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Regular Research Article

Religious affiliation, education, and fertility in sub-Saharan Africa

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ABSTRACT

Sub-Saharan Africa (SSA) is a weakly secularized region, where religions play an important place in the lives of individuals and communities. In many countries, religious currents are involved in the structuring of educational offer, while the increase in women's level of education is considered as a major driver of the fertility decline. In this article, we raise the question if and in how far the association between female education and fertility depends on religion. We test this interaction by using Demographic and Health surveys (earliest and most recent available) for a corpus of 23 Sub-Saharan African countries.

We find that the association between female education and fertility does not differ between religious groups in the vast majority of Sub-Saharan countries, implying that globally, religion does not weaken the negative educational gradient of fertility in this region. Our results strongly suggest that education takes on an emancipatory function by modifying the reproductive norms of women, independent of their religious background.

1. Introduction

The demographic transition in sub-Saharan Africa, and in particular the speed and intensity of the fertility decline, is the subject of much demographic research (see for example [Sánchez-Páez and Schoumaker, 2022](#), for an overview). The role of mothers' education is one of the most important factors to be considered ([Bongaarts and Hodgson, 2022](#)). School is indeed an institution that can influence fertility at several levels: by delaying the age of marriage (incarceration effect), by disseminating norms and values favorable to family planning, notably through knowledge of contraceptive practices ([Bongaarts, 2010](#)), and by increasing professional opportunity costs ([Becker, 1960](#); [Grant, 2015](#)). Girls' schooling is also known to be a source of women's empowerment. It allows women to have greater power of negotiation and arbitration within their couple or within their family, especially regarding reproductive choices ([Lutz and KC, 2011](#)).

Besides education, another factor that is crucial to consider for fertility in sub-Saharan Africa is religion. The importance of religion in the daily lives of individuals remains particularly strong in Sub-Saharan societies. As early as 1987, [Caldwell and Caldwell \(1987\)](#) explained the failures of family planning by its inadequacy with certain local socio-cultural norms. The cults of ancestors would thus be one of the factors limiting the spread of birth control practices. The discourses of various religions are not limited to simple recommendations on the observance of rites and customs but address broader elements of the lives of their

followers. They are norm-producing institutions. These norms are known to have the potential to influence fertility behaviors ([Goldscheider, 1971](#)).

However, religion should not be considered as an isolated factor. [McQuillan \(2004\)](#) noted that the clergy's hold on its followers and its norms increases when it is involved in education, by inculcating its vision of good practices from childhood. It is thus important to consider that the influence of religion on fertility can depend on other social factors, such as education. In many sub-Saharan African countries, part of the school offer is carried by religious congregations. Catholic missions have been involved for a long time in schooling in this region, as [Gallego and Woodberry \(2010\)](#) noted: « Often, missionary activity preceded the colonization period. In these cases, colonizers often allowed missionaries to start or continue schooling in the colonies. » (p. 298). Since then, the weight of religious congregations in school provision has remained quite strong in this region due to the privatization of education ([Lange et al., 2021](#)). In a global context of strong demographic growth and budgetary constraints, this option has been taken by various states, anxious to meet the demand for schooling and the objectives of the Dakar conference in 2000.

Despite these interconnections between fertility, education and religion in sub-Saharan Africa, empirical research on fertility in this region often focuses on education more than on religion. Demographers studying fertility often consider religion as a secondary factor only (integrated as a control variable in the analytical models). The association

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between religion and fertility has been the subject of only a few dedicated studies. Heaton (2011) used DHS data for 30 low-income countries to study links between religion and fertility. McQuillan (2004) analyzed the mechanism that links religion and fertility to enlighten the impact of religious schooling and minority status. Agadjanian and Yabiku (2014) focused on the impact of religion on fertility in Mozambique. These studies point to ambiguous and variable associations between religion and fertility across countries. Overall, Muslim women are shown to have significantly more children than Christian women, even if the religion-fertility association appears to be relatively weak in comparison to the education-fertility association.

In this article, we investigate in how far religion shapes the education-fertility nexus, based on data from the Demographic and Health surveys (DHS) for a panel of 23 Sub-Saharan African countries. To do so, we model the number of children ever born by age, using a Poisson model that will incorporate not only female education and religion, but also an interaction term between both variables. Unlike other studies that have investigated the differential impact of education on fertility with regards to women's religion and that are based on cross-continental groups of countries which make regional statements difficult (Heaton, 2011), we propose a country-by-country analysis by setting the focus on sub-Saharan African countries. This allows considering Traditional religions besides the Christian and Muslim religion as well as distinguishing between the different countries of this region. Our results illustrate that these distinctions are quite important in sub-Saharan Africa countries when it comes to identify in how far religion is related to the education-fertility association.

Questioning if and in how far religion shapes the association between education and fertility is specifically important for sub-Saharan Africa. Does religion act as a brake for the demographic transition by limiting the impact of the increase in education on the fertility decline? Or rather, does women's empowerment due to increased female education make it possible to counterbalance the effect of religious norms on fertility in sub-Saharan Africa?

This question is highly relevant given that over the past years, the fertility decline has been weaker than expected in many sub-Saharan African countries. In some countries like Congo or Kenya, it seems that fertility stalls at quite high levels (Schoumaker, 2019). Moreover, it appears that over the last decade, this fertility stall is observed for all education levels (Schoumaker and Sánchez-Páez, 2024). This situation risks delaying the demographic transition and therewith accelerating population growth in this region. A holistic understanding of the determinants of fertility behavior in sub-Saharan African countries is thus crucial. While women's education is known to be one of the key drivers of fertility, less is known so far about how religion interferes with the education-fertility nexus in sub-Saharan African countries.

We find no empirical evidence that religion shapes the association between education and fertility in most sub-Saharan African countries. Most importantly, our results highlight that the Muslim religion is *not* related to a weaker negative educational gradient of fertility in comparison to the Christian religion in the large majority of sub-Saharan African countries. This strongly suggests that due to its emancipatory function, female education can modify the reproductive norms of women, independent of their religious affiliation.

The first part of this article summarizes hitherto existing theoretical and empirical findings for the associations between education and fertility, between religion and fertility, as well as between these three factors. The second part proposes country-by-country analyses to study the significance of the interaction between education and religion on fertility in sub-Saharan Africa.

2. Influences of education and religion on fertility

2.1. Education and fertility

Education, and more specifically women's education, is classically

associated with the level of fertility. As education increases, the average number of children decreases (Bongaarts, 2010). This relationship is particularly strong in the sub-Saharan context, where the impact of education on fertility is one-third stronger than in other developing regions (Büttner et al., 2022). The number of years of school attendance by women has an important influence on the association between education and fertility. Below secondary education, the effect of schooling is found to be much smaller than above (Bongaarts, 2010; Corker et al., 2022). This is in line with De la Croix and Gobbi (2014), who indicated that the effects of education on fertility are significant "once it crosses a threshold, between five and eight years of education" (p.48).

The measurement and explanation of the causal relationship between women's education and their fertility levels has been the subject of an extensive literature, of which several sets of factors are briefly summarized here.

Women's education can play an indirect role by modifying intermediate factors of fertility. The first of these factors is the time of exposure to the risk of pregnancy, which would be reduced by girls' schooling. The longer a girl stays in school, the more she will delay her union and her entry into fertile life. This is sometimes referred to as the 'incarceration effect' (Black et al. 2008). In particular, the fear of exclusion from school if they become pregnant may affect girls' behavior. This practice is for example documented in Kenya (Duflo et al. 2015).

However, while the "incarceration effect" impacts women's early life stages, education might also have longer time impacts, as education can change women's preferences, perceptions, aspirations and representations:

First, women's education can have a 'per se' influence on the fertility decline, as it is an important factor in women's empowerment. It gives women more latitude to impose their reproductive choices in the trade-offs that take place within the family unit (Lutz and KC, 2011). Education can allow women to become more independent of their socio-cultural and family environment, thereby encouraging a reduction in fertility.

Second, education is negatively associated with union formation. For example, Westoff (1992) explained that education could delay the age of marriage as it "offers literacy and exposure to ideas and values that may compete with traditional customs leading to early marriage" (p.7). In addition, educated women are found to have more difficulty in forming formal relationships (Bongaarts, 2010).

Third, the classical economic literature, explains the influence of education on fertility through the increase in the substitution cost between women's economic activity and child rearing (Becker, 1960). The more children a woman has, the less she will be able to take up paid employment. However, income options tend to increase with the level of education. Having children therefore represents a greater opportunity cost for the most educated women, which encourages them to limit their offspring. This impact is all the stronger when women's education effectively allows them to access the skilled labor market. Goujon and Al Zalak (2018) found, for example, that the most educated Egyptian women are the most exposed to unemployment in a context of economic crisis, which leads them to marry earlier and to accelerate the arrival of their first children.

Hence, it should be remembered that female empowerment takes place mainly in a context of patriarchal organizations of society in sub-Saharan Africa which might limit economic options for women despite their access to education. In addition, many women, even if educated, still lack options to become formally employed and/or economically independent in this region. Therefore, women's economic autonomy that comes with education and its impact on the reduction of births are questioned in certain empirical studies (Johnson-Hanks, 2006). The combination of above-mentioned factors is likely to lead to a shift in women's fertility preferences, which has been documented in several empirical studies. Based on the latest DHS survey for sub-Saharan countries in 2019, Channon and Harper (Channon and Harper, 2019)

have demonstrated for example that the most educated women belonging to this region declare an ideal number of children of 3.7, while the less educated ones declare an ideal size of 5.9.

To address fertility preferences, access and use of contraception is a key issue. Educated women are found to have more knowledge about available contraceptive methods and how to use them, and they also use more contraception (Bongaarts, 2010). In this respect, schools can also serve as a mediating tool to bring information about family planning to women.

Finally, beyond the individual level of education of women, the overall level of education in a society is also crucial. It would indeed be more difficult for an educated woman to change her fertility preferences and outcomes when living in a social environment with a low overall level of education that comes with strong patriarchal norms and high fertility levels (Kravdal, 2002).

Whether through direct or indirect effects, education is at the center of mechanisms affecting the evolution of fertility levels. This is particularly true in sub-Saharan Africa, where a link has been observed between stagnating fertility levels and stagnating school enrolment rates following the budget cuts associated with the structural adjustment policies of the 1980s (Goujon et al. 2015).

2.2. Religion and fertility

The association between religion and fertility is considered as rather ambitious in the scientific literature (Agadjanian and Yabiku 2014). Goldscheider (1971) was a precursor on this issue and proposed three theoretical links between religion and fertility. He first hypothesizes that minority and majority religious groups do not have the same relationship and behavior regarding fertility, notably because they differ in their desire to preserve a sense of 'between oneself', or on the contrary, a desire to reduce a demographic minority position.

The second link proposed by Goldscheider (1971) is based on the idea that religion produces a set of norms and values that govern the lives of their followers. These norms, which are sometimes pro-natalist, can push believers to have more children, notably by proscribing contraceptive practices. This is the thesis developed by Caldwell, Orubuloye and Caldwell (1992) who linked traditional religions and cultures to the maintenance of high levels of fertility. These religious currents are often based on ancestor worship, where the more descendants there are, the better is the worship.

The opposition of religions, particularly the Catholic Church, to contraception and abortion is also a factor to consider. In addition to birth control, religions also regulate forms of union. Polygamous unions are prohibited among Christians but are permitted among Muslims (up to four wives) and in traditional religions. The fact that polygamy reduces women's average fertility levels is a long-standing finding (Pebbley and Mbugua 1989; Pison 1986).

However, the complexity and non-automaticity of the transmission of norms and values disseminated by religious currents and their concrete application by individuals must be considered. Religious texts are interpreted and thus produce a multitude of discourses among local clergy. For example, the use of condoms, although clearly prohibited by the Catholic Church, is sometimes not condemned by priests in certain geographical areas particularly affected by AIDS (Trinitapoli and Weinreb 2012). Abdi, Okal, Serour and Temmerman (2020) highlighted different uses of the Koran in Kenya to allow or forbid contraceptive use. Similarly, just because an individual defines themselves as a believer does not mean that they follow all the recommendations of their religion. The transition from prescribed norms to practice is affected by a variety of factors, from the charisma of the clergyman to individual will and the fit between ideals and realities.

McQuillan (2004) showed, however, that religious education reinforces the impact of these norms on behaviors. This theory is difficult to study with quantitative tools. The few data available, notably from the Pew Research Center, indicate that religion is an important social

component in sub-Saharan Africa. This leads one to believe that clergy are heard, and their discourses applied. Religious activities are presented as important elements in the women's social lives (Kendall, 2019).

Finally, the last hypothesis proposed by Goldscheider (1971) states that it is the sociodemographic characteristics of different religious groups that explain differences in behaviors and not the religions themselves. In fact, although there are often fertility differentials between religious communities, the latter component also goes hand in hand with other socio-economic characteristics associated with fertility, such as level of wealth, education or place of residence.

From an empirical point of view, the results are also ambivalent. Religion is not always found to have a significant impact on fertility, neither in Western countries (Zhang, 2008) nor in sub-Saharan Africa (Johnson-Hanks, 2006), once the above-mentioned differences in socio-demographic structures are controlled for. However, a couple of studies found a residual influence of religious affiliation on demographic behavior, including fertility (Agadjanian and Yabiku, 2014; Heaton, 2011). These studies showed that in Sub-Saharan Africa, the Muslim religion is associated with higher fertility than the Christian one (see also Ishak and Gradstein, 2022), but fewer fertility than traditional religions. In a systematic review of the publications focusing on the relationship between religion and fertility, Turner and Götmark (2023) confirmed that in most sub-Saharan African countries, Christians have lower fertility levels compared to Muslims and traditional religions.

2.3. Religion, education, and fertility

In this article, we address the question of the interaction between religion and education on fertility. Our hypothesis is that education and religion may have opposite impacts on fertility for a range of reasons that we present below.

The first factor is the role of religious congregations in structuring school systems. The organization and financing of the school system in sub-Saharan Africa is very heterogeneous. Many social as well as spatial inequalities persist. Remote rural areas are often less targeted by national investment programs and have lower enrolment rates as well as higher dropout rates (Gnoumou-Thiombiano and Kaboré, 2017; Lewandowski, 2012; Meunier, 2008). These situations sometimes leave the management of schools and education to parents (Lange et al., 2021). Furthermore, the simultaneous increase in the number of children and school enrolment rates in sub-Saharan Africa has increased the challenges related to costs and access to education. This has led to the emergence of many private schools (Lange et al., 2021), which has provided an opportunity for various religious institutions to open faith-based schools.

Today, the role of religious congregations in the structuring of school infrastructures seems to be important even if quantitative data to precisely measure the weight of religious school on the scale of the sub-continent are insufficient. For example, Koranic schools are often difficult to identify and their pupils are not always counted in school enrolments (D'Aiglepiere and Bauer, 2016). Authors often point to the limitations of state surveys, which rarely count unrecognized schools and their pupils, especially as they must deal with the presence of illegal schools (Lange et al., 2021). The school space seems to be composed, on the one hand of official state schools, often secular, and, on the other hand, of Muslim or Christian religious establishments, not always recognized, whose curricula are more or less autonomous. However, the boundaries between public and faith-based schools can be blurred in other cases. This is the case, for example, in the Democratic Republic of Congo, where most public schools have close links and operations with private Christian schools (Poncelet and Kapagama, 2020).

Finally, if religious congregations seem to be involved in the provision of primary and secondary education, they are also involved in higher education. The Catholic religion has developed a transnational university network with the Catholic University of West Africa (UCAO).

More recently, there is a growing number of Muslim Universities in sub-Saharan African part funded by foreign institutions like the Organization of the Islamic Conference (Karram, 2011).

The educational content of faith-based schools may thus not be the same as that of other schools. As different religious currents are openly hostile to birth control, it is possible that these views impact the educational content of these schools. For example, Duflo et al. (2015) explained that contraception is rarely discussed in schools in Kenya for religious reasons.

In general, the learning held by religious groups is identified as a factor that strengthens the hold of their norms on the faithful, which would impact their behaviors (McQuillan, 2004).

We therefore hypothesize that the development of faith-based schools may modify the mediating role of education on fertility. For example, it may weaken a potentially negative fertility-education association. Furthermore, the involvement of religious congregations in schooling could potentially play a differential role depending on the religion of the women. In other words, the extent and direction of the impact of religion on the fertility-education association may depend on the type of religion. This hypothesis seems even more relevant as parent's motivations regarding the choice of religious schools vary between religions. A study conducted by the World Bank in 2010 in Ghana and Senegal found that for Islamic schools, the main reason for enrolling a child in a religious school was faith, whereas for Christian ones, the quality of education was the first cited reason.

However, it should be noted that denominational schools do not necessarily make it a condition of entry to follow the religion of the establishment. This is notably the case for Catholic schools, which have a recognized policy of denominational openness, as Sarr (2017) attested for Senegal or Amoné and Indeanyiya (2013) for Uganda, where 1/3 of students of Catholic founded schools are found to be not Catholic themselves. This is probably less the case for Muslim schools, whose educational content is often centered on the study of the Koran, sometimes integrating Islamic sciences (André and Demonsant, 2012).

The second set of factors concerns the ability of education to modify fertility preferences according to women's religion. School and religion are two institutions of socialization that can deliver contradictory norms. The relative impact that these two institutions will have on individuals may differ from one religious' group to another. This differential impact can be explained by the different coercive capacity of one religious group to enforce its reproductive norms. However, it may also stem from an educational effect of the religious group as a whole. If a faith group is less educated overall, then the ability of educated women in that group to adjust their fertility will be lower than that of a woman belonging to a religious group where the level of education is higher (Krvdal, 2002). On average, Christian communities are better educated than Muslim and traditional communities. That could lead to a differential impact of education on fertility between religions.

At the same time, one of the factors to explain the influence of education on fertility is the "incarceration effect" (delayed age of marriage due to education). This effect should be the same for all women regardless of their religion.

In the light of these theoretical arguments, the possible differential impact of education on fertility with regards to women's religion is rather unclear. The hitherto existing empirical literature on that topic does also not allow so far clear statements on the education-fertility association differentiated by religion for sub-Saharan African countries.

To our knowledge, so far only one study has investigated the education-fertility association in lower income countries by clearly distinguishing between religious groups: Based on DHS data covering years 1995 to 2007, Heaton (2011) explicitly tests the interaction by integrating an interaction term between religion and women's education when modelling determinants of fertility using a multilevel Poisson model. He finds that the education-fertility association is more negative among Christian women than among Muslim women. However, Heaton (2011) does not consider African traditional religions. Their importance

may be decreasing in many parts of sub-Saharan Africa, but in several countries, up to one third of the population still declares being a member of a traditional religion. Furthermore, in his multilevel model, Heaton (2011) simultaneously groups together about thirty developing countries, located in Asia, Africa and South America. It stays therefore unclear in how far religions, including traditional ones, shape the education-fertility association specifically in sub-Saharan Africa, and in how far the differentiation of this association by religion differs between sub-Saharan African countries.

This question is particularly relevant in a time where decreases in fertility seem to slow down in many African regions (Schoumaker, 2019), and in a context in which education is often considered as the most important factor of family planning.

As the answer to this question could be different from one country to another in this region, we propose in this article an analysis of the interaction between education and religion on fertility for 23 Sub-Saharan African countries taken one by one, based on Demographic and Health Survey Data sets from the end of the 1980s to the early 2020s. Results presented in the core manuscript are based on the latest available DHS wave for each country, while analyses on previous waves are presented in the Appendix. The therewith covered time period of almost four decades allows us addressing whether the interaction between religion and education on fertility is constant over time.

3. Data and methods

3.1. Data

The Demographic and Health Surveys (DHS) is the only source providing high quality data on religion, education and fertility simultaneously for a large number of countries in sub-Saharan Africa. The surveys are all based on the same collection methods (nationally representative stratified cluster design) and on the same questionnaire, which allows for comparability between countries. The DHS program has been launched in the 1980s and is still ongoing, which makes it possible to draw evidence over a period of several decades.

For this research, we selected those continental sub-Saharan African countries in DHS for which information on religion is available and for which we dispose of at least two religious groups with enough respondents for empirical analysis.¹ This leaves us with 23 sub-Saharan African countries, which represents a large majority of countries of this region. The core results presented in this article are based on the latest available wave for each country. Therewith, we obtain data covering years between 2011 and 2022, while in the large majority of covered countries (20 out of 23), the latest wave took place withing the relatively recent year span 2014 to 2022: Angola 2015–16, Benin 2017–18, Burkina Faso 2021, Burundi 2016–17, Cameroon 2018, Chad 2014–15, Congo 2021, Ethiopia 2016, Gabon 2012, Gambia 2019–20, Ghana 2022, Guinea 2018, Ivory Coast 2011–12, Kenya 2022, Liberia 2019–20, Malawi 2015–16, Mali 2018, Mozambique 2011, Nigeria 2018, Senegal 2019, Sierra Leone 2019, Togo 2013–14, and Zimbabwe 2015.

In addition to our core results based on the recent available wave, we present results based on the earliest available wave for each country in the Appendix, allowing us to assess whether our results can be considered as rather time constant or whether the interaction between education and religion has undergone important variations over the last decades. The earliest wave covers years 1988 to 2013 for our 23 countries, implying a time delay between a minimum of 6 years and a maximum of 26 years. For most countries, the time delay between the earliest and the most recent DHS wave lies between 10 and 20 years.

The DHS uses several variables to address education levels. The one

¹ We decided to include only countries where the majority religion represents less than around 95% of the population.

used here classifies women according to the highest level of education attained into four categories: no education, primary level, secondary level and higher level. In some countries, the low level of development of higher education among women, combined with sometimes minority religions, has necessitated an aggregation of the secondary and higher categories.

The number of modalities of the religion variable varies from three to more than ten, depending on the country. The DHS does not allow for distinctions among Muslim women (as for example Sunnites, Shiites, etc.), even though these might be relevant for fertility (Johnson-Hanks, 2006). Among Christians, differences between Catholics and Protestants are often found to be small and rarely significant in terms of fertility outcomes (Westoff and Bietsch, 2015; Turner and G tmark, 2023). For this research, we tested the distinction between Catholics and Protestants for countries where this was possible. However, as the results were not very different from those for Christian women (combined), we only present the aggregated results in this article.

Finally, four religious identities are retained: Christian, Muslim, no religion and traditional religions. This last modality includes several names used in the DHS, such as ‘Voodoo’ or ‘Animist’.

3.2. Methods

To measure whether the impact of education on fertility varies according to the religion of mothers, we propose to model the number of children ever born by age using Poisson models. This is a tool adapted to the modeling of discrete quantitative variables with rare occurrence such as count variables. It is therefore well suited to model the number of children ever born – a count variable that can only have integers and that is not necessarily normally distributed.²

More specifically, we use Quasi-Poisson models that consider the complex stratum and cluster sampling design of the DHS in order to correctly estimate the significance of the model coefficients. All our estimations were performed on R software using the Survey package dedicated to the analysis of data collected with complex sampling designs. We also ensured that the distribution of the numbers of children ever born did not present an over-representation of women without children creating a shift with a Poisson distribution which could have biased our results.

We have decided to abstain from the use of a multilevel model (i.e. grouping together all countries and integrate country-fixed effects), but rather model the number of children ever born country by country. Sample size is sufficiently large for all our 23 selected countries to proceed with this approach. This strong methodological choice allows us to propose detailed results that will not reflect an average regional effect but the specificities of each country in the sub-Saharan African region. Religious and educational contexts vary greatly from one country to another in this region, and in this article, we intend to present results as accurately as possible for sub-Saharan Africa.

In our econometric model, the dependent variable is the number of children ever born reported by women aged 15 to 49.³ A first model controls for age, religion (Christian, Muslim, no religion and traditional religions), marital status (out of union, polygamous or monogamous marriage), region of residence, area of residence (urban or rural),

² We also implied linear regressions as a robustness check. The main conclusions are very similar to the ones we get from our Poisson-specification. Results are available on request.

³ As further robustness check, we tested the models restricted to women aged 40–49 years old, allowing us to focus on the quantum of fertility. Overall, we find that our results do not strongly depend on the considered age of women, but rather hold across all ages. However, results by age-groups are often not interpretable because of the small number of observations for specific age-groups of women from minority religions and/or for highly educated women. Results are available on request.

household wealth in quintiles (as defined by DHS⁴) and mothers’ education (none, primary, secondary, tertiary). A second model also includes an interaction term between education and religion to measure whether the association between education and the number of children ever born is the same for all religious groups.

Before presenting in detail –country-by-country– our results, we highlight potential limitations due to the DHS data design in the next section.

3.3. Data and method limitations

The collection of DHS data on religious affiliation presents several limitations. First, religion is collected as a single categorical variable. It does record religious affiliation, but not religiosity, and there is no alternative variable in DHS recording the degree of religiosity. However, although the intensity of religious practice often yields significant results in studies concentrated on Western countries (Zhang, 2008), adding religiosity besides religion to our estimation model may yield rather limited additional value in the sub-Saharan African context: Studies that include the limited data on religiosity that is available for this region (Pew Research Center, 2018) suggest that self-declared “low-investment believers” are rather rare in sub-Saharan Africa.

Second, also due to limited data availability, it is not possible to account for the local level of influence of religious groups in our analysis which covers a large set of sub-Saharan African countries. By using information about the localization of the historical implementation of Christian missionary centers, some country-specific studies have demonstrated that the geographical distance to religious centers has the potential to influence individual behavior. Nunn (2010), for example, provided evidence of the influence of the spatial distance from a Christian missionary on individual beliefs in sub-Saharan Africa. Using the same methodology, Okoye (2020) showed that living next to a Christian missionary can lead to a weakened traditional social constraint. We believe that the geographical proximity of places of faith is an important mechanism allowing to better understand the influence of religion on fertility in the sub-Saharan African context. However, our study does not integrate information about the geographical location of (Christian) parishes as we intend to deliver a large-scale comparison of sub-Saharan African countries, all by covering as many religions as possible.

A third limitation linked to the measure of religion in DHS is that DHS does not allow tracing the full set of religious backgrounds. The DHS reports religion at the time of the survey, but not at the time of the birth of the children. In certain populations, however, there may be frequent conversions, particularly during youth (Dasr  and Hertrich, 2020). Finally, the existence of syncretic practices, multiple religious affiliations, or rapid movement between religions (religious shopping) is relatively frequent in many sub-Saharan African countries (Gez et al., 2017; Langewiesche, 2003). In other words, declaring a ‘Book religion’ (Christian, Muslim) is not always synonymous with abandoning traditional beliefs.

Besides the mentioned limits of the measure of religion in DHS, the measure of education in DHS also comes with a shortfall that is relevant for our research question: DHS do not provide information about the kind of school that women have attended during their childhood. We therefore do not know if they have been in a private religious school or in a public school.

Finally, DHS data are cross-sectional. It is therefore not possible to measure a strict causal relationship between religion, education, and fertility. As mentioned above, it is thus not possible to disentangle if the interaction between education and religion is caused by the proximity and/or offered infrastructure of religious communities including

⁴ <https://dhsprogram.com/topics/wealth-index/#:~:text=The%20wealth%20index%20is%20a,water%20access%20and%20sanitation%20facilities>.

schools, religious norms or other reasons. In general, using cross sectional data does not allow addressing endogeneity between education and fertility, which makes it impossible to claim causality.

Due to these data limitations, the mechanisms through which religion potentially affects the association between education and fertility remain not fully identified in our empirical setting. In our conclusion section, we nevertheless mention potential causal mechanisms and point to methods that are complementary to our comparative analytical setup and that would allow to model these mechanisms more explicitly.

However, despite those limitations, this research allows to show if the association between education and fertility is different between religions. For the set of countries where there is no differential association, we are able to conclude that religion does not interfere with the education-fertility-association. For countries where a differential is found, we can see precisely at which education level (primary, secondary) religion interferes with the education-fertility-association. Identifying the group of sub-Saharan countries in which religion interferes will ultimately facilitate the set-up of follow-up qualitative and/or quantitative studies that are necessary to understand why religion shapes the education-fertility association in some contexts but not in others in sub-Saharan Africa.

4. Results

In view of the large number of results produced (estimation results for 23 countries, plus descriptive statistics), we present in the core manuscript –besides descriptive statistics presented in Fig. 1 and Table 1– a summary of estimation results in Table 2, as well as some specific estimation results that are illustrated in Fig. 2. Further descriptive and estimation results are presented in Appendix I and II.

Fig. 1 shows the number of children ever born of women aged 40–49 (i.e. observed at the end of their reproductive period to focus on ‘completed’ fertility) by religion for the 23 countries. Countries are sorted by the mean number children for Muslim women.⁵

Fig. 1 shows that in most countries (18 out of 23), Muslim women have more children on average than Christian ones. The 5 countries where Muslim women have fewer children than Christian women are Burundi, Chad, Congo, Gabon and Mozambique. In countries where sample size is sufficiently large to treat women declaring a traditional religion as primary one as a separate group (blue points in Fig. 1), women declaring a traditional religion tend to have more children than women of other religions. In countries with women declaring no religion (black points in Fig. 1), these women most often have a higher average number of children than other religious categories, except for traditional religions. This result should be interpreted with caution. It is possible that there exists a confusion between the categories “no religion” and “traditional religion” in several countries: the absence of religion may not be read in the secular sense of the term and therefore may cover several realities, including atheism and refusal to identify with (only) one of the other modalities proposed by the survey.

Table 1 presents the distribution of women aged 15 to 49 by religion as well as by education, country-by-country.

Table 1 shows that within our sample of 23 countries covering women aged 15–49, 15 countries are predominantly Christian (>50 % of the population), 7 are predominantly Muslim and 1 country has no religious group with more than 50 % of the population. Women declaring themselves as having no religion or practicing traditional religions are never in the majority. However, even if Table 1 shows that women who declare themselves belonging primarily to a traditional religion represent a minority in many countries, qualitative studies indicate that traditional religions remain very important for everyday life in many sub-Saharan African countries: They often exist in juxtaposition to the practice of another religion (Lasseur and Mayrague,

2011), integrated into socio-cultural traditions and therefore not necessarily perceived by the respondents as a religion in the strict sense.

Further descriptive statistics presented in Appendix I show how women aged 15–49 are distributed over education within each of the four religious groups. Christian women are the most educated religious community in 21 countries in the corpus, with proportionally more female respondents with secondary and higher education in comparison to other religions. Congo and Burundi are the two countries in which Muslim women are the most educated.

With three exceptions, women who declared themselves to have no religion or who practice traditional religions are less educated than those of the ‘Book religions’ (Christian and Muslim). In Cameroon and Chad, Muslim women are less educated than women who declare no religion.

In our regression analysis, we model with a quasi-Poisson model the number of children ever born as a function of religion, education, age, region of residence within the country, place of residence within the country (urban/rural), household wealth (in quintiles) and marital status (single, monogamy, polygamy) – separately for each country. Our first simple model is run without an interaction term and is written as follows:

$$CEB = \alpha + \beta_1 religion + \beta_2 education + \beta_3 age + \beta_4 region + \beta_5 place\ of\ residence + \beta_6 marital\ status + \beta_7 wealth + \varepsilon$$

In a second model, we introduce an interaction term between religion and education. This model can be written as follows:

$$CEB = \alpha + \beta_1 religion + \beta_2 education + \beta_3 age + \beta_4 region + \beta_5 place\ of\ residence + \beta_6 marital\ status + \beta_7 wealth + \beta_8 religion * education + \varepsilon$$

All models have been estimated separately for each of the 23 countries.

Table 2 summarizes for each country the core results of our regressions, i.e. the ones related to religion: columns 1 to 4 present the estimated coefficient β_1 for the different categories of religion based on Model 1 (without the interaction term), and the last column presents the global p-value (95 % significance level) (type III⁶) of the interaction between religion and education (β_8), based on Model 2.

The full set of estimated coefficients and global p-values of Model 2 are shown in Appendix II for all 23 countries (including results based on the earliest DHS wave for countries for which more than one wave is available). Full estimation results of Model 1 are available on request.

Overall, education is the variable that is most associated with fertility in all countries, even when controlled for, and interacted with, religion. The estimated education coefficients in Model 1 (not shown here) indicate a significant negative association between education and fertility, with lower educated women having more children than higher educated women, for all 23 countries. While the difference in fertility is important between all education groups (none, primary, secondary, tertiary) in most of the countries, the difference is strongest when moving from primary to a higher education level. The finding that the switch from no education to primary education is less important for the fertility decline than the switch from primary to secondary education in sub-Saharan African countries is in line with hitherto existing empirical findings (see for example De la Croix and Gobbi, 2014).

Focusing now on religion, Columns 1 to 4 in Table 2 show that religion is significantly associated with the number of children ever born in only half of the covered countries (12 out of 23 countries), once the socio-demographic structure (education, age, region, place of residence, marital status and wealth) is controlled for in the Poisson model. In these 12 countries, Christianity is always associated with lower fertility levels than Islam. This is in line with previous findings on the subject (see for example Turner and Götmark, 2023).

Note that when education is excluded from Model 1, religion is significantly associated with fertility in a total of 18 out of 23 countries (while controls for age, region, place of residence, marital status and

⁵ There are no Muslim women in DHS for Zimbabwe and Angola.

⁶ Type III test are required to test interaction terms significance.

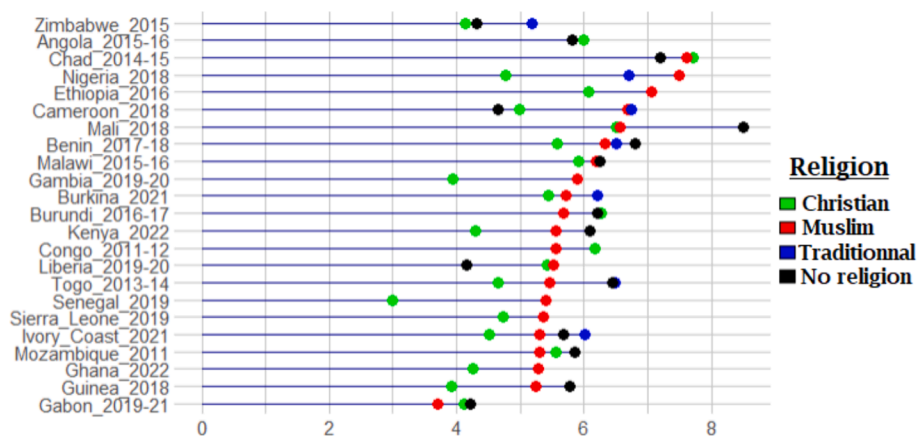


Fig. 1. Mean number of children ever born by religion for women aged 40–49. Data source: DHS in the years and countries concerned Sample: Women aged 40–49, at written year and country.

Table 1
Distribution of women aged 15–49 by education and by religion.

Country and year	Education				Religion			
	% No Education	% Primary	% Secondary	% Higher	% Christian	% Muslim	% Traditional	% No religion
Angola 2015–2016	22	34.9	38.4	4.8	94.8	–	–	4.9
Benin 2017–2018	55.2	19.7	23	2	55.7	9.3	30	5.1
Burkina 2021	58.2	14.2	25.3	2.3	33	63.8	–	3.1
Burundi 2016–2017	36.1	39.3	23.4	1.3	95.8	3.2	–	1
Cameroun 2018	21.8	27.7	43.2	7.3	72	24.4	1.8	1.9
Chad 2014–2015	62.3	22.7	14	1	44.5	52.6	–	2.9
Congo 2011–2012	7.3	30.9	58	3.8	69.7	27.5	–	2.8
Ethiopia 2016	47.3	35.3	11.7	5.6	70.2	29.8	–	–
Gabon 2019–2021	6.6	15.2	64.1	14.1	87.8	7.6	–	4.6
Gambia 2019–2020	34.7	15.6	42.3	7.3	3.5	96.5	–	–
Ghana 2022	14.7	13.7	61.2	10.5	79.9	20.1	–	–
Guinea 2018	68.9	11.5	15.7	3.9	12.5	86	–	1.5
Ivory Coast 2021	49.3	18.5	26.8	5.4	49.2	44.6	2.2	4
Kenya 2022	5.4	36.3	39.1	19.2	91.6	7.3	–	1.1
Liberia 2019–2020	30.6	23.7	39.9	5.9	84.4	14.4	–	1.2
Malawi 2015–2016	12.1	62.1	22.8	3	83	15.7	–	1.2
Mali 2018	65.4	13.2	19.3	2.1	2.9	94.2	–	2.9
Mozambique 2011	31.6	50.4	16.6	1.3	74	15.3	–	6.7
Nigeria 2018	35	14.4	39.6	11	46	53.6	0.3	–
Senegal 2019	47.3	21.1	27.3	4.3	2.7	97.3	–	–
Sierra Leone 2019	45.5	13.5	36.8	4.3	23.2	76.8	–	–
Togo 2013–2014	31.8	33.5	31.4	3.3	63.3	15.1	15.3	6.2
Zimbabwe 2015	1.3	25.8	65.5	7.4	94.4	–	0.6	4.9

Data source: DHS at written year and country.
Sample: Women aged 15–49, at written year and country.

wealth are maintained; results available on request). This number is reduced to 12 once education is included in the model.

If religion remains statistically correlated with fertility in around one out of two of the 23 countries in our corpus once controlled for education, it should be noted, however, that the values of the religion coefficients of the Poisson model presented in Model 1 are relatively low compared to the other socio-demographic characteristics of individuals in these 12 countries, in particular compared to education.

Finally, the last column of Table 2 provides information about our core research question, namely whether the negative association between education and fertility holds for all religious groups and whether the association is similarly strong for all religious denominations.

To answer this question, we first interpret the global p-value (type III) of the interaction term between education and religion, estimated with Model 2. If the global p-value is lower than 0.05, the interaction is significant, suggesting that the association between education and fertility differs with respect to women’s religious affiliation.

Among the 23 countries of our sample, the interaction term is significant in 10 countries (p-values printed in bold in Table 2): Angola,

Benin, Burundi, Cameroun, Congo, Ghana, Ivory Coast, Kenya, Nigeria and Senegal.

Therewith, the interaction between women’s level of education and religion is found to be not statistically significant in most countries of our sample: In 13 out of 23 sub-Saharan African countries, the association between education and fertility does *not* depend on the religion of the women. In other words, the negative association between education and fertility is the same for Christian, for Muslim women and for women belonging to a Traditional religion.

Interpreting the significant interaction term that we find for 10 countries must be done with caution, as focusing on the p-value only can be misleading. Besides the p-value, we also must consider if the interaction is strong and universal, or if differences in fertility levels between religious groups are limited to specific education groups or driven by distinct fertility behavior of specific religious minorities.

To answer this question, Fig. 2 illustrates the number of children predicted by the Poisson regression model for all crossings of the religion/education interaction for the 10 countries where the interaction term was found significant.

Table 2
 Estimated coefficients of type of religion (β_1 of Model 1) and global p-value (type III) of the interaction between religion and education (β_8 of Model II) – Poisson regression of the number of children ever born of women aged 15–49.

Country and year of the survey	Model 1				Model 2
	Christian	Muslim	Traditional religions	No religion	Religion-education Interaction global P-value
	β	β	β	β	
Angola 2015–2016	Ref	–	–	–0.1**	0.049
Benin 2017–2018	Ref	0.01	0.02	0.01	0.044
Burkina Faso 2021	Ref	0.03**	0.08***	–	0.2
Burundi 2016–2017	Ref	0.07	–	0.08	<0.001
Cameroun 2018	Ref	0.05	–0.12	–0.27**	<0.001
Chad 2014–2015	Ref	0.03	–	–0.06	0.079
Congo 2011–2012	Ref	0.06	–	–0.05	0.037
Ethiopia 2016	Ref	0.08**	–	–	0.063
Gabon 2019–21	Ref	–0.09	–	–0.04	0.5
Gambia 2019–2020	Ref	0.14	–	–	0.8
Ghana 2022	Ref	0.02	–	–	0.01
Guinea 2018	Ref	0.11**	–	0.25**	0.2
Ivory Coast 2021	Ref	0.03*	0.1***	0.08**	<0.001
Kenya 2022	Ref	0.07*	–	0.07	0.003
Liberia 2019–2020	Ref	–0.02	–	0.04	0.3
Malawi 2015–2016	Ref	0.07***	–	0.07	0.3
Mali 2018	Ref	–0.02	–	0.11*	0.2
Mozambique 2011	Ref	–0.05	–	0.03	0.2
Nigeria 2018	Ref	0.13***	–	0.16***	<0.001
Senegal 2019	Ref	0.15	–	–	0.014
Sierra Leone 2019	Ref	0.02	–	–	0.8
Togo 2013–2014	Ref	0.03	0.1***	0.12***	0.4
Zimbabwe 2015	Ref	–	0.31***	0.03	0.14

*p < 0,05; ** p < 0.01; *** p < 0.001.

Data source: DHS at written year and country; Sample: Women aged 15–49, at written year and country.

Dependent variables in Model 1: education, religion, age, region, place of residence, marital status and wealth.

Dependent variables in model 2: education, religion, age, region, place of residence, marital status and wealth, education * religion

How to read the table: In Angola, women who declared themselves with no religion have significantly less children than Christian ones (Model 1). The interaction between religion and education is globally significant (p = 0,049; Model II) This implies that the significantly negative association between education and fertility is found to be different between Christian women and women with no religion in Angola.

Fig. 2 shows that, globally, the fertility level decreases with education for all religious affiliations. It illustrates furthermore that the significant religion/education interaction in these 10 countries is driven by an important difference in fertility levels within one specific level of education and/or between one specific religion in comparison to the other religions. Fig. 2 suggests that there exists a specificity of women declaring a traditional religion and/or no religion. For example, within the group of women with primary and/or higher education, these women have significantly higher fertility levels than Christian and Muslim women in Benin, Burundi, Ivory Coast, and Cameroun.

However, these results must be interpreted with caution as women declaring a traditional religion or no religion are often few in numbers, in particular if highly educated, which implies a significant level of random variability.

In order to see in how far the significant interaction terms are driven by the minority group of women declaring a traditional religion or no religion, we reproduce our analyses for these countries while focusing only on Christian vs. Muslim women. These analyses show that the interaction remains significant in only 5 countries: Burundi, Ghana, Kenya, Nigeria and Senegal.

Except for Kenya and Nigeria, the interaction is significant due to differences in fertility levels between Christian and Muslim women that exist only within the specific group of women with the highest level of education: in Burundi, Ghana and Senegal, only within the group of women with higher education, Muslim women have considerably higher fertility levels than Christian women. In Kenya, Muslim women have significantly higher fertility levels than Christian women only within the group of women with primary education. In Nigeria, the difference between Christian and Muslims is largest for the most educated women, but Muslims women have higher fertility levels than Christian women in all education groups.

This leads us to the core result of our analysis: In only 4 out of 23 sub-Saharan African countries (Nigeria, Ghana, Senegal, Burundi), the negative educational gradient of fertility is significantly weaker for Muslim than for Christian women, indicating that higher educated women have a somewhat higher fertility level if Muslim than if Christian. However, in these 4 countries, the fertility difference between higher educated Muslim and higher educated Christian women remains quite small, and both Muslim and Christian women have a lower fertility level if higher educated than if lower educated.

To better understand the drivers of the fertility gap between higher educated Muslim and Christian women, we propose an additional analysis for this group of countries. Our purpose is to see if the gap appears, in particular at early in life, which would suggest that the incarceration effect is more important for higher educated Christian than for higher educated Muslim women, or if the gap exists over the whole life cycle.

To investigate these life-cycle aspects, we take advantage of the availability of retrospective data including date of birth, to reconstitute the average number of children that women aged 40–49 at the time of the survey had at every age between 15 to 49 years old. We apply this methodology to two countries for which we find that the fertility gap between Muslim and Christian women is limited to higher educated women⁷: Burundi and Ghana.

Fig. 3 illustrates that the fertility gap between higher educated Christian and Muslim women evolves very differently over age when comparing Burundi and Ghana, while age patterns are very similar for lower educated Christian and Muslim women within both countries. In Burundi, the fertility differences between higher educated Christian and Muslim women appear at an early stage of their reproductive lives: the gap between the two curves is growing from ages 15 to 25 and stays rather stable for higher ages. It seems thus that the incarceration effect is more important for higher educated Christian than for higher educated Muslim women, implying that in Burundi, higher educated Christian women delay childbirth more than higher educated Muslim women at early stages, do not catch up in later stages and thus end up with fewer children at the end of their reproductive life (4,47 children on average for higher educated Christian women and 5,12 for higher educated Muslim women aged 40 to 49 at the time of the survey in 2016/2017).

⁷ We do not include Senegal due to the few numbers of high educated Christian women. For the same reason we had to aggregate women with secondary and higher level of education together for Burundi and Ghana. Nigeria is not considered because a fertility gap between Christian and Muslim women exists for all education groups (albeit being highest for high educated women).

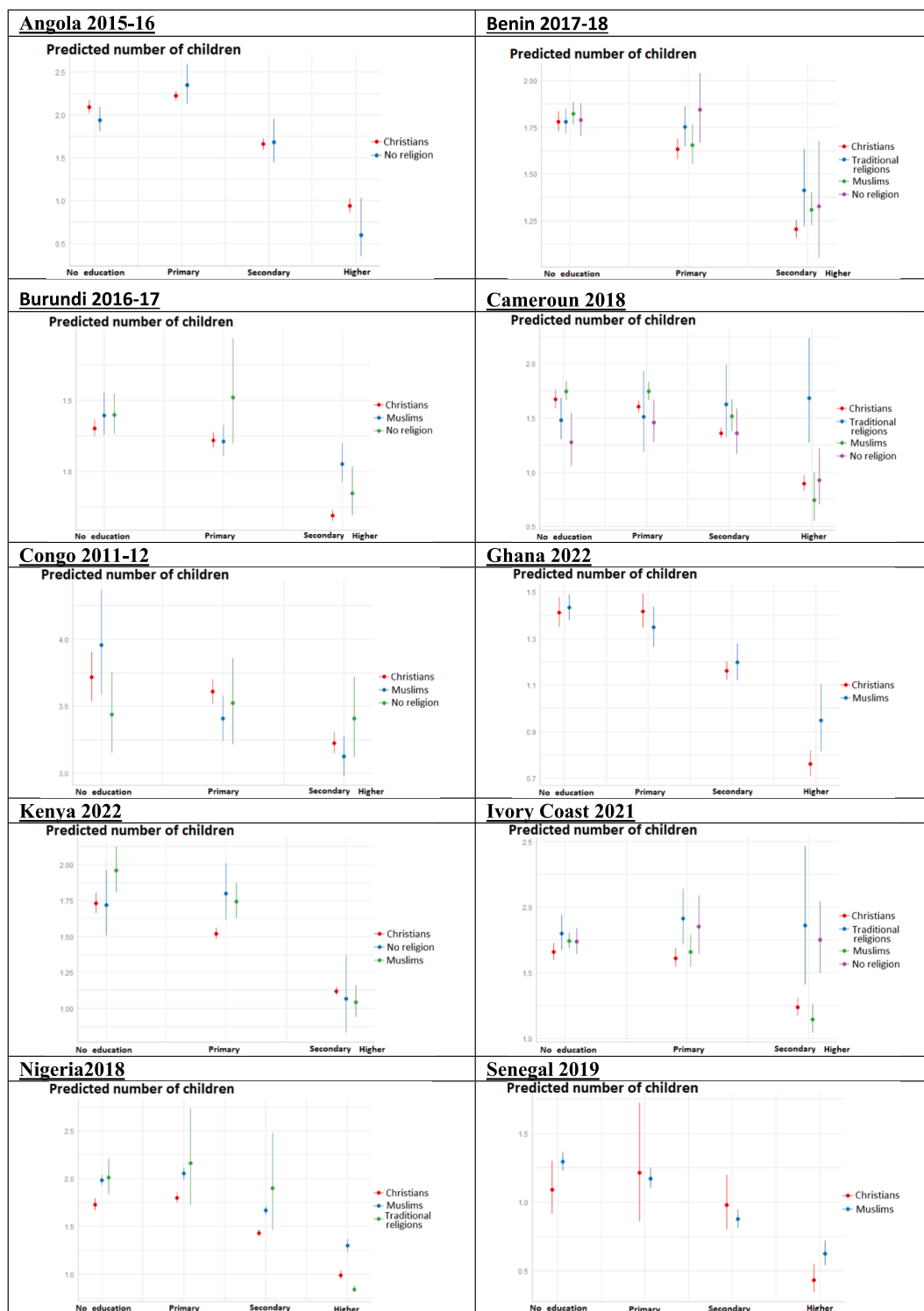


Fig. 2. Predicted number of children by education and religion combined. Data . Source: DHS in the years and countries concerned; Sample: Women aged 15-49, at written year and country. Note: Each point represents the average offspring that women in the country would have if they were all of the same religion and education level, all other things being equal (age, region, place of residence, marital status and wealth)

In Ghana, on the contrary, there is no difference in the curves for higher educated Muslim and higher educated Christian women before the age of 35, implying similar timing and intensity of childbirth at the earlier stages of reproductive life. The fertility gap appears quite late, only after age 30, implying that higher educated Christian women stop extending their families at lower parity than their Muslim counterparts

(3,87 children on average for higher educated Christian women and 4,51 for higher educated Muslim women aged 40 to 49 at the time of the survey in 2022). The fact the gap appears only at the end of the reproductive life may reflect different preference for the quantum of fertility between higher educated Christian and Muslim women.

The lowering effect of education on fertility appears thus to be

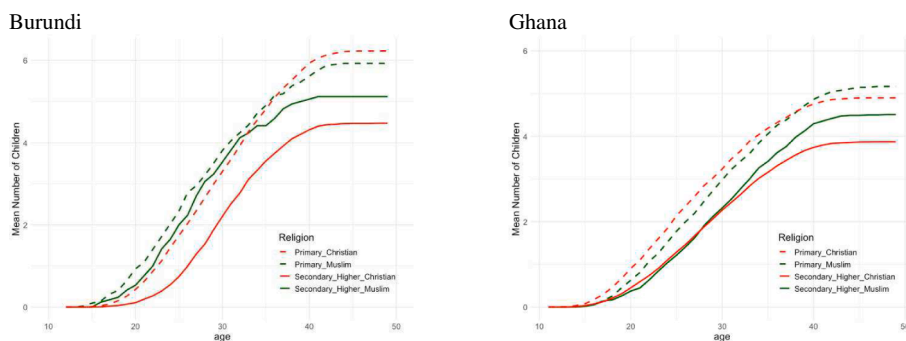


Fig. 3. Mean number of children by age, education and religion for women aged 40–49 years old at the latest available DHS-survey Data source: DHS 2017–2018 for Burundi, DHS 2022 for Ghana; Sample: Women aged 40–49.

stronger for Christian than for Muslim, in particular, at the earlier stages of reproductive life in Burundi, and rather at the later stages of reproductive life in Ghana. This suggests that no general conclusions can be drawn to explain the fertility gap between educated Christian and Muslim women in these two countries. What Fig. 3 illustrates above all else is the lowering effect of education on fertility that exists over the whole life cycle, independent of religion: in both countries and for both Christian and Muslim women, higher educated women have lower fertility levels than lower educated women, and that since the beginning of their reproductive life.

Finally, to consider eventual changes over time, we analyze the religion-education interaction by comparing our results based on the newest available DHS wave to those based on the oldest DHS surveys available for each country. The oldest available waves vary from 1988 for Togo to 2013 for Gambia. The time delay between the oldest and the newest available wave varies from 6 years in Burundi to 26 years in Togo.

Regression results of Model 2 based on the earliest as well as the most recent wave are presented in Appendix II for each country. For Angola, Burundi, and Gambia, we only dispose of one wave.

The time comparison is important, as over the last decades, sub-Saharan African countries have faced important social and demographic changes. On the one hand, a fertility decline has been observed in many countries, and on the other hand, the level of education has been on the rise. It could therefore be misleading to conclude that the impact of religion on the association between education and fertility is weak based on a single cross-sectional dataset. Even if our models control for age, it remains possible that different age groups experienced different religious and educational experiences. However, modelling regressions by age-groups is difficult due to sample size, which is why we propose a comparison of different waves as an alternative.

Results presented in Appendix II show that in 14 out of 20 countries, the statistical significance of the interaction between education and religion on fertility remains the same between the earliest and the most recent wave. For Benin, Congo, Kenya, and Nigeria, the interaction has remained significant over time. For Burkina Faso, Ethiopia, Gabon, Guinea, Liberia, Malawi, Mali, Sierra Leone, Togo, and Zimbabwe, the interaction has remained insignificant. Amongst the 6 countries where the interaction varies over time, there are 2 countries for which the interaction has disappeared between the earliest and the most recent wave (Chad and Mozambique), and 4 countries for which the interaction is significant in the most recent but not the earliest wave (Cameroon, Gambia, Ivory Coast and Senegal).

In these 6 countries, the time-variations are mainly driven by changes specifically related to highly educated women. In Chad, amongst the higher educated, women declaring no religion had a significantly lower fertility level than Muslim and Christian women in 1996/97, and this difference disappeared in 2014/15. This is similarly the case in Mozambique when we compare waves 1997 to 2011. In

Cameroon and Ivory Coast, amongst the higher educated, traditional women had significantly higher fertility levels than those of other religious groups in the most recent wave (2018 in Cameroon, 2021 in Ivory Coast), but not the earliest wave (2004 in Cameroon, 1998/99 in Ivory Coast). In Senegal and Ghana, amongst the higher educated, Muslim women had significantly higher fertility levels than those of other religious groups in the most recent wave (2019 in Senegal, 2022 in Ghana) but not in the earliest wave (2008 in Senegal, 2003 in Ghana).

As amongst our sample of 20 countries, for which at least two waves are available, the interaction stays unchanged in 14 countries and gets weaker in 2 countries, our time comparison shows that the impact of religion on the association between education and fertility has not become stronger over time in most sub-Saharan African countries.

5. Discussion

The aim of this article was to investigate whether the association between women's education and fertility differs in intensity according to religion in sub-Saharan Africa.

Our study shows that there is no empirical evidence that the negative association between education and fertility is weaker for some religions than for others in the majority of sub-Saharan African countries. First, the education-fertility association is not significantly differentiated by religion in 13 out of 23 countries. Amongst the remaining 10 countries for which we find a significant interaction between religion and education, in 5 countries the differentiation by religion is limited to the minority of women belonging to a traditional religion (i.e. women with a traditional religion are found to have significantly higher fertility levels than Christian and Muslim women within the group of women with primary and/or higher education). In only 5 out of 23 sub-Saharan African countries, fertility levels are found to be significantly different between Muslims and Christian women. The negative educational gradient of fertility is weaker for Muslim women than for Christian women in 4 out of 23 sub-Saharan African countries: Burundi, Ghana, Senegal and Nigeria (higher educated Muslim women have fewer children than higher educated Christian ones, while lower educated women have similarly high levels). The negative educational gradient of fertility is stronger for Muslim than for Christian women in one country: Kenya (lower educated Muslim women have more children than higher educated Muslim women, while higher educated women have similarly low fertility levels). In each case, the fertility-difference between Muslim and Christian women is limited to one specific education group. This is the one of higher educated women for the four countries for which we found a weaker negative educational gradient of fertility for Muslim than for Christian women. However, even in those few countries and within this specific level of education, fertility differences between religious groups are quiet low – and much lower than fertility differences between education groups.

Why is fertility lower for Muslim than for Christian women amongst higher educated women in these few countries? Our life-cycle approach

suggests that no generally valid conclusions can be made, as we found that in Burundi, higher educated Christian women limit fertility more than their Muslim counterparts at the beginning of their reproductive ages, while they do so rather at the end of their reproductive years in Ghana. At the same time, we find that for both Christian and Muslim women, higher educated women have lower fertility levels than lower educated women since the beginning of their reproductive life. Our finding of a lowering effect of education on fertility is thus generally valid for sub-Saharan African countries, even in those few countries for which the negative correlation between education and fertility is found to be weaker for Muslim than for Christian women.

While it is impossible to fully capture causal mechanisms with DHS data, our analysis allows shedding light on the role of religion and education for the demographic transition in sub-Saharan Africa. Important parts of the education system are held by religious congregations in many sub-Saharan African countries, and one might ask if this weakens the effect of education on fertility. This question seems to be particularly relevant for higher education, as the offer in higher education had to grow up very fast in order to meet the rising number of students in many African countries over the last two decades, and an important number of universities are private and confessional. An important difference between the secondary level and the higher level is thus the source of funding in sub-Saharan African countries. While the secondary level is mainly locally funded, confessional universities are often funded by international religious organizations (the united Methodist Church for Christians, for example, or the Organization of the Islamic Conference for Muslims) (Karram, 2011). Lindow (2007) has documented how sub-Saharan Africa’s universities have become a way to mitigate a certain vision of Islam for countries such as Iran and Saudi Arabia. In a field interview at the Islamic University in Uganda, Lindow stated that “students and faculty members alike insist that they have not been swayed by Saudi influences. Yet many agree that their experiences here have opened them to a different form of Islam.”

Some countries for which we found a significant interaction between education and fertility are mentioned by Lindow (2007), such as Ghana, Kenya or Nigeria. The development of confessional high schools seems to be particularly strong in those countries since the beginning of the 21st century. Thaver (2008) found that their number has increased by 70 % from 2003 to 2008 in Ghana, Nigeria, Kenya, Tanzania, Uganda and Zimbabwe.

It is therefore possible that the introduction of a more conservative vision of Islam has led to a higher preference for fertility for women who went to those universities in these countries, or for women whose partners went there.

However, at this stage it is premature to draw such conclusions. Most Muslim universities are also welcoming Christian students (Karram, 2011), and so far, little is known about the exacts scholar contents of these schools and how students receive them. Exploring this field

qualitatively would be an important step for future research.

For quantitative analysis, a more substantial interpretation of our results is rather difficult, if not impossible due to the limited availability of adequate data. The cross-sectional character of DHS data does not allow the empirical modelling of causal mechanisms by covering a large part of sub-Saharan African countries. To better identify causal impacts, country-specific studies based on longitudinal survey data as well as qualitative case-studies emerge as complementary to our comparative analytical set-up.

Our results strongly suggest, however, that school is a means of emancipating women per se in sub-Saharan Africa. This emancipatory role of the school seems to succeed in modifying the reproductive norms of women, whatever their religious background. While the important role of education on fertility already has been shown for this region by several other studies, our study goes an important step further: By proposing a country-by-country analysis for sub-Saharan Africa rather than a multi-level analysis that groups different countries together and assumes uniform associations, the present study shows that the Muslim religion is *not* related to a weaker negative educational gradient of fertility in comparison to the Christian religion in the large majority of sub-Saharan African countries.

CRedit authorship contribution statement

Ho l Berger: Writing – review & editing, Writing – original draft, Formal analysis. **Aur lien Dasr :** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

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Appendix I. Distribution of women aged 15-49 over education, within religious groups

Survey	Christian			Muslim			Traditional			No religion		
	No education	Primary	Secondary+	No education	Primary	Secondary+	No education	Primary	Secondary+	No education	Primary	Secondary+
Angola 2015-16	20,5	35,1	44,4							49,6	30,8	19,6
Benin 2017-18	43,6	24	32,4	69,6	12,6	17,8	67,9	20,1	12	74,6	14,1	11,3
Burkina Faso 2021	47,3	16,1	36,5	62,6	13,6	23,8	82,4	8,4	9,2			
Burundi 2016-17	36,2	39,4	24,4	18,2	44,6	37,3				82,2	15,6	2,2
Cameroun 2018	10,6	27,6	61,8	50,5	28,6	20,9	71,6	17	11,4	33,4	28,9	37,7
Chad 2014-15	36,6	37,9	25,5	83,7	10	6,3				69,9	22,7	7,4
Congo 2011-12	7,3	32,2	60,5	5,9	27	67,2				22,9	36,6	40,4
Cote d’Ivoire 2021	32,1	24,7	43,2	22,3	11,9	22,3	74,8	15,4	9,9	63,6	17,9	18,5
Ethiopia 2016	36,5	42,1	21,4	48,9	40,8	10,3						
Gabon 2019-21	4	14,7	81,3	36,4	18	45,6				7,1	20,5	72,4
Gambia 2019-20	12,5	13,5	74	35,5	15,7	48,8						
Ghana 2022	9,7	13,7	76,7	34,6	13,7	51,7						

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Survey	Christian			Muslim			Traditional			No religion		
	No education	Primary	Secondary+	No education	Primary	Secondary+	No education	Primary	Secondary+	No education	Primary	Secondary+
Guinea 2018	63,8	15,6	20,6	69,4	10,9	19,7				78,6	13,7	7,7
Kenya 2022	3,3	36,4	60,4	30,8	34,9	34,3				17,8	37,8	44,4
Liberia 2019-20	27,5	24,5	48	46,9	17,6	35,5				51,6	34,4	14
Malawi 2015-16	11,9	62,7	25,3	19,6	68,4	12				33,9	61,2	4,9
Mali 2018	53	16,3	30,7	65,3	13,2	21,5				80,4	11,3	8,3
Mozambique 2011	25,2	51,4	23,4	32	52	16				44,9	46,3	8,8
Nigeria 2018	8,7	16,2	75,1	57,3	12,9	29,8	71,6	14,8	13,6			
Senegal 2019	15,6	15,7	68,7	48,2	21,3	30,5						
Sierra Leone 2019	29,9	13,3	56,8	50,2	13,5	36,3						
Togo 2013-14	19,8	33,6	46,6	39,1	25,1	35,8	68,8	22,3	8,9	49,3	34,2	16,5
Zimbabwe 2015	1,1	24,7	74,2				3,7	35,8	60,5	4,9	46,6	48,5

Data source: DHS at written year and country.

Sample: Women aged 15-49, at written year and country.

Appendix II. Poisson models: Full results for all countries and DHS waves

Angola 2015-2016

Characteristic	Modality	Beta	p-value
Education	No education	—	
	Primary	0.06	<0.001
	Secondary	-0.23	<0.001
	Higher	-0.8	<0.001
Religion	Christian	—	
	No religion	-0.08	0.028
Type of place of residence	Urban	—	
	Rural	-0.05	0.022
Age	15-19	—	
	20-24	1.4	<0.001
	25-29	1.9	<0.001
	30-34	2.2	<0.001
	35-39	2.5	<0.001
	40-49	2.5	<0.001
Region of residence	Other regions	—	
	Namibe	0.05	0.05
	Cuanza Sul	-0.02	0.4
	Lunda Norte	-0.08	0.005
Wealth	Richer	—	
	Poorer	0.32	<0.001
	Poor	0.29	<0.001
	Middle	0.21	<0.001
	Rich	0.11	<0.001
Marital status	Monogamous	—	
	Polygamous	-0.03	0.087
	Not in union	-0.42	<0.001
Religion – education Interaction	Primary * No religion	0.13	0.023
	Secondary * No religion	0.09	0.3
	Higher * No religion	-0.37	0.2
	P-value (type III)		0.049

Benin

Characteristic	Modality	1996		2017-2018	
		Beta	p-value	Beta	p-value
Education	No education	—		—	
	Primary	-0.14	<0.001	-0.09	<0.001
	Secondary Higher	-0.61	<0.001	-0.39	<0.001
Religion	Christian	—		—	
	Traditional	0.03	0.2	0	>0.9
	Muslim	0	0.9	0.2	0.13
	No religion	0	>0.9	0	0.8
Type of place of residence	Urban	—		—	
	Rural	0.11	<0.001	0.05	<0.001
Age	15-19	—		—	
	20-24	1.5	<0.001	1.6	<0.001
	25-29	2.2	<0.001	2.3	<0.001
	30-34	2.6	<0.001	2.7	<0.001
	35-39	2.9	<0.001	2.9	<0.001

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Characteristic	Modality	1996		2017-2018	
		Beta	p-value	Beta	p-value
Region of residence	40-49	3.1	<0.001	3.1	<0.001
	Borgou_Donga_Alibori	NM	NM	—	—
	Borgou	—	—	NM	NM
	Oueme	-0.06	0.11	NM	NM
	Mono_Zou	-0.02	0.5	NM	NM
	Collines_Plateau_Oueme_Littoral	NM	NM	-0.04	0.021
	Couffo_Mono_Zou	NM	NM	-0.03	0.2
	Atacora	0.06	0.13	0.09	<0.001
Wealth	Atlantic	-0.07	0.1	0	0.9
	Richer	—	—	—	—
	Poorer	—	—	0.3	<0.001
	Poor	—	—	0.26	<0.001
Marital status	Middle	—	—	0.21	<0.001
	Rich	—	—	0.14	<0.001
	Monogamous	—	—	—	—
	Polygamous	-0.04	0.005	-0.02	0.065
Religion – education interaction	Not in union	-0.55	<0.001	-0.45	<0.001
	Primary * Traditional	0.13	0.009	0.07	0.053
	Secondary Higher * Traditional	0.61	0.003	0.16	0.045
	Primary * Muslim	0.1	0.12	-0.01	0.8
	Secondary Higher * Muslim	0.18	0.013	0.06	0.12
	Primary * No religion	0.13	0.076	0.12	0.046
	Secondary Higher * No religion	0.6	<0.001	0.09	0.5
P-value (Type III)	—	<0.001	—	0.044	

Benin_No religious minority

Characteristic	Modality	1996		2017-2018	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	-0.12	<0.001	-0.09	<0.001
	Secondary Higher	-0.58	<0.001	-0.39	<0.001
Religion	Christian	—	—	—	—
	Muslim	0.01	0.9	0.03	0.93
Type of place of residence	Urban	—	—	—	—
	Rural	0.11	<0.001	0.04	0.003
Age	15-19	—	—	—	—
	20-24	1.5	<0.001	1.6	<0.001
	25-29	2.3	<0.001	2.3	<0.001
	30-34	2.7	<0.001	2.7	<0.001
	35-39	3	<0.001	2.9	<0.001
	40-49	3.2	<0.001	3.1	<0.001
Region of residence	Borgou_Donga_Alibori	NM	NM	—	—
	Borgou	—	—	NM	NM
	Oueme	-0.04	0.4	NM	NM
	Mono_Zou	0.01	0.8	NM	NM
	Collines_Plateau_Oueme_Littoral	NM	NM	-0.04	0.05
	Couffo_Mono_Zou	NM	NM	-0.02	0.4
	Atacora	0.05	0.3	0.08	<0.001
	Atlantic	-0.08	0.1	0.02	0.5
Wealth	Richer	—	—	—	—
	Poorer	—	—	0.31	<0.001
	Poor	—	—	0.26	<0.001
	Middle	—	—	0.22	<0.001
Marital status	Rich	—	—	0.14	<0.001
	Monogamous	—	—	—	—
	Polygamous	-0.05	0.02	-0.01	0.2
Religion –education interaction	Not in union	-0.69	<0.001	-0.47	<0.001
	Primary * Muslim	0.09	0.2	-0.01	0.8
	Secondary Higher * Muslim	0.16	0.026	0.06	0.13
	P-value (Type III)	—	0.036	—	0.2

Burkina Faso

Characteristic	Modality	1998-99		2021	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	-0.11	0.01	-0.09	<0.001
	Secondary	-0.56	<0.001	-0.36	<0.001
Religion	Higher	-1.2	<0.001	-0.8	<0.001
	Christian	—	—	—	—
	Traditional	0.02	0.3	0.07	0.002

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Characteristic	Modality	1998-99		2021	
		Beta	p-value	Beta	p-value
Type of place of residence	Muslim	0	>0.9	0.03	0.049
	Urban	—	—	—	—
Age	Rural	0.17	<0.001	0.07	<0.001
	15-19	—	—	—	—
	20-24	1.6	<0.001	1.6	<0.001
	25-29	2.3	<0.001	2.2	<0.001
	30-34	2.7	<0.001	2.6	<0.001
	35-39	2.9	<0.001	2.8	<0.001
Region of residence	40-49	3.1	<0.001	3	<0.001
	Centre	NM	NM	—	—
	Ouagadougou	—	—	NM	NM
	Nord	-0.03	0.3	NM	NM
	Est	-0.02	0.5	NM	NM
	Centre sud_Ouest	-0.06	0.044	0.08	0.001
	Sahel_Nord_Centre nord_Boucle Mouhoun	NM	NM	0.07	0.004
	Plateau central_Centre est	NM	NM	0.06	0.024
	Sud ouest	NM	NM	0.09	0.004
	Hauts bassins_Cascades	NM	NM	0.11	<0.001
Wealth	Est	—	—	0.13	<0.001
	Richer	—	—	—	—
	Poorer	—	—	0.27	<0.001
	Poor	—	—	0.23	<0.001
	Middle	—	—	0.19	<0.001
Marital status	Rich	—	—	0.16	<0.001
	Monogamous	—	—	—	—
Religion – education interaction	Polygamous	-0.03	0.035	0	0.8
	Not in union	-0.53	<0.001	-0.66	<0.001
	Primary * Traditional	0.17	0.2	0.11	0.2
	Secondary * Traditional	—	—	0.11	0.2
	Higher * Traditional	0.15	0.5	-0.49	0.3
	Primary * Muslim	0.09	0.052	0.05	0.073
	Secondary * Muslim	0.05	0.6	0.03	0.3
Higher * Muslim	0.16	0.7	-0.11	0.4	
	P-value (Type III)	—	0.3	—	0.2

Burundi

Characteristic	Modality	2016-2017	
		Beta	p-value
Education	No education	—	—
	Primary	-0.07	<0.001
	Secondary Higher	-0.64	<0.001
Religion	Christian	—	—
	Muslim	0.07	0.2
	No religion	0.07	0.14
Type of place of residence	Urban	—	—
	Rural	0.02	0.4
Age	15-19	—	—
	20-24	2.3	<0.001
	25-29	3	<0.001
	30-34	3.4	<0.001
	35-39	3.7	<0.001
	40-49	3.9	<0.001
Region of residence	Other regions	—	—
	Bujumbura Mairie	-0.09	0.015
	North	NM	NM
	Center east	NM	NM
	West	NM	NM
	South	NM	NM
	Muyinga	0.14	<0.001
	Rumonge	0.15	<0.001
Wealth	Richer	—	—
	Poorer	0	0.8
	Poor	-0.05	0.011
	Middle	-0.03	0.1
	Rich	0	>0.9
Marital status	Monogamous	—	—
	Polygamous	-0.04	0.049
	Not in union	-0.61	<0.001
Religion – education interaction	Primary * Muslim	-0.07	0.3

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Characteristic	Modality	2016-2017	
		Beta	p-value
	Secondary Higher * Muslim	0.35	<0.001
	Primary * No religion	0.15	0.2
	Secondary Higher * No religion	0.13	0.2
	P-value (Type III)		<0.001

Burundi - No religious minority

Characteristic	Modality	2010		2016-2017	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	-0.03	0.054	-0.06	<0.001
	Secondary Higher	-0.53	<0.001	-0.63	<0.001
Religion	Christian	—	—	—	—
	Muslim	-0.01	>0.9	0.06	0.3
Type of place of residence	Urban	—	—	—	—
	Rural	0.01	0.8	0.02	0.5
Age	15-19	—	—	—	—
	20-24	2.3	<0.001	2.3	<0.001
	25-29	3	<0.001	3	<0.001
	30-34	3.5	<0.001	3.4	<0.001
	35-39	3.8	<0.001	3.9	<0.001
	40-49	4	<0.001	4	<0.001
Region of residence	Other regions	NM	NM	—	—
	Muyinga	NM	NM	0.15	<0.001
	Bujumbura Mairie	NM	NM	-0.09	0.017
	Rumonge	NM	NM	0.15	<0.001
	Bujumbura	—	—	NM	NM
	North	0.04	0.3	NM	NM
	Center east	-0.03	0.5	NM	NM
	West	0.1	0.027	NM	NM
Wealth	South	0.02	0.6	NM	NM
	Richer	—	—	—	—
	Poorer	0	>0.9	0	>0.9
	Poor	0.01	0.8	-0.05	0.013
	Middle	0.04	0.2	-0.03	0.11
Marital status	Rich	-0.01	0.7	0	>0.9
	Monogamous	—	—	—	—
	Polygamous	-0.03	0.2	-0.04	0.078
Religion – education interaction	Not in union	-0.57	<0.001	-0.61	<0.001
	Primary * Muslim	0.14	0.12	-0.07	0.3
	Secondary Higher * Muslim	0.34	0.001	0.36	<0.001
	P-value (Type III)		0.004		<0.001

Cameroun

Characteristic	Modality	2004		2018	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	-0.09	<0.001	-0.04	0.093
	Secondary	-0.29	<0.001	-0.21	<0.001
Religion	Higher	-0.82	<0.001	-0.63	<0.001
	Christian	—	—	—	—
	Traditional	-0.08	0.1	-0.12	0.062
Type of place of residence	Muslim	0.04	0.13	0.04	0.11
	No religion	0.01	0.8	-0.27	0.005
	Urban	—	—	—	—
Age	Rural	0.05	0.02	0.06	0.006
	15-19	—	—	—	—
	20-24	1.4	<0.001	1.5	<0.001
	25-29	2.1	<0.001	2.1	<0.001
	30-34	2.4	<0.001	2.5	<0.001
	35-39	2.7	<0.001	2.7	<0.001
Region of residence	40-49	2.8	<0.001	2.8	<0.001
	Adamawa	—	—	—	—
	South_center_littoral	0.09	0.01	0.09	0.01
	South_west	-0.01	0.8	-0.16	0.008
	Douala_Yaounde	-0.06	0.13	0.03	0.5
	East	0.12	0.002	0.17	<0.001
	Far North_North	0.13	<0.001	0.12	<0.001
	North West	0.01	0.8	0	>0.9
Wealth	West	0.13	<0.001	0.13	<0.001
	Richer	—	—	—	—

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Characteristic	Modality	2004		2018	
		Beta	p-value	Beta	p-value
	Poorer	0.17	<0.001	0.27	<0.001
	Poor	0.16	<0.001	0.3	<0.001
	Middle	0.16	<0.001	0.22	<0.001
	Rich	0.1	<0.001	0.15	<0.001
Marital status	Monogamous	—		—	
	Polygamous	-0.07	<0.001	-0.06	0.001
	Not in union	-0.42	<0.001	-0.49	<0.001
Religion – education interaction	Primary * Traditional	0.11	0.2	0.06	0.5
	Secondary * Traditional	0.14	0.4	0.3	0.012
	Higher * Traditional			0.76	<0.001
	Primary * Muslim	0.06	0.2	0.04	0.2
	Secondary * Muslim	0.04	0.6	0.06	0.3
	Higher * Muslim	0.12	0.7	-0.23	0.14
	Primary * No religion	0.03	0.6	0.18	0.2
	Secondary * No religion	-0.01	>0.9	0.27	0.032
	Higher * No religion			0.3	0.082
P-value (Type III)		0.8		<0.001	

Cameroun - No religious minority

Characteristic	Modality	2004		2018	
		Beta	p-value	Beta	p-value
Education	No education	—		—	
	Primary	-0.09	<0.001	-0.04	0.1
	Secondary	-0.29	<0.001	-0.2	<0.001
Religion	Higher	-0.81	<0.001	-0.62	<0.001
	Christian	—		—	
Type of place of residence	Muslim	0.05	0.11	0.04	0.12
	Urban	—		—	
Age	Rural	0.04	0.05	0.06	0.005
	15-19	—		—	
	20-24	1.4	<0.001	1.5	<0.001
	25-29	2	<0.001	2.1	<0.001
	30-34	2.4	<0.001	2.4	<0.001
	35-39	2.7	<0.001	2.7	<0.001
Region of residence	40-49	2.8	<0.001	2.8	<0.001
	Adamawa	—		—	
	South_center_littoral	0.08	0.013	0.09	0.011
	South_west	-0.01	0.8	-0.16	0.006
	Douala_Yaounde	-0.06	0.14	0.03	0.4
	East	0.11	0.003	0.17	<0.001
	Far North_North	0.12	<0.001	0.12	<0.001
	North West	0.01	0.9	0	>0.9
Wealth	West	0.12	<0.001	0.12	<0.001
	Richer	—		—	
	Poorer	0.19	<0.001	0.27	<0.001
	Poor	0.18	<0.001	0.3	<0.001
	Middle	0.16	<0.001	0.22	<0.001
	Rich	0.11	<0.001	0.15	<0.001
Marital status	Monogamous	—		—	
	Polygamous	-0.08	<0.001	-0.05	0.004
	Not in union	-0.43	<0.001	-0.49	<0.001
Religion – education interaction	Primary * Muslim	0.06	0.15	0.04	0.2
	Secondary * Muslim	0.04	0.6	0.07	0.3
	Higher * Muslim	0.12	0.7	-0.23	0.14
	P-value (Type III)		0.5		0.2

Chad

Characteristic	Modality	1996-1997		2014-2015	
		Beta	p-value	Beta	p-value
Education	No education	—		—	
	Primary	-0.06	0.002	0.02	0.2
	Secondary Higher	-0.38	<0.001	-0.35	<0.001
Religion	Christian	—		—	
	Muslim	-0.08	0.053	0.03	0.12
Type of place of residence	No religion	-0.11	0.018	-0.06	0.079
	Urban	—		—	
Age	Rural	-0.01	0.5	0	>0.9
	15-19	—		—	
	20-24	1.4	<0.001	1,4	<0.001
	25-29	2	<0.001	2	<0.001

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Characteristic	Modality	1996-1997		2014-2015	
		Beta	p-value	Beta	p-value
Region of residence	30-34	2.4	<0.001	2,4	<0.001
	35-39	2.6	<0.001	2,6	<0.001
	40-49	2.7	<0.001	2,7	<0.001
	Wadi_Fira	NM	NM	—	—
	Batha_lac	—	—	NM	NM
	Mayo Kebbi	0.01	0.8	NM	NM
	BET	-0.12	0.047	NM	NM
	Ouadda	-0.01	0.8	NM	NM
	Salamat	0.03	0.5	NM	NM
	Tandjil	0.06	0.3	NM	NM
	Biltine	-0.07	0.1	NM	NM
	Kanem	-0.01	0.8	NM	NM
	Logone_Occidental_Oriental	0.02	0.7	0.28	<0.001
	Guera	-0.03	0.6	0.32	<0.001
	Moyen_Chari	-0.01	0.8	0.22	<0.001
	Chari_Baguirmi	0.04	0.4	0.22	<0.001
	NDjamena	-0.01	0.9	0.17	<0.001
	Batha_Kanem_Lac_Barth_el_Gazal	NM	NM	0.19	<0.001
	Mandoul_Tandjile	NM	NM	0.26	<0.001
	Mayo_Kebbi_Est	NM	NM	0.25	<0.001
Mayo_Kebbi_Ouest	NM	NM	0.27	<0.001	
Ouaddai_Salamat_Sila	NM	NM	0.19	<0.001	
Borkou_Tibesti_Ennedi	NM	NM	0.01	0.7	
Hadjer_Lamis	NM	NM	0.23	<0.001	
Wealth	Richer	—	—	—	—
	Poorer	—	—	0.05	0.04
	Poor	—	—	0.03	0.2
	Middle	—	—	0.05	0.053
	Rich	—	—	0.02	0.4
Marital status	Monogamous	—	—	—	—
	Polygamous	-0.05	<0.001	-0.03	0.002
Religion – education interaction	Not in union	-0.48	<0.001	-0.44	<0.001
	Primary * Muslim	0.11	0.008	0.04	0.2
	Secondary Higher * Muslim	0.24	0.009	0.1	0.024
	Primary * No religion	0.19	0.2	0.04	0.6
	Secondary Higher * No religion	-0.79	0.043	0.22	0.084
	P-value (Type III)		<0.001		0.079

Congo

Characteristic	Modality	2005		2011-2012		
		Beta	p-value	Beta	p-value	
Education	No education	—	—	—	—	
	Primary	-0.02	0.6	-0.03	0.3	
	Secondary Higher	-0.25	<0.001	-0.14	<0.001	
Religion	Christian	—	—	—	—	
	Muslim	0.31	0.033	0.06	0.3	
	No religion	-0.06	0.6	-0.08	0.14	
Type of place of residence	Urban	—	—	—	—	
	Rural	0.02	0.7	-0.02	0.5	
Age	15-19	—	—	—	—	
	20-24	1.6	<0.001	0.4	<0.001	
	25-29	2.1	<0.001	0.8	<0.001	
	30-34	2.5	<0.001	1.1	<0.001	
	35-39	2.7	<0.001	1.3	<0.001	
	40-49	3	<0.001	1.5	<0.001	
Region of residence	Likouala	NM	NM	—	—	
	Brazzaville	—	—	NM	NM	
	Pointe Noire	0.06	0.063	NM	NM	
	Sud	0.1	0.013	NM	NM	
	Nord	0.1	0.084	NM	NM	
	Kouilou_Niari	NM	NM	-0.13	<0.001	
	Brazzaville_Pointe Noire	NM	NM	-0.15	<0.001	
	Lekoumou	NM	NM	-0.14	<0.001	
	Bouenza	NM	NM	-0.13	<0.001	
	Pool	NM	NM	-0.17	<0.001	
	Plateaux	NM	NM	-0.15	<0.001	
	Cuvette_Cuvette Ouest	NM	NM	-0.08	<0.001	
	Sangha	NM	NM	-0.12	<0.001	
	Wealth	Richer	—	—	—	—

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Characteristic	Modality	2005		2011-2012	
		Beta	p-value	Beta	p-value
	Poorer	0.29	<0.001	0.32	<0.001
	Poor	0.26	<0.001	0.27	<0.001
	Middle	0.24	<0.001	0.16	<0.001
	Rich	0.1	0.008	0.09	0.013
Marital status	Monogamous	—	—	—	—
	Polygamous	−0.01	0.7	0	0.8
Religion – education interaction	Not in union	−0.32	<0.001	−0.11	<0.001
	Primary * Muslim	−0.51	0.004	−0.12	0.054
	Secondary Higher * Muslim	−0.1	0.6	−0.09	0.12
	Primary * No religion	−0.01	>0.9	0.05	0.4
	Secondary Higher * No religion	0.09	0.5	0.13	0.058
	P-value (Type III)	—	0.039	—	0.037

Congo - No religious minority

Characteristic	Modality	2005		2011-2012	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	−0.02	0.6	−0.03	0.3
	Secondary Higher	−0.25	<0.001	−0.14	<0.001
Religion	Christian	—	—	—	—
	Muslim	0.31	0.028	0.06	0.3
Type of place of residence	Urban	—	—	—	—
	Rural	0.03	0.5	−0.01	0.7
Age	15-19	—	—	—	—
	20-24	1.5	<0.001	0.4	<0.001
	25-29	2.1	<0.001	0.8	<0.001
	30-34	2.5	<0.001	1.1	<0.001
	35-39	2.7	<0.001	1.3	<0.001
	40-49	2.9	<0.001	1.5	<0.001
Region of residence	Likouala	NM	NM	—	—
	Brazzaville	—	—	NM	NM
	Pointe Noire	0.06	0.064	NM	NM
	Sud	0.1	0.016	NM	NM
	Nord	0.09	0.2	NM	NM
	Kouilou_Niari	NM	NM	−0.13	<0.001
	Brazzaville_Pointe Noire	NM	NM	−0.14	<0.001
	Lekoumou	NM	NM	−0.14	<0.001
	Bouenza	NM	NM	−0.13	<0.001
	Pool	NM	NM	−0.17	<0.001
	Plateaux	NM	NM	−0.16	<0.001
	Cuvette_Cuvette Ouest	NM	NM	−0.08	<0.001
	Sangha	NM	NM	−0.12	<0.001
	Wealth	Richer	—	—	—
Poorer		0.28	<0.001	0.33	<0.001
Poor		0.27	<0.001	0.28	<0.001
Middle		0.23	<0.001	0.15	<0.001
Rich		0.11	0.006	0.09	0.012
Marital status	Monogamous	—	—	—	—
	Polygamous	−0.03	0.4	0	>0.9
Religion – education interaction	Not in union	−0.33	<0.001	−0.11	<0.001
	Primary * Muslim	−0.51	0.004	−0.12	0.053
	Secondary Higher * Muslim	−0.1	0.5	−0.09	0.12
	P-value (Type III)	—	0.008	—	0.2

Ethiopia

Characteristic	Modality	2005		2016	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	−0.08	0.001	−0.17	<0.001
	Secondary	−0.5	<0.001	−0.72	<0.001
Religion	Higher	−0.67	<0.001	−0.95	<0.001
	Christian	—	—	—	—
Type of place of residence	Muslim	0.04	0.11	0.07	0.011
	Urban	—	—	—	—
Age	Rural	0.16	<0.001	0.014	0.002
	15-19	—	—	—	—

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Characteristic	Modality	2005		2016	
		Beta	p-value	Beta	p-value
Region of residence	20-24	1.6	<0.001	1.8	<0.001
	25-29	2.4	<0.001	2.6	<0.001
	30-34	2.8	<0.001	3	<0.001
	35-39	3.1	<0.001	3.3	<0.001
	40-49	3.3	<0.001	3.5	<0.001
	Tigray	—	—	—	—
	Addis adaba	-0.21	<0.001	-0.41	<0.001
	Harari Dire Dawa	-0.06	0.087	-0.1	0.008
	Afar Somali	0	>0.9	0.05	0.12
	Amhara	0	>0.9	-0.16	<0.001
Wealth	Oromia Benishangul	0.06	0.014	0.02	0.5
	SNNPR Gambela	0.04	0.13	-0.01	0.7
	Richer	—	—	—	—
	Poorer	0.04	0.2	0.1	0.004
	Poor	0.02	0.4	0.06	0.045
Marital status	Middle	0.01	0.8	0.03	0.3
	Rich	0.04	0.2	0.03	0.3
	Monogamous	—	—	—	—
Religion – education interaction	Polygamous	-0.08	<0.001	-0.03	0.3
	Not in union	-0.56	<0.001	-0.67	<0.001
	Primary * Muslim	0.08	0.13	0.04	0.3
	Secondary * Muslim	0.11	0.3	0.21	0.044
	Higher * Muslim	-0.24	0.3	0.23	0.2
	P-value (Type III)		0.3		0.063

Gabon

Characteristic	Modality	2000		2019-2021		
		Beta	p-value	Beta	p-value	
Education	No education	—	—	—	—	
	Primary	0.08	0.2	0.26	<0.001	
	Secondary	-0.08	0.2	0.13	0.023	
	Higher	-0.56	<0.001	-0.31	<0.001	
Religion	Christian	—	—	—	—	
	Muslim	-0.08	0.4	0.03	0.8	
	No religion	0.14	0.2	0.12	0.5	
Type of place of residence	Urban	—	—	—	—	
	Rural	0.02	0.5	-0.07	0.028	
Age	15-19	—	—	—	—	
	20-24	1.3	<0.001	1.6	<0.001	
	25-29	1.9	<0.001	2.3	<0.001	
	30-34	2.3	<0.001	2.6	<0.001	
	35-39	2.6	<0.001	2.7	<0.001	
	40-49	2.8	<0.001	2.9	<0.001	
Region of residence	Libreville	NM	NM	—	—	
	Libreville_PortGentil	—	—	NM	NM	
	North	0.15	<0.001	NM	NM	
	East	0.12	<0.001	NM	NM	
	West	0.17	<0.001	NM	NM	
	South	0.16	<0.001	NM	NM	
	PortGentil	NM	NM	0.02	0.6	
	Ogooue_Ivindo_Ogooue_Lolo	NM	NM	0.17	<0.001	
	Estuaire_Woleu_Ntem	NM	NM	0.08	0.044	
	Haut_Ogooue	NM	NM	0.06	0.3	
	Moyen_Ogooue	NM	NM	0.08	0.056	
	Nyanga_Ngounie	NM	NM	0.04	0.3	
	Ogooue_Maritime	NM	NM	0.2	<0.001	
	Wealth	Richer	—	—	—	—
		Poorer	—	—	0.37	<0.001
Poor		—	—	0.2	<0.001	
Middle		—	—	0.15	<0.001	
Rich		—	—	0.11	0.001	
Marital status	Monogamous	—	—	—	—	
	Polygamous	-0.08	0.007	-0.07	0.2	
	Not in union	-0.24	<0.001	-0.33	<0.001	
Religion – education interaction	Primary * Muslim	0.02	0.9	-0.2	0.13	
	Secondary * Muslim	-0.05	0.7	-0.12	0.4	
	Higher * Muslim	0.16	0.3	-0.37	0.11	
	Primary * No religion	-0.12	0.3	-0.24	0.3	
	Secondary * No religion	-0.11	0.4	-0.16	0.5	
	Higher * No religion	-0.82	0.14	-0.04	>0.9	
	P-value (Type III)		0.4		0.5	

Gabon - No religious minority

Characteristic	Modality	2000		2019-2021	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	0.08	0.2	0.26	<0.001
	Secondary	-0.07	0.2	0.12	0.029
	Higher	-0.55	<0.001	-0.31	<0.001
Religion	Christian	—	—	—	—
	Muslim	-0.08	0.4	0.02	0.8
Type of place of residence	Urban	—	—	—	—
	Rural	0.02	0.4	-0.05	0.1
Age	15-19	—	—	—	—
	20-24	1.3	<0.001	1.6	<0.001
	25-29	2	<0.001	2.3	<0.001
	30-34	2.3	<0.001	2.6	<0.001
	35-39	2.6	<0.001	2.7	<0.001
	40-49	2.8	<0.001	2.9	<0.001
Region of residence	Libreville	NM	NM	—	—
	Libreville_PortGentil	—	—	NM	NM
	North	0.16	<0.001	NM	NM
	East	0.13	<0.001	NM	NM
	West	0.16	<0.001	NM	NM
	South	0.16	<0.001	NM	NM
	PortGentil	NM	NM	0.01	0.8
	Ogooue_Ivindo_Ogooue_Lolo	NM	NM	0.17	<0.001
	Estuaire_Woleu_Ntem	NM	NM	0.08	0.058
	Haut_Ogooue	NM	NM	0.07	0.3
	Moyen_Ogooue	NM	NM	0.06	0.2
	Nyanga_Ngounie	NM	NM	0.04	0.3
	Ogooue_Maritime	NM	NM	0.2	<0.001
	Wealth	Richer	—	—	—
Poorer		—	—	0.36	<0.001
Poor		—	—	0.2	<0.001
Middle		—	—	0.16	<0.001
Rich		—	—	0.11	0.002
Marital status	Monogamous	—	—	—	—
	Polygamous	-0.25	0.017	-0.08	0.2
Religion – education interaction	Not in union	-0.07	<0.001	-0.32	<0.001
	Primary * Muslim	0.02	0.9	-0.2	0.13
	Secondary * Muslim	-0.06	0.6	-0.12	0.4
	Higher * Muslim	0.15	0.4	-0.36	0.12
	P-value (Type III)		0.5		0.3

Gambia

Characteristic	Modality	2013		2019-2020	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	0	0.9	-0.01	>0.9
	Secondary	-0.27	<0.001	-0.17	0.2
	Higher	-0.56	<0.001	-0.63	<0.001
Religion	Christian	—	—	—	—
	Muslim	0.13	0.1	0.16	0.068
Type of place of residence	Urban	—	—	—	—
	Rural	0.04	0.083	0.04	0.074
Age	15-19	—	—	—	—
	20-24	1.6	<0.001	1.6	<0.001
	25-29	2.2	<0.001	2.4	<0.001
	30-34	2.6	<0.001	2.9	<0.001
	35-39	2.9	<0.001	3.1	<0.001
	40-49	3	<0.001	3.3	<0.001
Region of residence	Banjul	—	—	—	—
	Kanifing	-0.01	0.7	0.03	0.4
	Brikama	0.07	0.062	0.1	<0.001
	Mansakonko	0.06	0.2	0.08	0.051
	Kerrewan	0.04	0.4	0.09	0.01
	Kuntaur Janjanbyreh Basse	0.01	0.9	0.08	0.014
Wealth	Richer	—	—	—	—
	Poorer	0.25	<0.001	0.29	<0.001
	Poor	0.22	<0.001	0.23	<0.001
	Middle	0.21	<0.001	0.19	<0.001
	Rich	0.16	<0.001	0.11	<0.001
Marital status	Monogamous	—	—	—	—

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Characteristic	Modality	2013		2019-2020	
		Beta	p-value	Beta	p-value
Religion – education interaction	Polygamous	-0.01	0.6	-0.02	0.3
	Not in union	-0.78	<0.001	-0.76	<0.001
	Primary * Muslim	-0.08	0.6	-0.01	>0.9
	Secondary * Muslim	-0.08	0.5	-0.12	0.3
	Higher * Muslim	0.14	0.4	-0.04	0.8
	P-value (Type III)		0.4		0.8

Ghana

Characteristic	Modality	2003		2022	
		Beta	p-value	Beta	p-value
Education	No education	—		—	
	Primary	0.04	0.2	0	0.9
	Secondary	-0.17	<0.001	-0.2	<0.001
	Higher	-0.53	<0.001	-0.62	<0.001
Religion	Christian	—		—	
	Muslim	-0.01	0.9	0.02	0.5
Type of place of residence	Urban	—		—	
	Rural	0.05	0.11	0.03	0.032
Age	15-19	—		—	
	20-24	1.8	<0.001	1.6	<0.001
	25-29	2.6	<0.001	2.3	<0.001
	30-34	3	<0.001	2.8	<0.001
	35-39	3.3	<0.001	3.1	<0.001
	40-49	3.6	<0.001	3.3	<0.001
Region of residence	Geater accra Eastern Volta	—		—	
	Centre western Ashanti	0.14	<0.001	NM	NM
	Centre western Ashanti Western north Ahafo	NM	NM	0.07	<0.001
	Upper east	-0.09	0.1	-0.1	<0.001
	Upper west	0.02	0.7	-0.12	<0.001
	Bono	NM	NM	-0.05	0.13
	Bono east	NM	NM	0.02	0.6
	Oti	NM	NM	0.06	0.038
	Savanah Nothern North east	NM	NM	-0.04	0.093
	Brong ahafo	0.02	0.6	NM	NM
	Nothern	0.05	0.2	NM	NM
Wealth	Richer	—		—	
	Poorer	0.43	<0.001	0.44	<0.001
	Poor	0.41	<0.001	0.38	<0.001
	Middle	0.36	<0.001	0.29	<0.001
	Rich	0.23	<0.001	0.14	<0.001
Marital status	Monogamous	—		—	
	Polygamous	-0.07	0.006	-0.01	0.5
	Not in union	-0.52	<0.001	-0.48	<0.001
Religion – education interaction	Primary * Muslim	-0.07	0.2	-0.07	0.11
	Secondary * Muslim	0.05	0.6	0.02	0.7
	Higher * Muslim	0.35	0.03	0.2	0.011
	P-value (Type III)		0.062		0.01

Guinea

Characteristic	Modality	2005		2018	
		Beta	p-value	Beta	p-value
Education	No education	—		—	
	Primary	0	>0.9	0.06	0.3
	Secondary Higher	-0.09	0.2	-0.14	0.049
Religion	Christian	—		—	
	Muslim	0.14	<0.001	0.12	0.005
Type of place of residence	No religion	-0.06	0.3	0.27	0.003
	Urban	—		—	
Age	Rural	0.07	0.004	-0.03	0.3
	15-19	—		—	
	20-24	1.4	<0.001	1.3	<0.001
	25-29	2	<0.001	1.8	<0.001
	30-34	2.3	<0.001	2.1	<0.001
	35-39	2.6	<0.001	2.3	<0.001
	40-49	2.8	<0.001	2.5	<0.001
Region of residence	Boke Kindia	—		—	
	Conakry	-0.02	0.6	-0.09	0.003
	Faranah	0.04	0.084	0.05	0.11
	Kankan	0.13	<0.001	0.2	<0.001
	Labe Mamou	-0.07	0.003	-0.08	0.009

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Characteristic	Modality	2005		2018	
		Beta	p-value	Beta	p-value
Wealth	Nzerekore	0.14	<0.001	-0.15	<0.001
	Richer	—	—	—	—
	Poorer	0.1	0.01	0.26	<0.001
	Poor	0.11	0.007	0.25	<0.001
	Middle	0.11	0.003	0.21	<0.001
Marital status	Rich	0.08	0.013	0.15	<0.001
	Monogamous	—	—	—	—
	Polygamous	-0.03	0.055	-0.04	0.004
Religion – education interaction	Not in union	-0.47	<0.001	-0.85	<0.001
	Primary * Muslim	-0.03	0.6	-0.05	0.5
	Secondary Higher * Muslim	-0.23	0.013	-0.16	0.03
	Primary * No religion	0.06	0.7	-0.04	0.8
	Secondary Higher * No religion	-0.14	0.7	0.02	>0.9
	P-value (Type III)		0.2		0.2

Ivory coast

Characteristic	Modality	1998-1999		2021	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	-0.06	0.2	-0.03	0.2
	Secondary Higher	-0.46	<0.001	-0.29	<0.001
Religion	Christian	—	—	—	—
	Traditional	NM	NM	0.08	0.021
	Muslim	0.04	0.5	0.05	0.006
Type of place of residence	No religion	NM	NM	0.05	0.11
	Urban	—	—	—	—
	Rural	0.07	0.045	0.04	0.025
Age	15-19	—	—	—	—
	20-24	1.4	<0.001	1.4	<0.001
	25-29	2	<0.001	2	<0.001
	30-34	2.5	<0.001	2.3	<0.001
	35-39	2.7	<0.001	2.6	<0.001
Region of residence	40-49	2.9	<0.001	2.7	<0.001
	Abidjan	—	—	—	—
	Other regions	0.13	<0.001	NM	NM
	Montagne Sassandra Marahoue	NM	NM	0.14	<0.001
	Savanes Lacs Lagunes	NM	NM	0.1	0.001
	Vallee du Bandama	NM	NM	0.11	0.005
	Deguele Woroba	NM	NM	0.18	<0.001
	Zanzan	NM	NM	0.06	0.071
	Yamoussoukro	NM	NM	0.03	0.4
	Bas Sassandra Goh Djiboua	NM	NM	0.06	0.069
Wealth	Richer	—	—	—	—
	Poorer	—	—	0.42	<0.001
	Poor	—	—	0.37	<0.001
	Middle	—	—	0.28	<0.001
	Rich	—	—	0.16	<0.001
Marital status	Monogamous	—	—	—	—
	Polygamous	-0.01	0.7	-0.02	0.12
	Not in union	-0.41	<0.001	-0.54	<0.001
Religion – education interaction	Primary * Traditional	NM	NM	0.09	0.2
	Secondary Higher * Traditional	NM	NM	0.33	0.028
	Primary * Muslim	-0.03	0.7	-0.02	0.6
	Secondary Higher * Muslim	0.09	0.5	-0.13	0.019
	Primary * No religion	NM	NM	0.09	0.15
	Secondary Higher * No religion	NM	NM	0.3	0.001
	P-value (Type III)		0.6		<0.001

Ivory coast - No religious minority

Characteristic	Modality	2021	
		Beta	p-value
Education	No education	—	—
	Primary	-0.03	0.2
	Secondary Higher	-0.29	<0.001
Religion	Christian	—	—
	Muslim	0.05	0.008
Type of place of residence	Urban	—	—
	Rural	0.05	0.012
Age	15-19	—	—
	20-24	1.4	<0.001

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Characteristic	Modality	2021	
		Beta	p-value
Region of residence	25-29	2	<0.001
	30-34	2.4	<0.001
	35-39	2.6	<0.001
	40-49	2.8	<0.001
	Abidjan	—	
	Montagne Sassadra Marahoue	0.14	<0.001
	Savanes Lacs Lagunes	0.11	<0.001
	Vallee du Bandama	0.1	0.015
	Deguele Woroba	0.17	<0.001
	Zanzan	0.04	0.2
Wealth	Yamoussoukro	0.03	0.5
	Bas Sassadra Goh Djiboua	0.06	0.1
	Richer	—	
	Poorer	0.41	<0.001
	Poor	0.36	<0.001
Marital status	Middle	0.27	<0.001
	Rich	0.16	<0.001
	Monogamous	—	
Religion – education interaction	Polygamous	–0.02	0.3
	Not in union	–0.55	<0.001
	Primary * Muslim	–0.02	0.6
	Secondary Higher * Muslim	–0.12	0.023
	P-value (Type III)		0.074

Kenya

Characteristic	Modality	2003		2022		
		Beta	p-value	Beta	p-value	
Education	No education	—		—		
	Primary	–0.07	0.012	–0.13	<0.001	
	Secondary Higher	–0.4	<0.001	–0.44	<0.001	
Religion	Christian	—		—		
	Muslim	0.09	0.018	0.12	0.006	
	No religion	0.05	0.5	–0.01	>0.9	
Type of place of residence	Urban	—		—		
	Rural	0.04	0.3	0.01	0.5	
Age	15-19	—		—		
	20-24	1.6	<0.001	1.8	<0.001	
	25-29	2.3	<0.001	2.5	<0.001	
	30-34	2.6	<0.001	2.8	<0.001	
	35-39	2.9	<0.001	3	<0.001	
	40-49	3	<0.001	3.2	<0.001	
Region of residence	Coast	—		NM	NM	
	Nairobi	–0.08	0.093	—		
	North eastern	0.1	0.22	NM	NM	
	Eastern	–0.03	0.4	NM	NM	
	Central Rift valley	0.05	0.2	NM	NM	
	Western	0.1	0.004	NM	NM	
	Nyanza	0.16	<0.001	NM	NM	
	Mombasa Kwale	NM	NM	–0.08	0.044	
	Marsabit Isiolo	NM	NM	–0.06	0.2	
	Meru Embu	NM	NM	–0.17	<0.001	
	Tharak Nithi Kitui Makueni Kirinyaba Muranga Nyeri Machakos	NM	NM	–0.14	<0.001	
	Nyandarua	NM	NM	0.01	0.9	
	Baringo Nakuru Kianbu	NM	NM	0.05	0.14	
	Turakana West Pokot Elgeryo Marakwet Samburu Laikipia	NM	NM	0.09	0.009	
	Bugoma Busia Trans Nzoia	NM	NM	0.11	0.001	
	Uasin Gishu Nandi	NM	NM	0	>0.9	
	Kilifi Taita Kajiado	NM	NM	0	>0.9	
	Kericho Bomet Narok Kisumu Vihiga Siaya Kakamega Homa Bay Migori	NM	NM	0.09	0.004	
	Tana River Garissa Wajir Mandera	NM	NM	0.05	0.3	
	Kisii Nyamira	NM	NM	0.03	0.5	
	Lamu	NM	NM	–0.05	0.3	
	Wealth	Richer	—		—	
		Poorer	0.35	<0.001	0.47	<0.001
Poor		0.25	<0.001	0.36	<0.001	
Middle		0.22	<0.001	0.26	<0.001	
Rich		0.12	0.025	0.13	<0.001	
Marital status	Monogamous	—		—		
	Polygamous	–0.07	<0.001	–0.02	0.4	
	Unspecified Union ¹	NM	NM	–0.01	0.3	
Religion – education interaction	Not in union	–0.41	<0.001	–0.4	<0.001	
	Primary * Muslim	0.01	0.8	0.01	0.8	

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Characteristic	Modality	2003		2022	
		Beta	p-value	Beta	p-value
	Secondary Higher * Muslim	-0.3	0.012	-0.19	0.002
	Primary * No religion	0.16	0.14	0.18	0.041
	Secondary Higher * No religion	0	>0.9	-0.04	0.8
	P-value (Type III)		0.05		0.003

1: several respondents of Kenya 2022 DHS declared that they are In union but data for “number of other wives” are missing.
Kenya - No religious minority

Characteristic	Modality	2003		2022		
		Beta	p-value	Beta	p-value	
Education	No education	—		—		
	Primary	-0.06	0.013	-0.13	<0.001	
	Secondary Higher	-0.4	<0.001	-0.44	<0.001	
Religion	Christian	—		—		
	Muslim	0.09	0.02	0.12	0.007	
Type of place of residence	Urban	—		—		
	Rural	0.05	0.3	0.01	0.5	
Age	15-19	—		—		
	20-24	1.6	<0.001	1.8	<0.001	
	25-29	2.3	<0.001	2.5	<0.001	
	30-34	2.6	<0.001	2.8	<0.001	
	35-39	2.9	<0.001	3	<0.001	
	40-49	3.1	<0.001	3.2	<0.001	
Region of residence	Coast	—		NM	NM	
	Nairobi	-0.08	0.12	—		
	North eastern	0.1	0.023	NM	NM	
	Eastern	-0.03	0.3	NM	NM	
	Central Rift valley	0.04	0.2	NM	NM	
	Western	0.1	0.005	NM	NM	
	Nyanza	0.16	<0.001	NM	NM	
	Mombasa Kwale	NM	NM	-0.08	0.044	
	Marsabit Isiolo	NM	NM	-0.06	0.2	
	Meru Embu	NM	NM	-0.17	<0.001	
	Tharak Nithi Kitui Makueni Kirinyaba Muranga Nyeri Machakos	NM	NM	-0.14	<0.001	
	Nyandarua	NM	NM	0	>0.9	
	Baringo Nakuru Kianbu	NM	NM	0.05	0.2	
	Turakana West Pokot Elgeryo Marakwet Samburu Laikipia	NM	NM	0.09	0.009	
	Bugoma Busia Trans Nzoia	NM	NM	0.11	<0.001	
	Uasin Gishu Nandi	NM	NM	0	>0.9	
	Kilifi Taita Kajiado	NM	NM	-0.02	0.6	
	Kericho Bomet Narok Kisumu Vihiga Siaya Kakamega Homa Bay Migori	NM	NM	0.09	0.003	
	Tana River Garissa Wajir Mandera	NM	NM	0.05	0.3	
	Kisii Nyamira	NM	NM	0.02	0.5	
	Lamu	NM	NM	-0.05	0.3	
	Wealth	Richer	—		—	
		Poorer	0.35	<0.001	0.47	<0.001
Poor		0.25	<0.001	0.36	<0.001	
Middle		0.22	<0.001	0.25	<0.001	
Rich		0.12	0.024	0.12	<0.001	
Marital status	Monogamous	—		—		
	Polygamous	-0.07	0.001	-0.02	0.4	
	Unspecified Union	NM	NM	-0.01	0.3	
Religion – education interaction	Not in union	-0.41	<0.001	-0.4	<0.001	
	Primary * Muslim	0.01	0.8	0.02	0.8	
	Secondary Higher * Muslim	-0.3	0.012	-0.19	0.002	
	P-value (Type III)		0.04		0.003	

Liberia

Characteristic	Modality	2007		2019-2020	
		Beta	p-value	Beta	p-value
Education	No education	—		—	
	Primary	-0.02	0.4	0.03	0.2
	Secondary Higher	-0.27	<0.001	-0.21	<0.001
Religion	Christian	—		—	
	Muslim	0.02	0.5	0.03	0.5
	No religion	-0.09	0.084	0.04	0.7
Type of place of residence	Urban	—		—	
	Rural	0.01	0.7	0.1	<0.001
Age	15-19	—		—	

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Characteristic	Modality	2007		2019-2020	
		Beta	p-value	Beta	p-value
Region of residence	20-24	1.4	<0.001	1.4	<0.001
	25-29	2.1	<0.001	2	<0.001
	30-34	2.4	<0.001	2.3	<0.001
	35-39	2.6	<0.001	2.5	<0.001
	40-49	2.8	<0.001	2.7	<0.001
	Monrovia	—	—	NM	NM
	North western	0.05	0.3	—	—
	South central	0.15	<0.001	0.03	0.5
	South Eastern A	0.18	<0.001	0.04	0.4
	South Eastern B	0.16	<0.001	0.04	0.3
	North central	0.12	<0.001	-0.01	0.8
Wealth	Richer	—	—	—	—
	Poorer	0.13	<0.001	0.42	<0.001
	Poor	0.17	<0.001	0.39	<0.001
	Middle	0.19	<0.001	0.31	<0.001
Marital status	Rich	0.19	<0.001	0.22	<0.001
	Monogamous	—	—	—	—
	Polygamous	-0.04	0.12	0.01	0.7
	Not in union	-0.21	<0.001	-0.26	<0.001
Religion – education interaction	Primary * Muslim	-0.03	0.6	0.01	0.9
	Secondary Higher * Muslim	0.1	0.3	-0.14	0.052
	Primary * No religion	0.12	0.3	-0.14	0.4
	Secondary Higher * No religion	0.28	0.033	0.14	0.5
	P-value (Type III)	—	0.2	—	0.3

Malawi

Characteristic	Modality	2004		2015-2016	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	-0.04	0.01	-0.03	0.003
	Secondary Higher	-0.47	<0.001	-0.41	<0.001
Religion	Christian	—	—	—	—
	Muslim	-0.01	0.6	0.07	<0.001
Type of place of residence	Urban	—	—	—	—
	Rural	0.05	0.006	0.11	<0.001
Age	15-19	—	—	—	—
	20-24	1.6	<0.001	1.6	<0.001
	25-29	2.1	<0.001	2.3	<0.001
	30-34	2.5	<0.001	2.6	<0.001
	35-39	2.7	<0.001	2.9	<0.001
	40-49	2.9	<0.001	3	<0.001
Region of residence	North	—	—	—	—
	Central	-0.01	0.5	-0.04	0.007
	south	-0.04	0.004	-0.03	0.033
Wealth	Richer	—	—	—	—
	Poorer	0.18	<0.001	0.18	<0.001
	Poor	0.11	<0.001	0.14	<0.001
	Middle	0.11	<0.001	0.12	<0.001
	Rich	0.09	<0.001	0.09	<0.001
Marital status	Monogamous	—	—	—	—
	Polygamous	-0.05	0.001	-0.03	0.002
	Not in union	-0.31	<0.001	-0.23	<0.001
Religion – education interaction	Primary * Muslim	0.03	0.4	-0.04	0.2
	Secondary Higher * Muslim	0.14	0.075	0.01	0.8
	P-value (Type III)	—	0.2	—	0.3

Mali

Characteristic	Modality	2006		2018	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	0.03	0.7	-0.06	0.7
	Secondary Higher	-0.66	<0.001	-0.48	<0.001
Religion	Christian	—	—	—	—
	Muslim	0.08	0.063	-0.01	0.8
Type of place of residence	No religion	0.08	0.11	0.08	0.1
	Urban	—	—	—	—
Age	Rural	0.04	0.032	-0.08	0.001
	15-19	—	—	—	—
	20-24	1.3	<0.001	1.1	<0.001
	25-29	1.9	<0.001	1.7	<0.001

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Characteristic	Modality	2006		2018	
		Beta	p-value	Beta	p-value
Region of residence	30-34	2.2	<0.001	2.1	<0.001
	35-39	2.5	<0.001	2.3	<0.001
	40-49	2.6	<0.001	2.4	<0.001
	Kayes	—	—	—	—
	Sikasso Koulikoro	0.06	<0.001	-0.1	<0.001
	Segou	0.01	0.7	-0.11	<0.001
	Mopti	-0.06	0.014	-0.17	<0.001
Wealth	Bamako	-0.1	<0.001	-0.18	<0.001
	Tombouctou Gao Kidal	-0.09	<0.001	-0.22	<0.001
	Richer	—	—	—	—
	Poorer	0.08	0.044	0.35	<0.001
	Poor	0.06	0.15	0.31	<0.001
	Middle	0.07	0.066	0.28	<0.001
	Rich	0.06	0.2	0.16	<0.001
Marital status	Monogamous	—	—	—	—
	Polygamous	-0.03	0.021	0.01	0.6
Religion – education interaction	Not in union	-0.57	<0.001	-0.86	<0.001
	Primary * Muslim	-0.09	0.3	0.01	>0.9
	Secondary Higher * Muslim	0.23	0.1	0.23	0.045
	Primary * No religion	-0.11	0.4	0.14	0.5
	Secondary Higher * No religion	0.47	0.3	0.29	0.036
	P-value (Type III)		0.072		0.2

Mali - No religious minority

Characteristic	Modality	2006		2018	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	0.03	0.7	-0.07	0.6
	Secondary Higher	-0.67	<0.001	-0.48	<0.001
Religion	Christian	—	—	—	—
	Muslim	0.08	0.067	-0.01	0.8
Type of place of residence	Urban	—	—	—	—
	Rural	0.04	0.038	-0.08	<0.001
Age	15-19	—	—	—	—
	20-24	1.3	<0.001	1.1	<0.001
	25-29	1.9	<0.001	1.7	<0.001
	30-34	2.2	<0.001	2.1	<0.001
	35-39	2.5	<0.001	2.3	<0.001
	40-49	2.6	<0.001	2.4	<0.001
Region of residence	Kayes	—	—	—	—
	Sikasso Koulikoro	0.06	<0.001	-0.1	<0.001
	Segou	0.01	0.8	-0.11	<0.001
	Mopti	-0.06	0.012	-0.17	<0.001
	Bamako	-0.11	<0.001	-0.18	<0.001
	Tombouctou Gao Kidal	-0.09	<0.001	-0.22	<0.001
	Richer	—	—	—	—
Wealth	Poorer	0.08	0.039	0.35	<0.001
	Poor	0.06	0.2	0.31	<0.001
	Middle	0.07	0.062	0.28	<0.001
	Rich	0.06	0.2	0.16	<0.001
Marital status	Monogamous	—	—	—	—
	Polygamous	-0.03	0.042	0.01	0.6
Religion – education interaction	Not in union	-0.56	<0.001	-0.86	<0.001
	Primary * Muslim	-0.09	0.3	0.01	>0.9
	Secondary Higher * Muslim	0.23	0.1	0.23	0.045
	P-value (Type III)		0.028		0.13

Mozambique

Characteristic	Modality	1997		2011	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	-0.05	0.14	0.05	0.012
	Secondary	-0.45	<0.001	-0.26	<0.001
Religion	Higher	-0.68	<0.001	-0.87	<0.001
	Christian	—	—	—	—
	Muslim	-0.18	0.018	-0.05	0.073
Type of place of residence	No religion	-0.07	0.2	0.03	0.3
	Urban	—	—	—	—
Age	Rural	-0.03	0.2	-0.03	0.14
	15-19	—	—	—	—

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Characteristic	Modality	1997		2011	
		Beta	p-value	Beta	p-value
Region of residence	20-24	1.4	<0.001	1.4	<0.001
	25-29	2	<0.001	2	<0.001
	30-34	2.3	<0.001	2.3	<0.001
	35-39	2.6	<0.001	2.5	<0.001
	40-49	2.7	<0.001	2.6	<0.001
	Niassa Cabo Delgado	—	—	—	—
	Maputo province	-0.08	0.11	-0.1	0.003
	Maputo city	-0.13	0.032	-0.17	<0.001
	Nampula	0.12	0.002	-0.12	<0.001
	Zambezia	-0.01	0.8	0.01	0.6
Wealth	Tete	0.17	<0.001	0.09	0.002
	Manica Sofala	0.1	0.048	-0.01	0.9
	Inhambane	-0.1	0.085	-0.18	<0.001
	Gaza	0.02	0.7	-0.08	0.013
	Richer	—	—	—	—
	Poorer	—	—	0.19	<0.001
	Poor	—	—	0.15	<0.001
	Middle	—	—	0.16	<0.001
	Rich	—	—	0.12	<0.001
	Marital status	Monogamous	—	—	—
Polygamous		-0.05	0.3	-0.02	0.2
Religion – education interaction	Not in union	-0.25	<0.001	-0.26	<0.001
	Primary * Muslim	0.12	0.3	-0.04	0.3
	Secondary * Muslim	0.21	0.5	0.07	0.3
	Higher* Muslim	-0.22	0.049	0.06	0.7
	Primary * No religion	0	>0.9	-0.07	0.11
	Secondary * No religion	0.4	0.011	-0.11	0.2
	Higher* No religion	-1.2	<0.001	-0.54	0.13
	P-value (Type III)	—	<0.001	—	0.2

Mozambique - No religious minority

Characteristic	Modality	1997		2011	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	-0.06	0.14	0.04	0.02
	Secondary	-0.47	<0.001	-0.27	<0.001
	Higher	-0.69	<0.001	-0.87	<0.001
Religion	Christian	—	—	—	—
	Muslim	-0.18	0.018	-0.06	0.042
Type of place of residence	Urban	—	—	—	—
	Rural	-0.04	0.2	-0.03	0.2
Age	15-19	—	—	—	—
	20-24	1.3	<0.001	1.4	<0.001
	25-29	1.9	<0.001	2	<0.001
	30-34	2.3	<0.001	2.3	<0.001
	35-39	2.5	<0.001	2.5	<0.001
	40-49	2.6	<0.001	2.6	<0.001
Region of residence	Niassa Cabo Delgado	—	—	—	—
	Maputo province	-0.1	0.092	-0.11	<0.001
	Maputo city	-0.13	0.033	-0.18	<0.001
	Nampula	0.1	0.019	-0.12	<0.001
	Zambezia	-0.06	0.3	0.01	0.6
	Tete	0.14	0.006	0.06	0.027
	Manica Sofala	0.07	0.2	-0.01	0.7
	Inhambane	-0.11	0.076	-0.19	<0.001
	Gaza	0.03	0.6	-0.08	0.007
	Wealth	Richer	—	—	—
Poorer		—	—	0.17	<0.001
Poor		—	—	0.13	<0.001
Middle		—	—	0.15	<0.001
Rich		—	—	0.12	<0.001
Marital status	Monogamous	—	—	—	—
	Polygamous	-0.03	0.7	-0.01	0.5
	Not in union	-0.24	<0.001	-0.26	<0.001
Religion – education interaction	Primary * Muslim	0.12	0.3	-0.04	0.3
	Secondary * Muslim	0.22	0.5	0.07	0.3
	Higher* Muslim	-0.22	0.053	0.06	0.7
	P-value (Type III)	—	0.013	—	0.4

Nigeria

Characteristic	Modality	2003		2018	
		Beta	p-value	Beta	p-value
Education	No education	—		—	
	Primary	−0.04	0.3	0.04	0.026
	Secondary	−0.38	<0.001	−0.19	<0.001
	Higher	−0.59	<0.001	−0.56	<0.001
Religion	Christian	—		—	
	Muslim	−0.01	0.9	0.14	<0.001
Type of place of residence	Traditional	0.04	0.6	0.15	0.002
	Urban	—		—	
Age	Rural	0.01	0.6	0.01	0.4
	15-19	—		—	
	20-24	1.3	<0.001	1.7	<0.001
	25-29	2	<0.001	2.4	<0.001
	30-34	2.4	<0.001	2.8	<0.001
	35-39	2.7	<0.001	3	<0.001
Region of residence	40-49	2.8	<0.001	3.2	<0.001
	South west	—		—	
	North central	0.21	<0.001	0.15	<0.001
	North east	0.34	<0.001	0.25	<0.001
	North west	0.26	<0.001	0.33	<0.001
	South east	0.16	0.002	0.16	<0.001
	South South	0.28	<0.001	0.13	<0.001
Wealth	Richer	—		—	
	Poorer	0.12	<0.001	0.2	<0.001
	Poor	0.11	0.003	0.19	<0.001
	Middle	0.11	0.003	0.19	<0.001
	Rich	0.14	<0.001	0.12	<0.001
Marital status	Monogamous	—		—	
	Polygamous	−0.05	0.014	−0.02	0.03
Religion – education interaction	Not in union	−0.74	<0.001	−0.66	<0.001
	Primary * Muslim	0.07	0.14	−0.01	0.8
	Secondary * Muslim	0.18	0.002	0.02	0.5
	Higher * Muslim	0.15	0.15	0.13	<0.001
	Primary * Traditional	−0.07	0.7	0.03	0.8
	Secondary * Traditional	0.53	0.003	0.13	0.4
	Higher * Traditional			−0.32	<0.001
P-value (Type III)		0.003		<0.001	

Nigeria - No religious minority

Characteristic	Modality	2003		2018	
		Beta	p-value	Beta	p-value
Education	No education	—		—	
	Primary	−0.04	0.3	0.04	0.03
	Secondary	−0.38	<0.001	−0.19	<0.001
	Higher	−0.59	<0.001	−0.56	<0.001
Religion	Christian	—		—	
	Muslim	−0.01	0.8	0.14	<0.001
Type of place of residence	Urban	—		—	
	Rural	0.01	0.6	0.01	0.4
Age	15-19	—		—	
	20-24	1.3	<0.001	1.7	<0.001
	25-29	2	<0.001	2.4	<0.001
	30-34	2.4	<0.001	2.8	<0.001
	35-39	2.7	<0.001	3	<0.001
	40-49	2.8	<0.001	3.2	<0.001
Region of residence	South west	—		—	
	North central	0.21	<0.001	0.15	<0.001
	North east	0.35	<0.001	0.25	<0.001
	North west	0.27	<0.001	0.33	<0.001
	South east	0.16	0.004	0.17	<0.001
	South South	0.28	<0.001	0.14	<0.001
	Richer	—		—	
Wealth	Poorer	0.12	<0.001	0.2	<0.001
	Poor	0.11	0.006	0.2	<0.001
	Middle	0.11	0.003	0.19	<0.001
	Rich	0.14	<0.001	0.12	<0.001
	Monogamous	—		—	
Marital status	Polygamous	−0.05	0.015	−0.02	0.031
	Not in union	−0.76	<0.001	−0.67	<0.001
Religion – education interaction	Primary * Muslim	0.07	0.2	−0.01	0.8
	Secondary * Muslim	0.18	0.002	0.02	0.5
	Higher * Muslim	0.14	0.2	0.13	<0.001
	P-value (Type III)		0.008		<0.001

Senegal

Characteristic	Modality	2005		2019	
		Beta	p-value	Beta	p-value
Education	No education	—		—	
	Primary	-0.22	0.004	0.11	0.6
	Secondary	-0.53	<0.001	-0.11	0.4
	Higher	-0.67	0.011	-0.92	<0.001
Religion	Christian	—		—	
	Muslim	0.07	0.027	0.17	0.048
Type of place of residence	Urban	—		—	
	Rural	0.01	0.7	-0.01	0.7
Age	15-19	—		—	
	20-24	1.4	<0.001	1.5	<0.001
	25-29	2.1	<0.001	2.2	<0.001
	30-34	2.5	<0.001	2.6	<0.001
	35-39	2.7	<0.001	2.9	<0.001
	40-49	3	<0.001	3.1	<0.001
Region of residence	Dakar	—		—	
	Matam Louga Saint Louis	-0.11	<0.001	NM	NM
	Kolda Tambacounda	0	>0.9	NM	NM
	Thies Fatick	-0.02	0.5	0.02	0.8
	Ziguinchor	-0.06	0.084	0.03	0.6
	Diourbel Kaolak	0.02	0.6	0.05	0.4
	Matam Louga Saint Louis Kaffrine	NM	NM	-0.01	0.8
	Kedougou Zolda Tambacounda Sedhiou	NM	NM	0.08	0.12
	Richer	—		—	
Wealth	Poorer	0.41	<0.001	0.45	<0.001
	Poor	0.37	<0.001	0.34	<0.001
	Middle	0.31	<0.001	0.25	<0.001
	Rich	0.16	<0.001	0.12	0.005
	Monogamous	—		—	
Marital status	Polygamous	-0.03	0.054	-0.02	0.3
	Not in union	-0.86	<0.001	-1.1	<0.001
	Primary * Muslim	0.16	0.047	-0.21	0.3
Religion – education interaction	Secondary * Muslim	0.13	0.2	-0.28	0.027
	Higher * Muslim	0.04	>0.9	0.19	0.2
	P-value (Type III)		0.2		0.014

Sierra Leone

Characteristic	Modality	2008		2019	
		Beta	p-value	Beta	p-value
Education	No education	—		—	
	Primary	0.06	0.2	0.02	0.6
	Secondary	-0.27	<0.001	-0.21	<0.001
	Higher	-0.71	<0.001	-0.56	<0.001
Religion	Christian	—		—	
	Muslim	0.04	0.3	0.02	0.4
Type of place of residence	Urban	—		—	
	Rural	-0.03	0.4	0.01	0.6
Age	15-19	—		—	
	20-24	1.3	<0.001	1.6	<0.001
	25-29	1.8	<0.001	2.2	<0.001
	30-34	2.2	<0.001	2.5	<0.001
	35-39	2.4	<0.001	2.7	<0.001
	40-49	2.6	<0.001	2.9	<0.001
Region of residence	Eastern	—		—	
	Northern	0.1	<0.001	-0.13	<0.001
	North_Western	NM	NM	0	>0.9
	Southern	0	>0.9	0	0.9
	Western	0.02	0.6	-0.04	0.12
	Richer	—		—	
Wealth	Poorer	0.17	<0.001	0.3	<0.001
	Poor	0.18	<0.001	0.29	<0.001
	Middle	0.16	<0.001	0.29	<0.001
	Rich	0.15	<0.001	0.21	<0.001
	Monogamous	—		—	
Marital status	Polygamous	0.01	0.7	-0.01	0.4
	Not in union	-0.27	<0.001	-0.4	<0.001
	Primary * Muslim	-0.08	0.2	-0.01	0.9
Religion – education interaction	Secondary * Muslim	0.09	0.2	0.01	0.7
	Higher * Muslim	0.16	0.5	0.09	0.3
	P-value (Type III)		0.084		0.8

Togo

Characteristic	Modality	1988		2013-2014	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	0.01	0.8	-0.08	0.002
	Secondary Higher	-0.31	<0.001	-0.41	<0.001
Religion	Christian	—	—	—	—
	Traditional	0.1	0.001	0.008	0.005
	Muslim	0.11	0.003	0.04	0.2
Type of place of residence	No religion	0.11	0.016	0.1	0.001
	Urban	—	—	—	—
Age	Rural	0.18	<0.001	-0.05	0.061
	15-19	—	—	—	—
	20-24	1.4	<0.001	1.5	<0.001
	25-29	2.1	<0.001	2.3	<0.001
	30-34	2.5	<0.001	2.6	<0.001
	35-39	2.7	<0.001	2.9	<0.001
Region of residence	40-49	2.9	<0.001	3.1	<0.001
	Lome	—	—	—	—
	Maritimes	0.08	0.002	-0.04	0.2
	Plateaux	0.11	0.001	0.03	0.3
	Centrale	0.11	<0.001	0.05	0.092
	Kara	0.18	<0.001	0.07	0.034
	Savanes	NM	NM	0.11	<0.001
Wealth	Richer	—	—	—	—
	Poorer	—	—	0.49	<0.001
	Poor	—	—	0.45	<0.001
	Middle	—	—	0.4	<0.001
	Rich	—	—	0.2	<0.001
Marital status	Monogamous	—	—	—	—
	Polygamous	-0.04	0.051	-0.05	<0.001
Religion – education interaction	Not in union	-0.57	<0.001	-0.55	<0.001
	Primary * Traditional	-0.08	0.2	0.03	0.4
	Secondary Higher * Traditional	-0.05	0.8	0.18	0.024
	Primary * Muslim	0.08	0.3	0	>0.9
	Secondary Higher * Muslim	-0.1	0.6	0.05	0.4
	Primary * No religion	-0.24	0.039	0.01	0.9
	Secondary Higher * No religion	0.01	>0.9	0.01	0.9
	P-value (Type III)		0.2		0.4

Zimbabwe

Characteristic	Modality	1994		2015	
		Beta	p-value	Beta	p-value
Education	No education	—	—	—	—
	Primary	-0.08	0.19	-0.06	0.15
	Secondary	-0.42	<0.001	-0.24	<0.001
	Higher	-0.87	<0.001	-0.53	<0.001
Religion	Christian	—	—	—	—
	Traditional	-0.03	0.5	0.35	<0.001
Type of place of residence	No religion	NM	NM	0.01	0.9
	Urban	—	—	—	—
Age	Rural	0.14	0.006	0.2	0.5
	15-19	—	—	—	—
	20-24	1.8	<0.001	1.7	<0.001
	25-29	2.5	<0.001	2.3	<0.001
	30-34	2.9	<0.001	2.6	<0.001
	35-39	3.1	<0.001	2.8	<0.001
Region of residence	40-49	3.3	<0.001	2.9	<0.001
	Manicaland	—	—	—	—
	Bulawayo	-0.06	0.4	-0.07	0.056
	Mashonaland central	-0.05	0.2	-0.07	0.036
	Mashonaland east	-0.01	0.8	-0.01	0.7
	Mashonaland north	0.02	0.6	0	>0.9
	Mashonaland south Masvingo	0	>0.9	-0.08	0.008
	Mashonaland west	0.01	0.9	-0.06	0.1
	Midlands	0.04	0.4	-0.01	0.8
	Harare	-0.03	0.7	-0.06	0.11
Wealth	Richer	—	—	—	—
	Poorer	—	—	0.37	<0.001
	Poor	—	—	0.29	<0.001

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Characteristic	Modality	1994		2015	
		Beta	p-value	Beta	p-value
Marital status	Middle	—	—	0.24	<0.001
	Rich	—	—	0.14	<0.001
	Monogamous	—	—	—	—
	Polygamous	−0.01	0.7	0.12	<0.001
Religion – education interaction	Not in union	−0.39	<0.001	−0.41	<0.001
	Primary * Traditional	0.04	0.4	−0.3	0.017
	Secondary * Traditional	0.11	0.03	−0.33	0.019
	Higher * Traditional	0.04	0.9	−0.11	0.7
	Primary * No religion	NM	NM	0.03	0.8
	Secondary * No religion	NM	NM	0.04	0.7
	Higher * No religion	NM	NM	−0.26	0.2
	P-value (Type III)		0.14		0.14

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