

# The Long-Term Effects of Christian Missions on Family Formation in sub-Saharan Africa

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**Abstract:** This paper uses early 20<sup>th</sup> century missions to estimate the long-term effects of shocks to human and social capital on contemporary family formation in sub-Saharan Africa. I find that women who live in closer proximity to a Protestant or Catholic mission desire smaller families, have fewer children, and exercise greater autonomy over their family planning. Additionally, this paper investigates various pathways through which missions effect these contemporary outcomes. I find evidence of a long-term persistence of educational attainment, but find no evidence supporting health or religious pathways.

# 1. Introduction

From the 16th to the early 20th century, Christian missionaries settled across sub-Saharan Africa in an effort to spread Christianity. As part of the conversion strategy, missionaries invested in various forms of human and social capital, which impacted the religious, cultural and economic conditions of the areas they settled in. The most notable investment was the construction of schools to increase literacy and encourage the reading of religious texts. Missions also provided healthcare, built health facilities, and were the first to bring modern medicine to the continent. Other investments include the introduction of the printing press and newspapers, changes to political and social organization, and greater inclusivity. Due to these contributions, Christian missions have been used to study long-term effects of historical shocks to human and social capital on present-day economic, political, and cultural development.

Two cultural outcomes that are particularly relevant for sub-Saharan Africa are fertility and family planning. Though steadily decreasing since the 1970s, Africa has higher and more resilient fertility rates than any other continent (World Bank, 2016). There is a positive association between poverty and fertility, and population growth and a high dependency ratio continue to limit social and economic development. Despite marginal progress, family planning methods are not meeting the needs of African women (Cleland, Nudugwa, and Zulu, 2011), and limitations to contraception access continue to disadvantage women of lower socioeconomic status (Creanga et al., 2011). Moreover, inequality and gendered social roles have consequences for the fertility decision, which is made between women, their husbands, and other family members.

This paper attempts to identify a link between historical Christian missionary involvement and present-day family formation in sub-Saharan Africa. I use historical Catholic and Protestant mission data to determine the long-term effects of mission activities on contemporary fertility, ideal family size, contraception use, and female empowerment. I find that historical missionary influence has implications for family formation in the present, as women living in areas with greater exposure to early 20<sup>th</sup> century missions not only desire smaller families, but ultimately have fewer children.

Using individual survey data from 31 sub-Saharan African countries and missionary data from Roome's 1925 *Ethnographic survey of Africa. Showing the tribes and languages; Also the Stations of Missionary Societies*, I measure the distance from survey respondents to the nearest historical Catholic and Protestant mission to create my key explanatory variable. It is possible that the timing of mission presence in sub-Saharan Africa allows for a study of the effect of exogenous shocks to human and social capital on contemporary outcomes. There are, however, concerns of endogenous selection of missions into areas with more favorable geography and/or pre-colonial characteristics. To address this, I follow Cage and Rueda (2016) and restrict the sample to only respondents that live near the missions.

One of the most significant contributions made by Christian missionaries was the construction of schools. At the time, missions were the primary providers of education. Given the negative relationship between educational attainment and fertility, I examine education as a possible pathway through which missions affect family formation in the present. This paper discusses outcomes specifically through this pathway, though it is possible that others exist given the variety of investments made by missions. My reduced-form estimate finds that proximity to historical mission locations is associated with higher educational attainment in the present for both Protestant and Catholic mission locations.

Consistent with the increase in schooling, I find that women living near Protestant and Catholic missions both desire and ultimately have fewer children. A one standard deviation increase in proximity to a Protestant mission is associated with desiring 0.15 fewer children, and a decrease in total fertility by 0.12 children in the present. Catholic missions have a comparable effect: a one standard deviation increase in proximity to a Catholic mission is associated with desiring and having 0.13 fewer children.

Two additional factors that potentially influence family size are a woman's use of contraception and her empowerment. Women who are more knowledgeable about contraception and have a greater say in the fertility decision may have fewer children. I find that women living near historical mission locations are more likely to use contraception, and find that this effect is larger for women living in closer proximity to a Protestant mission. There is also evidence of long-term mission effects on female empowerment, though the magnitude is small. Living near a Protestant mission shows some indication of greater autonomy and decision making, but living near a Catholic mission is surprisingly associated with lower female empowerment measures, specifically regarding the likelihood of women having a say in how to spend money.

The findings in this paper are consistent with much of the existing literature on Christian missions—namely that missions have beneficial long-term effects on contemporary cultural, political, and social conditions. By looking at family formation, I contribute to a section of this literature concerning the determinants of women's well-being and autonomy, and the characteristics of modern families in sub-Saharan Africa.

## **2. Literature Review**

This paper fits into a large body of literature on the long-term determinants of development. It is a relatively new area of study, with the first major contributions starting just a couple decades ago (Acemoglu et al., 2001; Engerman and Sokoloff, 1997, 2002; Glaeser and Sheifer, 2002). This earlier work identified correlations between historical events related to colonization and contemporary economic growth and institutional development. As summarized by Nunn (2014), the literature has evolved significantly in recent

years. New data and methodologies allow for better identification of a causal link between historical events and present-day development measures, and the specific pathways through which these effects persist.

Among this newer literature is a section of research focused on the relationship between religious missionaries and contemporary religious, cultural, and economic outcomes. Missions with various religious affiliations settled across the globe making human and social capital investments as part of their conversion strategies. Some of the most influential were Christian missions from Europe, which settled in Africa, Asia and the Americas. The empirical evidence documenting the long-lasting effects of their early investments is extensive, and finds that the shocks to human capital affect nearly every aspect of modern development.

Given the extent of schooling investments made by missions, one of the most investigated outcomes is the persistence of educational attainment. Gallego and Woodberry (2010) and Nunn (2014) identify a long-run positive impact of missions on schooling. Both studies find Protestant missions have a more persistent effect—this is true overall in the case of Gallego and Woodberry (2010), and specifically for females in Nunn (2014). A greater effect of Protestant missions is also confirmed by Barro and McCleary (2017), who look education investment differences between Mainline Protestant schools, Other Protestant schools and Catholic schools in Guatemala, and find that Protestant schools have greater consequences for literacy than Catholic schools. Caicedo (2018) looks at missions founded by the Jesuit order in modern-day Argentina, Brazil, and Paraguay. He finds that higher educational attainment today can be attributed to the missions—250 years after the initial schooling investments were made.

The increase in educational attainment and other human capital measures is often looked at in relation to economic development. Caicedo (2018) finds that living closer to a Jesuit mission district is associated with higher incomes. Specifically, a 100 km increase in proximity to a mission district decreases poverty by 10% (as measured by an unsatisfied basic needs index). In Benin, Wantchekon et al. (2015) find that missions' human capital investments have long-term positive effects on living standards. Those living near the initial school locations and their decedents have greater educational attainment, are more politically active, and are less likely to work in the agricultural sector. Finally, Becker and Woessmann (2009) revisit the claim made by Weber (2001) that the economic development of areas with historical Protestant mission involvement is due to the Protestant work ethic. The original theory was based on the Protestant belief that hard work is a requirement set by God, and that unnecessary spending is sinful. Looking at late 19<sup>th</sup> century Prussia, Becker and Woessmann (2009) measure the consequences of Protestantism for human capital as an alternative to the work ethic theory. They find that through teaching people how to read religious texts, Protestants increased the amount and quality of education for the local population, and link literacy with greater economic prosperity.

An additional focus within the literature is the effect of missions on contemporary political outcomes. The relationship between missions and political institutions is looked at both across countries

and at the sub-national level. Two influential papers from Woodberry (2004, 2012) document the correlation between Protestant missions' investments in education and the development of civil society, which contributed to the development of democracy in countries across the globe. In looking at India, Lankina and Getachew (2012) find that Christian missions directly influenced the emergence of democracy. The human capital investments increased social inclusivity and, consistent with Woodberry (2012), promoted organization and social reform. Finally, Cage and Rueda (2016) identify an increase in civic culture indicators (e.g., trust and newspaper readership) in sub-Saharan Africa that are attributable to the printing press initially introduced by Protestant missions.

Finally, there is evidence suggesting missions are particularly consequential for women and families. Both Becker and Woessmann (2015) and Nunn (2014) find gendered differences in long-term educational effects, with women benefiting more from the Protestant schooling investments. Salhausen (2014) finds that for women born between 1880 and 1945 in Uganda, Protestant missions were a source of empowerment, as they increased literacy and provided paid employment opportunities. This resulted in a postponement of marriage and changes in husbands' characteristics, such as a smaller age gap. Finally, with respect to marriage and family structure, Fenske (2015) finds that missions are associated with a reduction in polygamous relationships. The practice of polygamy is negatively correlated with female empowerment indicators, and given the corresponding increases in educational attainment, missions appear to improve women's well-being in the present day through human capital investments.

This paper makes its contribution by determining the long-term impact of mission activities on female autonomy with respect to their husbands and their own reproduction. Specifically, this paper builds on the findings of Fenske (2015) by determining whether these effects have subsequent consequences for family structure and size in sub-Saharan Africa.

### **3. Data**

The data come from the individual women's survey from the Demographic and Health Surveys (DHSs) for 31 sub-Saharan African countries. A total of 74 surveys are collected from 1986–2017. The individual women's survey contains information on demographic and health characteristics for female respondents in each country. This includes age, type of residence, religion, and years of schooling, as well as birth and reproductive activity history. Responses for women aged 15 to 49, born between 1950 and 1990 are included in the sample. Additionally, latitude and longitude coordinates are reported for respondents' survey clusters, and are used to determine proximity to Christian missions.

Information on the locations of Christian missions in Africa comes from Roome's 1925 *Ethnographic survey of Africa. Showing the tribes and languages; Also the Stations of Missionary Societies*, which was digitized and used by Nunn (2014). The map is taken from Nunn's website and contains the

latitude and longitude coordinates of 361 Catholic and 932 Protestant missions in 1925. To determine a location's historical exposure to Christian missions, distance from the missions' locations and the respondents' survey clusters are calculated with the coordinates in ArcGIS. Distances are measured in kilometers using the African Equidistant Conic coordinate projection system. The distance variable is calculated separately for Catholic and Protestant missions, as there is evidence suggesting long-term effects of missions differ depending on denomination (Gallego and Woodberry, 2010).

Additionally, geography and historical controls are included to account for the determinants of mission locations. At the cluster level, the geography variables include suitability for agriculture, precipitation, and elevation, which come from the GREG shapefiles from the World Map, International Conflict Research; the potential yield of low intensity rain-fed wheat, which comes from the Climate Research Unit, University of East Anglia; and distance from a major river, which comes from The World Bank Data Catalog. Absolute latitude and distance from the coast are calculated using ArcGIS. At the country level, geography variables include minimum rain and lowest temperature, which come from Nunn (2008); ruggedness, land area, and soil quality, which come from Nunn (2012); and a malaria index from Fenske (2015). For historical variables, pre-colonial population and slave export data come from Nunn (2008). Distance from a European explorer route are calculated in ArcGIS using shapefile data from Nunn (2011).

Summary statistics on the individual level controls, Christian missions, and outcome variables are reported in Table 1. Summary statistics for all geography and pre-colonial variables are included in the Appendix (Table A.1).

**Table 1: Summary Statistics**

	Mean	s.d.	Min.	Max.	N
<u>Individual</u>					
Age	31.2	8.69	15	49	408,100
Years of schooling	5.22	4.61	0	26	352,384
Urban	0.36	0.48	0	1	405,048
Year of birth	1977	8.87	1950	1990	408,100
Religion: Catholic	0.35	0.48	0	1	359,903
Religion: Protestant	0.36	0.48	0	1	359,903
Religion: Christian	0.71	0.45	0	1	359,903
<u>Missions</u>					
Ln distance to any mission	2.93	1.13	-2.19	4.60	408,100
Ln distance to Catholic mission	3.85	1.26	-1.97	7.11	408,100
Ln distance to Protestant mission	3.23	1.16	-2.19	6.14	408,100
<u>Fertility and Contraception</u>					
Desired number of children	4.66	2.26	0	20	376,984
Total children born	3.33	2.72	0	18	408,100
Ever used contraception	0.48	0.50	0	1	209,337
Currently using contraception	0.26	0.44	0	1	384,241
Use of modern contraception	0.24	0.43	0	1	398,898
<u>Female Empowerment</u>					
Final say in own healthcare	0.63	0.48	0	1	262,006
Final say in visiting relatives	0.65	0.48	0	1	282,188
Final say in household purchases	0.53	0.50	0	1	282,160
Final say in spending husband's earnings	0.53	0.50	0	1	198,145
<u>Labor Market Participation</u>					
Currently employed	0.73	0.45	0	1	376,577
Self employed	0.71	0.45	0	1	281,676
Employed in last 12 months	0.73	0.45	0	1	376,577
Wealth	0	1	-8.16	25.9	367,602
<u>Health Access</u>					
Visited health facility in last 12 months	0.53	0.50	0	1	372,777
Antenatal visit during pregnancy	0.93	0.26	0	1	223,704

There are 408,100 women ages 15–49 that live within 100 km of a historical mission location. The average age and year of birth is 31 and 1977. Approximately 36 percent of women in the sample reside in an urban area. The average years of schooling completed is 5.2 years.

Women in this sample have an average of 3.3 children. There are limitations to contraception access in sub-Saharan Africa, which reflects in the relative low usage in the summary statistics. Only 24

percent of women use a modern form of contraception, and 48 percent have ever used any form of contraception. The female empowerment measurements used in this paper are whether the woman has a final say in various decision she makes with her husband or another party. Of the women included in this sample, 57 percent have a final say with respect to their healthcare, 61 percent have a say regarding visits to relatives, 50 percent have a say in large household purchases, and 48 percent participate in deciding how to spend their husband's income. Approximately half of the women visited a health facility in the last year, and 93 percent had at least one antenatal visit for their pregnancy. Finally, 73 percent of women are currently employed, and a large percentage of women identify as self-employed.

## 4. Empirical Methodology

This paper uses a reduced form estimation to determine the effect of historical missionary activity on present-day education, desired family size, fertility, contraception use and female empowerment. I estimate the equation:

$$S_{ij} = \alpha + \beta \ln(\text{Distance}_j) + \gamma X_{ij} + \varepsilon_{ij} \quad (1)$$

The dependent variable  $S_{ij}$  is the outcome of interest for woman  $i$  in cluster  $j$ .  $\text{Distance}_j$  is the distance from the women's survey cluster to the closest Catholic or Protestant mission. The coefficient of interest,  $\beta$ , captures the effect of the survey cluster's distance from the mission location in 1925 on the dependent variable for women  $i$  in the present day.  $X_{ij}$  is a vector for individual, geography and historical controls. Individual controls include the women's year of birth, the women's age and its square, and type of residence. Geographic controls include absolute latitude, distance from the coast, suitability for agriculture, precipitation, elevation, malaria, potential yields for low-intensity rain-fed wheat, minimum precipitation, maximum humidity, low temperature, ruggedness, land area, soil quality, and distance from a major river. Historical controls include distance to a European explorer route, slave exports and export area, and the log of population density in 1400.

### 4.1 Sources of Bias

The use of Christian missions to study long-term effects of human and social capital is an area of increasing interest. As more attention is paid to early mission activities, there is an increasing concern of a possible endogeneity problem of Christian mission location and expansion. This problem arises from mission selection into favorable locations, and the subsequent investments made based on these preferable conditions. This could potentially overestimate the effect of missions on contemporary outcomes if the missions capture the effect of omitted variables that are long-term determinants of these outcomes.



There are a variety of strategies used in the literature to account for the potential issue of endogenous selection of mission location and investments. In looking at several South American countries, Caicedo (2018) is able to determine a long-term effect of Jesuit missions with two empirical tests. First, he compares Jesuit missions that were abandoned with those that remained in a placebo-type test. Finding no evidence of long-term effects from abandoned missions, the area of settlement seems inconsequential for contemporary development. Second, he compares Jesuit missions to near-by Franciscan Guarani missions, which placed less emphasis on education in the conversion process. Once again he finds an effect only for Jesuit missions, which suggests it was the human capital investments that were most important. In Benin, Wantchekon et al. (2015) also uses two strategies. First, villages with missions are compared to nearby villages without missions to minimize variation in geography. Second, they look at areas where schools were established prior to the arrival of European colonizers to better isolate the human capital investments. Cage and Rueda (2016) use a matching strategy to not only isolate the effect of the missions, but to isolate the specific investments. By comparing missions with and without printing presses, they are able to find the long-term effect of this investment on civic culture and other social outcomes.

Many other papers have focused on the inclusion of control variables, particularly geography and pre-colonial characteristics, but also some contemporary outcomes such as the persistence of religion (Fenske, 2015; Nunn 2010, 2014; Woodberry, 2012). This was most notably done by Jedwab et al., (2018) who builds an extensive list of control variables in an attempt to determine the extent of the endogeneity problem.

This paper follows the strategy of the latter group and includes several geography and historical controls that could be determinants of both where the missions located and present-day development. Additionally, all results use a sample consisting of individuals that live within 100 km from a mission location. Since missions located in favorable areas, this reduces the likelihood of an omitted variable, as locations surrounding missions should theoretically share many of the same characteristics.

## **5. Results**

This section documents the long-term effects of Christian missions on contemporary family formation. The effects of missions are looked at with respect to a possible education pathway, as this is the most theoretically plausible. Following this section, I address outstanding concerns regarding the use of Christian missions as a source of exogenous variation.

### 5.1.1 Effect of Mission Activity on Education

First I estimate the effect of past Catholic and Protestant missions on present-day educational attainment. Years of schooling is a relevant outcome when looking at family formation for two reasons. First, given the early investments in education and literacy, there could be long-term effects through the persistence of educational values and/or the persistence of schooling infrastructure. Second, theory and empirical evidence suggest a negative correlation between educational attainment and fertility (Ainsworth et al., 1996; Schultz, 1994). Therefore, education is a possible pathway through which missions affect family formation in the present.

**Table 2:** Effect of mission activity on present-day education

Dependent Variable: Years of Schooling		
	(1)	(2)
Ln distance to any mission	-0.422***	
S.E.	(0.023)	
Ln distance to Catholic mission		-0.124***
S.E.		(0.023)
Ln distance to Protestant mission		-0.375***
S.E.		(0.023)
N	266,475	266,475

Standard errors are clustered by survey cluster  
 Sample includes women born between 1950 and 1990 from the 1986–2017 DHS that live within 100 km of a Christian mission  
 \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

The results in Table 2 show that closer proximity to any mission is associated with more years of schooling. A one standard deviation increase in proximity to a Protestant mission is associated with an increase in schooling of 0.44 years. This effect is less for Catholic missions: a one standard deviation increase in proximity to a Catholic mission is associated with a 0.16 year increase in schooling in the present day. This suggests that the activities and investments of missions have long-term consequences, and those living near the location of these initial investments still benefit from them today. Additionally, the different long-term effects of Protestant and Catholic missions on educational attainment are consistent with the Protestant denomination valuing and investing more in education and literacy than their Catholic counterparts.

### 5.1.2 Effect of Mission Activity on Fertility and Ideal Family Size

The main finding of this paper focuses on the effect of historical mission activity on contemporary fertility and the ideal family size. First, I look at the correlation between proximity to historical mission

locations and women’s desired number of children. Then I identify a similar correlation with the total number of children born per woman.

**Table 3:** Effect of mission activity on desired number of children in the present day

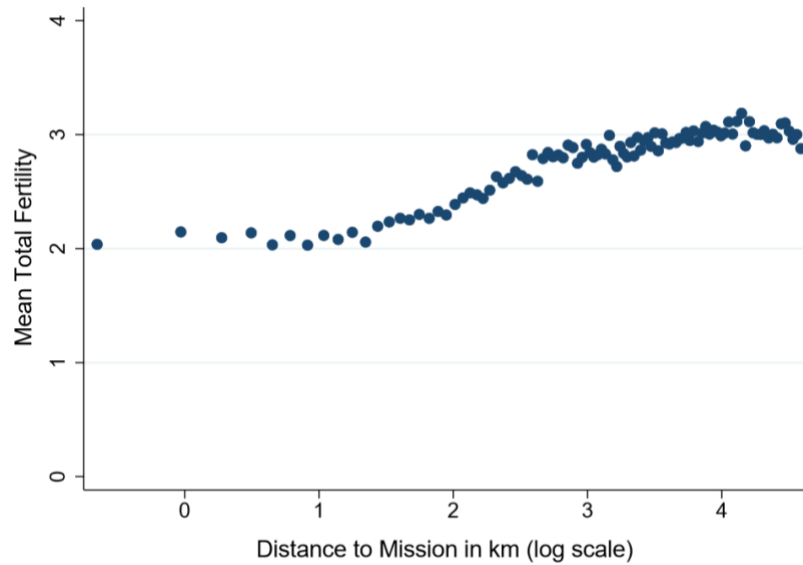
Dependent Variable: Desired Number of Children		
	(1)	(2)
Ln distance to any mission	0.164***	
S.E.	(0.083)	
Ln distance to Catholic mission		0.105***
S.E.		(0.008)
Ln distance to Protestant mission		0.130***
S.E.		(0.008)
N	287,247	287,247

Standard errors are clustered by survey cluster  
 Sample includes women born between 1950 and 1990 from the 1986–2017 DHS that live within 100 km of a Christian mission  
 \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

The results in Table 3 indicate that living closer to a historical mission location is associated with preferring fewer children in the present. A one standard deviation increase in proximity to a historical Protestant mission is associated with desiring 0.15 fewer children in the present day. A one standard deviation increase in proximity to a Catholic mission is associated with desiring 0.13 fewer children. This finding is consistent with the “quality-quantity trade-off” theory, in which more educated parents may want to invest more in their children, and therefore desire fewer of them (Becker, 1960).

To determine if the desire for a smaller family size corresponds with a reduction in total fertility, I estimate the effect of historical mission activity on the number of children born per woman in the present. Figure 1 shows the raw correlation between distance from a mission and total fertility in the present. Living farther from a mission location is associated with higher fertility rates.

**Figure 1:** Correlation between distance to a mission and total fertility



Includes women living within 100 km of a mission

There are two broad pathways through which mission activities could affect fertility outcomes. The first is through the long-term effects of early investments in human and social capital, which are expected to have a negative correlation with fertility. The second is through the persistence of religion. If religion is a pathway through which missions effect contemporary outcomes, then given Christian attitudes toward reproductive practices and using contraception to prevent pregnancy, the consequences for fertility would likely be in the opposite direction of the human and social capital investments.

**Table 4:** Effect of mission activity on present-day fertility

Dependent Variable: Fertility		
	(1)	(2)
Ln distance to any mission	0.136***	
S.E.	(0.007)	
Ln distance to Catholic mission		0.099***
S.E.		(0.007)
Ln distance to Protestant mission		0.101***
S.E.		(0.007)
N	314,799	314,799

Standard errors are clustered by survey cluster

Sample includes women born between 1950 and 1990 from the 1986–2017 DHS that live within 100 km of a Christian mission

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

The results in Table 4 show a negative correlation between missionary activity and present-day fertility for both Catholic and Protestant missions. Therefore, if Christian values have real consequences

for reproductive practices, this finding indicates a stronger long-term effect of human and social capital investments.

A one standard deviation increase in proximity to a historical Protestant mission is associated with 0.12 fewer children born today per woman. Similarly, a one standard deviation increase in proximity to a Catholic mission is associated with 0.13 fewer children born per woman. The larger coefficient on the Catholic mission distance is unexpected, as it is inconsistent with the findings in Section 5.1.1. Moreover, it appears that women living near a Catholic mission are better able to achieve their ideal family size than women who live near a Protestant mission. Considering evidence of Protestants' greater investments in human capital, and a larger correlation with present-day educational attainment, this potentially complicates education as the most significant pathway through which missions have an effect on contemporary family formation.

To investigate this finding, I look at contemporary education and fertility outcomes for Christian and non-Christian women separately. I find that the long-term effect of living near a Catholic mission on both education and fertility is only present and of a considerable magnitude for Christian women (Appendix Table A.2 and A.3). For non-Christian women, living near a Catholic mission is associated with less schooling, and a minor change to total fertility. This is not the case for Protestant missions—living near a historical Protestant mission is associated with more years of schooling and lower fertility for both Christian and non-Christian women.

While this doesn't fully explain the results in column (1) and (2), it does provide some helpful takeaways for long-term mission effects. First, this suggests that Catholic missions do have a considerable long-term effect on educational attainment, though the provision of education by Catholics may have been more exclusionary as the effect persists only for Christian women.<sup>1</sup> Second, the finding that schooling increases for Christian women and decreases for non-Christian women provides evidence of an education pathway, as the women who receive additional years of schooling have a greater reduction in fertility. However, it does not explain the difference in magnitude between the Protestant and Catholic fertility outcomes. If changes in fertility are purely explained by education, living near a Protestant mission should have a larger effect on fertility. This leaves open the possibility of other pathways determining present-day fertility outcomes. It also makes omitted variable bias more likely. Both of these concerns are discussed in more detail in Section 5.2.

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<sup>1</sup> This is consistent with a greater persistence of Christianity around areas with historical Catholic missions (Appendix Table A.4)

### 5.1.3 Effect of Mission Activity on Contraception Use

To further investigate the effects of early mission activities on present-day family formation, I estimate the effect of historical mission exposure on women’s contraception use. If women are better able to make family planning decisions due to better access and knowledge of contraception, they can delay or prevent pregnancy to better achieve their ideal family size. The three contraception outcomes of interest are whether the woman currently uses any form of contraception, whether she has ever used any form of contraception, and if she uses a modern method.

**Table 5:** Effect of mission activity on present-day contraception use

Dependent Variable:	Currently using		Ever used		Use modern method	
	(1)	(2)	(3)	(4)	(5)	(6)
Ln distance to any mission	-0.016***		-0.028***		-0.014***	
S.E.	(0.001)		(0.002)		(0.001)	
Ln distance to Catholic mission		-0.003**		-0.010***		-0.004***
S.E.		(0.001)		(0.003)		(0.001)
Ln distance to Protestant mission		-0.013***		-0.024***		-0.012***
S.E.		(0.001)		(0.002)		(0.001)
N	296,804	296,804	172,564	172,564	305,569	305,569

Standard errors are clustered by survey cluster

Sample includes women born between 1950 and 1990 from the 1986–2017 DHS that live within 100 km from a Christian mission

\*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

Both Catholic and Protestant missions are associated with an increased likelihood of using contraception in the present day. A one standard deviation increase in proximity to a Protestant mission is associated with a two percentage point increase in likelihood of currently using contraception, a three percentage point increase in the probability of ever having used contraception, and a one percentage point increase in likelihood of using a modern method. For Catholic missions, a one standard deviation increase in proximity is associated with an increase in the likelihood of ever having used contraception and using a modern method by roughly one percentage point. The greater likelihood of using contraception when living near a Protestant mission distance is consistent with the results in Section 5.1.1. Higher levels of schooling could allow women to better obtain and properly use contraception, especially modern methods.

### 5.1.4 Effect of Mission Activity on Female Empowerment

The final outcome of interest is female empowerment. Women typically want fewer children than their husbands, which means more empowerment and greater decision making ability could result in smaller family sizes. To determine the long-term impact of past missionary activities on present-day female empowerment, I use several variables that measure a woman’s say in household decisions relative to her

husband. The four variables measure a woman’s final say in her own healthcare, visiting relatives, large household purchases, and how to spend her husband’s income.

**Table 6:** Effect of mission activity on present-day female empowerment

Dependent Variable: Final Say In	Own Healthcare		Visiting Relatives		Large Household Purchases		Spending Husband’s Earnings	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance to any mission	-0.007***		-0.007***		-0.005***		-0.006***	
S.E.	(0.002)		(0.002)		(0.002)		(0.002)	
Ln distance to Catholic Mission		0.001		-0.006***		0.005*		0.006***
S.E.		(0.002)		(0.002)		(0.002)		(0.002)
Ln distance to Protestant Mission		-0.009***		-0.006***		-0.008**		-0.009***
S.E.		(0.002)		(0.002)		(0.002)		(0.002)
N	197,350	197,350	213,033	213,033	212,915	212,915	149,814	149,814

Standard errors are clustered by survey cluster

Sample includes women born between 1950 and 1990 from the 1986–2017 DHS that live within 100 km of a Christian mission

\*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

There is a weaker and less consistent correlation between Catholic and Protestant mission locations and present-day female empowerment. A one standard deviation increase in proximity to a Protestant mission is associated with a roughly one percentage point increase in likelihood of having a final say in one’s own healthcare, visiting relatives, making large household purchases and deciding how to spend the husband’s earnings. A one standard deviation increase in proximity to a Catholic mission is associated with approximately a one percentage point increase in the likelihood of having a final say in visiting relatives, and surprisingly, a roughly one percentage point decrease in both the likelihood of making large household purchases and deciding how to spend husbands’ earnings. In other words, women who live in areas with a history of Catholic mission presence are less empowered with respect to how they spend money. However, even though these findings are statistically significant, the magnitude is quite small, which suggests mission activities do not have meaningful consequences for modern female empowerment.

## 5.2 Results Discussion

There are several concerns with using Christian missions as a source of exogenous variation to measure the long-term effects of religion and human capital shocks on contemporary outcomes. Recent findings suggest the endogeneity of mission locations and expansion is greater than previously considered and, therefore, the effect of missions on present-day outcomes is overestimated (Jedwab et al. 2018). Section 5.2.1 and 5.2.2 address concerns regarding the source of mission data and potential omitted variable bias, and how these two may interact to inflate the long-term effects of missions. Section 5.2.3 attempts to

add some clarity to an additional limitation of this study regarding the identification of the different pathways through which missions have a long-term effect.

### **5.2.1 Measurement Error**

An important finding by Jedwab et al. (2018) is the endogenous measurement error created when relying on atlases to locate historical missions. Studies on the long-term effects of missionary activity consistently rely on one of two atlases: Beach (1903) and Roome (1925). These atlases underreport the number of missions by approximately 93 and 98 percent, and document missions that were considered “better” with respect to location, geography, and pre-colonial development (Jedwab et al. 2018). This is particularly true for the Roome (1925) atlas used in this study. Jedwab et al. (2018) find that the data in Roome (1925) documents the location of earlier missions and does not account for mission expansion during the period 1900–1925. Furthermore, the missions recorded were those with greater investments (e.g., mission stations and schools). Since earlier missions were located in better areas, it is probable that they selected these investments due to more favorable conditions. If the investments are correlated with location, missions cannot be used as a source of exogenous variation, and long-term mission effects are likely overestimated. To address this source of bias, a possible solution involves including geography and historical characteristics that can explain why missionaries chose to locate where they did. If the results hold after the addition of these controls, it increases the likelihood that we are observing the long-term effects of the missions themselves, rather than a case of path dependence.

The inclusion of these variables is also helpful in that it reduces omitted variable bias—a different but closely related concern of using missions. If there is an interaction between the omitted variable and the selection of mission location, this could inflate the upward bias on contemporary outcomes to an even greater degree.

### **5.2.2 Omitted Variable Bias**

Omitted variable bias is more frequently addressed in the literature on the long-term effects of Christian missions. Since economic factors such as safety, accessibility, development, and health played a significant role in where missionaries decided to locate, the favorable conditions could explain the long-term cultural outcomes identified in this paper rather than the activities of the missions themselves (Jedwab et al., 2018; Johnson, 1967; Nunn, 2010). This paper uses three strategies to determine the possibility and extent of omitted variable bias.



### *Control variables*

First, I include the likely determinants of mission locations that could be correlated with contemporary outcomes. I control for 14 geography and 4 historical variables, which is comparable to the studies of Nunn (2010, 2014), Cage and Rueda (2016), and Fenske (2015). I also include some of the variables from the more exhaustive list built by Jedwab et al. (2018). The results are robust to the inclusion of these controls, however, the number of variables is insufficient to rule out omitted variable bias.

An additional concern is that several of the geography and historical controls used in this paper are at the country level rather than the cluster level. These country-level controls do a poorer job at capturing the effect of geography and historical characteristics on present-day outcomes, as there is much within-country variation that is unaccounted for. The variables at the cluster level are mostly geography variables, such as distance from the coast and suitability for agriculture. The variables at the country level mostly fall into the category of potential historical determinants, such as pre-colonial population.

### *Sample size*

Another strategy is to limit the sample to only individuals that live within a close proximity to the missions. If Christian missions located in favorable areas, this restricts the sample to locations that share the same geography and historical characteristics, which reduces the likelihood that the missions are capturing the effect of some other long-term determinant. This paper uses this method, testing sample restrictions of 100, 40 and 20 km from missions (only 100 km included), and the results remain intact. Using this method does not, however, account for any endogenous selection into specific investments. If missions chose to invest in things like schooling or health facilities because they located in an advantageous area, I would be unable to prove or control for this given the data restrictions.

Narrowing the sample size is helpful in revisiting the unexpected fertility result in Section 5.1.2. Perhaps the coefficient on the Catholic mission is larger because it captures the effect of an omitted variable that is a long-term determinant of fertility. To test this, I further restrict the sample to respondents living 40 km and then 20 km from the nearest mission. The objective is to reduce the variation in geography and historical characteristics to better isolate the effect of the mission activities. Interestingly, the coefficients change only slightly in magnitude, and the Protestant distance coefficient remains larger than the Catholic distance coefficient (Appendix A.4). In light of these findings, it is less likely that an omitted variable explains the results in 5.1.2. If Protestant and Catholic missionaries settled in locations using the same criteria, the coefficients should remain proportional to the initial results with each additional restriction of

the sample size.<sup>2</sup> If the coefficients changed significantly that would be an indication that there was a bias coming from an omitted variable

### *Long-term economic development*

If missions settled in more favorable areas, this might be a case of path dependence as these areas were predestined to be more economically and socially developed. One way to test this is to look at present-day economic development outcomes such as labor market participation.

I find that women who live near a historical Catholic and Protestant missions are less likely to be currently employed, self-employed, or employed in the last 12 months (Appendix Table A.6). There is, however, a correlation between living closer to a mission and being wealthier. A one standard deviation increase in proximity to a Protestant mission is associated with a 0.12 standard deviation increase in wealth. Proximity to a Catholic mission has no effect on present-day economic prosperity. While there is a statistically significant correlation between Protestant missions and wealth, the magnitude is quite small and therefore does not undermine the labor market outcomes in columns (1)-(3). From this, less economic opportunity near mission locations seems to weaken the worry of path dependence and omitted variable bias. An additional takeaway is that the change in fertility and ideal family size cannot be attributed to increased labor market participation.

This result is somewhat surprising given several findings within the literature. In South America, Caicedo (2018) finds that poverty is lower near Jesuit mission districts, though specific labor market outcomes are not investigated. Wantchekon et al. (2014) finds that living standards are higher and there is a lower likelihood of being a farmer when living near a colonial school. Also notable are findings from Huillery (2009) who finds that French colonial public investments in school and health infrastructure are consequential for unequal economic performance in present-day West Africa.

Interestingly, the findings in this paper are more consistent with those of Jedwab et al. (2018). They use satellite night light data to measure economic prosperity in areas that received mission investments, and as a strategy to determine the size of omitted variable bias. Without any geography or historical control variables, the relationship between missions and satellite night lights is extremely strong. However, as each subsequent round of controls are added, the long-term effect of missions on economic development in sub-Saharan Africa become smaller, until they are almost inconsequential.<sup>3</sup> Specifically, they find that a one

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<sup>2</sup> This assumption is only true if Protestant and Catholic missions settled in locations using the same criteria for what constitutes a “good” area. There is some evidence suggesting this may not have been the case (Johnson 1967). However, differences seem marginal, and therefore, the assumption does not seem wildly unreasonable.

<sup>3</sup> The first set of controls are considered the standard controls in the literature, i.e., a merged list of the controls used by Nunn (2010) and Cage and Rueda (2016). The second set of controls are more extensive, and reflect a more thorough consideration of the determinants of mission location and expansion (Jedwab et al., 2018).

standard deviation increase in the dummy variable for mission presence increases log night lights by a 0.06 standard deviation. Perhaps the addition of more controls can partially explain why the economic outcomes identified in this paper differ from the findings in other literature.

### *Summary*

Overall, the evidence for the presence and extent of omitted variable bias is mixed. The control variables are imperfect and I cannot rule out the possibility of a missing geography or historical variable(s) that affects the fertility outcome. However, the findings regarding contemporary economic outcomes make omitted variable bias less likely as the areas surrounding mission do not seem more developed with respect to economic opportunity. Better economic conditions would be convincing evidence of path dependence, and the findings in this paper show little indication of this.

### **5.2.3 Channels**

If the results in this paper are in fact capturing the effects of the missions, the long-term effects on education, fertility, contraception, and empowerment could be the result of any number of pathways (e.g., religion, the construction of schools, health facilities) given the variety of investments made by missions. While I am unable to isolate specific investments within my empirical methodology, some clarity can be added to the existence of other pathways through a process of elimination. So far, evidence has been found for the persistence of education for both mission denominations, and a very small persistence of Christianity for Catholic missions. Additionally, economic opportunity has been ruled out as an explanation for changes in fertility. The most significant remaining pathway is the persistence of health infrastructure, which, in theory, is likely to influence many outcomes related to family formation, such as contraception use and total fertility.

I look at two variables to measure accessibility of healthcare.<sup>4</sup> The two variables are whether or not a woman visited a health facility in the last 12 months, and whether or not she had any antenatal visits for her pregnancy.

A one standard deviation increase in proximity to a Protestant missions is associated with a one percentage point increase in the likelihood of having visited a health facility in the last 12 months (Appendix Table A.7). For Catholic missions, the magnitude of the relationship is the same, however, it is in the opposite direction. Women living closer to a historical Catholic mission are less likely to visit health facilities. Similarly, a one standard deviation increase in proximity to a Protestant mission is

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<sup>4</sup> Ideally, more variables would have been included to measure the quality of healthcare in addition to accessibility. However, there were a limited number of health variables available over the majority of the 31 countries in the sample.

associated with an increase in the likelihood of having at least one antenatal visit for pregnancy by one percentage point. This same relationship is less than one percentage point for Catholic missions.

Though statistically significant, the magnitude of these outcomes is not meaningful. This suggests that health is an unlikely pathway through which missions effect family formation in the present. This makes it more likely that we are observing a change in family formation as a result of a long-term persistence in education. An important caveat is that there were only two outcome variables identified. A more definitive conclusion on the existence of this pathway would require a more thorough look at health outcomes.

## **6. Conclusion**

The findings in this paper document a link between missions from the early 20<sup>th</sup> century and contemporary family formation in sub-Saharan Africa. Using distance from a mission location as the treatment, I find that women who live near Protestant and Catholic missions both desire and have fewer children, and have more control over their family planning due to a higher usage of contraception.

Family formation is looked at in the context of educational attainment because this is the most theoretically plausible pathway. The outcomes are fairly consistent with the existence of an education pathway, though the findings in 5.1.2 remain partially unexplained. While this paper finds little evidence of the two other major channels of religion and health, some ambiguity remains. Therefore, this paper's contribution is limited to identifying a correlation between all of the mission activities and contemporary fertility, ideal family size, contraception use and female empowerment.

It is important to note that this limitation is not unique to this study. As the current literature stands, there are few successful efforts to isolate the causal relationship between a specific investment and a contemporary outcome. However, there's reason to be optimistic. If the trend noted by Nunn (2014) continues, and new data and methodologies become available, there will be a greater opportunity to isolate the specific investments and quantify their present-day impact for people living in countries across the globe. As these strategies develop, there will be more nuance to the story of historical development paths, and a better understanding as to why the past is so consequential for the present.

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## Appendix

**Table A.1:** Geography and Historical Controls Summary Statistics

	Mean	s.d.	Min.	Max.	N
<u>Geography</u>					
Absolute latitude	9.32	6.86	0.0003	34.3	408,100
Distance from coast	426,166	370,000	1.64	1,637,637	408,100
Distance from major river	3.48	2.86	0.0004	14.7	399,716
Elevation	811	666	-263	4,485	400,790
Land area	49,216	50,472	1,720	226,705	408,100
Low intensity rain-fed wheat	504	626	0	2,489	408,100
Malaria	0.33	0.16	0.03	0.63	325,217
Maximum humidity	71.4	11.2	35	95	408,100
Minimum rain	10.6	12.6	0	46	408,100
Minimum temperature	8.94	6.97	-5	19	408,100
Precipitation	2.64	1.48	0	8	399,688
Ruggedness	0.90	0.81	0.14	3.31	408,100
Soil quality	37.7	17.1	7.55	75.0	408,100
Suitability for agriculture	0.39	0.23	0	1	408,100
<u>Pre-colonial</u>					
Distance from European explorer route	220,911	281,173	0.23	1,434,337	408,100
Ln population density in 1400	0.88	1.16	-2.12	3.04	408,100
Ln export area	4.77	3.24	-2.30	8.82	408,100
Slave exports	388,923	600,831	0	2,021,759	408,100

**Table A.2:** Effect of mission activity on present-day education for Christian and non-Christian women

Dependent Variable: Years of Schooling		
	Not Christian (1)	Christian (2)
Ln distance to Catholic mission	0.069*	-0.167***
S.E.	(0.038)	(0.026)
Ln distance to Protestant mission	-0.415***	-0.367***
S.E.	(0.044)	(0.026)
N	72,778	161,712

Standard errors are clustered by survey cluster

Sample includes women born between 1950 and 1990 from the 1986–2017 DHS that live within 100 km of a Christian mission

\*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

**Table A.3:** Effect of mission activity on present-day fertility for Christian and non-Christian women

Dependent Variable: Fertility		
	Not Christian (1)	Christian (2)
Ln distance to Catholic mission	0.043***	0.115***
S.E.	(0.012)	(0.009)
Ln distance to Protestant mission	0.099***	0.105***
S.E.	(0.012)	(0.008)
N	87,659	194,032

Standard errors are clustered by survey cluster  
Sample includes women born between 1950 and 1990 from the 1986–2017 DHS that live within 100 km of a Christian mission  
\*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

**Appendix A.4:** Effect of mission activity on present-day religiosity

Dependent Variable: Christian religious affiliation	
	(1)
Ln distance to Catholic mission	-0.011***
S.E.	(0.002)
Ln distance to Protestant mission	0.007***
S.E.	(0.002)
N	281,619

Standard errors are clustered by survey cluster  
Sample includes women born between 1950 and 1990 from the 1986–2017 DHS that live within 100 km of a Christian mission  
\*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

**Table A.5:** Effect of mission activity on present-day fertility (restricted samples)

Dependent Variable: Fertility		
	Mission ≤ 40 km (1)	Mission ≤ 20 km (2)
Ln distance to Catholic mission	0.113***	0.102***
S.E.	(0.008)	(0.010)
Ln distance to Protestant mission	0.124***	0.128***
S.E.	(0.009)	(0.012)
N	210,018	131,738

Standard errors are clustered by survey cluster  
Sample includes women born between 1950 and 1990 from the 1986–2017 DHS that live within 100 km of a Christian mission  
\*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1



**Table A.6:** Effect of mission activity on present-day labor participation and economic well-being

Dependent Variable:	Currently Employed	Self Employed	Worked in Last 12 Months	Wealth
	(1)	(2)	(3)	(4)
Ln distance to Catholic Mission	0.011***	0.012***	0.011***	-0.006
S.E.	(0.002)	(0.002)	(0.002)	(0.009)
Ln distance to Protestant Mission	0.003*	0.010***	0.003*	-0.092***
S.E.	(0.002)	(0.002)	(0.002)	(0.009)
N	289,024	211,500	289,024	277,353

Standard errors are clustered by survey cluster

Sample includes women born between 1950 and 1990 from the 1986–2017 DHS that live within 100 km of a Christian mission

\*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1

**Table A.7:** Effect of mission activity on present-day healthcare access

Dependent Variable:	Visited health facility last 12 months	Antenatal visit for pregnancy
	(1)	(2)
Ln distance to Catholic mission	0.006***	-0.003**
S.E.	(0.002)	(0.001)
Ln distance to Protestant mission	-0.004***	-0.008***
S.E.	(0.002)	(0.001)
N	282,683	172,958

Standard errors are clustered by survey cluster

Sample includes women born between 1950 and 1990 from the 1986–2017 DHS that live within 100 km from a Christian mission

\*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1