *	0.52 (0.15, 1.86)	0.7 (0.32, 1.53)
Wealth Index				
Poorest	1	1	1	1
Poorer	2.66 (1.30, 5.51)	2.7 (0.76, 10.80)	0.83 (0.28, 2.45)	0.96 (0.50, 1.95)
Middle	0.6 (0.18, 2.03)	2.47 (0.67, 9.16)	0.92 (0.37, 2.27)	0.71 (0.34, 1.48)
Richer	0.27 (0.06, 1.30)	1.76 (0.46, 6.75)	0.62 (0.26, 1.50)	0.76 (0.28, 2.08)
Richest	0.32 (0.06, 1.69)	1.02 (0.19, 5.43)	0.66 (0.15, 2.93)	0.25 (0.08, 0.79) *
Sex of Household Health				
Male	1	1	1	1
Female	1.43 (0.78, 2.65)	1.05 (0.49, 2.23)	1.03 (0.44, 2.41)	1.2 (0.70, 2.05)
Place of Residence				
Urban	1	1	1	1
Rural	0.82 (0.38, 1.76)	0.5 (0.23, 1.10)	0.71 (0.18, 2.90)	1.4 (0.77, 2.43)
Read News				
No	1	1	1	1
Yes	0.21 (0.04, 1.25)	0.55 (0.16, 1.87)	0.55 (0.07, 4.62)	1.3 (0.50, 3.40)
Listen to Radio				
No	1	1	1	1
Yes	0.68 (0.35, 1.31)	1.21 (0.72, 2.05)	0.96 (0.52, 1.81)	0.88 (0.54, 1.44)
Watch TV				

No	1	1	1	1
Yes	1.17 (0.68, 2.04)	1.30 (0.54, 3.13)	0.82 (0.17, 3.90)	0.36 (0.21, 0.62) *
N (Person-Years)	10794	19918	11426	51861

Source: Demographic and Health Surveys

*P<0.05

Table 4: Odds Ratios of Discrete-time Logistic Regression Estimates of Union Formation Among Adolescents in Mali, Burkina-Faso, Niger, and Nigeria

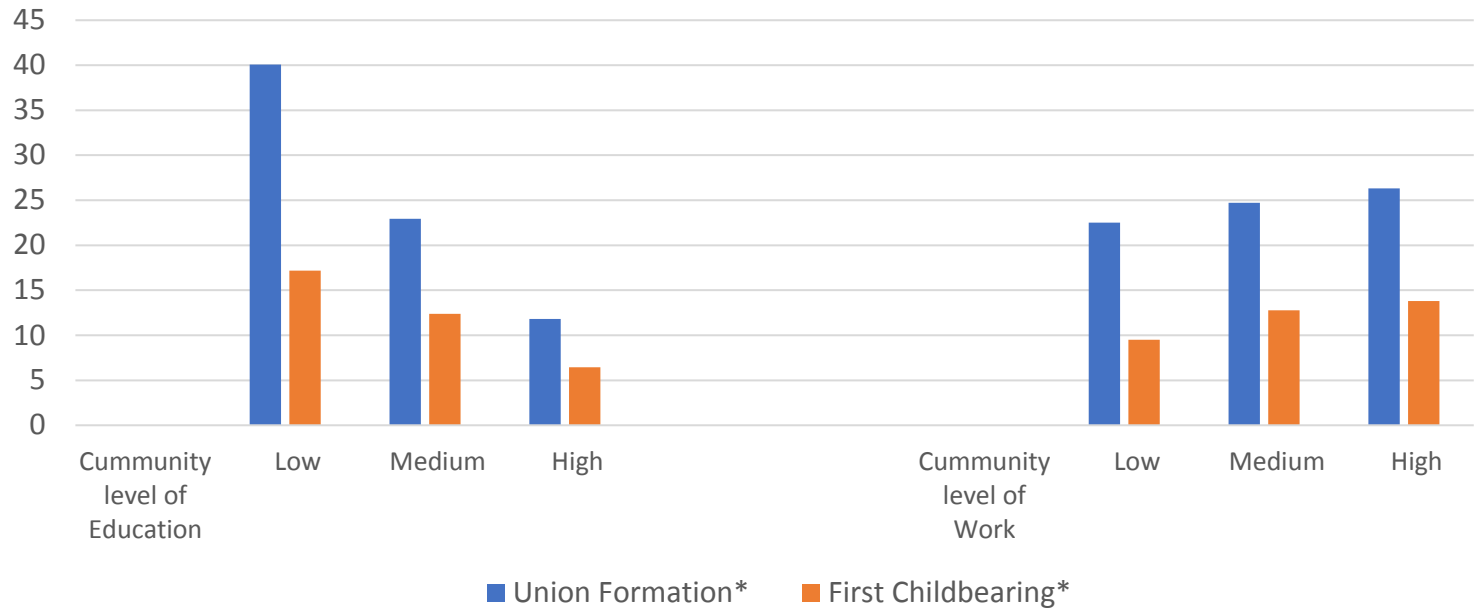
	Full Model			
Variables	**Ghana**	**Burkina-Faso**	**Niger**	**Nigeria**
Community-level characteristics	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
% Of women educated				
Low	1	1	1	1
Medium	1.95 (0.93, 4.10)	0.63 (0.47, 0.84)*	1.16 (0.75, 1.80)	0.39 (029, 0.52)*
High	0.31 (0.07, 1.41)	0.69 (0.39, 1.23)	0.94 (0.50, 1.78)	0.34 (0.22, 0.51)*
% Of working women				
Low	1	1	1	1
Medium	1.24 (0.56, 2.80)	0.78 (0.58, 1.10)	1.12 (0.72, 1.73)	0.92 (0.71, 1.20)
High	1.07 (0.50, 2.42)	0.68 (0.50, 0.93)*	0.73 (0.47, 1.14)	0.89 (0.66, 1.19)
Individual-level characteristics				
Respondent's Education				
None	1	1	1	1
Primary	0.22 (0.09, 0.50)*	0.34 0.25, 0.47()*	0.52 (0.35, 0.77)*	0.38 (0.29, 0.49)*
Secondary/higher	0.1 (0.040, 0.23)*	0.25 (0.16, 0.38)*	0.3 (0.16, 0.44)*	0.15 (0.11, 0.20)*
Wealth Index				
Poorest	1	1	1	1
Poorer	1.13 (1.13)	1.33 (0.95, 1.88)	(0.78, 2.13)	1.95 (1.5, 2.54)*
Middle	1.15 (1.15)	1.19 (0.84, 1.69)	1.49 (0.90, 2.47)	1.75 (1.28, 2.41)*
Richer	1.58 (0.43, 5.90)	1.38 (0.93, 2.06)	1.7 (0.97, 2.95)	1.58 (1.08, 2.30)*
Richest	0.75 (0.09, 6.08)	0.95 0.54, 1.70)	2.12 (1.10, 4.09)*	0.8 (0.44, 1.34)*
Sex of Household Health				
Male	1	1	1	1
Female	0.54 (0.25, 1.17)	0.61 (0.40, 0.95)*	0.45, 1.09	0.58 (0.42, 0.79)*
Place of Residence				
Urban	1	1	1	1
Rural	1.07 (0.48, 2.43)	1.31 (0.68, 2.50)	3.22 (1.74, 5.97)*	1.63 (1.24, 2.13)*
Read News				
No	1	1	1	1
Yes	0.01 (0.01, 0.01)	0.64 (0.25, 1.63)	0.38 (0.14, 1.06)	0.42 (0.18, 0.98)*
Listen to Radio				
No	1	1	1	1
Yes	1.41 (0.76, 2.63)	1.52 (1.20, 1.93)*	1.1 (0.77, 1.59)	1.74 (1.35, 2.25)*
Watch TV				
No	1	1	1	1
Yes	1.01 (0.51, 2.01)	0.63 (0.41, 0.95)*	0.53 (0.31, 0.90)*	0.8 (0.57, 1.12)

N (Person-Years)	10794	19918	11426	51861

Source: GDHS 2014

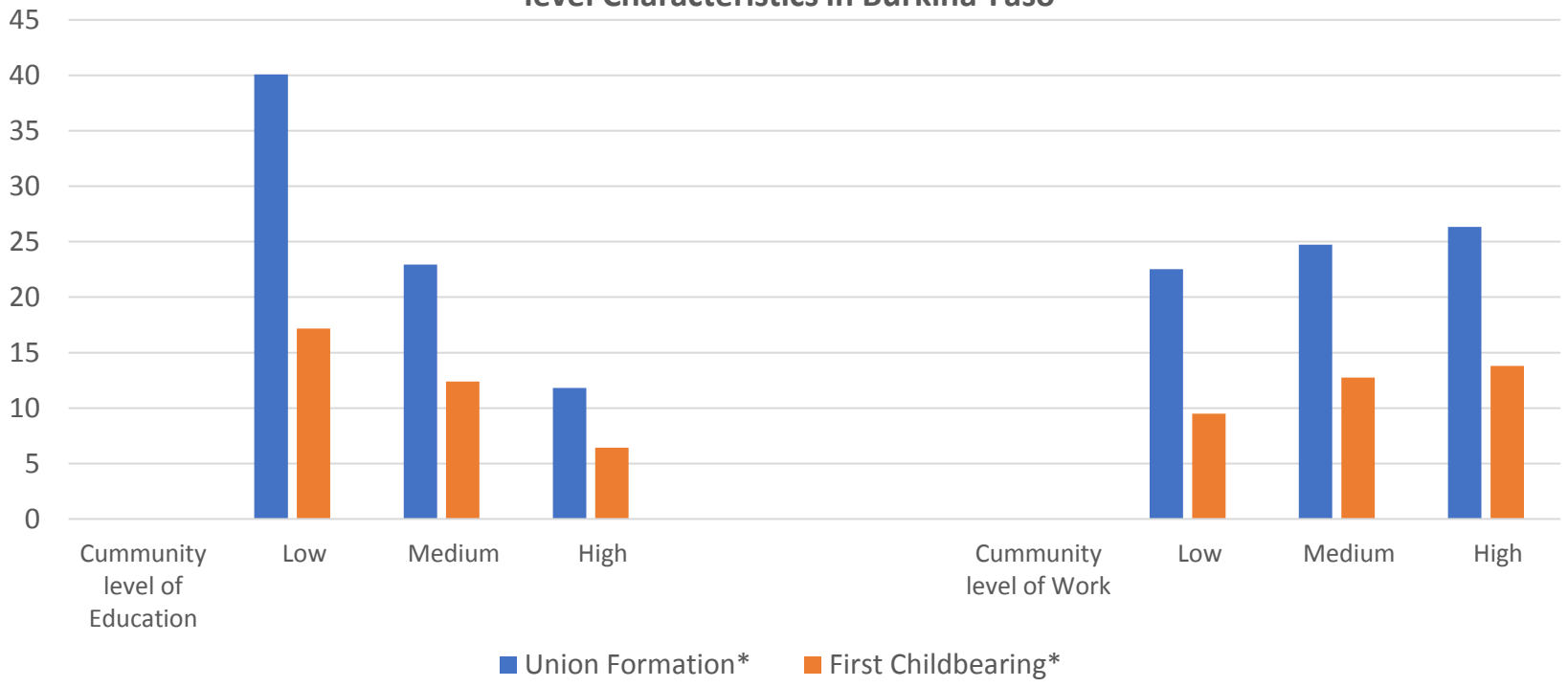
*P<0.05

Figure 1: Percentage of Adolescents in Union and First Childbearing by Community-level Characteristics in Ghana



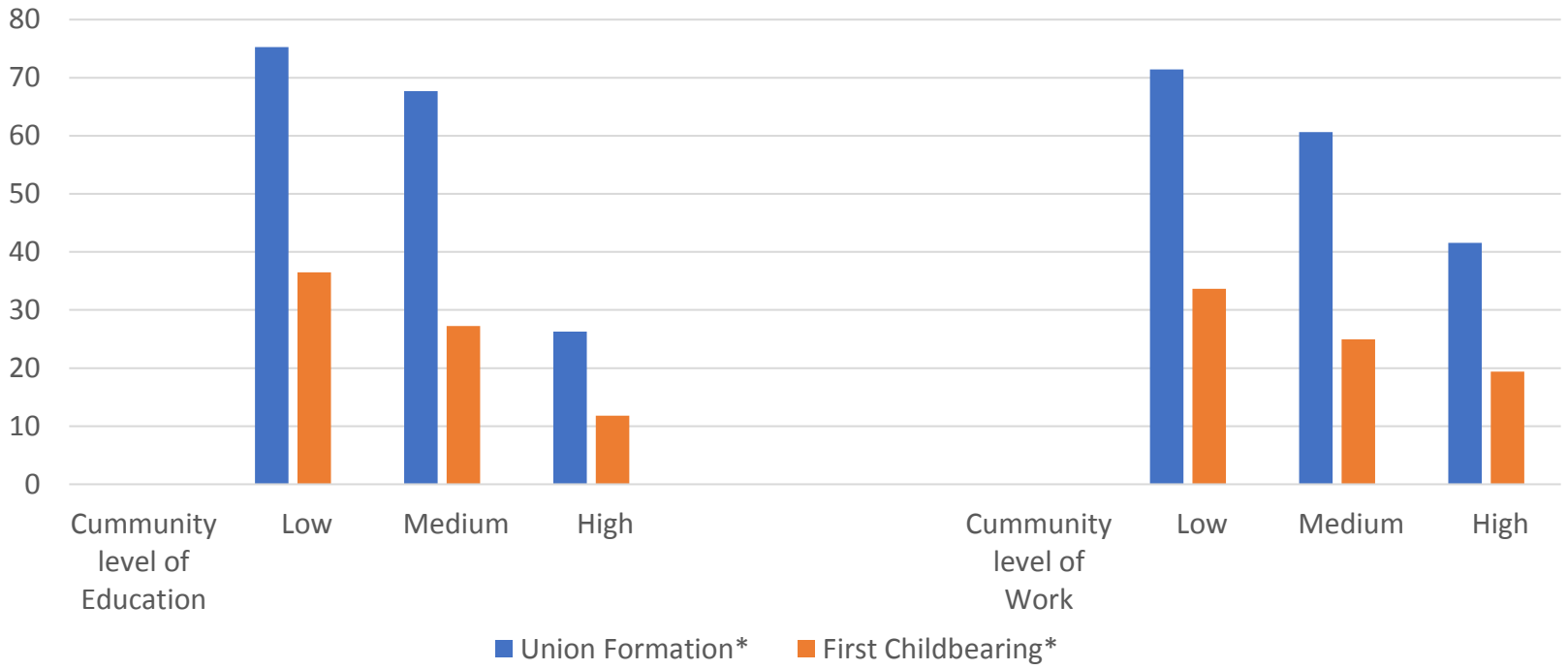
Source: Ghana Demographic and Health Survey (2014)
*P<0.05

Figure 2: Percentage of Adolescents in Union and First Childbearing by Community-level Characteristics in Burkina-Faso



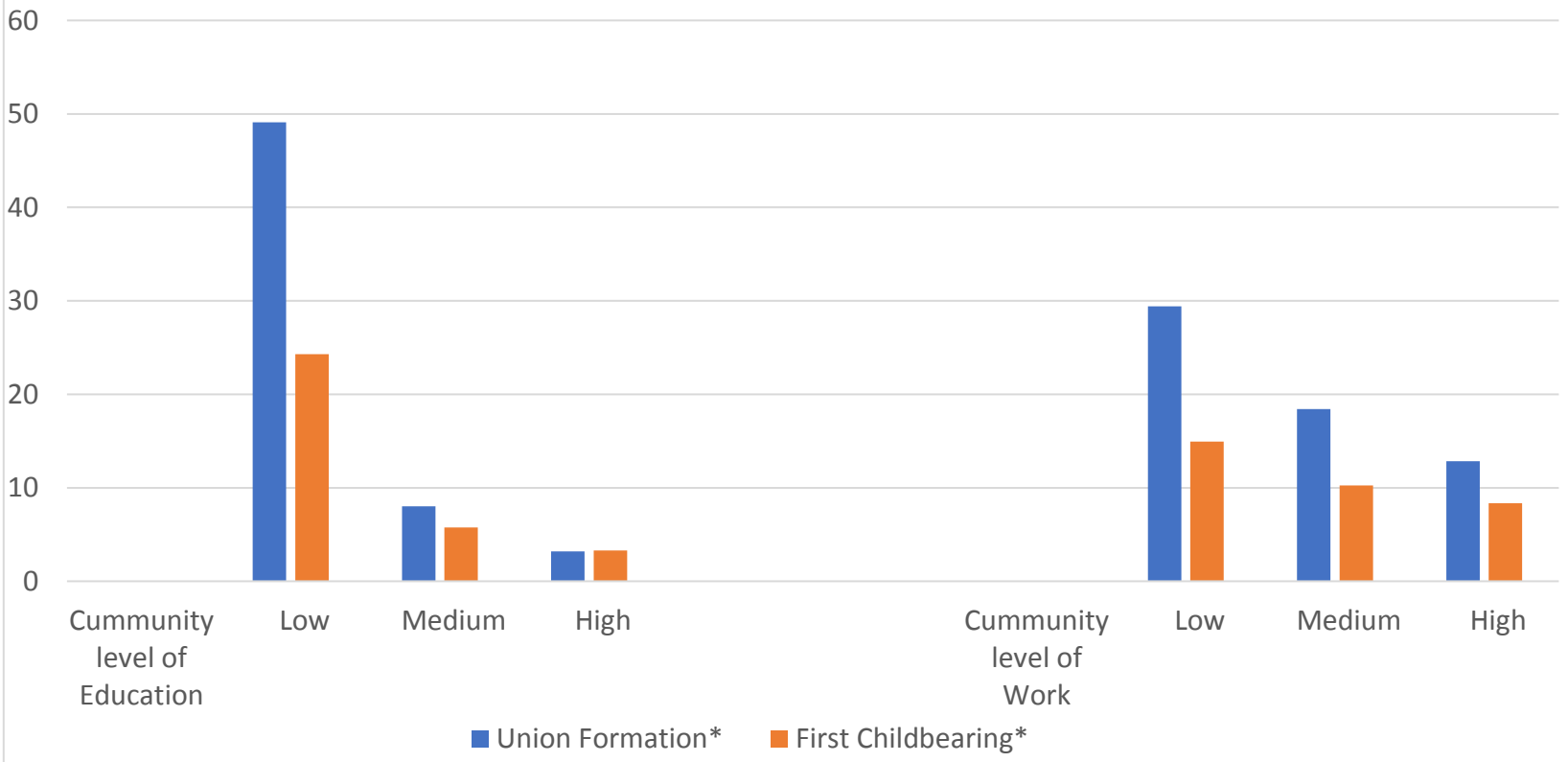
Source: Burkina-Faso Demographic and Health Survey (2010)
*P<0.05

Figure 3: Percentage of Adolescents in Union and First Childbearing by Community-level Characteristics in Niger



Source: Niger Demographic and Health Survey (2012)
*P<0.05

Figure 4: Percentage of Adolescents in Union and First Childbearing by Community-level Characteristics in Nigeria



Source: Nigeria Demographic and Health Survey (2018)
*P<0.05